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# LONG-TERM ECONOMIC GROWTH

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HEARINGS  
BEFORE THE  
JOINT ECONOMIC COMMITTEE  
CONGRESS OF THE UNITED STATES  
NINETY-FOURTH CONGRESS  
SECOND SESSION

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NOVEMBER 9, 10, 16, 17, 18, AND 19, 1976

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# LONG-TERM ECONOMIC GROWTH

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TUESDAY, NOVEMBER 9, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to notice, at 10 a.m., in room 324, Cannon House Office Building, Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representatives Bolling, Moorhead, Hamilton, Long, and Rousselot.

Also present: William A. Cox, Robert D. Hamrin, and Louis C. Krauthoff II, professional staff members; Michael J. Runde, administrative assistant; and Mark R. Policinski, minority professional staff member.

## OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative BOLLING. The committee will come to order.

Today's hearing marks the beginning of what I expect to be one of the most interesting and important set of hearings ever held by the Joint Economic Committee. I base such a statement on the fact that the overall questions we are addressing are certainly among the most critical ones facing America at this time: What are the long-term prospects for economic growth and what measures may be taken to assure that the United States moves toward, and hopefully along, the optimal growth path?

The Joint Economic Committee felt that these questions had to be addressed in a comprehensive fashion and deserved the serious attention of many of this country's leading thinkers. It was also believed that the question of economic growth is simply too complex and broad ranging to leave to the consideration of economists alone. Many diverse disciplines had to be represented. Finally, it was determined that the great differences of opinion which existed on the many various issues related to future U.S. economic growth should be presented in one forum where they could easily be compared. All of these were accomplished, and may I add, quite successfully, in the study series launched by the Joint Economic Committee in September 1975.

The 41 papers in this study series were written over the following 12 months. They constitute an excellent series of papers, for each author has addressed the specific questions that were sent to them. Thus, the papers complement, rather than duplicate each other.

The "coming alive" of these papers begins today. These hearings were called in order to bring together many of the authors in the study

series so that they, the other participants and the committee members may interact in a discussion concerning the principal conclusions and policy recommendations of the papers. The Joint Economic Committee hopes that these hearings will make clear exactly why there are such great differences of opinion and research results concerning future U.S. economic growth, what consensus does exist and how we may be able to move toward greater agreement in the future so that policy-makers will have a clearer picture of what actions need to be taken to achieve optimal growth.

Today and tomorrow we will be looking at the "big picture" on economic growth. In doing so we will examine some major new and innovative ideas on the basic forces that will affect future growth as well as the major forecasts of growth over the next decade. Of the eight papers being looked at, only four are by economists so the broad perspective as to what influences long-term growth prospects is well represented.

Before we start I am going to ask each witness to try to stay within the limit of 10 minutes and if possible, even less, so that we will have some time to have discussions among ourselves. It is very difficult, I know, for all of us to restrain ourselves when we have a great deal to say, but initially I think it would be helpful if we could stay within the 10-minute limit.

It is most appropriate that we start off this morning's session with Herman Kahn, director of the Hudson Institute, a man who has long been associated with predicting the future. Mr. Kahn is well known to all of us as the author of many books and articles on the future prospects, both economic and social, of our own society and the entire world. The title of his recent book, "Things To Come," expresses exactly the theme of our hearings. So it is a special pleasure to welcome him here as our leadoff participant.

**STATEMENT OF HERMAN KAHN, DIRECTOR, HUDSON INSTITUTE,  
INC., CROTON-ON-HUDSON, N.Y.**

Mr. KAHN. Actually I have published another book since then called "The Next 200 Years," a bicentennial book, really. It has more to do with images of growth in the future than with the next two centuries as such.

This book turned out to be quite surprising to us. When we started this project about 3 or 4 years ago we expected to have to say something to the effect that it is all right to have faith that future technology will be able to deal with all the problems of the future, but you cannot prove that you can do so until the time comes.

As of 1976 we feel that while we can't be sure about many problems which are obviously uncertain—like war or climate changes, we will be able to feed a world with a population of 15 or 20 billion.

Can you give them energy?

Yes.

Can you give them raw materials?

With some exceptions, yes.

And deal with pollution?

Pollution has two aspects. One is the clean air, clean water, and esthetic landscape problem. And the answer there seems to be yes.

When I say you can deal with it, that doesn't mean that it will happen. But this is a possibility.

On the other hand, pollution has unexpected aspects. You often do things you don't intend to do. If you don't know what you are doing, it is very hard to say you can deal with it, to put it mildly.

The second point, we believe that certain tendencies in American life, and probably worldwide, will bring technical and economic growth to the stagnation point. These tendencies have to do with the supply side of the house and the demand side of the house. Roughly speaking, you can make a pretty good case today, using UN data, that the world has already passed the maximum growth rate in population. And people talk of exponential growth. But it just isn't like that.

To go back to the topic of this committee, which is the next 10 years, I take it that we have no interest in zero economic growth starting in 1976. And in my own judgment the United States won't reach this point until the middle of the 21st century, in the natural course of events.

I do think that, roughly speaking, the physical conditions that are available for a 5 percent U.S. economic growth rate annually between now and 1986; this year the economy should produce about one and two-thirds trillion dollars worth of goods and services. A 6 percent increase would result in a GNP of two and two-thirds billion dollars, by the end of the decade. That is an impressive change in the American standard of living.

I have a personal belief, not shared by the other members of the Hudson Institute, that when the median income reaches about \$20,000 per capita, you are going to find a very big change in the system. More than half of the people will be more or less satisfied. In other words, a lot of Americans today want to live in suburbia, they need two cars, and they want to pay \$3,000 a year school taxes and send a couple of kids to college. You can't do it with the present median income now of \$14,000. You can with 20,000. This makes a big difference. And my own guess is that economic growth drops very rapidly from that point on.

Now, looking at these things, we have an oversimplified model, which I think is terribly useful, but terribly dangerous, because it has been abused. In this study you use values and priorities. Our basic model is something like the following: We take one model that we call the square American: Achievement oriented, work oriented, patriotic, tradition oriented, reasonably respectful of authority, and so on. What people call the middle class. And that represents, we believe, a little less than two-thirds of the country, roughly. We take what we call the "new class." Now, the new class are people who basically come from upper middle class origins. And they tend to make their living by having academic knowledge, they are articulate, with literary and esthetic skills rather than entrepreneurial, business or manual skills. Most people in this room would be reasonable candidates for the "new class." The term is used to designate the upper level intelligentsia. Their social origins are kind of interesting. Although we lack complete documentation, a high percent certainly come from liberal Jewish, Episcopalian, Presbyterian, Congregationalist, Quaker, Unitarian, and the old abolitionist families. In fact, in our judgment its transcendentalist origins goes back to the mid-19th century.



The new class tends to have a very different set of priorities from the square America. Their agenda calls for things like, first of all, the avoidance of risks. They don't like to have the Government subject anybody to any kind of risk.

Second, they are interested in defending their neighborhoods. They don't want to change. If you want to be very unfriendly, you might say that they want to pull up the ladder or cut down the bridge after themselves. That is a little unfair.

They tend to go for an ecology oriented environment, and to have antibusiness and antitechnology attitudes.

And I have a list of their characteristics.

We believe that the period 1965 to 1975 saw an enormous increase in the influence of this group of people. And the next decade will see a decrease in their influence. By the end of the next decade, however, their influence will probably again increase enormously and their size will also grow very significantly.

And we argue that the attitude that they will have toward economic growth is likely to be negative. I think I have taken up 10 minutes.

Representative BOLLING. We thank you for your statement.

Next is Professor Lester Thurow, professor of management and economics at MIT. He has specialized in problems in public finance, and income distribution, both key questions for the future of our economy.

Since his work with the Council of Economic Advisers in 1964, Professor Thurow has followed developments from the academic perspective, specifically the high powered inside of the economic faculty at MIT. I am sure he will share those inside views with us.

#### **STATEMENT OF LESTER C. THUROW, PROFESSOR, MANAGEMENT AND ECONOMICS, MIT**

Mr. THUROW. The question I was asked to look at is, what would be the implications if we had zero economic growth—not is it good or bad, but simply if we put it in place, what would happen?

What are the consequences of low or zero economic growth? To answer this question it is necessary to specify the institutional environment within which ZEG is to be accomplished. What economic policies coexist with ZEG? Do we transfer resources to those who become unemployed, or do we find some system of sharing the work that is available? Are we talking about an economy that is static with no growth in productivity, or are we talking about a dynamic economy where total output is fixed but where components are rapidly rising and falling?

Since the interest in zero economic growth springs from a desire to avoid depletion of nonrenewable natural resources and to reduce pollution, I shall assume that a ZEG economy is one in which technical progress occurs and where productivity continues to rise. Gains can be made in the efficiency with which natural resources are extracted and used and new processes can be designed to reduce pollution. Industries rise and fall within a fixed total. The problems with a completely static economy are so numerous and obvious that they hardly need analysis. What I am now going to do is list the conclusions of

the paper. These are derived on the assumption that the economy is stopped in place at the current GNP and held there. We will let the components go up and down, but not allow any economic growth. If you examine that scenario, it is so disastrous that you wouldn't want to do it. But what is really says, is that if you are serious about zero economic growth, you have to be willing to change the structure of the economy. But what would happen if you just shut off the economic machine at the current GNP level and didn't change any other institutions in the economy?

First, given an increase in productivity of about 3 percent per year and an increase in the labor force of 2 percent per year (the 1970 to 1975 rate of increase), unemployment will of necessity rise about 5 percentage points per year.

Second, there are many ways to measure changes in the distribution of income, but one simple technique is to look at the gap between families who are at the 25th percentile of the population and those who are at the 75th percentile of the population. With ZEG this interquartile range rises by about 0.2 percent per year for whites and 2.3 percent per year for blacks. Moreover, black family incomes fall relative to whites by about 6.5 percent per year.

Third, in a ZEG world there is no way to employ more women without unemploying more men. Which men are to be thrown out of work to achieve work parity?

Fourth, the income gap between young and old will rise.

Fifth, if ZEG is not to imply a falling real standard of living, ZEG must include the achievement of zero population growth (ZPG). While the fertility rate has fallen to or below the level necessary to stabilize the population in the 21st century, the fertility rate would have to fall from the long-term ZPG rate of 2.1 children per family to a short run ZPG rate of 1.2 children per family if the population were to be stabilized at its current level. Unless this were done, ZEG could not be implemented until early in the 21st century without forcing real reductions in per capita standards of living.

Sixth, in a ZPG world it is possible to reduce the investments that we now make in educating the young—there are fewer of them—and equipping the young with the average amount of capital—private and social. In a short run ZPG world—1.2 children per family—these savings would free enough funds to raise our real per capita living standards by about 11 percent.

Seventh, the service sector cannot be used as an outlet for economic growth since it in fact directly and indirectly uses economic resources and produces inflation.

Let me just give an illustration. If you go to New England, the largest consumer of electricity in New England is the Massachusetts Institute of Technology, and the second largest consumer is the affiliated hospitals of Harvard. It just isn't true that the service industries are pollution free and not resource intensive.

Eighth, sociologically, ZEG cannot be implemented in any one country. It would have to cover the industrialized world.

Ninth, an effective fair job rationing system is either difficult or impossible to design. Savings would also need to be controlled. Look at the problems of sharing work in a ZEG or sharing capital invest-

ment in a ZEG. ZEG would just require stringent controls over human activity, because we basically must decide how much anybody is allowed to work in a ZEG environment. You have to ration work and cannot let them make the decision.

Tenth, the pollution problem is not a problem that would be even partially solved by the achievement of ZEG. It may not be made worse, but it wouldn't be solved.

We have had a number of experiences in our economy with ZEG. All the post-World War II recessions are ZEG periods. Pollution did not decrease.

Representative BOLLING. Thank you.

Our next participant is actually the representative of coauthorship. And while Mr. Allvine will do the talking to begin with, we are going to ask his associate, Mr. Tarpley, to come up when we get to the question. He is in town by a happy coincidence, and I have met him.

Mr. Allvine is a professor of marketing at the Georgia Institute of Technology, and has long been interested in problems of economic growth. He is one of the first to focus on the long-run implications of high energy costs when he was chief economist for Senator Jackson's energy hearings in 1973. He is not one to take statements at their face value. Professor Allvine's habit of probing deeper I am sure will enliven our discussion.

Professor Allvine.

**STATEMENT OF FRED C. ALLVINE, PROFESSOR OF MARKETING,  
GEORGIA INSTITUTE OF TECHNOLOGY, ACCOMPANIED BY FRED  
A. TARPLEY, JR., PROFESSOR OF ECONOMICS**

Mr. ALLVINE. I will try to stay within the time limit.

The disappointing performance of the economy in the 1970's with two back-to-back recessions is good reason to carefully examine the economic environment. It is the conclusion of a study we have just completed that the underlying conditions supporting economic growth have significantly deteriorated in the 1970's and are contributing to economic instability and slow and irregular growth. We believe that it is essential for those dealing with the economy to understand how dramatically conditions have changed and then to design new policies to deal with the realities of the 1970's. A failure to be analytical about the problems of the economy and to design appropriate responses will commit the economy to aggravated swings as experienced in the severe recession of 1973-75.

The quarter century expansion of the economy from 1945 through 1970 was supported by three interacting factors.<sup>1</sup> At the end of World War II there was a national resolve not to slip back into a depressed economic state as experienced over the decade of the 1930's. The American public demanded and the Government accepted the responsibility for insuring full employment and growth. This commitment was codified in the Full Employment Act of 1946 which gave us the Council of Economic Advisers and the annual report of the President on the state of the economy, as well as this Joint Economic Committee. At this

<sup>1</sup> See fig. 1, p. 11.

juncture of our economic history, smokestacks and industrial activity were a sign of progress and jobs. The attitude of the time was "pro growth and pro business."

A second major factor supporting economic growth was a huge storehouse of technology existing at the end of World War II. During the Great Depression research and development activities were sharply curtailed or entirely eliminated as firms cut expenditures in a fight for survival. Those inventions which did occur similarly suffered from the lack of financial resources to finish the process of innovation. The necessities of the war effort required an heretofore unexcelled effort in research and development activity. Many of the discoveries needed to successfully conclude an air, sea, and land war were transferrable to the civilian economy. The improved and new products developed after the war created attractive investment opportunities and created millions of new jobs.

A third important factor supporting the postwar economic expansion was cheap and abundant energy resources. At the end of the war we were actually exporting oil, and gas was so plentiful that huge quantities were being flared off in the production of oil. The reserve of coal was estimated to exceed a thousand years. Cheap energy was increasingly substituted for more expensive resources and we enjoyed the benefits of an energy intensive life style. Many new products were developed to take advantage of our tremendous energy resources.

The economy of the 1970's is being battered by a simultaneous erosion of the factors which had supported growth over the prior quarter century. In place of the "pro growth and pro business" attitude we now have a "society conservation" attitude. Where once smokestacks and business activities were viewed as a sign of progress they are now considered primarily in terms of their negative effects. Business is on the defensive today and a great deal of effort and resources is being spent to adjust to new societal imposed standards. One of the important changes was brought about by the 1970 amendments to the Clean Air and Water Acts which required that businesses meet stringent environmental standards. No longer was air, water, and public land free to be used in the production process. At great cost business is being required to clean up the environment and to cease disposing of wastes from production in a manner which pollutes. In addition, business is confronted with adjusting its employment practices to satisfy the requirements of the Equal Employment and Opportunity Act which imposes higher recruiting and training costs on businesses. In addition, the Occupational Safety and Health Act and Mine Safety Act require many costly changes in the work place. Beyond the clean environment, fairer and safer employment practices, business is also confronted with a host of consumer oriented laws. The laws concerning product safety, product liability, consumer information, advertising and promotion, et cetera, have in many instances greatly added to costs and increased the complexity of introducing new products.

Over the quarter century following World War II the storehouse technology resulting from the war effort was converted into many products for civilian use and product innovations that had languished from lack of demand during the depression became fully developed. Unfortunately, by the early 1970's many of these new products had ad-

vanced to a stage in their life cycle of slow growth, maturity or even decline.<sup>1</sup>

Perhaps the most important economic innovation of the century has been the automobile. From the end of World War II to the early 1970's automobile registration climbed from 25 million to 100 million cars and the United States was converted from a mass transit system of intercity travel to the highly flexible personal automobile. Perhaps more important than the automobile itself were its second and third order economic effects. What the automobile did was to open the suburban frontier to rapid development. Following the Second World War the suburban land became covered by huge tract housing developments as millions realized their dream of owning a home in the suburbs. To capture the pleasurable life style of the suburbs, huge road and expressway construction programs were undertaken. New stores had to be built to meet the demand of the affluent suburban population and tens of thousands of neighborhood, community and regional shopping centers and discount stores were constructed. The problem with suburbia today is that it is no longer a frontier and is maturing with land cost, construction expense, taxes and congestion accelerating. The decline in building of single family housing is indicative of this condition. Also the suburbs are fully stored to meet the shopping needs of the suburban dwellers. The boom of suburbia is over. Similarly the automobile acted as a catalyst for the massive construction effort in building the Interstate Highway System. The coast-to-coast and border-to-border Interstate Highway System was a boon to the tourist business. However, this industry is now also highly developed and the rate of growth has sharply declined.

Several of the other major growth industries over this quarter century period include civilian aviation, television and consumer electronics, pharmaceuticals which have emerged from the "wonder drug era," photocopying and even the computer. Growth rates of 15 to 30 percent a year enjoyed during the expansion phase of these industries have been sharply cut. When expansion was rapid huge capital investments were being made and millions of new jobs were created. With the loss of the driving force of several of these major innovations the economy has become lackluster. While most economic models treat technology and economic innovation as occurring at a constant rate, empirical evidence suggests that this is not the case.

Our economy is suffering from a decline in the rate of economic innovation. Among the reasons for the decline in the pace of innovation are the more hostile business climate as previously discussed, the grouping of many innovations as a result of the Great Depression followed by World War II and the rapid increase in the price of energy.

From 1957 through 1969 the nominal price of oil and coal was constant or declining. Over practically all the 25 year period the nominal price of electricity was declining. In a real sense the cost of oil, coal and electricity was decreasing. Energy was a real bargain and was lavishly used in the production of goods and services and also in the use of products. Life became easier and cheap and abundant energy was the fuel.

<sup>1</sup> See fig. 2, p. 12.

A unique set of circumstances permitted the United States to temporarily enjoy this energy feast. The day of reckoning started in the 1970's as the domestic production of oil and natural gas peaked and the Environmental Protection Agency slapped restrictions on the burning of high sulfur coal. Our energy shortage was converted into a crisis with the embargo on oil sales from OPEC to the United States late in 1973 and in early 1974. What all of this means is the era of cheap and abundant energy is over. Since 1970 the price of our primary sources of energy has almost tripled and it is no longer available in unlimited quantities. Furthermore, the price of energy is forecast to continue to increase throughout the remainder of the decade, but fortunately at a slower rate. The promise of relief from escalating energy prices as a result of nuclear power is yet to be proven. The impact of higher energy prices is not simply a one-time ratcheting of inflation as some have claimed, but instead means enormous and costly adjustments in the production process which will be felt for years to come.

To manage an economy where factors supporting economic growth have diminished is obviously much harder than when conditions were more favorable. However, we believe that the economy can be stabilized and a reasonable rate of growth enjoyed if proper account is taken of our economic problems and appropriate policies are developed and implemented. The economics profession has primary responsibilities for developing insights into the problems that are undermining the growth prospects for the economy and for suggesting policy alternatives.

#### RECOMMENDATION ONE

Economists must recognize and respond to the realities of the U.S. economy of the 1970's.

Unfortunately, the primary intellectual focus of the economics profession has been and continues to be on the demand side of the economy. Elaborate theoretical and mathematical models have been developed to study and analyze problems of aggregate demand. The supply problems which are so important today, and that will continue to be a major difficulty for years to come, have largely been ignored. The economics profession must refocus a good deal of its effort from the demand to the supply side of the economy. It will be necessary to rediscover the origin of economics which was focused on the allocation of scarce resources among alternative ends. We must husband our limited resources and use them in more efficient ways. Ways must also be found to stimulate economic innovation, to reduce governmental imposed restrictions on the efficiency of the business process, and to improve upon the productivity of the capital and labor.

A legacy of the strong performance of the economy over a 25-year period following World War II has been a rising expectation for more. When the economy was healthier, the demand for more could be reasonably well satisfied, but that is no longer the situation.

#### RECOMMENDATION TWO

The fires of excessive expectation must be banked. Society has to grow to expect less in order to have more.

As most segments of the laboring force—white, gray, and blue collar—press their claim for more under today's conditions, they actually decrease the likelihood of greater gain. Their catchup and cost of living wage demands feed the flames of inflation. Inflation in turn inhibits the efforts of firms to make capital investment in more efficient plant and equipment as needed to increase productivity. Political and labor leaders must struggle to reestablish the linkage between wage increase—and indeed all factor payments—and improvement in productivity. Unless this is done, the cancerous effect of inflation will spread, destroying the opportunity for the economy to grow at a level near its potential.

One of the obvious ways to increase the efficiency of the business process and to stimulate growth is through putting greater emphasis on the competitive process.

#### RECOMMENDATION THREE

The competitive process should be stimulated throughout all segments of the economy. Particular attention should be directed to the service side of the economy.

Where monopoly conditions exist, other than the few true cases of natural monopoly where technological conditions argue for regulation, they should be attacked. The effort to combat monopoly has largely centered on the product side of the economy. However, since World War II most of the growth in industrial employment has been in the broadly defined service side of the economy where approximately half of the work force is now employed. Productivity gains in this segment of the economy have been relatively poor, and the increasing cost of services has been a major source of inflation. The professions—medicine, law, dentistry, accounting, pharmacy, et cetera—have developed under the banners of standards and code of ethics, mechanisms which constrain competition and lead to higher prices and often to poorer service.

Another major opportunity for improving the efficiency of services is in the regulated industries. There is growing evidence that regulators often protect the regulated, rather than carrying out their responsibility to the general public. This is particularly true in the transportation industry—the airlines, truckers, and railroads. In many instances the cost of the service could be reduced, and the quality of the service improved, by deregulating the industry. The challenge in these less economically exuberant times is to gain improved productivity by introducing long overdue competition into the service side of the economy.

The prospects for growth can be enhanced by stimulating competition and improving the productivity of business. In contrast the effect of the large number of societally oriented laws is to reduce the efficiency of business.

#### RECOMMENDATION FOUR

Societally oriented laws must be evaluated on a cost-benefit basis and least cost methods of achieving reasonable goals should be selected.

It has been fully documented that society had the right to be concerned about the negative side effects associated with our production of goods and services. This concern was codified in legislation in the

late 1960's and early 1970's. Unfortunately, standards were set and procedures adopted which did not give proper attention to our increasing knowledge of the negative side effects and the cost of various levels of corrective activity.

There is great need to recognize the tradeoff between goals such as environmental purity, a riskfree work place, and completely safe products and the cost of achieving the objective. Furthermore, it must be recognized that the closer business advances to the standard of perfection the more rapidly costs rise. For example, industry will eliminate some 90 percent of air and water pollutants as it meets the interim standards established for 1977. To this point societal benefits seem to justify the cost. What now needs to be carefully examined before plunging ahead to meet the tougher standards of the 1980's is whether the high incremental cost of eliminating the remaining five to ten percent of pollutants warrants the additional expenditure. Across the spectrum of societal laws the cost benefit relations must be measured and appropriate standards then established.

Thank you.

Representative BOLLING. Thank you, Mr. Allvine.

[The following figures were attached to Mr. Allvine's statement:]

U.S. NOW STRUGGLING TO RECOVER FROM WORST ECONOMIC DOWNTURN  
SINCE WORLD WAR II

PRIMARY PROBLEM: LOSS OF SUPPORT FROM THREE MAJOR SOURCES  
OF LONG-RUN ECONOMIC GROWTH

HUGE PENT-UP DEMAND PROVIDES STIMULUS FOR ECONOMY AT END OF  
WORLD WAR II

U.S. EXPERIENCED 25 YEAR PERIOD OF RELATIVELY STEADY GROWTH  
FROM 1945 TO 1970.

CONDITIONS FAVORABLE TO GROWTH

1. A PRO GROWTH AND PRO BUSINESS ATTITUDE
2. CHEAP AND ABUNDANT ENERGY RESOURCES
3. A STOREHOUSE OF ECONOMIC INNOVATION

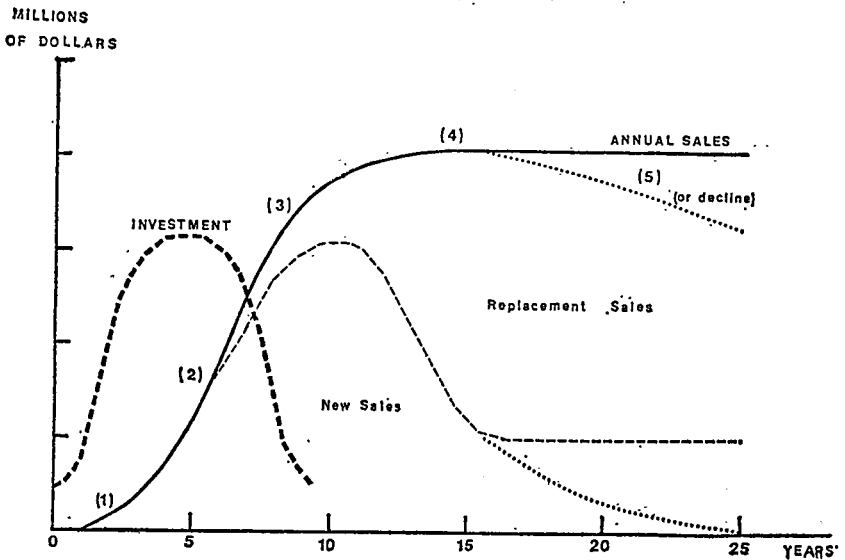
CONDITIONS SLOWING GROWTH

1. A SOCIETAL CONSERVATION ETHIC
2. EXPENSIVE AND SCARCE ENERGY RESOURCES
3. FEW NEW ECONOMIC INNOVATIONS

FIGURE 1.—Uncertain prospects for economic growth.



## Life Cycle of a Major Innovation



(1) PIONEERING (2) RAPID GROWTH (3) SLOW GROWTH (4) MATURITY (5) DECLINE

FIGURE 2

Representative BOLLING. Next, Mr. Georgescu-Roegen, who is visiting Benedum professor of energy economics, Regional Research Institute, West Virginia University.

His special concerns have included the analytical method of economics and the theory of consumer behavior and resource economics. These specialties are central to our inquiry into growth prospects.

**STATEMENT OF NICHOLAS GEORGESCU-ROEGEN, VISITING BENE-  
DUM PROFESSOR OF ENERGY ECONOMICS, REGIONAL RESEARCH  
INSTITUTE, WEST VIRGINIA UNIVERSITY, MORGANTOWN,  
W. VA.**

Mr. GEORGESCU-ROEGEN. In my opinion what will happen in the next 10 years, or in the next 25 years, depends largely on what will happen in the Middle East and South Africa, and whether we are going to strike a Faustian bargain with the breeder.

After working for 25 years in mathematical economics and economic theory, I have reached the conclusion that the problem of man's relationship with the environment cannot be reduced to what the price of crude oil will be tomorrow, and how much oil this country will import next year. The nature of this problem is bioeconomic, for it involves our particular mode of life as a biological species. Only if we view it in this very broad perspective, not in the narrow one of standard economics, can we guide our steps into a uncertain future with reasonable safeness. Complete safeness here is the myth of model-builders.

Like all other species, ours has become better fit for life through biological mutations. But only the human species transgressed this extremely slow mode of progressing, as it began to use and later to produce "detachable limbs"—a club to extend the arm, at first, jet propelled wings, in our own time. We have thus acquired exosomatic organs—that is, organs which do not belong to our bodies and which we could not have developed on the biological track. We must, however, realize that this marvelous evolutionary feat brought upon mankind some irreducible predicaments.

The first predicament is man's dependence on terrestrial resources in a degree without parallel. Man is now the most active geological agent, for he must take from the bowels of the Earth the energy and materials with which to produce his detachable limbs. Almost the entire mankind thus became addicted to the comfort, be it reasonable or extravagant, offered by these limbs, just as we are biologically addicted to food, for example. An abrupt restriction of the use of our detachable limbs will produce unimaginable withdrawing spasms. Yes, we live not only on bread and butter, but also on natural resources.

Our addiction to exosomatic enjoyment is a strange one. So far, no one has died of an overdose. To wit, we, in this country, feed it proportionately far more intensively than the rest of the world put together, and nevertheless we are still going strong—or so we think.

The difference between the developed and undeveloped is the second predicament brought about by the exosomatic evolution. This evolution has divided mankind into exosomatic species, just as different from one another as biological species are. A characteristic exosomatic organ of *Homo Americanus*, for example, is the self-starting, self-cleaning, microwave oven. *Homo Indicus* cooks in a contraption which burns dry dung. Because of such inequalities, the world is now boiling with unhappiness and ominous unrest. The difference being bioeconomic in nature, any reduction of the inequalities can come up from a development at the exosomatic level of *Homo Indicus*.

And the tragedy is that no R. & D., anywhere, has ever thought of developing a cooking utensil that would revolutionize, not America's way of cooking, but that of the countries such as India. Because standard economists have failed to see that development of the undeveloped is a task that cannot be accomplished with money alone, the financial aid of the United States has been successful only in helping the countries which already were at almost the same exosomatic level with us—Western Europe and Japan—to recover.

For the sake of completion, I shall also mention the third predicament of the exosomatic evolution, the perennial social conflict which cannot be eliminated by any kind of social system. Since the production of detachable limbs requires an organized society, human communities came to be divided into "governors" and "governed." And the conflict emerged, in our own case because, in contrast with other social species—ants, bees, termites—we have not come to live in society by biological evolution; humans are not born so as to be fit only for some particular role, whether that of a ricksha man or a mandarin; we are all born for equal roles when we are born.

History, past and present, proves that man's struggle to obtain and control the natural resources dominates the entire picture just out-

lined. Yet both standard and Marxist economies have completely disregarded the role of natural resources. The omission may be explained by the fantastic mineralogical bonanza which the developed countries—where both strains of economics originated—have enjoyed for the last 200 years or so. It may seem hard, because it is unpleasant, to think that this bonanza may be a unique episode in the long life of mankind. Yet it most certainly is.

Traditionally, man has always hoped to discover an endless source of motive power. People once believed in perpetual motions; later on, in the 19th century, in the inexhaustible nature of electricity. Such mythical hopes have by now been definitely exposed by the science of thermodynamics, although some dangerously still linger on.

In essence, thermodynamics is a physics of economic value, since it distinguishes energy and matter into two qualities—available to man for his particular purposes—and nonavailable. What it teaches us is that matter energy always remains constant, although it continuously and irrevocably changes its quality, always from available into nonavailable form. This is the irreversible hourglass of the material environment. Unavailable matter energy continuously and irrevocably increases. And since entropy is a rough index of the amount of unavailable matter energy in a system, we come to talk about the law that entropy constantly increases. However, its speed is undetermined. So some living creatures—the green plants—slow it down, while others—especially man—accelerate it.

Without the working of the entropy law there would be no scarcity. As it happens, we can use the available energy of a gallon of gasoline only once. An automobile tire, for example, can also be used only once.

In view of these thermodynamic laws, it is certainly inept to push aside the scarcity of matter by the idea that the whole earth is made of available matter which also is accessible to us. The same applies to energy, which as thermal energy exists in fantastic amounts in the ocean waters but is completely unavailable for sailing. We can think of what would be the price of oil today if the oil resources were geologically distributed in a different amount, if France had a little bit, Germany a little bit, and the Arabs had less.

The fact that our terrestrial dowry is finite and can be used only once is the crux of mankind's ecological problem; for this, economics can be of no help. Prices are parochial coordinates. Moreover, it was because pricers were right that deforestation took place on a staggering scale. "The polluter pays" is an inane idea. The surest way to make crime pay is to apply it to the crime pollution.

Even technology has not always moved in the right direction of ecological economy. The most salient example is mechanized agriculture, which has replaced organic agriculture, a system relying mainly on solar energy, by a system relying exclusively on terrestrial energy. Think of the fact that the entire fossil fuel reserves represent only 2 weeks of sunshine, whereas the sun will shine for another 200 billion weeks.

Those who have taken pride in claiming that the earth could feed even a population of 50 billion have not stopped to ask the question, "for how long?" The greater the pressure of population on land, the greater the cost in scarce resource per man. Recently, we have heard

of the ecological salvation lying in a stationary economy. But this thesis fails to offer any criterion for the optimal size of population. I believe that the only rational criterion to guide the policy of the future is that population should be kept at all times at the level which can be fed by organic agriculture.

We should, however, not be mistaken: Even a stationary population will continue to deplete the finite terrestrial stock of matter-energy and accumulate irreducible pollution. There is no such thing as pollution free activity. Struggle is the inevitable feature of life, especially of man's.

Plans like Project Independence as well as advertising technical means which are not yet available—some, possibly, not even feasible at all—are fraught with the danger of lulling us by illusions. We must wait until we can block our gravitation before we sell shares in houses without staircases and elevators.

The only sound policy is to act on demand, as nations have always done in times of scarcity—which is the soundest and most practical way—and welcome the innovations only after they take shape. There are numberless activities with which we can dispense and still gain. Fashion is one of them. The use of two-garage cars and of such things as the golfcart or the electronically operated flagpoles is another one.

Our ecological temper is dominated by "bigger and better," by "no deposit-no return," by "when the razor becomes dull you toss it away." Why not "toss the whole automobile away when the ashtrays ultimately become full?" Still worse, we are now beating the plowshares of future generations into present swords or warheads.

Standard economics offers ample justification to such abnormalities through the principle of maximizing utility and of discounting the future. Mankind, as a whole, cannot possibly discount the future; for, in contrast with a single individual, mankind must count on its quasi-immortality. Every generation must behave so as to minimize future regrets, not to maximize present satisfaction. Because of this we should establish controls upon the faucets that lets the energy pour into the economic process, and on the drains that let out the wastes to return to the environment.

The market, being the only computer which, if well supervised, can solve the immense system of optimization of given ends with given means, as the textbooks say, must be allowed to operate. But the faucets through which terrestrial matter-energy pours into the economic process and the drains by which waste returns to the environment must be put under a control independent of the market or any ownership.

An imperative task at this time is that of helping the hungry, not by constantly sending them food, but by aiding them to grow their own. The developed must come to realize that he is overdeveloped.

Viewed from all angles, the ecological problem calls for a reorientation of our values, not for building more economic models—which are in great part the blame of the present ecological imbroglio. The new commandment is: "Love thy species as thyself."

Can we listen to it?

Thank you.

Representative BOLLING. Now for a not so academic view of the outlook. We have requested Mr. Jerome Hardy to join us today. He is a

distinguished businessman who has been in the publishing business for many years before becoming president of the Dreyfus Corp. in 1970. He is therefore in a good position to assess what the financial and business output might be and what problems we will encounter in the years ahead.

#### **STATEMENT OF JEROME HARDY, PRESIDENT, THE DREYFUS CORP.**

Mr. HARDY. That is no small assignment.

Let me begin by saying that after reading Mr. Georgescu-Roegen's paper I did not have the nerve to submit 100 copies of my statement. I will give it verbally.

I compliment the gentlemen around this table on some very impressive papers. I don't recall working this hard since I prepared for final exams.

I assume the purpose of this study that the committee is undertaking, which involves planning for 10 years, includes the concept of getting through those years without leaving a terrible mess behind. That is implicit, it seems to me, in all the papers.

I would like also to compliment the committee for reaching past economists, a dour and quarrelsome lot at best, to thinkers from other discipline such as biologists. One hopes the time will come when philosophers may also be included in our hearings, since they have something to do with figuring out what it is that people want from life that will make it worth living.

Let me make only a few points and then let's get to the roundtable.

First, I would like to propose that the committee, if not this morning, at some point study carefully the impact of the accelerating pace of change over the past 100 years, and most painfully over the past 25 or 30 years. It is a subject about which we were not adequately warned. Alfred North Whitehead was telling us about it 40 years ago. It has, however, introduced a peculiar new element which is only beginning to be realized in economics. As the pace of change accelerates, so that tomorrow is upon us before today's sun has set, the means with which we meet the problems we perceive take longer and longer to accomplish. One could build a factory in less than a year not too many years ago. It now takes 5 years or more to plan and build one. Societal demands and to the years of planning substantial new research to meet the new requirements of the kind of factory we want in the society.

We are in a curious position where the pace of change and the demands of the society upon itself are in sharp conflict.

Second, I hope the committee will find itself capable of writing down a definition of growth. I hope by growth we do not mean only material things. Economics should not ruthlessly push aside less tangible but perhaps more important aspects of the "good life."

Third, I suggest that the committee examine very closely the phenomenon of communications. the development of radio and TV, which have had profound effects upon the way the society perceives itself and is run. I was one of the first to laugh at McLuhan. But I am not sure that he wasn't telling us something profoundly important.

I suggest that without radio the third world would not be so poignantly aware of how badly off it is, and without TV we wouldn't be so involved in their travail.

Fourth, I suggest that a change is taking place in the United States, where its leadership in technology may be waning. I don't know whether it is going to pass to the Japanese, as Mr. Kahn was suggesting not too many years ago. A piece in last Sunday's New York Times suggested it has already passed to the Japanese in the area of automobiles.

It is curious that this country, which began as an agricultural nation working with its hands, may end up as an agricultural producer in ways that are more important than our leadership in technology.

I suggest also that food is the most poignant human problem, since the lack of it can only be endured for a few days.

Fifth, I suggest to the committee that if it has the time and the will, it begin to try to understand what it is that motivates not only the American people, but people all over the world. I have traveled in parts of the world where our way of life does not seem to attract the inhabitants of that population. They seem more interested in inner peace than they do in outer possessions, more devoted to a cause than to gadgets.

Sixth, I suggest a definition of the proper role of government, a most difficult problem today. I would hope that it would be more in the area of research and reason and less in the area of rulemaking and rationing than might otherwise be suggested.

And last, I suggest that this kind of study be ongoing through something that is akin to an Aspen Institute, where economists, biologists, philosophers and perhaps poets can get together to talk about those things which motivate the people in a society, and which result in what we choose to call an economy, but which is really a functioning organization of which economics is but a part.

Representative BOLLING. Thank you for a most provocative statement.

I don't really know how to introduce our last witness. He is a colleague who was recently reelected. I haven't even had a chance to congratulate him. But before he became a Congressman he was a planner with the National Resources Planning Board, an economist with the State Department, a senior economist with the Council of Economic Advisers, and he has been associated in a variety of ways for a number of years with Resources for the Future. It gives me a lot of pleasure to introduce Joe Fisher, the Congressman from nearby Virginia.

**STATEMENT OF HON. JOSEPH L. FISHER, A U.S. REPRESENTATIVE  
IN CONGRESS FROM THE 10TH CONGRESSIONAL DISTRICT OF THE  
COMMONWEALTH OF VIRGINIA**

Representative FISHER. Thank you very much. It is hard to know what hat to put on. But I will try to make off my campaign hat and engage in this discourse in the spirit that is already evident.

I want to make just one main point, and then talk a few minutes about some of the problems and the implications of it.

As people become better off and their resources change, I think the main problem is to achieve a smooth shift in the composition of economic growth—to simplify it, away from quantity and in the direction of quality, right across the board.

This will mean fewer things, measured in sheer numbers, but greater quality in the things that are produced and consumed.

If we could throw our emphasis this way and put more people to work planning, developing and technology, producing, managing the qualitative phase of the economy, and do it smoothly, matching it with the shifting of demands in this direction, I believe we could solve many of our problems. We could keep people at work producing qualitative elements in response to the shift in demand in this direction. GNP, measured in any sensible way, could continue on the increase. It would just have more qualitative value in it than quantitative.

I don't think this would be an easy thing to do in any sense. But I do believe that it constitutes a major challenge.

Among the problems that come to mind in shifting emphasis and pattern and style of the whole economy in this direction are these: Can a single country, or just a few countries, move in this direction, while other major countries do not?

I don't know. But I suspect that if the United States over the next 10 years or longer devotes its incremental growth to qualitative elements, and the U.S.S.R. does not, we lay up severe problems for ourselves.

Another difficulty with this involves the role of government. At the first look one would think that any such shift in a qualitative direction as I have been talking about would have to be done by the Government taking a much larger role and arranging through transfers, and taxes, expenditures, incentives, and a variety of policies that the shift for sure take place. I don't know whether the American people, the business sector, the labor sector, would be willing for this to happen and if it would support the political leadership that might move in this direction. It would be nice if a shift in the qualitative direction could be achieved with a minimal Government role confined to some guidelines, some suggestions, a few incentives, and not too much else, leaving it to the private sector, and to what Richard Bolling calls the grant sector, the philanthropy, and so forth, the foundations to do it. But I suspect it will involve a major effort on the part of Government, which carries us into all kinds of difficulties, such as how to manage the regulations that would be involved, how to administer the activities, how to obtain the consent and support of the people.

Much of the problem of slowing down growth comes over how to provide jobs for a growing labor force. So my hope here is that there wouldn't have to be any slowdown of growth whatsoever in achieving this shift in a qualitative direction, that instead of salesmen we would have environmental protection officers. Instead of producers of sheer quantities we would have other people working to make jobs safer or more satisfying, to improve all kinds of conditions of life.

If indeed what I am calling for can't be done except with a severe reduction in economic growth, then the thing probably will flounder on the lack of employment for people who want to work.

I think much of this hinges on the pace of changes, how rapidly we have to move, let us say, in the direction I am offering. Mr. Thurow said he was going to talk about what it would be like if there were not growth, zero economic growth. Well, it is a horrible thing for most of us to contemplate. On the other hand, if one moves slowly, not toward zero economic growth, but toward economic growth of different composition along the lines I am speaking of, it doesn't become a night-

mare. In fact, it becomes quite attractive, especially as the average income goes over \$20,000 a year mark. At that time I do believe people will want parks, clean air, symphony concerts, benign technology, and will be willing to pay for it, and will want the economy and the enterprise system and government policies to respond to give them that kind of an economy.

The one thing, it seems to me, that is needed if we are to go in this direction is some way to speed up the rate at which significant decisions, economic decisions can be made. I am horrified that it takes so long now to establish a new plant. By the time the environmental impact statements have been made and studied and the various parties to decisions have been heard from, by the time the new technology has been assessed, and all the rest of it, by the time the local zoning board is willing to move, by the time the bankers, backed up by government, have arranged the financing, years and years have passed. This reaches its extreme form in the locating of nuclear powerplants or any kind of powerplants. If you can move from the beginning to production in 10 years you are doing very well.

So it seems to me that if we are to achieve any kind of sensible and major change in the way the economy works and what it emphasizes, we are going to have to speed up the rate at which the major decisions can be made. Otherwise conditions can change completely before we get any response, and we reach a situation where even in the life span of a person nothing sensible can happen. You can't get a response out of the economy to some new direction called for.

Finally, I don't know exactly what kind of psychological impediments will appear as the economy may try to shift in the direction I have specified. How long after people earn \$20,000 a year will they be willing to give up the old set of demands for more beefsteak and a third car or a summer home and 10 pairs of shoes, in order to go in a different direction? And what other psychological problems are there to bring along changes in what people want from their economy to match up with the rest of it?

Well, this is what I had in mind to offer at this roundtable. I think a major challenge for this country to begin to meet in the next 10 years is a massive, pervasive shift in the composition of economic activity in a qualitative direction.

Representative BOLLING. Thank you very much, Congressman.

Mr. Tarpley, will you join us at the table for the discussion.

I mentioned earlier that he was an associate of Professor Allvine's in the preparation of the paper.

I hope that we will be able to go quickly into a conversation.

But I would like to call on my colleagues and see if they have anything they would like to add or if they would like to join in the conversation.

Congressman Moorhead.

Representative MOORHEAD. Thank you, Mr. Chairman.

First, I want to congratulate you on holding these hearings. And the menu you have given us is so rich that it is hard to digest, but we will do the best we can.

I am impressed very much with the emphasis that has been put on the quality of future life. But I think particularly in our jurisdiction,



the Joint Economic Committee, we can't disregard the purely economic growth. I think past civilizations have shown that a sound economic situation preceded a development in the qualitative life, whether of the Greeks or the Romans that followed the development of the economies of the Italian city states. And I think Professor Allvine talked about the aggravated situation of our economy. And you were the only one of the witnesses who mentioned the cancerous effect of inflation, and so forth.

And it seems to me that as we look around the world we see this problem of conflict between what I would call the workers who produce and the people who produce the financial wherewithal to provide the factories whereby they can produce.

You mentioned the linkage between wage increase and increased productivity. It seems to me that what we see around the world is, where the working people feel that they are being unfairly treated, you will find aggravation and strikes in some parts of the country, and even worse in the other part of the world, guerrilla warfare and the like, whereas in other parts of the country you see the people who can produce the capital for the factories and the like who believe they are being unfairly treated, that that money is being put away in a mattress or hidden away, or exported, and that for the economic growth, which is to me essential to the growth of the quality of life, we have to have, first, a justice between the two, and second, a perception that there is justice between the worker who feels that he is lagging behind or the potential investor who feels, why invest in the United States if he can get a better return abroad or can enjoy what he has got of luxury and life still rather than an investment in productivity.

I directed this to Professor Allvine, but if any other members of the panel want to comment, or my colleagues, I would welcome it. And I have some other subjects for discussion.

Mr. ALLVINE. Mr. Tarpley, I think, will comment.

Mr. TARPLEY. I think that is one of the major difficulties that we have, not only that we accomplish this connection between productivity and reward, but that we let the process be perceived to be fair. I think it is a long-range problem, one to which there is no short-range solution. I think this is where we do have a problem with the value structure. This is where our public officials may be able to help us out. We do need mind sets and changes in value systems which will allow us to react and allow us to legitimize different forms of reaction to the problems that we have as opposed to the mind set and the particular set of values that we have at the present time.

Mr. KAHN. Let's assume that there is no inflation. We would then have about a 4-percent interest rate for long-term guaranteed loans or triple A corporations. Under those circumstances I would guarantee that millions of people would be willing to buy homes at 4 percent, and millions of people would want to loan money at 4 percent. If continuing inflation is anticipated, the actual figure they would be paying is 8 percent, with 5 percent for inflation. So you might say their interest is only 2 or 3 percent. But it turns out that the poorer people don't have the cash flow to make such payments. And big corporations have to miscalculate the way they keep their books.

This is part of the general observation that Professor Allvine made, that there has been a change in the system in the United States. I would disagree with him on technology, but agree on everything else. You simply cannot do business in the United States under the current rules.

One other comment. I think these adjustments that we are talking about, Congressman Fisher, are already being made. If you go back to the 1950's you will find that we had 50 million people at work, 25 million in the producing industries and 25 million in the services. I don't like the term quality of life. But I think the priorities change, and you make the desired quality. But our economists have already made this adjustment, from roughly 50 percent production oriented and 50 percent service-oriented, to, roughly speaking, 30 percent production-oriented and 70 percent service-oriented. That adjustment has already been made.

Now, there are studies which are very difficult, and there are all kinds of special computations coming out.

Mr. Leontief who will testify tomorrow on the study he just did for the United Nations, made an assumption, which I share, that the richer countries simply don't care about growth that much. And you have this ratio, not between the poor and the rich, but between the middle income and the rich. The middle income represent about 45 percent of most populations. The usual picture of a mountain of wealth surrounded by a sea of poverty is wrong. The middle income group will catch up, and in some countries it has already.

That was an interjection. People often call me an optimist. I prefer the term "realist." I must agree that in much of the comment and discussion, the voice of realism belongs to an optimist.

Representative BOLLING. Congressman Long.

Representative LONG. Thank you, Mr. Chairman.

Mr. Kahn, I am, of course, familiar with your thesis on technological development, and that being a main core of the movement of the economy. What do you see in the next 10 or 20 years as the technological advances that could be made in fields in which we can move that would serve as the vehicle that the things that we discussed here earlier have served us since World War II, all the way from the computer to television, to communications and all these? What do you see substituted for that, and giving us a vehicle by which we can move in this technological development?

Mr. KAHN. The first performance I see, the bulk is going to be more of the same, bigger homes, two-car garages, and in many cases three-car garages, and suburban sprawl. There is a fantastic amount of unfinished business there. But in terms of new material, the No. 1 is computers. They have been growing by 30 percent a year. I will say that output will double in several years. It has the great advantage that it improves the efficiency of service and the quality of service. It is working in the areas that we want most.

Representative LONG. Do you see that perhaps as being an answer to the problem that was discussed by Mr. Hardy and Congressman Fisher with respect to being able to make our system work more efficiently in getting decisions made and the things underway rather than just having stagnation?

Mr. KAHN. It depends on the decisions. The big decisions are basically Government regulations. The problem here is the new active environmental control and ecology where three separate processes are going on. First and foremost, you have to learn how to do it. It takes time. Everything is new confrontation.

Second, many of the people putting in the innovations are unfriendly and hostile to business. They don't want to learn how to put the system into force. I don't think that is true. I think business is ready to cooperate. They weren't 5 years ago, but they have learned their lesson. In my own judgment, environmental and ecological protection will increase steadily over the years. But it is done much more sensibly today.

The third thing is this: I would argue that most of the problems occur because of higher standards on the old problems rather than because of new problems. If you look at Pittsburgh, for example, you will remember it was the dirtiest city in the world. Today young people think of their city as getting steadily dirtier. It is still getting cleaner. As that is true of New York and the Hudson River, and so forth.

Representative LONG. Professor Allvine talked on this point to some extent.

Professor, you have had some political experience on the Hill in looking at these things. Do you subscribe to Mr. Kahn's thesis that perhaps the days of the confrontation are passing and perhaps we are moving into a new process that will perhaps make this procedure work more smoothly than it has been working these last few years?

Mr. ALLVINE. If I was optimistic I would conclude that. But we must be realistic. Looking at the introductory comments Mr. Kahn made in his paper, he said that with a little bit of luck, and some wise policy. I don't think that we will necessarily perceive our problems and respond to them in the appropriate way.

I would say that Mr. Kahn had typically been optimistic about technology. At one time he was very optimistic about nuclear power. We know the problems that we have had with nuclear power. Mr. Tarpley and our team looked at the technological forecast at the end of the World War II. We saw so many things forecasted at that time which we have come to enjoy.

We also looked at the technological forecast of 1970. In our judgment, the types of interesting developments on which people will spend money and that will result in growth industries and new jobs do not exist anywhere nearly to the extent that we had 25 years ago. Technology does not come at an even pace. It has its ebbs and flows. Right now we are experiencing a sharp decline in the conversion of technology in products and services.

Representative LONG. One more comment. Perhaps this has been, as Mr. Kahn said, because of the fact that during this period we had had that period of confrontation. I know that we have seen it here in the Congress. We see the confrontation. Let's just take the strip mining bill, for example, and the difficulty that we have had in the Congress of doing anything with the strip mining bill. There are valid arguments on both sides of it. Within the next year or so there has got to come an end to the confrontation and the working out of an acceptable solu-

tion so that we can proceed with this. I think that is the period that we have been going through. That is the reason I am for the first time, in 2 or 3 years of reading on, this is coming more along the lines that we have got past in confrontation. Perhaps we can move to where it is a question, as most of these have been in the past, as Mr. Kahn described it, of due process. I hope this is true.

Thank you, Mr. Chairman.

Mr. TARPLEY. I agree with Mr. Kahn in terms of pollution. I think we are there, in the sense that businessmen are thinking ideas that were unthinkable 10 years ago. But I am not quite as sanguine as Mr. Kahn about innovation in general, because innovation is in many ways destructive of the culture of the firm. Especially when we look at business organizations today, with decentralized management where they are judged over a 3-year period, for example, on the bottom line of that particular division, and innovation, even to the extent that we have speeded up the process, is still a lengthy process. And much of the organizational impact, I think, is in a negative way toward the kind of changes in values that Congressman Fisher talked about. The idea of making a long-run commitment to an alien innovation, especially when it requires the business organization to redefine itself is hard to accept.

Mr. KAHN. There is a kind of rigor mortis in both the American business and government community. But it is not everywhere. You don't find it as much in the Southwest as you do on the east coast.

Second, I am not really thinking so much of that kind of study; 45 percent of the world population which is growing at a 6 to 12 percent a year sustained. They are big now, and they are growing as fast as can be. They don't have this rigor mortis. They have great enthusiasm and great confidence. And you know something? They are going to continue growing.

The third thing is, I think it is easy for economists to misjudge technological innovation because they tend to look at the field which already exists. For example, if you look at the cost of the shuttle, you will find that in the course of orbiting into space, it dropped by a factor of ten.

All of the sudden you will find yourself going from the ferry to the bridge. Ferries are small things. To double capacity, you have to double the number of ferries. Bridges are big and complicated, with an almost infinite capacity.

I can give you a number of things. Almost anything with a bio in front of it looks good for the next 10 years.

Representative BOLLING. Mr. Georgescu-Roegen.

Mr. GEORGESCU-ROEGEN. I want to point out that in the discounting of technology, by looking only at what happened in the past, we must bear in mind that the technology in the past was developed before this crisis. And if we would look at technology on the whole, we may say that it either moved against the ecological economy by shifting from the scarcer to the less scarce resources, from coal to oil, from plain to mechanized agriculture, and also through an increase of consumption of resources. Technology during the mineralogical bonanza was confronted with a tremendous amount of resources. Resources were not taken into consideration. So we must not count on the continuation.

I wanted also to say something in connection with the question about the role of labor and wages in the economy. It is true that labor, as it also was pointed out, must increase productivity. But the question is that the share of that increase is not a phenomenon that you can cut with a razor into two and say, this share of the increase belongs to the productive labor, and that share to the nonproductive labor. And in spite of the fact that there is increasing productivity of productive labor, there is the problem of how to decide its share. The difference between the two groups gives rise to the social conflict. We cannot get rid of it. The most we can do, is to always deal with it fairly.

Representative MOORHEAD. I quite agree with you, sir. I was trying to get a vague concept of a sense of justice which is not a razor cut.

Mr. GEORGESCU-ROEGEN. I said that we should establish control of the faucets. I didn't mean to do away with the market at all. I wanted to let the market operate between these new constraints. I believe that the market, and particularly the free enterprise, free press and free election, are the elements that could do what no computer in the world can do, optimize the flow through the economic process. But as mankind, we have to do something about the future generations. We have to do also something about the fact that individuals may pollute more. Therefore there must be controls on the entrances and on the exits of the economic process.

Representative MOORHEAD. Thank you.

Representative BOLLING. Congressman Hamilton.

Representative HAMILTON. Mr. Chairman, the question that is running through my mind as I listen to this discussion is, What kind of policies ought we to be concentrating on here in the Congress to achieve the kinds of economic growth that we have been discussing? I think our midyear report said that we have to have a 6-percent growth in output each year in order to achieve full employment by 1980. When you look at the discussions in the newspapers today about steps that we are going to be taking with the economy, we are talking about price stabilization policies, and different kinds of employment legislation. I get the feeling, as I think about that in relation to what you are saying, that we are really just tinkering around here with very short-term solutions to our problems, when the real problems are much more fundamental and structural. So my question to the panel really is—and you have discussed this in part—what kind of policies ought we to be thinking about in the Congress to achieve the kind of growth or the kind of economy that we want? Are we just fooling ourselves when we pass the public works bill or a public employment bill?

Mr. THURLOW. I think you have to face up to the fact that you have got a shortrun problem that you can't avoid. You have got to do the shortrun tapering. If you say, let's just address the 10-year problems and forget the short-range ones, these are going to get worse rapidly. You can say, where is the economy going to be 10 years from now, and how are we going to get there, but at the same time you have to run a reasonable economy in 1976. I don't think you can evade that.

One of the other longrun things that you have to think about is the perception of economic justice—there are various groups in our society that don't perceive that we have justice. The average black person and the full-time working white woman are saying that when it

comes to income they are unfairly treated. This can only change if somebody in some other group is willing to give something within a fixed total. We have been having economic growth and saying, well, if total income is going up, everybody is going to be happy even if they feel unfairly treated relative to somebody else in society. But if you really go to a low growth world, where a rising real standard of living doesn't exist, then the only thing you can do is fight with your neighbors. If you think about slowing down economic growth, you don't think about a world where we fight less with our neighbors, you think about a world where you fight more with our neighbors. The only way you can get ahead is to push somebody else down. Even if you think it is desirable for some reason to slow economic growth down, you cause devastating problems in the short run.

Mr. KAHN. But you have to make up your mind. For example, the weight of any object on the Earth and must be less than the Earth.

Mr. GEORGESCU-ROEGEN. You could say that you shouldn't take into consideration the law of gravitation; this is nonsense. Actually the reviewer of my own book, "From Behind the Iron Curtain," pointed out that my book describes how capitalism is struggling in the throes of entropy, that law of thermodynamics. I said, well, probably natural laws do not work behind the Iron Curtain in the socialist systems.

Mr. KAHN. Anything you build on the Earth has to weigh less than the Earth. But the difference between the weight of the object and the Earth is very large. If you are asking for available energy, I can show you today a number of ways which have reasonably high probability of getting the available energy we need to operate an economy of \$300 trillion.

Mr. GEORGESCU-ROEGEN. Would you defeat the law of entropy?

Mr. KAHN. No; I don't defeat the law of entropy. I say, working within the law of entropy is like the limitations that are so far above my other limitations that we are not interested in them. In the same way the weight of the Earth is so much heavier than the object I build. I have to live with the law of conservation of mass.

Mr. GEORGESCU-ROEGEN. I would like to answer Congressman Long's question.

You asked what Congress should do. What they should do is to try to stop talk about growth and growth in quantitative terms. I think that I would be in complete sympathy with Congressman Fisher about how to concentrate more not on growth, but on a better quality of life, which would be available even at the low quantitative growth. The syndrome of the shaving machine, as I have it in one of my books, is to try to shave faster and faster so as to have more time to go to the office and work on a machine that shaves faster, faster, so that we have more time to build a machine that shaves faster. This is a kind of infinite empty regression. And, I believe, we are engaged in it. We must somehow go out and move away from it.

Mr. THURLOW. It is hard to be against the word "quality," but I must say that when somebody uses the word "quality" I don't know exactly what they mean. I sometimes think that the things that are of bad quality are what the other guy likes and the things that are of good quality are what I like. Pollution I think is just a question of who is looking at it. Those of us who are skiers throw stones at snowmobiles. Snowmo-

biles look at ski resorts and see pollution on the hillsides. Rock climbers look at both of them and see pollution with either. If you ask what is a high quality of life, what is good that is of higher quality, you must mean something other than goods which last longer. If you mean cleaner air, then it is all in the perception of the individual as to whether clean air is a thing that adds to his quality of life most or least. I think it is fine to say, tune the economy toward quality rather than quantity. But I think that you have got to have a definition of quality other than that of imposing our preferences on the rest of the world. I think that is impossible.

Representative BOLLING. Congressman Fisher.

Representative FISHER. This is very much the answer of an economist who stands aside from all these things, and makes no judgments. I think the Congress is charged with making judgments on qualitative matters. And not to split hairs about it, but a judgment can be made that the amount of sulfur going up a smokestack in a coal-fired electric generating plant ought to be no more than this. And we can argue that. The economist, if he wants to stand aside from that, can stand aside. But once the judgment has been made, the policy set, then it seems to me the job of the economist, the engineer, and so on, is to organize things so as to do that as cheaply and with as few harmful side effects as possible.

In that case we do get what I would judge to be an improvement in quality of the air. If the decision is arrived at in a proper way, with proper participation and elected representatives casting their votes, then I say at least for a period of time, that is the arbiter, that is what the quality is.

Now, in this case I would like to bring out this point. It so happens that the most likely solution to the problem is some kind of scrubber or treatment of the emissions in the stack. This is a highly technological solution. There are all kinds of problems with it. It will take an enormous investment to cope with this. Over the lifetime of a typical coal-fired plant it will increase by 50 to 100 percent the cost of the plant. A tremendous economic and technological activity is generated here. So it is quite a mistake—and this is the point I want to emphasize—to think that moving toward higher quality—in this case less sulphur in the air—somehow won't involve enormous amounts of technology and investment, management, science, and everything else. So my whole point is that we can move to what I will call better quality—this can be determined by political process—without diminishing anybody's rate of economic growth. It will be just as much investment, just as many jobs, just as much technology, and just as many ecologists, but they will be doing things in a different way. They will be adding a different dimension to, in this case, a kilowatt-hour of electricity.

Representative BOLLING. Mr. Hardy.

Mr. HARDY. As the one who indulged in the most generalities to begin with, I would like now to stay on the specifics.

It strikes me that one of the things that has crept into the conversation here, but which has not been clearly stated, is that one of the problems which perhaps the committee should consider is the eruption of governmental policies which tend to frustrate governmental objectives. I will give you, for example, one that I discovered only when I entered the financial field. As far back as 1932 and 1933, the Govern-

ment passed laws requiring that when new securities were issued they be accompanied by a prospectus. The prospectus was meant to be completely revealing in those things about which the investor should be informed. The prospective investor picking up a prospectus today after it has been nurtured carefully by lawyers over 40 years, will find he has neither the time nor the intelligence to be informed by the tedious and murky language he encounters. The prospectus is a triumph of form over intent. And this is not the only place that intent has been buried by regulation.

For example, I believe the tax policy of this country could stand careful examination. Mr. Kahn raised the question of those people to whom 9 percent interest on a mortgage is prohibitively high. Nine, of course, is not really the effective number: Nine is the apparent number, it is like posted prices of oil. If you want to find out what the price is to take out a mortgage today, it is more like 11 percent when you get through all the points and charges that go into it. That is an absolute number which makes it impossible for people to buy houses. There will not be a revival of the housing industry in this country until the tax policy is reviewed, and until there is a way in which people can buy a house with a decent proportion of their income.

In the case of businesses, we cannot live in a world of inflation and have a depreciation policy that allows us to deduct what we paid for a plant when the replacement of that plant is going to cost 5 or 10 times what that plant cost originally. No money will ever accumulate that will be nearly capable of allowing us to build the new plant, unless we can charge off replacement expenses.

I might suggest that the natural gas taxation and pricing policy, and the fervent desire for energy independence in this country, are two contradictory policies that tend to frustrate each other.

I would suggest that the shift to a debt economy in this country is more hazardous than it seems. A large part of the growth of the economy and the industry of America was based upon the willingness of people to take risks. We have imposed a taxation policy in this country which first identifies dividends as somehow undesirable. So we tax profits before dividends are paid, and tax them again immediately upon receipt by the individual. On the other hand interest flows with no taxation and taxes are paid only by the recipient. There is something very weird about that. It tends to lead businesses to shift more and more to debt instruments, because they can write off the interest. Equity instruments such as stocks, become less attractive to business because dividends must be paid out of after-tax dollars, and less attractive to investors because dividend rates are low compared to interest, but are taxed at the same rate.

That taxation policy is wrecking the incentives for people to invest in the growth of businesses and is driving us into a larger and larger debt society. I ask you to study the history of heavily indebted societies. They inevitably slow down rapidly when they get past a certain point.

Representative BOLLING. Congressman Rousselot.

Representative ROUSSELOT. Thank you, Mr. Vice Chairman.

We have been reading a lot, Mr. Kahn, about the groups in Europe, Mr. Lucas, Mr. Wallace and Mr. Sargent, is that correct?

Mr. KAHN. Yes, sir.



Representative ROUSSELOT. According to Business Week, they have introduced a new theory. It is called "Rational Expectation." Maybe this has been discussed, I don't know. But since it relates to growth and the possibilities of growth, I think it is important to reemphasize here. As a general criticism of policymakers at the national level they said: "Policymakers go wrong because they make decisions that fail to incorporate the fact that the public has already formed expectations about what the policy is going to be, and have already acted on these expectations."

Could you comment on this?

Mr. KAHN. I will give you a typical example. Everytime President Ford made a speech that there would be no price controls, every business that I know raised its list prices, without exception. They also hired no people. Any discussion of price controls of this sort produces a reaction ahead of time which negates the effect of the price controls.

Actually during three or four periods lasting some months in the last three years where you had to call up all over the country and haggle, like you would in a Persian bazaar, for a discount. This is a typical kind of thing. You take any attempt to stimulate the economy by inflation. The economy is incredibly sensitized in ways that result in incredible speed. The withdrawal of money from the savings banks used to grow slowly over the country. Now it will take place in weeks. So I would argue, any attempt to stimulate an economy by raising any expectations will end up being negated.

Representative ROUSSELOT. Would that be true of the promises that Carter made?

Mr. KAHN. If I remember, he has made promises to the blacks, to the cities, and for the general stimulation of the economy. A coach at a famous university once said, I have to keep the troops sullen, but not mutinous. He has to pay off to the point where they are sullen but not mutinous. Every man in the room understands this. But unless he does that—in other words, if he said, I am going to bail out the cities, people say, as New York goes, so goes the country. But I would say, as New York goes, so goes Yonkers. If you don't have the money and you can't borrow it, you shouldn't spend it. That idea will disappear if you bail out the cities. And you get a fantastic expansion.

Obviously I think you may want a mild stimulation of the economy around January. We don't really know this yet, but I wouldn't be surprised. But the word "mild" is the keyword there. And so on down the line.

Let me make a comment on quality. I have in my hand—I will cover the manufacturer's name—a little gadget which has 50,000 micro-circuits in it. [Referring to a pocket computer.] When I used to work in this field 25 years ago, it would have cost about \$1 million and filled a room half this size. Now it costs a few hundred dollars and I can carry it in my pocket. It doesn't use any raw materials that you can notice. And that is what is going on today.

The same here. You couldn't reproduce this performance for any amount of money 50 or 25 years ago. [Referring to a pocket recorder.] And now I can carry it in my pocket.

You don't make your money today by bulk products. American industry had no interest in cutting back on materials. And now they have an interest, because of the shortage of materials.

Take elevators, for instance. When I was very young, young people used to have their hands chopped off by elevators. Today elevators have the rubber in them, and it is almost impossible to hurt yourself in an elevator if you try. The trend is going from kind of threatening to benign—with the exception of nuclear weapons, which aren't benign. So I am not saying that science is basically benign. But I am saying that most of the science we are talking about today is becoming benign.

But there are other kinds of science and technology that we are not sure of. Somehow or other, if you could design your children, that is going to be a mistake.

Representative ROUSSELOT. What do you think Congress can learn if anything from the concept of rational expectation?

Mr. KAHN. First of all, the word "irrational" doesn't mean they produce irrational results. The word "irrational" means diddling with reality.

In a book I published 10 years ago I suggested that by the year 2000 unemployment would reach 10 percent, and that this would be sort of normal. My only guess is that the current rate for normal unemployment is going to be 8 percent. If you get much below that, you are going to have inflationary pressures. So I will argue for 6-percent unemployment. I argue that it is decent and reasonable.

The people have been traumatized by 1929.

The second point about unemployment is that you just can't use any more shotgun techniques of general stimulation to handle the low income unemployment, the blacks, teenagers, women, and so on. Those are very specific problems. It takes strong specific measures to deal with them. You don't want any general stimulation to do that. I think these two things would absolutely straighten out 90 percent of the problems this area.

Representative ROUSSELOT. What percentage of your 6 percent is what we would call short-term unemployment?

Mr. KAHN. You have three kinds of unemployment here. The normal worker is 4 or 5 weeks between jobs. And you have the person who wants to leave the labor market.

Representative ROUSSELOT. What percent do you anticipate that would be?

Mr. KAHN. Something like three-quarters, four-fifths. And you have the people that are leaving the market. Almost all of them collect unemployment insurance, for the best of reasons. And they are unemployed just as long as the unemployment insurance lasts.

Representative ROUSSELOT. You mean they are voluntarily and purposely leaving the labor force?

Mr. KAHN. Voluntarily and purposely is a complicated concept. If you give them a very good job, they would take it. But in terms of the jobs that are available to them, they would just as soon collect unemployment insurance.

Now, this is part of the pattern of life, if you work in a cyclical field, or you have a husband and wife pattern, where the husband works 26 weeks and the wife 26 weeks. There is a lot of that in Canada and the United States. And the 1929 model is this 45-year-old chairman of an industry with a family. Now, it is basically a woman or teenager who is on the verge of working or not, can't decide whether

he wants to work or not. Now, almost all of these people will take good jobs. But they don't have the skills for good jobs. So it is hard to say it is involuntary.

You have a person who is at the low-income level, he is working at a deadend job, he doesn't like it, and he shows it. The boss doesn't like him, and he gets fired or quits. So he is 10 to 15 weeks between jobs.

Mr. THUROW. These numbers don't mean anything as to where we are at the moment. At the moment the average person is unemployed 15 to 16 weeks. He is exaggerating the amount of voluntary unemployment that would exist at a 6-percent unemployment rate. If you look at the numbers back when we had a 6-percent unemployment rate you can work out what the duration of unemployment and the structure of unemployment that would exist. It is nowhere near the kind of numbers he is talking about.

Mr. KAHN. First of all, you asked me the question.

There are two different numbers here that are terribly different. The average employed guy that leaves his job, and the existing stock of unemployment. There is a factor of more than 20 between those two numbers.

Mr. THUROW. That is true, because there are a lot of people who shift jobs, without being unemployed. But we are talking about the stock of unemployment, not the people who are job switchers.

Mr. KAHN. People are fired and look for a job. And I repeat, there is a factor of two that you get in any apportionment process. If you look at the existing stock, you get a number twice as big.

The second point I would like to make, my numbers are not incorrect, the model I gave I think is a reasonable model. These would correspond to the head of the family, 2½ or 3 percent.

Mr. THUROW. The white male head of the family or the female head of the family?

Mr. GEORGESCU-ROEGEN. I want to add something relevant to this.

Representative BOLLING. Professor Allvine has been waiting for quite a long time.

Mr. ALLVINE. I would like to go back to your original comment, because I don't think anyone adequately answered your question. I encourage you to continue throughout the hearings to pursue what government can do to stimulate long-run economic growth. Mr. Thurow makes the point here that we have got to be concerned about the short run. I will warn you that 90 percent of economic thinking is concerned with the short run, and a series of short runs become the long run. Unless we do things to prop up the long-run condition, we are not going to have economic growth. We are not going to have the employment opportunities. I think it is dangerous to have faith in the solution to aim long new growth along the lines Professor Kahn talks about. What he is talking about is incremental development of technology. In many cases that is all it is. The 747 was a tremendous technological feat. But people didn't fly faster, they didn't fly more comfortably, and they didn't fly more economically. This is characteristic of so much of the technology we are getting today. The test of the impact of technology is whether people will want and buy what is developed from new technology. That is the real problem. In answer to your question, I think Congress should be concerned with what

can be done to encourage long-run growth. I am not going to get into a debate on quantity and quality for I think that is largely irrelevant. We have to have growth to satisfy the desires of many people, not only because of political promises, but because of the realities of the problems of zero growth that Mr. Thurow talks about.

Now, how do you get that growth? I think you have to look beyond fiscal and monetary policy, which are the primary tools that we are using to keep near the existing potential for growth. What we have to be concerned about is the slope of the growth line. I believe the slope of the growth line has declined. Unless there is some people like yourself looking at what we can do to stimulate long run growth we are in trouble. We have to look at competition, we have to look at the service side of the economy. So many people have vested interests that are inhibiting the use of the new technology. We have to get people to be more productive in a qualitative way. We have to look at the environmental constraints. I reject the idea that Congress can impose meaningful standards. You have to look at standards quality improvements from the standpoint of what they cost relative to the benefits. Unless Congress backs off on some of the standards that have been set, we are going to be pouring tremendous resources down, in my judgment, a rat hole. People want results. The population is not satisfied with just quality improvements, they want goods and services. You and I and many people, we are satiated. But there are a lot of middle-income and low-income people that are not yet satiated and these people want more goods and services in the traditional sense. We are not going to solve the problems of the economy by fiscal and monetary measures. This committee should be looking at what can be done to improve the flow-through of technology to marked innovation, how to increase competition and the like. So I think your question is very appropriate.

Representative BOLLING. I can say this. At the moment the purpose of the committee is to try to do some of the things I think were suggested. Mr. Hardy was trying to establish some fact and in the process we are having some wonderful arguments. And to continue the argument, I will call on Mr. Tarpley.

Mr. TARPLEY. To get back to the question that Congressman Roussetot asked, and to try to incorporate some of the other points that have been raised, economists live in an interactive world in the sense that the economy we have today is different. Because we have had the Keynesian revolution, and because people understand that revolution, and businessmen understand it—Mr. Nixon made his public confession that he was a Keynesian several years ago—people expect certain things to happen when economic conditions change. The very fact that they understand that and react to it makes the economy operate differently than when it was a new idea. One of the difficulties of being an economist in such a situation is that the area you are studying always changes as the result of your understanding. The more you understand and transmit that understanding, the more the economy changes, and the more you have to reexamine. I think that we can truthfully say that the fiscal and monetary policy is basically understood by almost all businessmen to read *Business Week* or the *Wall Street Journal*. It is understood by all labor leaders from a shop steward on

up. They respond in the anticipated ways, if certain things happen they make a certain kind of response, which negates many of the manipulations that made Keynesian economics work in its earlier years.

This, I think, brings us to the role that the Congress has to play. That is in the area of expectations. Not only do you react to the social values that you perceive now, but through this medium and others you are in part a shaper of social values. In the area of social values and expectations, one of the things that has to be done is education of businessmen, of labor leaders, of the body politic in general. Especially we have to move into the service sector of the economy and rid of a lot of the restraints. It may be that the social system of doctors will have to be modified, that we may have to have mass produced medicine. We may have to have supermarket legal services, we may have a lot of things that have to be done. But we have to evaluate and to educate the public at large. I think this is one of the areas where Congress can play a very important role.

Representative BOLLING. Let me say that we have already lost one of our panelists, and I think that others have other engagements. I am going to recess the committee in 5 or 10 minutes.

Representative ROUSSELOT. May I add one thing more, Mr. Vice Chairman.

Representative BOLLING. Of Course.

Representative ROUSSELOT. Just so we can know where we actually are, we are discussing unemployment. The distribution of unemployment by duration of less than five weeks was 37 percent, according to our report in September. Five to fourteen weeks was 14 percent. And 27 weeks or over was 15 percent.

So I think, Mr. Kahn, you were less than correct.

Mr. KAHN. Those numbers were overstated, if the question you asked me was how long was a man unemployed who needs a job.

Mr. GEORGESCU-ROEGEN. I want to make two brief comments.

First of all, I am not of the opinion that we can go anywhere by denying there is such a thing as a quality of life. It is true we do not know what is good justice, that good justice may mean one thing one time and another time something different. But just because we have in a particular case disagreements as to what amounts to a good life or not, we should not reject it. So I come back to the idea that the Government should talk more about good life.

In connection with unemployment, I also wanted to point out that there is—I must do it because of my thesis on bioeconomy—there is a biological effect of the distribution by age. At this time there is a tremendous amount of pressure from the younger generations. And this is why in my opinion we speak now more and more about doing away with reducing the retirement age. These are the needs for making more room for the pressures of the younger generations. What will happen to them when they will become old, the kind of population that would be heavy at the top, will again be bioeconomics.

These are things that in a way we must take into consideration in our decisions and in our general policy, because these are factors that cannot be easily demitted or dismissed. Population structure has an influence on unemployment and upon the future. Even inflation today.

in most of the countries means a transfer of income, a transfer of income from the older to the younger generation. And this is because of this kind of difference in the size of generations.

There is also an impact on the pressure on the Government, that is why almost all governments practice inflation.

Representative ROUSSELOP. If I could follow up just briefly, here is a specific example where the young are bringing heavy pressure to put themselves in a better position. In the International Typographical Union the younger membership voted to abolish the \$100 a month income pension, change it to another pension, totally disregarding that they too may want to retire someday, they just abolished it for 20,000 members. It just came to my attention in recent times. They did that not thinking that they would someday want to retire themselves.

Representative BOLLING. Mr. Hardy.

Mr. HARDY. I would hope Congressman Fisher and the rest of you will not take off your campaign hats too often. One of the marvelous things that the campaign forces you to do is go out and mingle with the people and get some sense of what it is they want. I hope we remember that we are setting economic policy for individuals. I hope that we also remember that individuals respond to incentives, and we cannot set policies that people view indifferently or antagonistically and expect anything to happen.

If I may end up on a puckish note, since we mentioned Mr. Whitehead twice, I will tell you that one of the things he once said is, "a country is in its flower before it begins to analyze itself." I wouldn't take that too seriously.

Mr. KAHN. You may want to.

Representative BOLLING. I would like first to ask the panelists, if we send them some questions, if they would be willing to respond in writing.

And second, I would like to thank the panelists for what I consider a very good beginning to this series of hearings.

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF LESTER C. THUROW TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 10, 1976.

Prof. LESTER C. THUROW,  
*Department of Economics, Massachusetts Institute of Technology, Cambridge, Mass.*

DEAR PROFESSOR THUROW: On behalf of the Joint Economic Committee, I would like to thank you for your testimony before the Committee on November 9. At that time, the Committee was not able to ask all the questions it was interested in pursuing due to the lack of time. We would appreciate your cooperation in providing written answers to the following questions, both for the hearing record and to assist the Committee in the development of its report to Congress on future U.S. economic growth.

(1) How can leading thinkers such as those on the panel, drawing from the same data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or

worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

(2) This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventual results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study and results they should rely on concerning any given issue affecting longer-run economic growth?

(3) Let us move to the specific. The hearing centered on long-term growth prospects, one of the most important questions that can be considered. Yet we hear on the one hand that everything looks good for the next ten years, while on the other we hear that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we were told, that even just slower economic growth, much less negative growth, would do great harm to the socio-economic system and be very costly in terms of its impact on human lives. When can we conclude, what message can we as an economic advisory committee to the Congress send to the Congress concerning long-term growth prospects?

(4) Finally, let us consider very basic specifics. Each panelist has "looked into the future" and seen different forces in our society which will be shaping our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to shape the most optimal and beneficial economic growth path?

(5) Prof. Allvine has thrown down the gauntlet to the economic profession. He faults their "continued preoccupation with short-run stabilization policies and procedures," he states they will have to "leave the sophisticated and highly developed world where they have dwelled the past 30 years" and that "economics will be returning to its roots as a philosophical and social science." Are we in a new ballgame so to speak which requires such a restructuring and if so, what pragmatic changes will have to take place in the way economists think about problems and the methods they use to analyze them?

(6) During the hearing, you seemed to be in the middle between the two extreme positions being presented of solid economic growth forces acting over the next decade on the one hand and diminished support from traditional economic growth sources on the other. Which of these two scenarios comes closest in your estimation to accurately portraying economic growth over the next decade?

(7) Is the economic process "entropic, not mechanical" as Prof. Roegen asserts and has economic theory and analysis really been deficient by not taking into account physical realities as expressed in the Laws of Thermodynamics?

(8) Do you agree with Mr. Kahn's contention that one of the main reasons for the slowing down of economic growth in the long run will be changes in values and attitudes as expressed in his 13 New Emphases and Trends? Can such non-economic factors be the primary influence on long-run economic growth?

The Committee would appreciate your cooperation in providing as with this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY,  
ALFRED P. SLOAN SCHOOL OF MANAGEMENT,  
Cambridge, Mass., December 14, 1976.

JOHN R. STARK,  
*Joint Economic Committee, Congress of the United States,*  
Washington, D.C.

DEAR MR. STARK: Enclosed are my answers to the questions that you posed in your letter of November 10.

(1) I think that long projections are completely worthless since uncertainty grows to overwhelm knowledge. In any case, with a reasonable discount rate you are not interested in more than the next 8 or 10 years. Current long-run projections reflect the psyches of the projectors and the current fads.

(2) It is impossible to reach a consensus, but it is also unnecessary. Even if you could reach a consensus it would have a very high probability of being wrong. In addition, no one is going to do anything today based on what is projected to happen in the distant future.

(3) The rights and wrongs of this argument can be determined in a very simple way. Attempt to maximize economic growth over the next 10 years and see what happens. Constraints may stop us from growing rapidly, but we will only discover this in the process of attempting to grow rapidly. One discovers constraints by running into them.

(4) Growth paths are irrelevant unless we can get the economy near its potential. This should be the number one priority. Once we get the economy to full employment, we should ascertain what the potential rate of growth is and then decide whether it needs to be accelerated or decelerated.

(5) This allegation is pure nonsense. Economics has never been preoccupied with short-run stabilization. There are certainly economic problems that are poorly understood—inflation, etc.—but these will not be solved by a general admonition to return to our “roots.” They will be solved when someone is smart enough and lucky enough to solve them.

(6) I think that you can point to real factors that are going to slow growth (labor force growth, energy costs, etc.). I do not think that it is currently possible to predict whether the potential growth rate is going to accelerate or decelerate over the next 10 years. With the exception of energy, I do not think natural resource problems are going to be key factors in economic growth over the next 10 years.

(7) Entropy is a problem for some future generation to worry about.

(8) I see no evidence that satiation in economic desires is a prospect. Higher incomes will lead to different demands, but not to an absence of demands. Cross-sectional studies of consumption patterns always lead to misleading time series conclusions. Relative income, not absolute income, counts in the long-run.

Sincerely yours,

LESTER C. THUROW,  
*Professor of Economics and Management.*

RESPONSE OF FRED C. ALLVINE AND FRED A. TARPLEY, JR., TO ADDITIONAL WRITTEN  
QUESTIONS POSED BY THE COMMITTEE

*Question 1.* How can leading thinkers such as those on the panel, drawing from the same data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

*Answer.* It is to be expected that the Committee would receive widely varying forecasts on the prospects for long-run economic growth at this period in our economic development. One of the principal reasons for the widely varying forecasts for the future is the different perceptions of the reasons for the poor performance of our economy in the 1970s. Most economists seem to attribute our difficulties to incorrect fiscal and monetary policies, and to short-run external shocks such as those resulting from international crop failures and from the escalation of oil prices by OPEC. These economists believe that little about our economy has changed, and that with the proper blend of fiscal and monetary policy the economy will grow as it has in the past.

The study that we have completed leads us to quite a different conclusion about the reasons for the poor performance of the economy in the 1970s. Our study focused on major factors supporting the quarter century expansion of the economy from the end of World War II through 1970. We found that several important factors contributing to economic growth in this quarter century period had simultaneously diminished in the support they provided in the 1970s. The negative factors as developed in our paper include (1) the development of a “societal conservation ethic,” (2) accelerating energy prices and (3) a diminished stream of “economic innovations.” Since most economists focus on the problems of



short-run demand management, it is conceivable that they have missed the important changes that have occurred on the supply side of the economy.

*Question 2.* This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventual results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study and results they should rely on concerning any given issue affecting longer-run economic growth?

*Answer.* When an economy is changing, as we believe our economy is changing now, then decision making is going to occur in a less certain environment. This does not, however, diminish the need for decision making, for when conditions are changing it becomes more important to develop new responses than under conditions of slow and gradual evolution. The challenge before this Committee is to bring the issues into clearer focus and to marshal the best intellects to see what new strategies and policies can be developed to minimize the problems undermining our economy.

Your second question indicates some frustration over the lack of precision in the state of the art of economic analysis. But it must be recognized that contrary to great effort to make economics into a physical science, there are many aspects of the economic system that are hard to specify and measure, but that are also important to directing the economy. Furthermore, we argue that one of the real problems with economics today is its over-commitment to the physical science approach where precision of relationships is a feasible objective. Much of economics has a great deal in common with the behavioral sciences where variables are harder to specify and measure and conditions are frequently changing.

The varying forecasts about the prospects for economic growth underscore the need for the Committee to carefully analyze what is happening. Once this is done the Committee can then set about developing the initiative to minimize the impact of our new problems. To treat the economy as if it suffers from age old ailments which can be treated with the familiar tools of fiscal and monetary policy, is an inappropriate approach. False diagnosis leads to incorrect policy decisions. We argue that the severity of the 1973-1975 recession was to a considerable degree the result of attempting to overcome the long-run problems of economic growth with the short-run demand manipulation tools of fiscal and monetary policy. What this did was to aggravate our economic situation and contributed to the worst and most prolonged downturn since the Great Depression.

*Question 3.* The hearing centered on long-term growth prospects, one of the most important questions that can be considered. Yet we hear on the one hand that everything looks good for the next ten years, while on the other we hear that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we were told, that even just slower economic growth, much less negative growth, would do great harm to the socio-economic system and be very costly in terms of its impact on human lives. What can we conclude, what message can we as an economic advisory Committee to the Congress send to the Congress concerning long-term growth prospects?

*Answer.* We see no reason to accept the proposition that our economy cannot continue to grow over the next decade. In fact, we would argue that our socio-economic system is dependent upon restoring a healthy rate of growth to the economy. There are many problems to be solved and much poverty to be eradicated which require an expanding economy. A very slow or no growth economy would create great strain in our society, and we need not create such problems for ourselves.

Our analysis takes into account the environment and raw material problems confronting our economy. The newly recognized conditions do pose major challenges to our economy, but given time, capital resources, and technology a satisfactory response seems entirely feasible. The major danger one foresees is that economists and policy makers will fail to understand and appropriately respond to the conditions retarding economic growth which we discuss in our paper and in our forthcoming book entitled *The New State of the Economy*. The problems are not unsolvable if they can be brought sharply into focus and followed by appropriate policies designed to handle them. We can no longer engage in the self deception that the economy is basically unchanged and can be managed with the same emphasis on fiscal and monetary policies.

*Question 4.* Finally, let us consider very basic specifics. Each panelist has "looked into the future" and seen different forces in our society which will be shaping our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

Answer. In our testimony and prior submission to the committee we made four basic recommendations which we believe are important for maintaining a satisfactory rate of economic growth to more fully utilize our human resources, natural resources, and stock of plant and equipment. The essence of our first recommendation was that the inflationary pressures within the society must be tamed and extinguished; otherwise, badly needed capital investments to modernize plant and equipment and to expand housing will not occur at a rate necessary to permit economic growth and rising standards of living which has been our general experience since World War II. What this means is that all elements of our society must struggle to re-establish a relationship between productivity and reward. It is only through improved productivity that society in general can enjoy more. The danger is that the harder we struggle as individuals to have more without increasing our productivity, the less society in general is likely to have.

Our second major recommendation is that we must better utilize all of our resources through a recommitment to the competitive process. One of the difficult problems confronting our economy is that strong vested interest groups have developed throughout society, each endeavoring to protect its gains from what might be lost in a competitive marketplace. This is particularly true of the service industries where most of the growth of the work force has occurred since World War II. The service industries have not shown the improvement in productivity of the remainder of the economy even though it is sorely needed. Much of the problem of lagging productivity in services results from formalized restrictions to change codes of conduct and other work restrictions which reduce productivity. The rhetoric so often heard about why competition is not appropriate in many service and regulated industries must be carefully examined. Our studies indicate that there are great opportunities for improvement in the performance of the service industries, if the political processes which are used to support the vested interests can be turned back in favor of the allocative hand of the marketplace.

Our third recommendation deals with the proliferation of societal laws in the latter 1960s and early 1970s. Many of these laws were passed with good intention, but without adequate thought about what they would do to our need for maintaining an adequate rate of economic growth. The societally oriented laws dealing with the environment, the workplace, and the marketplace were cheap to pass, but are very expensive to implement. What is needed before we advance further into meeting higher standards prescribed by law is to ascertain the relationship between the costs and the benefits. Societal laws are absorbing great incremental resources and we must evaluate what we are getting in the bargain. When the laws are found to be excessive and to furnish only limited societal benefit, then they need to be adjusted and made more realistic.

The fourth and final recommendation is concerned with our external energy policy. As we struggle to become more self-sufficient it is absolutely imperative that the world price for oil not be further increased. The U.S. must exert some real leadership in capping the price of world oil and seeing that it is not raised to higher and more outlandish levels. Already extremely high energy prices have taken a heavy toll on the performance of the free world economies, and further increases could have catastrophic results. It is not just what the United States can afford to pay for energy nor the other industrialized societies including Europe and Japan, but the terrible burden that the world price of oil is having on the lesser developed countries. The economic chaos which has been created by the rapid escalation of world energy prices is causing great hardship, is toppling the governments, and is contributing to worldwide instability. We argue that the United States can and must take a harder stance with regard to the price that OPEC charges for its oil.

*Question 5.* Professor Allvine, could you be specific as to why you differ so radically from Mr. Kahn's point that "the forces making for growth are at the moment so strong and have such great intrinsic momentum that despite all the roadblocks thrown in their way in the last decade or so, they are almost certainly going to triumph in the short run." Are the two of you really viewing the same world and if so, is there no objective reality out there which can give a clear picture of what is happening?

Answer. There is very definitely a difference in Mr. Kahn's interpretation and ours about the current state of technology and what it is contributing to economic growth. You may recall from some of the testimony that Mr. Kahn said that fundamentally he does not disagree with our scenario, but rather the outcome. Now, it is hard for us to understand how one can agree on the new set of problems, yet be so optimistic as to the outcome. We believe that the fundamental reason for the difference is that Mr. Kahn and the Hudson Institute have a rather blind faith in technology and have not carefully examined the rate and impact of technological diffusion in our economy over the post World War II period. The booming economy of the 1960s was, to a considerable extent, a result of the rapid conversion of technology into new products, processes and services which called for increasing investments, created new jobs, and stimulated the economy. We have examined the spread of such technologies and have looked for the new technologies which could have a similar impact on our economic future. We would like to be able to conclude that there are many emerging technologies and industries which are going to propel the economy as did those of the 1950s and 1960s. However, our examination of emerging technologies does not permit us to reach such a conclusion. For that matter we have carefully read Mr. Kahn's paper, and while his forecast is very optimistic for the next ten years there is little support in his paper as to why these conclusions are reached. One is almost forced to take as a matter of faith Mr. Kahn's strong belief about the momentum of existing technologies.

When Mr. Kahn was questioned before the Committee as to where the impact is going to be felt, he suggested that there would be more of the same, as for example, larger homes. We do not see how such a conclusion is possible for one of the real problems today is housing. The public can no longer afford traditional housing because of the many adverse developments which have greatly increased the costs for the same size and quality of home. We would like to know more about why Mr. Kahn and the Hudson Institute are so enthusiastic about prospects for new technology which will feed industries, provide more employment, and contribute to our rising standard of living.

During the decade of the 1960s the jet era took off, the suburban development was in full swing, color television was introduced, the computer industry was exploding, xerography was being widely adopted by business, and "wonder drugs" were being widely used. The examples cited are but a few of the more dramatic technologies that absorbed great quantities of capital investment, that employed millions of new people, and that contributed to our rising standard of living. We believe that what Mr. Kahn and others fail to realize about technology is that it does not occur at a constant rate, but has a great element of lumpiness. As a result of first the Great Depression during the 1930s which held back research and development expenditures to fully exploit new ideas, and then the accelerated R&D as a consequence of the emergency of World War II, we had a grouping of many significant technologies following World War II. Surely there will continue to be many major technological advances, but they are going to be of a different nature than those which we have experienced over the past three decades. These earlier technologies have been great consumers of energy, of land, and of raw materials and were very costly to the environment. There is no way in the world that we could afford over the next 30 years to experience the same types of material accumulation that we experienced in the frontier-like utilization of resources from World War II until the 1970s. The challenge before society is how to adjust to an environment in which a much higher price tag is associated with all types of resources. In the first quarter century of development following World War II we used resources extravagantly and it was much easier then than now to more fully employ our labor force and maintain a constant and satisfactory rate of economic growth.

The problems undermining our economy are much too critical to be swept away by an unrealistic faith in technology as our salvation. Technology must be converted into products, services and processes which are in demand by consumers and businesses. Unless this conversion takes place in a manner that provides new job opportunities and attracts new capital investment at the same rate as in the past, then our economy will start to lag as it has in the 1970s. To wistfully hope away such a decline in the development of innovations is to do our economy and policy makers absolutely no good. If we enter into an age where the contributions of technology and innovation to growth have diminished, then

policy makers must develop new approaches to stimulating the economy and maintaining an adequate rate of growth. Unless this is done our maturing economy will be underproductive and lumber along with false expectations as to the benefits to be expected by new technologies.

Another problem with Mr. Kahn's analysis of technology is that there is a major difference between incremental improvements in technology and breakthrough technologies, so many of which we enjoyed over the 1950s and 1960s. We would encourage the Committee and others interested in policy development to read our discussion of the past impact of technology and the loss of thrust of technological force which we present in our book, *The New State of the Economy*, forthcoming from Winthrop, a division of Prentice-Hall. Mr. Kahn indicated in his introductory comments that, with a little luck and some wise policy, many of the new technologies will break through and provide the impetus for economic growth. He was very vague as to what these technologies were to be, where the capital investments would be made, where the contribution to improving productivity would occur and why the standard of living would continue to rise. What got us through the recessions of the 1950s and propelled us through the almost recessions of the 1960s was the inherent strength of many of the new products that were expanding in the economy. The problem of the 1970s is that we have fewer recession proof industries where demand is so strong that it carries the economy through a period of economic slump. Take the semiconductor industry, one of our advanced technological industries. The semiconductor industry suffered very badly in the recession of the 1973-1975 period. The problem within this industry, in terms of broad-based support for the economy, is that so much of what it produces has gone into making incremental improvements in other products. The semiconductor industry has not been responsible for creating great new industries such as was the case with the breakthrough technologies of television, jet air travel, computers, wonder drugs, etc.

I would certainly like to learn more of Mr. Kahn's and the Hudson Institute's assessment of what are these new technologies and innovations that will provide the driving momentum for the economy in the latter 1970s and early 1980s. Mr. Kahn simply points to the future and in a religious-like manner speaks of the wonders of technology and this is of no value in developing practical solutions to our poorly performing economy. Certainly we will continue to have incremental improvements in technology along the lines of what Mr. Kahn is suggesting. Technology will create better products and processes, but they will not be anything on the order of the economic impact of the major breakthrough types of development which were introduced over the quarter century long expansion of the economy following World War II.

*Question 6.* Do you agree with Mr. Kahn's contention that one of the main reasons for the slowing down of economic growth in the long run will be changes in values and attitudes as expressed in his 13 New Emphases and Trends? Can such non-economic factors be the primary influence on long-run economic growth?

Answer. We definitely agree with Mr. Kahn on the point that changing societal values can materially affect the rate of economic growth. Mr. Kahn suggests that for the *next decade*, the changing societal values are not going to be destructive to growth; but after that he expects them to have a deteriorating impact on growth. In our judgment changing societal values are having a detrimental effect on growth at this very time in our economic history. In the latter 1960s and early 1970s the negative side effects of business activity were stressed and numerous laws were passed that greatly restrict the way in which business today employs capital, labor and material resources. Estimates are that up to 10 percent of capital investment will be spent throughout the remainder of this decade to meet the requirements of the new societal laws. Instead of this incremental investment going into more efficient products and processes, it is being diverted into meeting the requirements of the laws. The goods and services to be produced by industry are not as a result going to be more in demand, but more expensive to produce. Once again we did not find in Mr. Kahn's statement reasons supporting his belief that the adverse consequences of the societal laws would not be felt until a decade later. The strict requirements of the laws now being enforced are requiring business to make massive investments to meet the new standards in a variety of areas. It is hard to understand why Mr. Kahn feels that a decade from now the laws are going to have a detrimental effect on the economy, while that is not the case at this point in time.

RESPONSE OF NICHOLAS GEORGESCU-ROEGEN TO ADDITIONAL WRITTEN QUESTIONS  
POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 10, 1976.

Professor NICHOLAS GEORGESCU-ROEGEN,  
*Regional Research Institute, West Virginia University,  
Morgantown, W. Va.*

DEAR PROFESSOR GEORGESCU-ROEGEN: On behalf of the Joint Economic Committee, I would like to thank you for your testimony before the Committee on November 9. At that time, the Committee was not able to ask all the questions it was interested in pursuing due to the lack of time. We would appreciate your cooperation in providing written answers to the following questions, both for the hearing record and to assist the Committee in the development of its report to Congress on future U.S. economic growth.

(1) How can leading thinkers such as those on the panel, drawing from the same data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or world-views, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

(2) This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventual results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study and results they should rely on concerning any given issue affecting longer-run economic growth?

(3) Let us move to the specific. The hearing centered on long-run growth prospects, one of the most important questions that can be considered. Yet we hear on the one hand that everything looks good for the next ten years, while on the other we hear that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we were told, that even just slower economic growth, much less negative growth, would do great harm to the socio-economic system and be very costly in terms of its impact on human lives. What can we conclude, what message can we as an economic advisory Committee to the Congress send to the Congress concerning long-term growth prospects?

(4) Finally, let us consider very basic specifics. Each panelist has "looked into the future" and seen different forces in our society which will be shaping our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one and two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

(5) In this paper, Herman Kahn attacks quite directly the "limits to growth" perspective. He further asserts that the "influence of this perspective probably peaked in early 1976 and that this movement now seems to be in retreat." Would you categorize your perspective as a "limits to growth" perspective and if so, how do you respond to such charges?

(6) Prof. Allvine has thrown down the gauntlet to the economic profession. He faults their "continued preoccupation with short-run stabilization policies and procedures," he states they will have to "leave the sophisticated and highly developed world where they have dwelled the past 30 years" and that economics will be "returning to its roots as a philosophical and social science." Are we in a new ballgame so to speak which requires such a restructuring and if so, what pragmatic changes will have to take place in the way economists think about problems and the methods they use to analyze them?

(7) Do you agree with Mr. Kahn's contention that one of the main reasons for the slowing down of economic growth in the long run will be changes in values and attitudes as expressed in his 13 New Emphases and Trends? Can such non-economic factors be the primary influence on long-run economic growth?

The Committee would appreciate your cooperation in providing us with this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

WEST VIRGINIA UNIVERSITY,  
REGIONAL RESEARCH INSTITUTE.  
*Morgantown, W. Va., December 2, 1976.*

**Mr. JOHN R. STARK,**

*Executive Director, Congress of the United States, Joint Economic Committee,  
Dirksen Senate Office Building, Washington, D.C.*

DEAR MR. STARK: Thank you for your highly thoughtful and provocative list of questions in your letter of November 10, 1976.

1. The differences between the position of the main body of the economic profession—a position which in its extreme form is taken by Dr. H. Kahn—and that which a handful of economists (mainly, Kenneth Boulding, Ezra Mishan, William Miernyk, and myself) stem from a well-known fact. All professions have at all times a vested interest in the traditional doctrine; any revolution about this doctrine is likely to find closed ranks. In the case of economics, this phenomenon is aggravated by the immense contrast between the high claims of the profession and the actual weakness of its achievements. Modern economists have indulged in excessive empty mathematization, on the one hand, and in extreme simplifications, on the other. (Leontief's system is the best example of this last respect, for it reduces everything to linear equations.) They have also ignored completely the role of natural resources. It is natural, therefore, that when the profession is confronted with proofs of all these capital flaws, they should react in self-defense. As I said once to Nicholas Wade (see *Science*, October 31, 1975), they must feel that someone wants to steal the marbles with which they currently play. (Please see some of my own articles reprinted in my recent volume, *Energy and Economic Myths*, Pergamon Press, 1976.)

Indeed, as long as no crisis came to make us see the faulty orientation of standard economics, one could indulge in anything one pleases. How hard it has been and still is, for me to bring home the point that technology, too, may run amok as long as resources are readily available, as they have been during this historically unique mineralogical bonanza!

2. Social truth has always been adapted to fit the evolutionary moment. There is no other basis for judging it. For Quesnay, value resided in agriculture, because France was then devastated by endless wars. Other examples can be offered almost at will.

Mineralogical bonanza led to an economic science glorifying maximum utility and maximum profit. Certainly, this represents a particular, parochial worldview. But the march of things now calls for change. That only a very few of us see the necessity for a new outlook is "personal" only insofar as not all observers become aware of a change at the same time.

Now, policymakers must not be simple mail carriers. Their role—as I see it—is not to just implement what the technicians tell us. For if this were their role, they should be replaced by technicians, with an immense economy for society. They are supposed to be the gifted people who can see the handwriting on the wall well ahead of time. Their job in a period of scientific upheaval is to recognize which expert is right, if they cannot do this, or if they do not see their role in this way, all is lost. There is no substitute for good political vision and statesmanship, the claims of scientific movement notwithstanding.

3 and 4. The issue is not what will happen in the next ten years. (Incidentally, I was unhappy to see that the theme set up by the Joint Economic Committee at the meeting at which I participated was formulated in this way.) Mankind has in front of itself another million years of life (hopefully). The real issue is to recommend today what will be valid and useful ten years from now, as well as one thousand years or one hundred years from now. Certainly, the answer is not the philosophy induced by the mineralogical bonanza: "Come what may, we shall find a way." We are no exception to the laws valid for the evolution of life on this planet.

The time has come to recognize that we do not have a simple way even now. Witness the situation in the Middle East, in South Africa, as well as the difference between the tribes of Africa, for example, and our Fifth Avenue or the Rue de la Paix in Paris. I am looking forward with great hope for the leader who will tell the world "like it is," instead of campaigning for (re)election on growth, and more growth.

5. Kahn, as in all he has said and written so far, can say anything he likes. He will never be made responsible for the consequences or even for the truth value of his statements. The advantage of the economist is precisely the possibility of having this free license. Speaking of peaking in 1976, why are there now more studies and greater preoccupations with the problems of resource conservation

and pollution elimination than in 1975, or 1974, or in 1966 (when I wrote my first essay on the entropic problem of mankind)? I know of no one retreating from the position that natural resources are the crucial element of man's existence in the long run as well as at one and the same time. If anything has happened recently, it is the bandwagoning around this position. I expect that this bandwagoning will continue and even become more accentuated. Let us wait until the OPEC comes out with a new price increase. Let us wait to see what will be the result via the European economic debacle.

6. Professor Alvine has trodden on well-trodden paths by now. He has only reformulated somehow the ideas that were presented to the profession by others long ago (especially, by myself). He fits the "bandwagoning" of which I spoke above.

7. Dr. Kahn's 13 New Theses constitute a nice game with his old deck of cards, now rearranged differently (to borrow a characterization made by a colleague of mine). I stick to my bioeconomic interpretation, as developed in my works and outlined in the paper prepared for the Committee.

You may consider my remarks rather blunt. In that case, I apologize, but I could not proceed otherwise. The time has come for us to stop playing "playotrics"—as the father of econometrics, Ragnar Frisch, urged us at the First World Congress of the Econometric Society. The rule of the Committee in this respect is crucial, nay, historically unique. No service would have been done if I would have concealed my full thoughts under a soft blanket of half-words.

Sincerely yours,

NICHOLAS GEORGESCU-ROEGEN,  
*Visiting Benedum Professor of Energy Economics.*

Representative BOLLING. I was struck by something that Mr. Hardy said in his opening statement, that the function of Government should be to research and reason more rather than to rule and ration—I think I have it correct. He also suggested that it would not be improper for people involved in Government to think a little bit about philosophy. I think we have had a good illustration today that we certainly need more research, and that reason is a hard thing to come by. Clearly we do not have a consensus as to philosophy.

I have sort of a naive notion that I can't prove that one of the reasons that the country did as well as it did in the 20 years from 1946 to 1966 is that the community, the whole country, more or less made up its mind to move in a certain direction, and, without regard to the changes in the political control of Government, that the community and the Government continued to move in that general direction. That direction was, that perhaps we didn't pay some attention to employment, and some attention to inflation at all times. I suspect that we will end up with the same problem. We can define the problem, perhaps, but we are going to have a great deal more difficulty in making the conditions whereby the community can be ahead of the politicians who will then ratify the community's more or less tacit decision.

And if it is all right, I will conclude on that note and the committee will stand recessed until tomorrow.

[Whereupon, at 12:15 p.m., the committee recessed, to reconvene at 10 a.m., Wednesday, November 10, 1976.]

# LONG-TERM ECONOMIC GROWTH

WEDNESDAY, NOVEMBER 10, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to recess, at 10 a.m., in room 345, Cannon House Office Building. Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representatives Bolling, Hamilton, Long, and Rousselot.

Also present: G. Thomas Cator, William A. Cox, Robert D. Hamrin, Sarah Jackson, and Louis C. Krauthoff II, professional staff members; Michael J. Runde, administrative assistant; and M. Catherine Miller and Mark K. Policinski, minority professional staff members.

## OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative BOLLING. The committee will be in order.

Today's hearing is the second in the JEC's current series of hearings on "Long-Term Economic Growth." Both yesterday's and today's hearing are focused on the broad question of long-term growth prospects. Next week, we will be moving to the more specific as we look at many of the major sources of economic growth: Capital formation, resources and energy, and productivity and technological change. After examining the issues, the final hearing will focus on what types of growth policy processes may be needed to deal with the issues discussed previously.

Yesterday, we heard a wide variety of viewpoints concerning future growth prospects. I am sure that divergent viewpoints will be presented today. I hope, however, that the panelists will focus on why they may differ on certain points and in what areas consensus may be reached. The committee is especially hopeful that the panelists can provide specific recommendations, stemming from their conclusions concerning long-term growth prospects, on what areas Congress should focus on and what specific actions it should take in the next year or two to achieve an optimal growth rate and pattern of growth.

One particular area in which I look forward to receiving some real insights in today's hearing is that of models and their usefulness in making long-run forecasts. We continually see results of one model or the other which are often quite contradictory. With the panel today, we should be able to learn exactly how helpful these models are and their potential for improvement in coming years.

I will call on the panelists in order, and then we will move into a general discussion.



I hope that the members of the panel will find it possible to limit themselves to 10 minutes or a little bit less. I know that is an arduous requirement. We had relative success with that yesterday. It makes it easier to move on to a discussion among us all, and that is the reason for the format. We tried to encourage an informal approach to discussion after a relatively formal presentation by the authors of the excellent papers that have been presented and the comments of the other participants who did not present papers.

First, I would like to welcome Professor Jay Forrester to our meeting. He has long been engaged in the frontiers of science and technology. Indeed, he was one of the originators of digital computer development back in 1944-51. He has wide research and development experience as director of the MIT Computer Lab, and division head of Lincoln Lab in Cambridge.

Most recently he focused on social problems and his books include "Urban Dynamics" in 1969 and "Word Dynamics" published in 1971.

He is now head of a System Dynamics Group at MIT.

With this varied career I am sure he will be able to offer us some valuable insights.

**STATEMENT OF JAY W. FORRESTER, DIRECTOR, SYSTEM DYNAMICS GROUP, SLOAN SCHOOL OF MANAGEMENT, MIT**

MR. FORRESTER. Thank you, Mr. Vice Chairman. It is a pleasure to be here. These hearings are especially important because of the turbulent times in which we live and the significance of questions of economic stability and growth.

We are in a period of growing economic instability. Symptoms of social and economic stress appear in such forms as the deepest recession since World War II and in simultaneous inflation and unemployment. Such economic crosscurrents create political confusion and public disenchantment with national leadership. In times like these, causes and remedies are urgently sought. But the economic system is complex, conflicting theories abound, and a desperate search for simple solutions can easily lead to wrong answers.

The search for answers has concentrated on the most apparent characteristic of the national economy—the short-term business cycle, which exhibits peaks of activity at intervals of three to seven years. Business cycles are familiar; most people have experienced several; changes during the business cycle occur fast enough to be readily observed; and economic research has focused on business cycles while neglecting longer term economic behavior. But familiarity need not be equivalent to importance.

As a consequence of overemphasis on cycles, almost all variations in economic behavior have been attributed to the business cycle. The Great Depression of the 1930's is alleged by many to have been just an unusually severe business cycle recession. Milder recessions since 1945 have been attributed to policies aimed at stabilizing the business cycle. The recent downturn of economic activity has been described as an accentuated business cycle that could have been avoided by wiser countercyclical policies. The public has been promised that present high unemployment can be relieved by expensive fiscal and monetary

actions recommended on the basis of business cycle theory. But all of these assertions may be incorrect. If so, it is because the business cycle is but one aspect, and probably the least important aspect, of present economic turbulence. I suggest that two longer term modes of economic behavior may be having more influence now than the business cycle.

Indeed, the social, political, and economic literature treats extensively a family of dynamic processes lying beyond the time horizon of simple business cycles. The Kuznets cycle is a fluctuation of economic activity with peaks some 15 to 25 years apart. The Kondratieff cycle is a name given to a long wave of economic and political change spanning 45 to 60 years. And the life cycle of growth shapes 300 years of economic development. These longer term manifestations have been relatively neglected. However, they may at the present time be powerful enough to dominate the short-term business cycle.

We perceive current economic events as arising primarily from three different dynamic patterns—the business cycle, the Kondratieff long wave, and the life cycle of growth. Each mode is generated by a different structure within the economy. The three dynamic modes can exist simultaneously. It is easy to misinterpret symptoms arising from the longer modes and to attribute them erroneously as coming from the business cycle. Effective policy responses to the several modes will be quite different. Using business cycle concepts to combat stresses that actually come from the long wave and the life cycle of growth will probably accentuate our economic difficulties.

Although capital investment is probably not an essential component of the business cycle, it does seem to be implicated in the Kuznets cycle and the Kondratieff long wave. Of the two, the Kondratieff wave appears far more important. The Kondratieff wave can span 45 to 60 years. Peaks of activity have occurred around 1815, 1870, and 1920. In the context of the long wave theory, the Great Depression of the 1930's would be interpreted as a typical trough between a peak occurring about 1920 and a succeeding peak in the 1970's. We believe it is urgent to examine the possibility that the 1980's could repeat behavior like that experienced in the 1930's.

The long wave process we are examining is created by major expansion and contraction of the capital sectors in the economy. The effect can be seen by starting in 1945 following the Depression and World War II when every aspect of capital plant was inadequate. Consumer durables, housing, office buildings, factories, transportation systems, and schools were old and inadequate. To rebuild the depleted capital stock in a short time, like 20 years, construction of housing and equipment rose to a rate higher than would be needed in the long run for replacing the depreciation of capital plant. But when an adequate capital plant has been created, a time that may have occurred in the 1960's, tremendous forces persisted to sustain capital accumulation. Labor unions wanted to continue construction, companies in the capital sector sold their output more effectively and extended more credit, banks had been successful in loaning on new capital plant and wanted to continue, and the Federal Reserve increased the money supply in the name of sustaining economic growth. The result has been an unbalancing of the system with too much capital expansion and too much debt. Eventually momentum must falter as capital plant becomes more and more

excessive. It is probable that enough capital plant now exists to sustain consumption output for one or two decades with little new additional investment. With a progressive decline in capital spending, unemployment would radiate from the capital sectors, and many companies in the capital sectors would go out of business.

I am aware that this scenario revolving around excess accumulation of capital plant is contrary to current press articles and economic policy recommendations calling for still more investment. But the scenario is consistent with present weakness in new investment. It is consistent with the interesting booklet "The Widening Cycle," by Albert Sommers of The Conference Board and with this recession having been deeper than those before. It is consistent with the book by Robert Gordon rejecting Federal Reserve actions as a cause of the Great Depression and instead showing excess accumulation of capital plant in the 1920's to be a precursor to economic stagnation. Because of the way debt and banking ratios arise from investment in physical assets, I believe the scenario is also consistent with the emphasis by Hyman Minsky on changes in debt and fragility in the financial system. The scenario is consistent with present unemployment concentrated in the capital sectors, rising unemployment among college graduates, weakness in housing construction, difficulties in real estate investments, vulnerability in the banking system, and a faltering economic recovery.

Another important long-term dynamic mode is also impinging on current affairs. It is the life cycle of economic growth. The life cycle is that time span of 300 years during which in the first part growth sweeps upward in an ever-steepening curve, in the second or transition part growth follows a straight line, and in the third part growth slows and ceases.

The transition region, in which I believe we are now living, covers no more than two or three decades between exponential growth and the approach to a future economic equilibrium. In this present transition interval, counterforces from nature rise until they become strong enough to suppress growth. By pushing for more growth, we are causing the counterforces to increase. The harder we push, the harder Nature will resist. We can exhaust ourselves by pressing into the region of rapidly rising real costs induced by our placing ever higher demands on the environment. Resistance is mounting in the form of energy and resource shortages, declining food reserves, and rising pollution.

Present Government policies are based on several assumptions—that the short-term business cycle is the major cause of economic problem, that there is a tradeoff between inflation and unemployment, and that nothing stands in the way of continuing along the economic growth path of the last three decades. The validity of these assumptions is crucial to the appropriateness of present policy. Our investigations are indicating that all three assumptions may be erroneous.

Over the last decade, money supply has increased far faster than real output. Money supply—M-2—per unit of real output has been doubled in the decade, and prices have kept pace by also nearly doubling. Money has been increased faster than output to encourage investment and reduce unemployment. But, in spite of a money policy

that produced inflation, unemployment has steadily worsened. If capital plant is already too high to be in balance with other economic forces, more money does not have leverage to increase investment or jobs in the capital sectors. If unemployment is coming from long-term changes that lie beyond the reach of money supply, then increasing the money supply only increases inflation. As far as money supply is concerned, we may be in a position of choosing between inflation or stable prices, but with little effect on unemployment. A mistaken belief in the ability of increased money supply to reduce unemployment can compound the problems by superimposing a high rate of inflation on other difficulties.

The country is moving to relieve unemployment by welfare, unemployment compensation, and temporary Government-created jobs. Such policies might be suitable if the present unemployment were arising from the short-term business cycle and people were being helped through a brief interval before returning to their former jobs. But if many former jobs are disappearing because some major sectors of the economy are in a long-term decline, such Government programs will trap people in a deadend and keep them from moving to situations where they can fill a new and useful role. Depending on the future form of the economy over the next two decades, guidance and help in shifting to new lines of work may be far more appropriate than policies that freeze people in situations where they cannot be productive. But to plan such alternative policies requires a consensus on the shape of the economic future for the next 20 years.

A government that promises continued growth in real per capita output while becoming entangled by environmental limits is apt to further disillusion the public. Our oil problem has not been caused by OPEC; it is a result of having grown beyond our own petroleum supplies. Pollution problems arise not so much from wanton disregard of the environment by business as from our consumption demands having grown beyond the cleanup capability of Nature. Government policies that seek growth as a solution to all ills will be increasingly frustrated by rapidly increasing costs from natural limitations. The life cycle of growth suggests that we should think about how large a stable population we can support, and at what standard of living. If we do not think and decide, social and natural forces will interact to strike for us a balance between population and standard of living that we may not like.

In summary, the business cycle seems to be the focus of Government economic policy. It is a short-range view. The major economic and social stresses are coming from longer term process in society. Economic policies derived from assuming the wrong causes are likely to accentuate the country's problems. To avoid serious damage from policies that do not adequately address the variety of changes now occurring in the economy, every effort should be made to understand better the entire time range of influences that are shaping the next one or two decades.

Representative BOLLING. Thank you very much for a very challenging statement.

Next, Professor Gary Fromm. He has been a senior fellow at the Brookings Institution since 1973 and is now the Washington director

of the Center for Economic Policy Research. His specialty is econometrics and economic model building. This rapidly growing field has become the key economic technique in forecasting and evaluating policy alternatives. So I am particularly happy to have him join us for the discussion of growth prospects.

**STATEMENT OF GARY FROMM, DIRECTOR, CENTER FOR ECONOMIC POLICY RESEARCH OF THE STANFORD RESEARCH INSTITUTE, WASHINGTON, D.C., AND SENIOR RESEARCH STAFF, NATIONAL BUREAU OF ECONOMIC RESEARCH**

Mr. FROMM. Thank you, Mr. Vice Chairman.

If I may make a correction, I am still affiliated with the National Bureau of Economic Research. But recently I have become the director of the Center for Economic Policy Research of the Stanford Research Institute here in Washington.

Representative BOLLING. We will certainly correct that.

Mr. FROMM. I am also delighted, as Professor Forrester is, that this committee is undertaking this study. I did participate 18 years ago in the study sponsored by this Committee on "Employment, Growth, and Price Levels." And I am glad to see, although it has been 18 years, a bit too long, that we are finally getting back to the right subjects.

The United States and the world economy today stand at a crossroad for economic policy. Both have emerged from troughs of recent sharp recessions, but unemployment and inflation rates remain at relatively high levels. The state of demand still is weak and the free world system might easily be plunged into another downturn by moderate shocks from large OPEC price increases, an international monetary crisis, or widespread harvest failures. There is substantial downside risk.

The principal issue currently confronting economic policymakers in the United States is the size of a tax cut needed to put the economy back on its growth path. Failure to provide this or equivalent stimulus within the near future not only will entail further large losses in domestic output, but will expose other nations to further erosion in their economic vitality and political stability. This we can ill afford.

Setting the present weakness aside, forecasts of U.S. economic growth over the next decade, obtained from a survey of 21 organizations, generally paint a more favorable picture than that experienced during the last 5 years. The median prediction for real GNP growth for 1975-80 is 4.9 percent. Inflation during 1975-80 is projected at a 5.7 percent annual rate, and in the first half of the 1980's at a lower rate of 4.8 percent. Unemployment rates for the remainder of this decade are predicted to average 6.5 percent and then fall to 5.0 percent for 1981-85.

In formulating these predictions, most of the forecasts assume that fiscal and monetary policy will neither be highly stimulative or restrictive and will steer a middle course which permits the private sector to grow at its own natural rate. But, some respondents anticipate a moderate or growth recession in two of these years, some expect it to be in 1977-78, and others in 1978-79, due to tight monetary policy in 1977-78.

While the sample is limited, the predictions from the survey are felt to be representative of the "best" and currently most widely used U.S. economic projections for the next decade. However, all were prepared prior to the election of Governor Carter and probably make little allowance for new directions in economic policies that his administration might pursue. Also, the anticipated 1975-85 median scenario is subject to major uncertainties, including errors in fiscal and monetary policy management, potential capacity shortages brought about by poor financial structure of capital intensive industries, and the effects of possible shocks from cartels, world food shortages, military or political upheavals, or from other unanticipated sources. For the United States and other free market economies, a successful growth outcome will depend upon pursuit of a galaxy of policies designed to affect both demand and supply and to maintain proper balance between them. Better analytical tools are needed to achieve that end and Government-sponsored research for that purpose should be given high priority.

This does not necessitate establishment of a planning agency, although such a group may be helpful in providing a focal point for research on long-range forces which affect the structure and functioning of the economy. Clearly, more extensive and intensive study of a demographic, social, scientific, technological, environmental, resource, economic, and political changes, short and long run, is needed. The structure of the world's economic, political, and social systems and institutions is not static, but constantly evolving.

Therefore, simple methods for projecting growth, and models which fail to allow for altered behavioral and technological characteristics, are unlikely to yield accurate predictions of rates of growth or functioning of the economy decades from now. By the same token, long-wave theories of economic fluctuations probably contain little that is relevant for predicting future output or for dealing with the economic problems currently confronting the United States. As to predictions, it is clear that Professor Forrester and I would tend to disagree.

We need not suffer another depression like the 1930's nor should we do so. But, poor economic policies easily could bring that about; developing the knowledge and tools to avoid them still remains to be accomplished. This committee is to be commended for its past and continuing interest in studies of economic growth and stability. It is hoped that it also will strongly support efforts to obtain the resources to augment knowledge in this critical area.

If I can fault the committee for anything in the past, it has been that it has put demands on our profession, asked us to prepare papers and testify, which we have gladly done in all cases, but has not at the same time been a strong force for providing the resources to conduct the research necessary to prepare those papers.

Thank you very much.

Representative BOLLING. Thank you.

Next, Professor Mancur Olson. His career spans several fields. He now is professor of economics at the University of Maryland, but he has also been Deputy Assistant Secretary at HEW. Welfare and economics and the theory of social choice and broader economic policies are all within his purview. In considering what our growth prospect would mean, we need this broader conception.

**STATEMENT OF MANCUR OLSON, PROFESSOR OF ECONOMICS,  
UNIVERSITY OF MARYLAND**

Mr. OLSON. Thank you, Mr. Vice Chairman. I thank you for having these hearings and for inviting me to them.

I would like to suggest that it is useful, in looking at the growth of the American economy and the growth of different regions of this country, to set our experience in the context of the international scene, and in particular in the context of other developed democracies.

As we look in this international way at the growth rates of different countries, we see a number of rather striking growth rates, striking because they are fast or striking because they are slow. In the former category we have the defeated countries of World War II, Germany and Japan, which have in general been the countries growing most rapidly of all the countries since World War II. Also, many of the nations occupied by Germany and Japan in World War II have grown rapidly, and so indeed has Italy, but not just lately.

By contrast, we have the experience of Great Britain, which certainly since World War II, and for nearly a century, really, has had the slowest growth rate of the developed nations. This case is a particularly puzzling one, Mr. Vice Chairman, because this same country, Great Britain, was the fastest growing country for a long period before the middle of the 19th century. It was, after all, the home of the Industrial Revolution, the place where modern economic growth began. This suggests that no enduring trait of that society could by itself explain Britain's slow growth because that trait would have had to be present also when it had the relatively fastest rate of growth.

How do we get an explanation of these strikingly fast and strikingly slow growth rates, an explanation that might also help us with our own national experience?

I would like to suggest, somewhat eccentrically, that we need to look at what we might call common-interest organizations, organizations that have market power like unions or cartels, and organizations which have political power, like pressure groups and lobbies. Of course, many organizations have both types of power, economic and political.

The main thing about these organizations, it seems to me, that needs emphasizing is that they provide a benefit that goes to everyone in some group; to all workers in a given industry or factory, to all farmers who raise a particular commodity, or something like that. From this it follows that the benefits of such organizations will go to an individual in the relevant group whether he supported the organization or not. The farmer will get the higher price obtained by the political activities of the farm organization whether or not he has paid dues in that organization. And so with all such organizations.

That means in the economist's language that these organizations provide a public good, a benefit that is like the benefits of Government in that you can't sell it in a market or provide it for at least large groups with purely voluntary mechanisms.

I argue that large organizations of this sort tend not to be supported because of the self-interested and voluntary action of their individual members; they are supported instead by coercive devices or other selective incentives that give individuals a reason to belong.

A classic case here, of course, is the union shop that is so important to union membership. In the Midwest one sees a somewhat different phenomenon in the case of farm organizations. Again and again the patronage dividends of the farm cooperatives are the real source of the incentive for the farmer to join a farm organization working in his interests; for the dues are often automatically subtracted from these dividends.

I would argue, then, that in general large organizations are supported not simply because they provide a benefit to some large group, but because of these selective incentives arising from coercion or other sources.

Now, if this is true, we might ask what implications it would have for the pattern of organizations that emerges in a democratic society. This argument would suggest that many groups that have common interests that might gain from action in the marketplace or in the political system will not in fact be well represented by organizations. Consumers, taxpayers, the unemployed, and the poor are not organized in any society, and by my argument we shouldn't expect them to be, the reason being that these groups are so dispersed that there is no way coercion or social pressure can be brought to bear on them the way it can be brought to bear on the workers in a particular factory, and there is no way really that they can work out any selective incentive that will induce people to join.

So we see not only in the United States but in other democratic systems that groups like the unemployed, the poor, the taxpayers, and the consumers, are not represented by organizations to which most of these individuals in these groups belong.

So we get, then, an uneven pattern of organizations with market power and political clout.

Further, those organizations that do develop—the unions, the farm organizations, the professional associations, and the cartels—usually emerge only after a long period of time. If I am right in my argument, you have just the right circumstances and the right leadership to get these organizations going.

Historical experience suggests this as well. The first labor union was set up in 1851 in Great Britain, nearly 100 years after that country had begun to industrialize. Unions in this country grew most rapidly in the period from 1937 to 1945, long after we had become an industrial country. One can find similar delays with other types of organizations.

So, organizations develop slowly and they develop unevenly in democratic societies.

Now, we need to ask, what is the effect of these organizations on the rate of economic growth? I would like to suggest, Mr. Vice Chairman, that though these organizations perform immensely valuable functions in a democratic society—they make the society more pluralistic and likely to stay democratic—they have mainly an adverse effect on economic growth. They block entry to growing occupations which slows the rate of growth. They will frequently block innovation which would be adverse to them, but in the interest of a more rapidly growing economy. Through their political power they bring about legislation which induces resources to go into areas where the social product of those resources is less.



I therefore suggest that the slow accumulation of these organizations, the uneven accumulation of these types of groups, leads then, to a situation which is adverse to economic growth.

What would this lead to in the way of predictions or explanations? It would suggest, I submit, that the very rapid growth of Germany and Japan, and the other occupied and defeated nations after World War II, is not so surprising. Totalitarian governments and the Allied occupations following them almost wiped the slate clean of common-interest organizations, thereby leading, I would argue, to very rapid growth.

Further, this argument would lead to the hypothesis that the society that has been industrialized longest, and that has not been invaded or had totalitarian government, would have the slowest rate of growth. And of course that is precisely the case with Great Britain.

Note that this explanation is not contradicted by the fact that Britain had the Industrial Revolution for then the slow accumulation of interest groups had not taken place.

Let's apply this model, if we may, to the case of the United States. We have been industrialized a little less long, and had a somewhat shorter period of political stability than Great Britain. We had our Civil War. We industrialized a little bit more recently. But there is no country besides Britain that has a longer experience of industrialization and democratic stability and freedom of organization than we have. And we have the second slowest rate of growth since World War II of the developed countries, exactly what my argument would suggest.

Of course, our country is a very large one, with diverse and different regions. So let us now apply this same logic to the regions of the United States.

An associate of mine at the University of Maryland, Mr. Kwang Choi, is doing some regressions on the rate of growth of personal income and private nonfarm income in the 48 contiguous States of the United States. And he finds that the following factors are among those that are positively correlated with the rate of growth: Defeat in the Civil War is positively correlated with the rate of growth since 1964-65. In this interpretation one can think of the South as a region with instability, with policies that gave an incentive for its black citizens to leave until, say, the midsixties. Since then, with policy changes partly, you might say, the result of the defeat of the South politically by the rest of the country in the midsixties, there has been a stable situation and the South has of course grown unusually rapidly.

One variable that is negatively related to the rate of growth now is the length of time since a State became a State as opposed to a territory, or was defeated in the Civil War, whichever was later. That would be a measure of the length of time it had had freedom of organization and political stability. And that variable is negatively related to the rate of growth as we would predict.

Another variable that is negatively related to current growth is industrialization and urbanization in the antebellum period of the 19th century, in a year like 1880 or so.

The same variables that are associated with slow growth tend to be positively correlated with membership in such common-interest organizations as we can now measure, like union membership. That

is, the same variables that explain slow growth also explain the proportion of union membership and we think, though we can't show this yet, also membership of such other common-interest organizations.

So I would suggest in closing, Mr. Vice Chairman, one somewhat unhappy thought. And that is that democratic societies, which I profoundly cherish, have within themselves also a problem that emerges over long periods of stability. And that is the building up of interest groups that, through their action in the market and their action in the political system, lower the rate of growth.

I would suggest this has something to do with the problems of some of our great cities like New York. I would suggest that this has something to do with the fact that our Nation's rate of growth is not one of the fastest of the developed democracies. And I think it has something to do with the problem that is loosely called wage inflation, and that we need special policies to deal with that.

I would also suggest that it provides a different explanation than Mr. Forrester offered. It suggests not that there are insufficient resources to maintain a rapid rate of growth, and not that the environment is such a constraining force that it would prevent our having a rapid rate of growth, not that cycles are the problem. It suggests that what we need most of all is to make our institutions and our political system work better.

Thank you.

Representative BOLLING. Thank you for a very interesting and original approach to this particular problem.

Next, Mr. Willis Harman. Mr. Harman is both an engineer and an economist, and director of the Center for the Study of Social Policy of the Stanford Research Institute. He has had a great deal of practice in looking into the crystal ball. I am sure we will all benefit from the insight that he and his colleagues at Stanford have come up with.

#### **STATEMENT OF WILLIS W. HARMAN, DIRECTOR, CENTER FOR THE STUDY OF SOCIAL POLICY, STANFORD RESEARCH INSTITUTE**

Mr. HARMAN. Thank you, Mr. Vice Chairman and members of the committee. It is a great privilege to be here to participate in these extremely important hearings.

The purpose of my remarks this morning is to place the subject of long-term economic growth prospects in a broader context.

This past decade has been characterized by a number of signs of system breakdown and disintegration. Simultaneously there may be observed indications of a possible major cultural change and reintegration. These signs are by no means unambiguous, and they are read differently by different persons. In brief, I am suggesting that what may appear to be an economic issue of long-term growth prospects is more fruitfully viewed as a debate about the interpretation of these two sets of indicators.

Among the first signs cited as indicative of possible system breakdown are:

Apparent inability of the system to achieve promised levels of overall growth, industrial investment, productivity, balance of trade, and employment, together with satisfactorily low levels of inflation, pollution, taxation, and public borrowing.

Accelerating urban decay and unmanageability of large cities.

Increasing cost of environmental protection.

Accelerating resource depletion.

Overwhelming world population and food problems.

Breakdown symptoms and escalating costs of service delivery systems, for example, health care, mail, protection, and insurance.

Capital problems, including increasing need for capital and decreasing capital productivity, in large energy and resource projects.

Collapsing money, in terms of its ability to purchase energy, raw materials, and replacement capital equipment— or almost anything else.

Appearance of at least a half dozen major books this year on the decline of industrial capitalism, and a Time cover story last year entitled "Can Capitalism Survive?"

And finally, the appearance of signs which, in some societies in the past, have heralded major breakdowns and revolutionary change: alienation, purposelessness; lowered sense of community; increased rate of mental disorders, violent hedonistic behavior, of lax public morality, increased fascination with diverse religious cults.

That is the first set.

A second set of indications may be interpreted as signs of a nascent cultural transformation and accompanying institutional innovation. They include:

Growing insistence on self-determination on the part of individuals, minority groups, ex-colonies, subcultures, women, communities.

Increasing emphasis on quality of life as contrasted with status symbols, wealth accumulation, power of position, and materialistic goals.

Movement toward "appropriate technology"—nonpolluting, humanized, community-promoting, resource and energy conserving.

Increasing acceptance of an ecological ethic emphasizing man acting in partnership with nature in protecting the complex life supporting systems of the planet; in modifying ecological relationships wisely; in husbanding resources appropriately; in establishing technological recycling mechanisms in harmony with natural ones; and in eliminating cancerous types of economic growth.

Widespread search for transcendental meanings, evidenced in a new religiosity, in heightened cultural interest in self-discovery and matters of the spirit, and in scientific explorations of altered states of consciousness, biofeedback training, holistic health care, and so forth.

The main consequences of taking seriously the two sets of signs just summarized is that the current debate over economic growth rate turns out to be in essence not an economic argument at all. It is, rather, a matter of the economic indicator reflecting a systematic crisis of far broader proportions.

The industrial era in all economically advanced nations has been characterized by a set of basic trends. A partial use of these would include: increasing technological and economic growth, increasing dominance of economic rationality in social decisionmaking, industrialization of an ever-enlarging segment of human activities, and what might be called "scientification" of knowledge, which brought the material standard of living in these countries to unprecedented heights. These

trends of a few centuries' duration were superimposed on a much longer trend of civilization itself. This longer evolutionary trend is characterized by:

Increasing cognitive understanding of the total environment and man's relationship to it, of oneness with fellow man and with Nature.

Emphasis on concern with a communication about the "great questions," the inner world, man's spiritual being.

Emphasis on increasing self-awareness and individual self-realization.

Societal development toward, and high value placed on, political liberty.

Movement toward democracy, equity, justice under law.

The question of future economic growth is a facet, and a facet only, of the broader question of the growing conflict between the influential trends of the industrial era and much longer term trends in the evolution of human civilization. The "limit to growth" argument is the negative side of modern society's search for more worthy goals than materialistic acquisition and hedonism.

What is at issue is not simply whether economic growth will continue in some specified form and at some specified rate. The broader issue is best illustrated by a medical parallel. Besides the diseases caused by some forms of circulatory disease, peptic ulcers, psychosomatic illness, alcoholism, and mental illness—which are related to stress coming from a person's total way of life. They are not cured until that overall lifestyle is changed. This fact suggests that societies might manifest similar disease—that at a point in the evolution of a society it might show symptoms of a malady so fundamental that it could only be cured by a throughgoing change of social and institutional lifestyle.

The prime issue before the Nation is to discern whether or not we have come to such a point of unavoidable breakdown and restructuring—of metamorphosis, if you will. For if we have, we face a formidable task of making the transformation in an nondisruptive a way as possible.

It is, I believe in this context that we need to examine the subject of long-term economic growth prospects for the United States.

Representative BOLLING. Thank you.

It begins to be obvious that the politician who has to make a decision on policy has some problems of choice.

Next we have Professor Wassily Leontief, who needs no introduction here. He is a Nobel laureate in economics. His specialty is input-output analysis, the technique which helps us see the interactions and linkages between economic factors, and a vital step if our projections and predictions are to make sense in a real world.

It is a pleasure to welcome you, sir.

#### STATEMENT OF WASSILY LEONTIEF, PROFESSOR OF ECONOMICS, NEW YORK UNIVERSITY

MR. LEONTIEF. The prepared statement which I have brought here is relatively short, 10 pages. And I brought only 15 copies. But I am sure it can be reproduced.

It deals with one particular problem. I entitled it "Modeling Approach of Policy Decisions in the U.S. Economy." Intellectually it is part of a wider enterprise, namely, part of my contribution to the work of the Advisory Committee to the Commission on Supplies and Shortages which for over the period of a year was engaged in the task of analyzing and making recommendations on the basis of the analysis of the operation of our Government, the project, which is very important, of formulating an orderly procedure with respect to policy formation and policy interpretation.

I see that you will have before you 9 days from now the Chairman of the Advisory Committee on National Growth Policy Processes, Mr. Arnold Saltzman and Ralph Widner will also appear.

But I also feel that if some things are worth saying at all they are worth saying twice. And since I am in this particular part of the report I will say something on a modeling approach.

And if I have time I will say something about the philosophical discussion of national objectives, not as an economic enterprise, but as an approach to policy decision.

I take a rather dim view of the general planning of capital in the national objectives as a practical guide to policy decisions. And certain types of modern capital approach gives us an alternative.

Now, since our question of growth prospects came up, let me just mention that I was engaged for sometime with the United Nations in a study of the growth prospects of the world over the next 25 to 30 years. And growth prospects in this country cannot be discussed without considering the entire world picture. And without trying to explain or justify it, let me say that my impression is that so far as crudely physical conditions are concerned, so far as the supply of natural resources, the alleged danger of unavoidable environmental disruption—there is a danger, but I think it is avoidable and manageable—my feeling is that there is no reason to expect the kind of mechanical obstacles that will come up, even if you consider the population problem in the presumptions about growth conditions.

On the other side there is the problem of the relative growth of different parts of the world, and particularly the difficulties encountered in the poor, less developed countries. The situation I think is very serious, extremely serious.

I might say on that prospect, if the prices of natural resources go up, the main beneficiaries will be the United States and Soviet Russia, a couple of developed countries. Europe will be slightly on edge, but they have good credits, so they can't resist. And the poorer countries will be particularly damaged. The United States will continue to produce and export much of the world's materials for a long time. If any thing, a mechanical increase in prices would not damage us. It would require some adjustments.

But now coming to the main subject, I think that one problem in our Government is that there is lack of systematic planning within the Government, I mean just in Government operations. The different parts of the Government do very good work, each within its own field, the research in its own field, the policy decisions each in its own field. And we have pluralism. One department makes decisions which might solve its problem, but creates problems for another depart-

ment, even coordination with environmental agencies. So it is a very serious problem.

And of course behind it is the problem of a more systematic guidance all over the country.

And here I think in terms of the modeling approach of the country, viewing the system as a whole, we have a certain framework in which you can put information. I purposely want to emphasize that. I am not emphasizing the high falluting models which kind of philosophically predict the future, but the framework in which we have some information that can put it in an orderly fashion.

There are all kinds of models, of course. You can describe the future of the world in five equations. You can describe the operation of our economy in something like ten equations. And for practical management it is not enough. It neglects too much information, it is superficial. And it forces you to rely not on primary information, but on some kind of a correlation, a series, long time series. You just look at two times series, and you see one is going up and the other going down, so there must be one connection. But the mathematician permits you to do it. But I don't think the output is very useful, and certainly, not persuasive to legislators.

I think we need models which are not only comprehensive, but quite detailed, models in which, when we speak of an industry such as the steel industry, we do not discuss correlation between the steel output and the coal output in the last 50 years, but we go to the steel plants and see what method of production is used, and what the technology is, and of course what the expectations of the technological possibilities or changes are in the future. And in exactly the same way go through an entire system. It is a big job.

But this is why we have statistical information. And it is a terribly large job. But if I were doing that job, formulating policy which actually will work, and expected to get results, it would be a very chancy enterprise.

We often speak about the lack of information. In Government very often we have what I refer to as adverse information procedures. I have my facts and the other fellow has the opposite facts. Now, I will go and send this fellow's back, certainly out of the halls of Congress, to do his work and then come out with facts that agree, particularly real facts and not some kind of theoretical position.

One year ago I provided an affidavit in a very important court fight about an important Government decision promulgated in which I looked at the document, and said, I do not know whether the decision is right or wrong, but I am convinced for this reason that whoever made this decision did not know it either. Send it back.

We need more facts, and we have the technical possibility to handle facts. If it requires money, fine, we can do it.

The modern approach, by the way, I think, is the only way to organize all facts. We need more information. You can collect information only if you know the purpose for which you collect it. And of course in the context of the U.S. Government, it must be a very wide purpose, to implement all kinds of policies and particularly see how one policy is related to another, how one decision will affect fields which you do not possibly expect, but which actually will be affected.

So a modern approach, I think, is the key to strengthening the organization of all of our information guidance and services, we must correlate not only statistical but economic information. Practically every government decision invokes not just general decisions, but technical know-how in a field.

Now, I have spoken too long. But I would like to make one remark of a philosophical nature. For many years, academics in particular, but also religious leaders, government people, and others engaged in a philosophical discussion of American goals. I think it is a very useful and educational enterprise. But then economists got hold of it and said, please give us the mathematical formulation of American goals. If you give it to us we will know how to get there. The economists called it objective functions. It is a very high falluting name. Y on the left of an equal function, and X on the right, and so forth.

I will say the computation of general social indices belongs in the same category. In one formula you describe the well-being of the American people. I think it is an impossibility.

My feeling is—and this applies not only to technical work but even to the public relations aspect—I repeat the example which I offered, which I think is a useful one. A friend calls me and says, “I want to take you out for dinner tomorrow in a good restaurant.”

And I say, “Fine.”

And then he tells me, “Can you quickly describe to me on the telephone your tastes, and then I will just order the courses to your taste.”

And I said, “No, my dear, show me the menu.”

The menu is not an index. It is a choice of alternatives. And I think that what the economists, what the technical people can do, is to show a set of alternatives describing considerable detail. I might not understand that national income is, but I do understand what somebody said, people like you will have so much space, will be able to buy this and that food, or will be able to get this and that. In other words, a very complete description. And this should include a description of public services. My feeling is that the model, and just a detailed model, can be used to describe the alternatives. I would have been prepared to describe the state of American economy in empathetic terms, and not nit-picking, according to Mr. Reagan and another according to Mr. Ford, and another according to Mr. Humphrey. I will, of course, give specifications. It will force people to be specific.

I have a feeling that the same applies to the Congress. If you can give concrete details, well, what happens now—give to the Congress, the separate committees, in complete detail a tax system or the environmental situation, or of energy production or foreign trade, but you don't give them the entire picture. So consequently it is very difficult to make a national judgment. A good economist should be able to do it.

In closing I would say, of course, the modeling approach is not something new. It became very fashionable. I began 50 years ago when I started producing models, I was considered a crazy fellow. But now everybody has a model, every department has a model. What is it? Instead of adversity, factfinding, you will have adversity model building. It is equally bad. And my feeling is, we have to put our heads together and not forbid building many models, but agree on some fun-

damental model, which is not ambiguous, which will pick not a strategic strategic point in our economy, but average it out nicely, and be able to use its formation, and provide information to other people who want to do specialized work on special models. This would be very useful both to the Executive and to the legislative branches of the Government. You can abolish it, but it tends to reduce the approach to troubles in the Government, and factfinding expeditions.

When the oil crisis hit us we should have known what the oil situation is instead of appointing a couple of guys to quickly get together the facts. It is entirely possible, with a good model approach, to do that.

I apologize for speaking too long.

Representative BOLLING. Thank you very much for a very interesting statement, which I think goes to the heart of the dilemma that Congress finds itself in constantly of never dealing with the whole thing, but always dealing with pieces of things.

[The prepared statement of Mr. Leontief follows:]

PREPARED STATEMENT OF WASSILY LEONTIEF

MODELING APPROACH OF POLICY DECISIONS IN THE U.S. ECONOMY

*The Modeling Approach*

The scientific tool best suited to the task of analyzing the operations of large economic systems is the model. A model is not so much a small scale replica of the real thing as it is a surveyor's map, a blueprint of its structure and of the interrelationships between all its different parts. The modelling approach can be considered today to be practically indispensable for systematic understanding of the functioning or, as the case may be, the malfunctioning of a modern economy, for tracing the actual or potential sources of trouble and for deciding what adjustments should be made, what actions could be taken—to set it right.

The model building approach is widely used both by government and private business. It has been recognized as an effective monitoring device and decision making aid in dealing with complex production, transportation or distribution systems, as well as in market analysis. Large government agencies—such as the Energy Research and Development Administration, the Environmental Protection Agency and the Department of Transportation and their State and local counterparts—resort to model building. Large oil companies and chemical concerns, both in the United States and abroad, use economic models to assess alternative patterns of corporate development. Several hundreds of economic models are operated in the Government and certainly a much larger number are used by members of the private sector.

Formally, a model is a system of equations. Some of the variables entering into it describe inputs, outputs and prices of different goods and services, the levels of income and of employment in various industries and regions; others represent, for example, the levels of investment in new productive capacities, or the quantities of exports and of imports. The "parameters" entering into the description of individual equations describe the structural characteristics of the various parts of the economy. Large sets of "technical coefficients" describe, for example, the "cooking recipes" of the individual industries—relationships between the quantities of labor, materials or energy used and the amounts of finished goods produced, others reflect the composition of the typical shopping basket of different income groups, the breakdown of various kinds of governmental expenditures, and still others describe the tax rates determining the level of government revenues.

As time goes on the magnitude of these relationship "parameters" must be expected to change, reflecting new methods of production, shifts in consumer tastes or, say, introduction of new environmental regulations.

*Large or Small Model*

Models differ in the scope of their coverage and detail. There are models of particular sectors of production such as, for example, U.S. Agriculture, or the



Petrochemical Industry, there are models of particular geographic areas as, for example, the State of Texas or the City of Philadelphia and, of course, there are models of the U.S. economy as a whole.

Detailed models such as those used by commercial market analysts, may have one variable representing coarse gray cotton fabric and another, printed cotton cloth. In a highly aggregative model, on the other hand, all types of cotton goods or even all kinds of textiles may be lumped together and represented by a single annual sales variable.

The size of a model, that is the total number of equations, variables and parameters it contains, depends on, not unlike the complexity of a road map, the magnitude of the geographic area it covers and the level of detail with which it is depicted.

A model describing the entire U.S. economy can be very simple if the picture it presents is drawn sketchily in terms of a small number of aggregative variables such as the total GNP, Investment and Consumption, Total Employment, Total Government Revenues and Government Outlays and, say, the total money supply and the average levels of wages and prices. The total number of equations describing such a system might be as small as ten. On the other hand, a detailed model of a single sector, say Petroleum Refining, can contain several hundred variables identifying separately each one of the different types of crudes and of the intermediate and finished products. The system of equations describing in minute detail the structure of production would, in this case, contain a separate description of each one of alternative processes that might be used to produce the same goods.

Models used for management purposes in the private sector, and more recently in the public sector as well, are mostly of the second type; detailed, but narrow coverage. Those used for description of general economic conditions and projection of business trends belong mostly to the first, aggregative kind. They are broad in coverage, but short on details. This is due, in a large part, to the fact that most of the theoretical thinking in this area has for many years been and still is dominated by the aggregative Keynesian approach. According to it the economy can be controlled effectively through skillful manipulation of a few strategic variables of the aggregative kind—the total government revenue and outlays, the total supply of money and the rate of interest. A small aggregative model could be expected to contain all the information required for managing as large and as complex an economy as that of the United States.

Experience of past years has shown this not to be the case. Moreover, a small aggregative model cannot possibly incorporate the factual information and provide the analytical understanding required for the handling of innumerable problems with which the government has to cope from day to day, from year to year, from one decade to the next. Questions raised by the energy crisis, potential shortages of some of the basic raw materials, and the problems of the environment cannot be treated or even posed in aggregative terms. Hence, it is not surprising that specialized models, narrow in coverage but rich in detail, are being used now not only in the private corporate sector, but by governmental agencies as well. Such separate, one might call them, departmental models, while helping an individual agency to organize and interpret facts and figures pertaining to the limited area lying within its immediate purview, can, obviously, not be used for purposes of interagency coordination. In fact, "adversary fact-finding" is being replaced nowadays with "adversary model building."

The more complex the economy, the greater the mutual interdependence of its parts. The greater such interdependence, the more complete, the more detailed must be the model needed to describe it. The integrating model of the American economy must be a large set of equations and it has to be detailed. Far from discouraging the construction of other models, it would facilitate it by providing their developers with large sets of well organized calibrated data.

#### *Predictive Models and Operational Models*

Most of the existing large models of the U.S. economy are used mainly, although not exclusively, for forecasting purposes: for anticipation of what might be loosely referred to as the general state of business three or six or, say, twelve months ahead. The primary data employed in construction of such predictive models come in the form of time series—most of them of a highly aggregative kind—showing the past behavior and relationships of the economic variables that enter into an equation. The forecasts are obtained through extrapolation of

past statistical relationship among these variables estimated on the basis of their observed behavior in the past with emphasis on apparent leads and lags. While some of these relationships could be interpreted unequivocally as describing direct observable connections between cause and effect, in most instances, however, this is not the case.

Models of the operational type depend to a lesser extent on formal extrapolation of statistical relationships observed in the past. Being usually more detailed than predictive models they can assimilate directly large sets of detailed factual information of a technical and organizational kind. For instance, the estimate of the use of fertilizers or pesticides per acre by different cultures on different soils can be obtained from agronomists and estimates of the capital requirements of the copper mining industry might involve a survey of operating of projected mines, an estimate of the demands for primary school teachers would require a systematic study of teacher-pupil ratios in selected school districts.

To be sure such information can be of little use for the purposes we have in mind unless it is combined within the framework of the model with other data of similar specialized kinds. To know how much fertilizer is required per acre of corn or how much investment to bring out an additional ton of copper in a particular type of mine does not suffice for estimating the total amount of fertilizer used for corn production or the investment requirement of the copper mining industry at some future point in time. The missing total output figures can be determined only within the framework of a large model covering all sectors of the national economy. Moreover, to be capable of absorbing concrete specific information of the kind described above that model has to be not only comprehensive but detailed. In spite of its size such models or, at least, the results of computation based on them will be more comprehensible to those familiar with corn growing, copper mining or teaching school from first-hand experience.

Some corporate users of an aggregative model of the U.S. economy do, indeed, undertake the task of "disaggregating" that part of it in which they happen to be particularly interested using additional specialized information which the builders of the model could not handle. Some builders of aggregative models supply to their customers what might be called special disaggregation kits as optional equipment. Needless to say, the results of such makeshift operations are bound to be inferior to those that could have been obtained if all details were incorporated in the original analytical design.

#### *Facts and Figures*

One of the great advantages of choosing the modelling approach is that it would provide an impetus and, at the same time, the means for modernizing and streamlining our entire statistical system.

The lack of effective coordination in the general area of policy formation and implementation is matched by the absence of a clear, overall design in gathering, organizing and presenting the facts and figures on which both public and private decision making so critically depends. While the U.S. Census might have been originally intended to function as our Central Statistical Office, by now there is hardly any Department or Federal Agency that has not been put in charge of collecting and publishing statistics pertaining to its particular domain. The Labor Department is mainly, but not entirely, in charge of employment, wage and cost-of-living statistics: Information on railroad and trucking freight is collected by the Interstate Commerce Commission and information on air shipments is collected by the Federal Aviation Administration. The Federal Power Commission is the principal collector of data for the electrical and power companies, while the Department of the Interior is the primary gatherer of coal and oil output data. While the Standard Industrial and Commodity Classifications are commonly adhered to, each agency feels free to use its own classification and definitions, and to determine on its own the frequency and timing of its statistical operations.

As every user of government statistics knows, to secure a modicum of comparability and compatibility between figures emanating from different agencies or even from different offices within the same agency is a trying task, absorbing an inordinate amount of time and money. In its process much valuable information falls inevitably by the wayside. The time elapsing between collection and the actual release of urgently needed figures is, in many instances, too long. An official input-output table describing the flow of goods and services between all sectors of the American Economy in the year 1972, a table based mainly on

Census figures, will, for example, be ready for release only in 1978. In the absence of a comprehensive statistical plan, data gathering crash programs are initiated which are both inefficient and costly. Much more complete and reliable information would be on hand at the time of a crisis if the need for it were anticipated and detailed basic data were collected year-in and year-out.

The construction of a large integrating model of the National Economy while serving the immediate needs of analysts and policy makers could make an important contribution to transforming our obsolete statistical services into a modern, well integrated information system that this country needs.

According to preliminary estimates (supported, incidentally, also by some of the most outspoken opponents of national economic planning), the sum total of present Federal budgets should be increased by some 450 million dollars. The modelling device can be used as a device for securing a reasonable order of priorities in allocation of these additional funds.

Most of the well deserved criticism of the existing large economic models used by the government and in private sectors as well is directed not at their potential capabilities, but at the rather obvious weaknesses of their data base. Even when the analytical design is criticized, it is because it often reflects a desperate attempt to compensate for the lack of reliable factual information by recourse to sophisticated but, nevertheless, very dubious estimating procedures.

Instead of permitting the technical advice that the policy maker needs so badly to be distorted by the lack of indispensable data, determined efforts should be made to upgrade our national statistical system so that it would be capable of meeting the legitimate demand for complete and reliable figures.

Most of the difficult problems confronting the country—energy, environment, natural resources—are partly economic, partly technical, partly social. The conventional distinction between economics, engineering, geology and even biology gradually disappears. This is bound to be reflected in the structure of the model and of the data requirements as well. It is also the reason why agencies possessing technical competence in certain areas should continue to collect specialized information pertaining to these areas. They should, however, do so in strict compliance with standards established by the organization charged with the responsibility for construction and maintenance of the master model.

Much emphasis was placed in recent years on summary indices such as the general price level, total level of unemployment, and so on. Not to be outdone by the economists, other social scientists are pressing for compilation and publication of summary measures of environmental disruption and even of a number describing the General Quality of Life. Such figures might assist an individual researcher to summarize the subjective impression gained from careful examination of long arrays of heterogeneous data. They should, however, not be interpreted as meaningful objective measures of observed facts, and, certainly, such broad indices cannot be used as viable substitutes for large sets of detailed data which they are often supported to represent. Reliance on broad index numbers is more often than not a sure sign of missing analytical insight or of a lack of detailed factual information and, in most instances of both.

Representative BOLLING. Next, Professor Clopper Almon, of the University of Maryland. He has specialized in economic forecasting in the American economy. He has used mathematical techniques and models as key tools in his projections. I am confident that we will all benefit from the insight we derive from him.

#### STATEMENT OF CLOPPER ALMON, PROFESSOR OF ECONOMICS, UNIVERSITY OF MARYLAND

Mr. ALMON. Thank you, Mr. Vice Chairman.

I would like to speak particularly about the very interesting paper presented by Gary Fromm, which speaks directly to the point of the subject of the morning, long-term growth prospects. It summarizes very nicely the results of some 20 models. I think that Mr. Fromm has performed a very great service in getting these model builders to send him their forecasts, in lining them up, and in making it possible

for us to compare the results to see to what extent the economists agree with one another and to what extent they disagree.

Perhaps because he knew I would be here this morning he left off the model that I built.<sup>1</sup> But he left a space for it. And he left the space right at the top. So I have put mine in right there. I would like to describe it for you briefly, and to point out the others with which it agrees and the ones with which it disagrees, and to tell you why I agree or disagree.

This model of ours goes by the name of Inforum, for interindustry forecasting at the University of Maryland. It distinguishes 200 industries in the economy, and, by using the method pioneered by Professor Leontief, it shows the sales of each of these industries to each of the others, and to capital formation by 90 industries—aggregates of the 200—and of course to exports, to personal consumption expenditure, and to inventory change.

It also analyzes employment at the level of 90 industries, so that we have projections of how many people will be employed, and what labor productivity will be for each of these 90 industries. We have been building and using this model, I might add, since about 1961 or so. In 1973 we produced a study, since published, based on data through 1971, in which we devoted one section to what we call the great slowdown of the 1970's. It was apparent from the data even at that time that the 1970's were going to be slow. We spoke of them as the sedate seventies, and the aging eighties. I have therefore had the painful satisfaction of seeing my predictions realized.

Our analysis of productivity, industry-by-industry, leads us to come out on the low side of the median forecasts shown by Mr. Fromm. I would like to suggest that you turn in his paper to table 7, "Long Term Economic Projections: Output, Inflation, and Income."

You will notice that the median forecast for GNP for the 10 years from 1975 to 1985 is given as 4.1 percent; that is to say, half of those surveyed were above 4.1, and half were below.

There is only one other private forecast in that list which studies productivity industry-by-industry. I might add that the one cryptically labeled SSG for special study group seems to be based upon Bureau of Labor Statistics material, and is therefore the only Government forecast in the group. It certainly stands out from all the others by being very high. You will notice that in its 1975 to 1980 prediction it predicts 6.5 percent growth, and the next highest is forecast number E which is 5.5, so that the Government projection seems to be the one which is farthest out of line.

Near the bottom of the list you will find the one labeled "Wharton." Now, that is the Wharton annual model rather than the Wharton quarterly model which is much discussed. That Wharton annual model also examines industries, I believe, about 66 industries, and studies their productivity in detail. You will notice that Wharton comes out with 3.9 for 1975 to 1980 growth, which is on the lower end of those projections, and corresponds closely with my own projections of 4.0 for the growth rates between 1975 and 1980. I conclude that two people studying productivity data in industry detail come out with the same conclusions about what the growth of industry is going to be.

<sup>1</sup> Mr. Fromm has added the INFORUM model to the printed version of his paper.

Furthermore, when only the aggregate data is looked at, there is a masking phenomena which causes exaggeration of growth rates. That masking is very simple. Much of our productivity has come from large industries with rapidly growing productivity such as agriculture or communications. Railroads happen also to be a fast grower in productivity and one which seems to have accelerated in recent years, I am glad to see.

As the employment in these industries which have fast rates of growth of productivity diminishes in relative importance, the weight they carry in the total growth rate gets small. If you can see that happening when you analyze industry-by-industry, then you can project the effects out into the future. And those people who have done that, with the exception of the Government group, have come up with these low growth rates. Consequently, I was very pleased to see that, working completely independently, the economists at the University of Pennsylvania's Wharton School and our group at Maryland have come out with essentially identical projections of productivity and the GNP out to 1985.

For some of the other predictions in more detail, we of course agree with them very closely in real disposable income. For example, we see a growth rate between 1980 and 1985 of 2.5 percent, whereas they saw 2.7 percent. And that is a negligible difference.

We do come out with a higher rate of capital formation in the next 5 years than anyone listed, except the Government group. Our rate of growth of real capital formation between 1975 and 1980 comes out at 8.2 percent. And between 1980 and 1985 it falls very sharply to 2.3 percent.

We do come out with higher rates of inflation than do the others. The inflation rates shown by the others correspond more to what we got before we put 1974 and 1975 data into the equations. When that recent experience was included in the data to which we were fitting our model, our rates of inflation went up very substantially, so that between 1975 and 1980, for example, we see about 8.5 percent inflation as against the median forecast of 5.7. I hope we will be wrong, but I wonder to what extent some of these other forecasts are based on equations which would not fit through the 1975 experience with inflation.

Since we spoke about the declining of growth of productivity, I would like to speak briefly to two of the explanations which Mr. Fromm advanced for that, one of which I don't agree with, and the other which I do. The first of those was that the slowdown in growth of productivity may be attributable to expenditure on pollution control. Now, most of the expenditures on pollution control are capital expenditures. The nature of these control devices is that they operate with relatively little labor. They are expensive to buy or build. They do not, however, once they are installed, require a lot of labor to operate them. I am sure there can be exceptions found, but I believe that is the general characteristic of them.

Now, that capital expenditure on these devices is fully reflected in the GNP, because expenditure on capital goods is part of GNP. In our equations it is output of the capital producing industry. And therefore it doesn't reduce productivity at all insofar as it is accounted for there. If additional labor were required to operate the pollution abatement machinery, that would slow down labor productivity.

I think it would be somewhat dangerous for the committee to feel that perhaps one of the major reasons for the slowdown in productivity growth is environmental protection legislation. It does not seem to me that that is likely to be the case.

We have used capital investment as a variable to explain labor productivity increases. Our projections of slow growth of labor productivity go with projections of high rates of capital expenditures. The effect of those high rates of capital expenditures has been already built into the equations. Nonetheless, despite that, we still come out with low productivity changes.

The other argument of Mr. Fromm that I think is probably correct is that there has been a large influx of young men and women into the labor force. And while it is not nice to say that they are not as productive as others, it is certain that they are less well paid than the others. What goes into the measurement of productivity is the value of the output divided by the number of man-hours. And so if young workers are paid lower rates than are the more experienced workers, an increase in their relative importance will show up as a reduction in productivity. I feel that is a genuine explanation of the slowing down of productivity. And I want to try to quantify it. I don't have the quantification of it today, and can't tell you to what extent one can hope to recover from it. Maybe Mr. Fromm can help us out on that point.

Representative BOLLING. Thank you very much.

Our last participant is an old friend of mine who is highly experienced in a variety of fields. One of them is the legislative field. His name is Mr. Charles Walker. He is an economist. He is a specialist in financial affairs. Following a wide banking career, he was named Under Secretary of the Treasury Department in 1969. And since 1973 he has been president of his own think tank, Charles E. Walker Associates. I am sure we can all benefit from this long experience in both the private and the public financial worlds.

**STATEMENT OF CHARLS E. WALKER, PRESIDENT, CHARLS E. WALKER ASSOCIATES, INC.**

Mr. WALKER. Thank you very much, Mr. Chairman.

I want to strongly echo what the other witnesses said in commending the committee for undertaking these hearings and commissioning these studies. I think it is very worthwhile indeed.

I also want to say that I am honored to be in this distinguished company of academicians today. I feel kind of like the mongrel that wandered into the back door of the National Dog Show in Madison Square Garden. With all these great dogs he knew he shouldn't be there, but he was quite overwhelmed at the honor of being with such a distinguished group.

However, I am not so bashful that I won't make a comment on what these other people said as a prelude to a couple or several remarks of my own.

I find a great deal of interest in all of these papers. Take the long run, long wave discussion of Professor Forrester. I am very much surprised at his conclusion that in recent years we have had too much investment. Almost everything I have seen from the academic community, business community, and everywhere else seems to point in

the other direction. And the absence in his paper of any discussion of the decline of investment per worker in recent years, which has been rather drastic, especially in real terms, seems to me surprising indeed.

And just in terms of very rough empiricism, when you look around it seems that the demonstrable needs are clear. Energy, for example. Professor Forrester's statement that our oil problem is not caused by OPEC, but resulted from this nation growing beyond energy supplies, surprised me very much. I am told that we have enough coal in the ground to last us for centuries, but it is dirty to get and dirty to use. And we know that we can develop the technology in nuclear and other resources. I am surprised at his conclusion.

And I disagree very strongly with Professor Gordon's analysis as to the impact of monetary policy in the 1920's. Professor Gordon's analysis, as reproduced in Professor Forrester's paper, implies that Federal Reserve policy should be measured in terms of what happened to interest rates in the twenties. I am not a pure and simple monetarist, but nonetheless I think money supply is a better economic indicator than interest rate.

I find considerable agreement with Mr. Fromm, but I do question whether the case for a tax cut in the immediate future is all that clear. I will come back to that.

I find Professor Olson's paper absolutely fascinating. I have not seen this before. It is new to me.

I think his case has considerable merit. I hope there is a lot more work and discussion in this area. He has some distressing conclusions vis-a-vis freedom on the one side and economic growth on the other. I can be facetious and say that it is also distressing to have to conclude that we need a revolution, dictatorship, or civil war to pave the way for future growth in this country.

But seriously, there are a lot of things that can be done to curb interest group activities. We have done this, both on the labor union side and on the side of cartels in business. So I wouldn't be quite so pessimistic on that score.

And of course Professor Leontief is absolutely correct in stating that in the Government your left hand may not know what your right hand is doing. One department may be doing very good work and another department may be doing very good work, but it may not be put altogether. As the professor well knows, and the people around this table, that may well happen also within departments. Looking at the Congress, if it would put all of its energy in one basket, it would have a better chance of dealing with the problem.

I think we can all agree that things are badly out of whack. And I agree with Mr. Fromm that we are at a crossroad—a very significant crossroads. But I think you members of Congress have to put it in the current context—what are you going to do in the here and now? I would like to help do that by noting a few of the critical aspects of the immediate policies of the President-elect and the Congress.

I am convinced that Federal policies in President Carter's first couple of years, or less, will not only greatly affect his chances for being a two-term President, but could set the course economically and otherwise for the rest of this century. And even more immediately, the basic thrust of his policies and recommendations, I think, are going to be determined within the next 90 days—in connection with the way he sets up his Cabinet and the policies he recommends to the Congress.

So by talking about his immediate decisions, I am not ignoring the topic of long-term growth. These decisions in the next few weeks may have a lot to do with long-term growth. And by talking about his situation I am not ignoring the fact that the Congress is going to have to be a full partner in this operation. As my friend, Speaker Rayburn used to say, "Yes, the President proposes but Congress disposes."

I think there are two crucial questions involved as to whether we can get back on track or not. The first question: Will the President welcome the go-for-broke approach, dealing with the unemployment situation—sort of a Humphrey-Hawkins approach—or will he lean more toward the sort of steady-as-you-go approach which has been the policy of the Ford administration.

This is history repeating itself. John Kennedy faced almost precisely the same problem in 1961. And he chose steady-as-you-go, primarily for international balance-of-payments reasons.

But the reason is irrelevant. The important thing was that we enjoyed the longest period of non-inflationary, sustained growth in the history of this country.

Second, will President Carter attempt to establish, if not a partnership, an alliance with the business community? Or will the President adopt what some members of his party practice—a strong adversary approach to the business community? A Carter-business alliance, if he would build that, would do a great deal for the country and for President Carter. If Mr. Carter wants to get a constructive program through Congress, the business community can and should help. And businessmen should recall that, in terms of capital formation and business taxation, a Democratic President can have much more influence with a Democratic Congress than a Republican President. In 1961, it was John Kennedy who recommended the investment tax credit and modernization of depreciation.

The final point I would make in that respect: There are some important straws in the wind, it seems to me, to indicate that not so much in terms of people, but because of the end of a generation of ideas, that the leaders of organized labor and the leaders of the business community are moving toward an understanding that, on a vast majority of the issues which they fight out in Congress, their interests are identical. These interests are jobs and economic growth. The founders of the labor movement and the leaders today recognize that profits are absolutely essential if we are going to have jobs, and if we are going to have the capital investment and the greater economic growth that we are all striving for—as opposed to trying to take something away from somebody else. President Carter could play an important role through institutional arrangements, for example, and also by using the prestige of the Oval Office in trying to get business and labor to sit down and look at a problem—not negotiate, but look at the problem.

Incidentally, as an aside before I conclude, I am very concerned as to the degree or the extent we have almost gone blindly down the road of adversary relationships. I think the press has abetted it. But business versus labor—and all your subgroups and your public interest groups and your environmentalists and so on—I just don't think that is the way to run a railroad. It has got its place, but it seems to me we have let it overtake us in too many ways.



The final point I would make gets back to the tax cut proposal. And that has a broader connotation. And I do not believe that a simple Keynesian approach to the problem of licking unemployment and getting the economic growth rate up is going to do the job this time around. I think that if it is big enough in terms of tax cut and/or spending increase, that you are going to put us on an inflationary treadmill. And even if that were not true in real terms, the expectations in financial markets and among businessmen are such that many are as nervous as cats on a hot tin roof. If the Federal deficit is very greatly enlarged, reactions in long-term financial markets can cause interest rates to go sky high and abort the whole thing.

I think we have got to disaggregate, to look more in terms of sectors and specifics. I would specifically mention investment, and targeting into the areas where investment is especially crucial and needed. Of course, energy comes to mind. I would also mention rebuilding the railroad beds. And second, unemployment, reducing the so-called structure barriers to unemployment. There is no single overall policy that will do that; you have to look at the industry, you have to look at the system. What will relieve unemployment for black teenagers will not help the displaced worker who is 45 years of age. And I would urge the committee, although it already has a full plate, to be moving to this area as quickly as possible.

Thank you very much.

Representative BOLLING. Thank you.

Before we continue with the discussion I would like to ask all of the participants if they are willing to respond to some written questions that we may send simply as a way of easing the discussion.

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF JAY W. FORRESTER TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,

Washington, D.C., November 19, 1976.

Professor JAY W. FORRESTER,

Director, System Dynamics Group E40-253, Massachusetts Institute of Technology, Cambridge, Mass.

DEAR PROFESSOR FORRESTER: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
Executive Director.

Enclosures.

## FOLLOW-UP QUESTIONS TO TESTIMONY AT ECONOMIC GROWTH HEARINGS

(1) How can leading thinkers such as those who have taken part in these hearings, drawing from the same general data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different *Gestalts* or worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

(2) This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventually results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study, which results or which forecasts they should rely on concerning any given issue affecting longer-run economic growth?

(3) Let us move to the specific. The hearings have focused on the economic growth prospects for the U.S. over the next decade, one of the most important questions that can be considered. Yet we have heard on the one hand that everything looks good for the next ten years, while on the other we have heard that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we have been told, that all it takes is just slower economic growth, much less negative growth, to do great harm to the socio-economic system and be very costly in terms of its impact on human lives. What can we conclude—what message can we as an economic advisory Committee to the Congress send to the Congress concerning long-term growth prospects?

(4) Finally, let us consider very basic specifics. When each panelist has "looked into the future," they have seen different forces in our society which will be shaping our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

(5) In the first two days of these hearings, there was a great deal of discussion concerning the many diverse, non-economic, non-quantifiable factors that will significantly affect economic growth over the next decade. Do you accept the argument that these are significant and if so, what really can models tell us about the longer term future when so much of vital importance is missing?

(6) Dr. Fromm foresees a continued improvement in the development of models as predictors of long-run economic growth. In particular, he sees a marriage between the best elements of econometric models and system dynamic models with the final product more closely resembling econometric models. Do you agree with this? Will these models in the future become much more useful for policy-making?

(7) Dr. Harman presented three very interesting divergent pictures of economic and social reality: (1) one in which continued economic growth is imperative, one in which it is considered improbable if not impossible and a third in which economic growth becomes the wrong measure on which to focus attention in a changing societal context. Which of these three do you think most accurately characterizes economic growth over the next decade?

(8) Dr. Harman claimed that the Central *unmet* challenge that could bring about a low-growth future is "our ability to democratically manage an increasingly large, complex, interconnected, industrialized social system." Would you agree that the future course of economic growth in this country primarily depends on management of the social system?

(9) In examining your national model, Dr. Fromm stated that its most tenuous characteristic is that you assume the structure of the economy has not changed. Do you feel that this is a valid critique of your model? Also, when will your model be at a stage where it could be of practical use to policymakers?

(10) The central thesis of Olson's paper is that powerful common interest organizations such as unions and trade associations gradually accumulate monopoly and/or political power which tends to lower economic growth. First, do you accept this thesis and if so, do you also agree with Olson that this has been a significant factor in the decline of Britain and that the U.S. should take heed lest it soon find itself in a similar position?

## RESPONSE OF JAY W. FORRESTER

On November 10, 1976 at a panel discussion before the Joint Economic Committee of the U.S. Congress, I submitted an opening statement "Understanding the Changing Basis for Economic Growth."<sup>1</sup>

In preparation for the hearings, Professor Nathaniel J. Mass and I had presented a full length paper "Understanding the Changing Basis for Economic Growth in the United States."<sup>2</sup>

At the hearing Congressman Richard Bolling asked participants to answer further questions in writing. Mr. John R. Stark, Executive Director of the Joint Economic Committee, has submitted the following questions, each of which is followed by my answer.

*Question 1.* How can leading thinkers such as those who have taken part in these hearings, drawing from the same general data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

Response 1. It is evident that different people, whether the public, political leaders, or social scientists, do interpret the same data base in quite different ways. The differing interpretations do stem from different paradigms or Gestalts or worldviews. It is important to understand why interpretation of available data rests on paradigms created by prior training and experience.

A social system is far too complex for interpretation by thought, debate, and the writing of essays. To cast the difficulty in mathematical terms, a reasonably adequate representation of the national economy would require a thousandth-order set of highly non-linear differential equations. On the other hand, not even a person trained in mathematics would venture to solve by inspection and unaided thought a simple linear differential equation of fourth order. The national economy is hundreds of times more complicated than can be effectively managed using the political tools of controversy and compromise. A man elected to Congress has been given an impossible job, as long as only conventional methods are available.

Historically, the social sciences have been no better prepared than elected officials to deal with national issues, because social science methods have not been able to put together the tremendous descriptive data base that tells how the economy is organized and how people within it are making decisions.

A number of erroneous attitudes stand in the way of properly converting available information into the correct dynamic implications:

a. Most people are not aware of the extent to which they fail to connect correctly the known policies and structure of a social system with the time-varying behavior implied by those policies and structure. If one believes he can accurately anticipate the behavior of a system, he has no incentive to develop methods for relating isolated elementary facts to combined behavior.

b. Simple systems mislead one by teaching lessons that do not apply in complex systems. In simple systems, like driving an automobile, one learns that cause and effect are closely related in both time and space. If an accident happens, it happens here and now and the cause is usually clear. But, in the more complex social systems, cause and effect are not closely related in either time or space. Causes may lie far back in time and arise from quite different sectors of the system from those where the symptoms are observed. But, to make matters more misleading, complex systems present the kind of relationships people expect to find when they look for cause and effect closely related in time and location. A complex system presents apparent causes that meet the usual simple expectations. However, such apparent causes are likely to be coincident symptoms of a cause that is actually distant in time and in space. By focusing attention on a coincident symptom rather than a true cause, people are led to take superficial actions that are ineffective.

c. It is frequently, but incorrectly assumed that people do not understand social systems because they do not have enough primary facts. Actually, a fully ade-

<sup>1</sup> Forrester, Jay W., "Understanding the Changing Base for Economic Growth." Opening Statement for a Hearing on Long Term Growth Prospects to the Joint Economic Committee of the United States Congress, Nov. 10, 1976. Also available as MIT Sloan School System Dynamics Group Memorandum D-2514-1.

<sup>2</sup> Forrester, Jay W. and Nathaniel J. Mass, "Understanding the Changing Basis for Economic Growth in the United States." Prepared for the Joint Economic Committee of the United States Congress, Aug. 9, 1976. Also available as MIT Sloan School System Dynamics Group Memorandum D-2392-2.

quate amount of information is available regarding the structure of social systems and the policies being followed within them. When known structure and policies are properly interrelated, the resulting system model behaves like the real system and generates the symptoms of difficulties as observed in the real system. The model becomes a basis for determining how alternative policies would affect behavior. In other words, adequate information exists about the parts of our social systems. Difficulty lies in the inadequacy of ways that have been used for putting together the known information.

In the last few years it has become possible to take descriptive information, non-quantitative information, knowledge of attitudes and objectives, and structural relationships of a social system and use such inputs to create a role-playing model that shows how the participants in a system produce its overall behavior.

Without a way to relate the known data base to the implied behavior, each person's Gestalt or worldview prevails. Different conclusions are drawn even when there is agreement on the underlying facts. Computer simulation models are capable of showing the conclusions that must result from a given set of input assumptions. Until we go beyond reliance on differing worldviews to interpret the data base, widely differing conclusions will continue.

Question 2. This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventually results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study, which results or which forecasts they should rely on concerning any given issue affecting longer-run economic growth?

Response 2. Under present circumstances policymakers cannot rely on the studies that are presented. For the most part, the studies do not explicitly reveal in detail the underlying assumptions nor do they show how the results follow from the assumptions. In those few studies where assumptions have been clearly stated and where results are shown unambiguously to come from those assumptions, neither the assumptions themselves nor the methodology have been sufficiently explained and debated to establish consensus.

But the situation could be different. The understanding of social systems is now at about the stage that understanding of physical science was several decades ago. Background work has been done. Ineffective methodologies have been tried and their weaknesses are becoming evident. The full magnitude of the task of becoming recognized. Major progress can be made within the next one or two decades.

But if progress is to be made rapidly, the country must attack the understanding of social systems with the same vigor that it attacked the understanding of natural science and technological systems. Team research will be needed. Alternative approaches must be supported until actual, not promised, results are evaluated. Budgeting must be in the spirit, even if not in the letter, of that devoted to military defense. Internal social and economic problems of the country should be seen as fully as dangerous as external ones. New approaches are needed to develop the various approaches to understanding social systems to a point of sufficient concreteness that the public can understand and evaluate the results.

Question 3. Let us move to the specific. The hearing on the economic growth prospects for the U.S. over the next ten years has raised important questions that can be considered. Yet, it is hard to hear that everything looks good for the next ten years. It is heard that the economic growth trip as we have known it will become what is even more serious, that the growth will become negative because of natural physical and social forces. It has been told, that all it takes is just slow economic growth, to do great harm to the terms of its impact on human lives. We as an economic advisory Commission are concerned concerning long-term growth prospects.

Response 3. The question of economic growth over the next ten decades has been governed by a number of factors. It is recognized that the economic growth trip as we have known it will become what is even more serious, that the growth will become negative because of natural physical and social forces. It has been told, that all it takes is just slow economic growth, to do great harm to the terms of its impact on human lives. We as an economic advisory Commission are concerned concerning long-term growth prospects.

Confusion and uncertainty have emerged in the last few years. A new set of inadequate information is available regarding the structure of social systems and the policies being followed within them. When known structure and policies are properly interrelated, the resulting system model behaves like the real system and generates the symptoms of difficulties as observed in the real system. The model becomes a basis for determining how alternative policies would affect behavior. In other words, adequate information exists about the parts of our social systems. Difficulty lies in the inadequacy of ways that have been used for putting together the known information.

d. It is clear that a consensus does not exist. No adequate effort has been made to uncover the relevant facts, the process underway, and the future implications of present assumptions. The future of the country is too important to be left in the hands of professional economists, and the future implications of present assumptions. It is clear that a consensus does not exist. No adequate effort has been made to uncover the relevant facts, the process underway, and the future implications of present assumptions. The future of the country is too important to be left in the hands of professional economists, and the future implications of present assumptions.

as an opportunity to attack the difficult and challenging problem of coming to understand the nature of our socio-economic system and where present forces are most likely to lead.

Quick and at the same time correct answers to economic policy and the future of the economic system are unlikely to be found. On the other hand, quick action can be taken toward setting up procedures for arriving at the desired answers. Time must be allowed to do necessary research, clarify questions, and resolve discrepancies between alternative answers. A decade may well be required. But if we say there is no time to understand properly, we will be committed to continuing in controversy and uncertainty.

The Joint Economic Committee could present to the Congress an assessment of the present true inadequate state of understanding followed by recommendations for remedying the deficiencies in knowledge and consensus.

The present state of economic knowledge and debate can be summarized in the following points:

a. Identifying "economic growth" as the essence of the present dilemma is much too narrow. As the hearings have shown, social, environmental, organizational, geographical, and political factors are all intimately interrelated.

b. Social and economic stress probably represents a greater threat to the long-term well-being of the United States than does armed invasion. National priorities are badly out of balance by emphasizing military systems to the exclusion of understanding social and economic systems.

c. Conflicting advice on social and economic issues is laid before Congress because the country is in a state of major change. During such change some recommendations grow out of hope for continuation of the past, some grow out of confusion about the present, and some grow out of varying perceptions

d. Several parallel research institutes should be initiated at once to address methodologies and the social and economic questions. The institutes should be established around different methodological approaches with the objective of demonstrating which approaches yield the most useful results. At this embryonic stage in the understanding of dynamics of social systems, it is most unlikely that debate alone can lead to the best methodological approach. Testing the alternatives in a competitive manner represents a small price compared to the importance of results.

e. Establish a government office or department responsible for promoting an understanding of social and economic interactions. The concept is conveyed by the terms "Department of the Whole" or "Agency on the Future" or "Office of Interrelatedness." The charter should be not to plan a particular future or establish conclusions, but to fully develop alternative viewpoints. New ideas, even when correct, are initially underdeveloped. Alternatives need to be developed and rounded out until they become explicit enough to be subject to debate and evaluation.

The charter should also mandate the development of specific competing methodologies for dealing with policy alternatives and the future, until results provide a basis for judgment.

*Question 4.* Finally, let us consider very basic specifics. When each panelist has "looked into the future," they have seen different forces in our society which will be shaping our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

*Response 4.* The only reasonable objective in economic growth is to produce a higher material standard of living per capita and to provide satisfactory circumstances for work and living. The emphasis should be on "per capita." Improvement per capita can be achieved by increasing the advantages to be distributed or by restraining the population over which the distribution must be made.

As growth encroaches more and more heavily on geographical space, resources, and pollution dissipation capacity, it becomes progressively more difficult to increase the total goods to be distributed. Given any assumed future level of technology, a higher population implies reduced material welfare, reduced space, and reduced individual freedom.

*Recommendation 1.* The fundamental long-term issue is population. Higher population aggravates the social, economic, and environmental symptoms that are dividing the country. Congress should emphasize actions that will discourage birth rate, restrict legal immigration, and reduce illegal immigration. Future international forces will progressively make the United States more dependent on its own internal capability. The country faces simultaneously a rising population and declining inputs of materials and energy from other countries. Emphasis so far has been on increasing output. But output per capita can also be increased by restraining the population side of the ratio. Contrary to the impression many people have gained from recent publicity, the present birth rate in the United States will continue to increase population for another several decades. In addition, immigration, both legal and illegal, total a sizeable fraction of the internal birth rate.

*Recommendation 2.* This involves action taken without adequate understanding. Advice about the future is contradictory. In retrospect many national policies of the last several decades have been expensive and ineffective, other policies have been expensive and detrimental. The antigovernment attitude in the country testifies to disappointment in past governmental programs. The odds favor disappointing results when action is taken without a clear understanding of the processes involved. It is better to do nothing than to take action that will make matters worse. Temporizing can be a virtue in changing times when the shape of wise action has not yet been established. The recommendation is not to rush into action for the sake of acting, the risks of detrimental action are too great.

*Question 5.* In the first two days of these hearings, there was a great deal of discussion concerning the many diverse, non-economic, non-quantifiable factors that will significantly affect economic growth over the next decade. Do you accept the argument that these are significant and if so, what really can models tell us about the longer term future when so much of vital importance is missing?

*Response 5.* Non-economic variables are of great importance to economic and social behavior. However, it is not correct that such variables must be omitted

from models. A system dynamics model can incorporate any set of relationships that can be described. Here lies one of the great strengths of system dynamics models as distinguished from models that are derived from numerical time series.

Perhaps a thousand times as much important and useful information exists in peoples heads than has yet been put in written form. In turn, the information in descriptive written form is at least a thousand times more informative than that which has been reduced to measured numbers. Any effective modeling that is to explain social and economic behavior must accept this full range of information input from numerical data to written description to human observation and experience. Descriptive information can be used in system dynamics models.

*Question 6.* Dr. Fromm foresees a continued improvement in the development of models as predictors of long-run economic growth. In particular, he sees a marriage between the best elements of econometric models and system dynamic models with the final produce more closely resembling econometric models. Do you agree with this? Will these models in the future become much more useful for policymaking?

*Response 6.* Econometric and system dynamics models differ more profoundly than is at first evident. An econometric model that had incorporated the important characteristics of a system dynamics model would probably no longer be considered an econometric model. The characteristics of a system dynamics model that tend to distinguish it from an econometric model include:

a. Variables and parameters can be included and quantified from descriptive information. By putting in the best numerical estimates available from observation and experience, a system dynamics model uses the best information available. Incorporating a best estimate for a previously intangible relationship is far better than omitting the relationship, which constitutes an assertion that the relationship is of no significance.

b. A system dynamics model represents, within every policy statement, the high degree of non-linearity that governs actual systems. Incorporating such non-linearity permits a system dynamics model to be valid over a much wider range of operation than for models that must be restricted to simple nonlinearities of a narrow region over which linearity can be assumed to prevail.

c. A system dynamics model is usually constructed entirely of endogenous variables and does not depend on externally provided exogenous variables for its operation (except for random components of policies). With all variables endogenous, that is internal to the system, the interacting dynamic processes of the actual system are replicated. By contrast, the exogenous variables in an econometric model tend to dominate its behavior so that much less can be learned about dynamic processes within the internal structure of the economic system.

d. A system dynamics model is usually not built on the basis of simplified macro-economic theory. Instead it is a model representing actual behavior by real people at the operating points in a system. Such a model reflects the structure of available, not idealized, information. It reflects the decisions that can be made, not optimum decisions that lie beyond actual human reach.

e. System dynamics models focus on the integrations (accumulations or stocks) that exist at every point in a system. Such accumulations include people, machines, money, information, and materials. It is the process of accumulation (integration) that is fundamental to generating time-varying behavior. Some accumulations are to be found to some extent in econometric models but structures derived from equilibrium economics tend to slight the representation of integrations that constitute a most important characteristic of dynamic systems.

Econometric methods can play a role in evaluating some parameter values and structural relationships in system dynamics models. However, an overwhelming percentage of variables in a large system dynamics model are ones for which prior numerical data have not been gathered. These intangible and non-economic relationships are of dominating importance but for the time being lie beyond econometric methods; they can be incorporated into a system dynamics model from descriptive information.

*Question 7.* Dr. Harman presented three very interesting divergent pictures of economic and social reality: one in which continued economic growth is imperative, one in which it is considered improbable if not impossible, and a third in which economic growth becomes the wrong measure on which to focus attention in a changing societal context. Which of these three do you think most accurately characterizes economic growth over the next decade?

*Response 7.* I do not see the three pictures by Harman as independent alternative views of the future. Instead, I see the three pictures he describes as a process

of changing perceptions that must necessarily occur at this time of social and economic turmoil. They represent a time sequence of changing attitude, not images of the future.

His first picture of indispensable and continuing growth represents a survival of past attitudes. Fifteen years ago there were almost no dissenters from the expectation of continued growth. Only a decade ago, most people expected growth to solve social and economic problems. But the problems were not solved. In fact, growth itself came under a combination of environmental and social pressures.

The second picture then began to emerge. Growth came to be seen as a process that cannot indefinitely continue. Low-cost energy sources are being depleted. Fish catches are declining. Intensive agriculture is destroying productivity of land. Pollution is becoming progressively more difficult to control as industrial output increases and synthetic chemicals become more destructive. Recreational areas are crowded. Commuting distances have increased. The impossibility of long-continued exponential growth of population and standard of living is becoming evident to the general public.

Finally, Harman's third picture is a necessary and natural consequence of the second. The changing societal context is a response to physical realities. Values of a society can change very rapidly under pressure. The movement is toward attitudes that do not equate growth with success. Falling birth rate, growing interest in smaller scale technology, and increasing concern for environmental issues are all responses to crowding and the consequences of growth impinging on fixed geographical constraints.

Harman's three pictures seem to me to be sequential with one leading to the next. We are in a period when all three exist contemporaneously but with the balance shifting from the first to the second and from the second to the third.

*Question 8.* Dr. Harman claimed that the central unmet challenge that could bring about a low-growth future is "our ability to democratically manage an increasingly large, complex, interconnected, industrialized social system." Would you agree that the future course of economic growth in this country primarily depends on management of the social system?

*Response 8.* As this question is stated it seems to miss the relationship between growth and social complexity. The difficulty of managing a social system rises very steeply as the system becomes more complex. On the other hand, complexity is generated by the crowding that comes from growth. In a frontier society human effort can disperse into open geographical space. Friction is reduced by dispersion. Social organization is on a small scale. Management is relatively easy. Goals are self-evident. Suboptimization is effective, that is, improving each part of the system improves the whole. But as land is fully occupied and environmental factors become overcommitted, friction develops between social constituencies. More time is spent in argument and arbitration. More agencies are established to deal with conflicts between people and groups. Suboptimization leads to disappointment, not improvement.

Growth has produced social complexity. Complexity rapidly increases the cost of social management. To the extent that social management is successful, growth continues until complexity becomes unmanageable. The limits to growth are not only from a direct application of physical limits. Physical limits induce social limits. The social limits resulting from physical limits will probably stifle growth before physical capability has been completely exhausted.

Better management must be seen as a rear guard action that will be overwhelmed as growth produces a complexity that makes management and a free society mutually incompatible. Encouraging growth is to encourage social complexity, increase demands for tighter social management, and reduce personal freedom.

I see no long-term solution in trying to increase "ability to democratically manage an increasingly larger, complex, interconnected, and industrialized social system." To place future hope in better management is to accept the trends that are making the management so difficult. Complexity can grow faster than the ability to manage. In fact, the management methods themselves create still more complexity. The best hope lies in reversing the trends and seeking a smaller, simpler, more decentralized, and self-sufficient social system. Reliance on the hope of better management will be a short-term delusion to take attention off the difficult task of reversing underlying causes.

*Question 9a.* In examining your national model, Dr. Fromm stated that its most tenuous characteristic is that you assume the structure of the economy has not changed. Do you feel that this is a valid critique of your model?

*Response 9a.* A system dynamics model is much less subject to this criticism than is an econometric model. A system dynamics model is not limited to the



behavior modes for which data have been accumulated in the past. In fact, a major strength of a system dynamics model lies in its ability to shift modes of behavior in response to behavior it has already generated. The model shifts from a condition where one part of the structure dominates to a condition where another part of the structure dominates as does the actual economy. In addition, a system dynamics model can contain hypotheses for how structure changes in response to development of the system variables. The model can be as rich and flexible as knowledge of the actual system permits.

Having pointed out the inherent flexibility of a system dynamics model, one is still left with the impossibility of incorporating into any model a set of concepts that have never been imagined. But in the absence of any hypothesis about relevant structure or change in structure, a system dynamics model is no worse off than any other form of modeling. For structural changes that can be imagined and described, a system dynamics model is more receptive to incorporating such structures.

*Question 9b.* When will your model be at a stage where it could be of practical use to policymakers?

Response 9b. The System Dynamics National Model is aimed first at understanding the behavior of the socio-economic system. As understanding emerges, alternative policies for altering behavior can be evaluated.

New insights are already beginning to emerge even though the National Model is at an early stage of assembly. The pieces that have been assembled are showing several modes of behavior that seem to correspond with the actual economy and current economic uncertainties. The present schedule calls for completion of the Model in three years if financial support permits.

The pace with which results from the system dynamics model will become available is dependent on the level of financial support for the staff needed to carry out the broad range of tasks necessary for completion, assembly, interpretation, validation, explanation, and policy analysis.

*Question 10.* The central thesis of Olson's paper is that powerful common interest organizations such as unions and trade associations gradually accumulate monopoly and/or political power which tends to lower economic growth. First, do you accept this thesis and if so, do you also agree with Olson that this has been a significant factor in the decline of Britain and that the U.S. should take heed lest it soon find itself in a similar position?

Response 10. I see this proposition by Olson as heavily overlapping Question 8 above regarding Dr. Harman's concern for managing complex social systems. To a substantial extent I believe the common interest organizations are a response to and a consequence of growth. Especially, they are a consequence of growth encroaching on the multiple dimensions of natural limits.

As crowding occurs, growth pressures, which were at one time dissipated in geographical exploration and expansion, are reflected back onto the society itself. Indeed, the U.S. should take heed of the British position, but that position is one of overrunning the country's growth capability. Britain grew outside of its boundaries into colonies and through the use of goods and resources from other places. As that outside support collapsed, Britain has faced the self-imposed consequences of having tried to over-extend its growth limit. Foreign trade for the United States has been serving the same role as did colonies for the British, but the United States can easily follow the British road if its aspirations about economic growth continue to ignore the realities of changing domestic and international conditions. Effort to sustain economic growth after the growth era is past can lead to more social stress and a less satisfactory society than efforts to adjust gracefully to slowing growth and a realizable future.

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RESPONSE OF GARY FROMM TO ADDITIONAL WRITTEN QUESTIONS POSED BY  
THE COMMITTEE

CONGRESS OF THE UNITED STATES,

JOINT ECONOMIC COMMITTEE,

Washington, D.C., November 19, 1976.

Mr. GARY FROMM,

Director of Washington Office, National Bureau of Economic Research, Stanford  
Research Institute, Arlington, Va.

DEAR MR. FROMM: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues

related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosures.

#### FOLLOW-UP QUESTIONS TO TESTIMONY AT ECONOMIC GROWTH HEARINGS

(1) How can leading thinkers such as those who have taken part in these hearings, drawing from the same general data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

(2) This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventually results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study, which results or which forecasts they should rely on concerning any given issue affecting longer-run economic growth?

(3) Let us move to the specific. The hearings have focused on the economic growth prospects for the U.S. over the next decade, one of the most important questions that can be considered. Yet we have heard on the one hand that everything looks good for the next ten years, while on the other we have heard that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we have been told, that all it takes is just slower economic growth, much less negative growth, to do great harm to the socio-economic system and be very costly in terms of its impact on human lives. What can we conclude—what message can we as an economic advisory Committee to the Congress send to the Congress concerning long-term growth prospects?

(4) Finally, let us consider very basic specifics. When each panelist has "looked into the future," they have seen different forces in our society which will be sharing our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

(5) In the first two days of these hearings, there was a great deal of discussion concerning the many diverse, non-economic, non-quantifiable factors that will significantly affect economic growth over the next decade. Do you accept the argument that these are significant and if so, what really can models tell us about the longer term future when so much of vital importance is missing?

(6) Dr. Harman presented three very interesting divergent pictures of economic and social reality: (1) one in which continued economic growth is imperative, one in which it is considered improbable if not impossible and a third in which economic growth becomes the wrong measure on which to focus attention in a changing societal context. Which of these three do you think most accurately characterizes economic growth over the next decade?

(7) Dr. Harman claimed that the central unmet challenge that could bring about a low-growth future is "our ability to democratically manage an increasingly large, complex, interconnected, industrialized social system." Would you agree that the future course of economic growth in this country primarily depends on management of the social system?

(8) Prof. Forrester presented an intriguing hypothesis in his paper—that long term economic growth and the instability in the economy are caused by “two principal modes of economic behavior: the Kondratieff cycle, or long wave, and the life cycle of economic development. If such cycles truly governed the system, their importance to the U.S. at this period of time would be great. How do you view such a hypothesis? Are such long cycles ultimately identifiable?”

(9) Professors Allvine and Tarpley, who testified on November 9, challenged economists to “leave the sophisticated and highly developed world where they have dwelled the past 30 years” in order that they may help in solving the critical long-run problems which usually are on the supply side. Olson, in speaking of his profession, talks of “the narrowness of our own preoccupations” and the need to develop a “breadth of vision.” Have economists been “missing the boat” by shunning their political-economy roots for the world of sophisticated, multiequation econometric models? Do they need a new vision to really be able to help America grapple with its long term problems which may be of a more serious nature than short run stabilization problems which receive virtually all the attention?

(10) The central thesis of Olson's paper is that powerful common interest organizations such as unions and trade associations gradually accumulate monopoly and/or political power which tends to lower economic growth. First, do you accept this thesis and if so, do you also agree with Olson that this has been a significant factor in the decline of Britain and that the U.S. should take heed lest it soon find itself in a similar position?

#### RESPONSE OF GARY FROMM

(1) and (2) The premise of these questions may be questioned. The long-run forecasts of those who study economic developments carefully and in depth essentially fall in a relatively narrow range and reach the same conclusion: During the next decade the economy is expected to grow moderately at an average rate of real GNP increase of approximately  $3\frac{1}{2}$  to  $4\frac{1}{2}$  percent per annum. Neither a severe recession or a strong boom is predicted. Nor is a runaway inflation with prices rising at double-digit rates or price stability (less than 3 percent inflation-rates) anticipated. It always is possible to find soothsayers and casual theorists and empiricists with views that differ markedly from the consensus of serious forecasters. Unless the procedures used in arriving at predictions widely divergent from the consensus can be validated, including evidence of accuracy of previous predictions using such techniques, policymakers would be well advised to heavily discount or ignore extreme forecasts from their application. If concern is great, probability analysis and decision theory can be used to devise strategies and policies to deal with possible, but unlikely, rare occurrences and extreme-scenarios.

(3) and (4) The message that the Joint Economic Committee should transmit to the Congress is that economic growth is affected by the socio-economic environment created by legislative actions and that growth impacts should be considered in establishing environmental standards, regulatory conditions, tax rate-schedules, expenditure programs, and so forth. Furthermore, more research in measuring such impacts is needed, and the Congress should furnish additional support for this purpose.

(5) While non-economic factors affect growth, they are not necessarily non-quantifiable. Moreover, if these forces do impinge on growth, they must do so in measurable fashion. Much discussion in this area has been amorphous, more idle speculation than findings based on persuasive and verifiable evidence. Models can be constructed which take account of hypothetical impacts or supposedly non-quantifiable factors such as attitudes toward work, tastes for different patterns of consumption and leisure, income redistribution preferences, et cetera. Whether possible changes in such elements will occur, or if they do, will be sufficiently strong and pervasive to significantly affect growth, remains to be determined. Qualitative existence of social forces which impinge negatively on growth need not necessarily lead to large quantitative impacts. It should also be remembered that there are forces pushing in the opposite direction.

(6) None of the above. Unless deliberately choked off, growth will occur as a natural process arising from utility- and profit-seeking behavior of households-

and firms. It is incorrect to focus attention solely on economic growth, but it also is wrong to treat growth of economic well-being as unimportant. The quality of life has material components, as well as aesthetic, philosophical, and other elements.

(7) If by management it is meant that strong and pervasive change in the present social system is needed to guarantee growth, the answer is no. On the other hand, some changes probably would be beneficial for helping to assure growth and for more equitably distributing its fruits.

(8) As noted in my testimony and study paper, it is highly doubtful that Forrester's thesis is valid. The economy of today is vastly different than that of the 19th century and that of the 1930s. Automatic stabilizers and use of discretionary fiscal and monetary policy greatly dampened cyclical swings during the past three decades. It is not inevitable or necessary for the United States to suffer another depression. But, external shocks and errors in management of the economy could bring that about. Therefore, further development of knowledge and tools to avoid or limit such occurrences should be given high priority.

(9) On the contrary, economists have broadened the vision of the public and policymakers by their emphasis on developing sophisticated tools, such as multi-equation econometric models, for the analysis of economic problems and the formulation of policies. This science of econometrics and mathematical economics is relatively new and its tools and their application are still quite imperfect. In time, they will be improved and greater emphasis will be given to analysis of broader issues than those of immediate concern. It is not surprising that primary attention initially has been devoted to short-run problems like economic stabilization. Political leaders typically emphasize dealing with the current situation because this has the greatest payoff in terms of re-election and public image. It is natural that economists pursuing policy studies have responded in kind. As stabilization issues are resolved, more emphasis and analytical efforts will be given to the many facets of economic growth—supply, demand, demography, income distribution, the quality of life, and so forth.

(10) Nations, like individuals, appear to go through life cycles. At early stages growth is slow; it then accelerates as a high degree of development is reached, and then declines as its social and political institutions mature. Olson, I believe, may have placed too much emphasis in ascribing the primary cause of the growth slowdown in the last phase of the exercise of monopoly or political power by strong vested interest groups. This probably is one of the factors in Britain's decline. For example, concentration of economic activity is higher and antitrust enforcement and competition are weaker in Britain than in the United States. But, there are many other factors. For instance, an outmoded educational system and inappropriate fiscal, monetary, and exchange rate policies may have contributed significantly to Britain's postwar difficulties. As for the United States, it is doubtful that it will find itself in a similar position during the foreseeable future unless economic and social policies are badly misguided.

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RESPONSE OF MANCUR OLSON TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 19, 1976.

Professor MANCUR OLSON,  
*Dept. of Economics, Tydings Hall, University of Maryland, College Park, Md.*

DEAR PROFESSOR OLSON. On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issue related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the

hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.  
Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosures.

#### FOLLOW-UP QUESTIONS TO TESTIMONY AT ECONOMIC GROWTH HEARINGS

(1) How can leading thinkers such as those who have taken part in these hearings, drawing from the same general data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it simply stem from different Gestalts or worldviews, thus making such forecasts or projections much more subjective and value laden than most intellectuals would like to admit?

(2) This leads to a very critical question: If it really is the person's worldview that colors his or her research methodology and eventually results, then isn't it true that there is not much hope for reaching any type of consensus as to where the economy is headed? If this is true, then how can policymakers know which study, which results or which forecasts they should rely on concerning any given issue affecting longer-run economic growth?

(3) Let us move to the specific. The hearings have focused on the economic growth prospects for the U.S. over the next decade, one of the most important questions that can be considered. Yet we have heard on the one hand that everything looks good for the next ten years, while on the other we have heard that the economic growth trip as we have known it is already over and what is even more serious, that the growth rate in the longer run may have to become negative because of natural physical laws and processes. Yet, we have been told, that all it takes is just slower economic growth, much less negative growth, to do great service to the socio-economic system and be very costly in terms of its impact on human lives. What can we conclude—what message can we as an economic advisory Committee to the Congress send to the Congress concerning long-term growth prospects?

(4) Finally, let us consider very basic specifics. When each panelist has "looked into the future," they have seen different forces in our society which will be sharing our rate and pattern of economic growth over the next decade. Based on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

(5) Dr. Fromm foresees a continued improvement in the development of models as predictors of long-run economic growth. In particular, he sees a marriage between the best elements of econometric models and system dynamic models with the final product more closely resembling econometric models. Do you agree with this? Will these models in the future become much more useful for policymaking?

(6) Dr. Harman presented three very interesting divergent pictures of economic and social reality: (1) one in which continued economic growth is imperative, one in which it is considered improbable if not impossible and a third in which economic growth becomes the wrong measure on which to focus attention in a changing societal context. Which of these three do you think most accurately characterizes economic growth over the next decade?

(7) Dr. Harman claimed that the central unmet challenge that could bring about a low-growth future is "our ability to democratically manage an increasingly large, complex, interconnected, industrialized social system." Would you agree that the future course of economic growth in this country primarily depends on management of the social system?

(8) Prof. Forrester presented an intriguing hypothesis in his paper—that long term economic growth and the instability in the economy are caused by two principal modes of economic behavior: the Kondratieff cycle, or long wave, and the life cycle of economic development. If such cycles truly governed the system, their importance to the U.S. at this period of time would be great. How do you view such a hypothesis? Are such long cycles ultimately identifiable?

(9) Professors Allvine and Tarpley, who testified on November 9, challenged economists to "leave the sophisticated and highly developed world where they have dwelled the past 30 years" in order that they may help in solving the critical

long-run problems which usually are on the supply side. Have economists been "missing the boat" by shunning their political-economy roots for the world of sophisticated, multi-equation econometric models? Do they need a new vision to really be able to help America grapple with its long term problems which may be of a more serious nature than short run stabilization problems which receive virtually all the attention?

(10) You say that if your argument is correct, there is a most disturbing "internal contradiction" in the evolution of the developed democracies. The contradiction is "between our desire for democratic stability and peace, on the one hand, and our desire for realizing our full economic potential, on the other." This is indeed a disturbing contradiction. Could you expand a bit on why you think it does exist and what steps the U.S. may take to help resolve it?

UNIVERSITY OF MARYLAND,  
DEPARTMENT OF ECONOMICS,  
College Park, Md., January 11, 1977.

Mr. JOHN R. STARK,  
*Executive Director, Joint Economic Committee, Congress of the United States,  
Washington, D.C.*

DEAR MR. STARK. You asked for my answers to the questions in your letter. I regret I haven't got answers to every question, but I have answered all of those on which I can state my views in a brief yet precise fashion. The answers are on the enclosed sheets.

Sincerely,

MANCUR OLSON.

Enclosures.

#### ANSWERS TO CERTAIN OF THE FOLLOW-UP QUESTIONS

(1) I believe that the differences of opinion among capable economists are not so great as this question implies. Often the dissenting views come from men or women who have not specialized in economics, but whose distinction grows out of achievements or controversies in other fields, and who may not be aware of all of the research and data that are relevant to their conclusions about the economy. Another factor is that economists naturally focus on unsettled issues rather than on the many issues on which there is fairly general agreement, on grounds that only the former will attract much interest or allow much novelty. At the same time, journalists concerned about the newsworthiness of views are sometimes likely to focus on those views that are most remarkable or startling, and these need not be the most important. Thus the disagreement among the experts on the economy is less than it sometimes seems to be. Most good economists are very cautious about long term forecasts and are in rough agreement about many policy alternatives that face our country today.

(2) Though the researcher's values and ideology do of course influence his or her choice of problems, and sometimes even conclusions, this is for the reasons set out in my answer to the prior question a less serious problem than is usually supposed. Moreover, it is possible to make better policy choices without knowing what the future will bring. Our physicians haven't any idea whether each of us will get cancer or a heart attack during the next ten years, but that doesn't mean that they don't know what they are talking about when they tell us not to smoke. Similarly, the fact that no economist can know now whether there will be a thermonuclear war, or the discovery of a cheap way of producing energy by nuclear fusion, or even a collapse of investor confidence, in the next generation, doesn't mean that we are wrong when we say that the law of comparative advantage will hold in the future as well as the present, and that restrictions on international trade can make sense only in narrow and rather special circumstances.

(3) As one whose testimony was devoted to showing how the passage of time in stable and democratic societies led to an accumulation of growth-repressing organizations, I should have a special license to say that there is no basis for the assertion that U.S. economic growth must or should end in the next decade. There are some growth-reducing developments that are getting stronger over time, only one of which I mentioned in my paper. But there are also some devel-

opments taking place which are working to speed up growth rates. The historical record of the developed countries shows that over the long run growth rates have been speeding up rather than slowing down—they have been higher on average since World War II than in any prior period of comparable length. So the Joint Economic Committee can conclude that, though we can't know the future or rule any of the logical possibilities out altogether, there is no evidence now that economic growth will cease in the next decade.

(8) I'm sorry to have to say that I do not agree with Professor Forrester on the overwhelming importance he attached to the alleged 50 year cycles in economic development. Our economic statistics do not go back long enough to justify any confident assertion that there is anything like a 50 year cycle; it is entirely possible that chance alone could explain the intervals between the particular events to which Professor Forrester refers. Some of these events, like the depression of the early thirties, clearly also grew at least in part out of the uneven occurrence of major investment-inducing innovations and in part out of the weaknesses of U.S. monetary policy and banking structures, to mention only two casual factors. What reason is there to suppose that either of these causes in turn grows out of forces that would insure a Kondrotieff cycle?

(10) I hope to do at least two years of further research on the idea outlined in my preliminary (but I hope suggestive) testimony, and then to write up the results of that research at book length. The book that I ultimately hope to produce should develop the idea at issue in a more formal or rigorous way, relate this idea to the economic histories of the major developed democracies since World War II and to the available statistical evidence, and set out a specific set of policy measures that would give a nation the best possible opportunity to escape from the "internal contradiction" described in my testimony. I regret that most of this further research has not yet been done and that this limits me in answering the last of the questions you put before me.

There is one policy recommendation growing out of my testimony that can, however, already be described with reasonable specificity. This is the recommendation to deal with simultaneous inflation and unemployment that came up briefly in response to the questions asked by the Members of the Joint Economic Committee. Though I didn't have the opportunity to go into it in my paper for the Committee, one of the implications of my argument is that the problem of simultaneous inflation and unemployment is one that is getting worse as time goes on in the developed democracies, and is (as the argument predicts) perhaps most serious in Great Britain, the country with longest experience of stable democracy and industrialization. The stronger common-interest organizations with market power are, the greater the likelihood that some of them will obtain wage or price levels in particular markets that won't allow these markets to clear, even when the monetary and fiscal policies would otherwise be sufficient to bring full employment. This is the sort of problem that prompted prior administrations to use "guidelines" or mandatory price and wage controls. Though it is often said that economists of the Chicago persuasion deny that there is a problem of this nature, this assertion is not correct—the disagreements among competent economists are often less great than they appear to be at first. In Milton Friedman's terminology, this problem shows up as a determinant of "the 'natural' rate of unemployment." In his terminology, the "institutional arthritis" of which I write raises the "natural" rate of unemployment.

Guidelines and mandatory controls haven't worked very well, yet something should be done to lower unemployment levels without generating great amounts of inflation. The answer, I continue to believe, is to use taxes and subsidies to give firms an incentive not to grant inflationary wage settlements. By making wage increases above some "target" levels even more costly than they would otherwise be, their extent and frequency will be reduced. Yet the system will remain flexible, so that rapidly growing firms can still pay higher wages to attract needed workers, albeit at greater cost. The flexibility will not only keep the system from interfering substantially with the allocation of resources, but will also avoid the need for the "exceptions" that tend to destroy the credibility of guidelines.

I have drawn on earlier proposals of other economists along these lines, and adopted them to deal with a number of practical and political difficulties, in memoranda I have prepared at the requests of some people concerned about

what economic policies should be adopted in the near future. I would be happy to share versions of these memoranda with anyone with a serious interest in this type of proposal for bringing full employment without inflation.

RESPONSE OF WILLIS W. HARMAN TO ADDITIONAL WRITTEN QUESTIONS POSED BY  
THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D. C., November 19, 1976.*

DR. WILLIS W. HARMAN,  
*Center for the Study of Social Policy, Stanford Research Institute,  
Menlo Park, Calif.*

DEAR DR. HARMAN: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

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Thank you and best wishes.

Sincerely,

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*Executive Director.*

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on what you have seen, what are your one or two most fundamental recommendations to the Congress on the actions that it should consider taking to help shape the most optimal and beneficial economic growth path?

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(6) The central thesis of Olson’s paper is that powerful common interest organizations such as unions and trade associations gradually accumulate monopoly and/or political power which tends to lower economic growth. First, do you accept this thesis and if so, do you also agree with Olson that this has been a significant factor in the decline of Britain and that the U.S. should take heed lest it soon find itself in a similar position?

#### RESPONSE OF WILLIS W. HARMAN

(1) How can different thinkers, drawing from the same data base, arrive at such widely differing conclusions concerning the long-run future of the economy? Does it stem from different worldviews, thus making such forecasts or projections much more subjective and value-laden than most intellectuals would like to admit?

The data base is ambiguous, as it is in all important human affairs. It does not lead to a unique interpretation. Observers differ in the emphasis they attach to the various data, in the relationships they take to be important, and in the overall patterns they perceive. The meaning of a collection of data is perceived in a broader framework of understanding—in a worldview of some sort. Thus, doctors, for example, observing the same symptoms may differ in their diagnosis, because the totality of their experience has led them to perceive those data in different appreciative frameworks.

After World War II a vast amount of data were gathered in Germany and Japan, relating to the effectiveness of strategic bombing toward disrupting the ability and destroying the will of a people to wage war. The data seemed to many analysts to indicate that strategic bombing was remarkably ineffective in these respects. Nevertheless, others held that the bombing was effective and consequently a similar strategy was employed in Vietnam—where again it was surprisingly ineffective in destroying the will of the North Vietnamese to wage war.

More recently, the consensus of the experts was that an oil cartel could not hold together effectively enough to raise crude oil prices to many times more than the production cost. There was lots of data and past experience to argue from; in the worldview of the experts, OPEC monopoly power simply wouldn’t hold together. As we know, the experts were wrong. When fundamental change is taking place the recognized experts are particularly prone to perceiving with a worldview that fits the past better than it fits the future.

In short, the perception of patterns in vast amounts of data relating to extremely complex affairs of social systems is always “subjective and value-laden” because it is the product of the interaction of the data with a perceiving framework which the observer brings to those data. In such areas as medical diagnosis and jurisprudence we have had to learn ways of dealing with that ambiguity. There are such ways.

(2). If it really is the person’s worldview that colors his or her research and results, then isn’t it true that there is not much hope for reaching any type of consensus as to where the economy is headed?

No. There is hope. The history of human knowledge is full of examples of issues that were at one time a matter of perception within competing Gestalts and later became resolved by empirical observation and testing in the open-minded spirit of scientific inquiry. It once was a matter of perception whether the sun revolves around the earth or vice-versa. It once was a matter of conflicting perceptions of the data whether or not man evolved from lower organisms. The existence of meteorites was officially denied, in the face of extensive evidence, by a prestigious scientific body headed by the eminent Lavoisier; in their world-

view "there are no stones in the sky to fall." The concept that unconscious mental processes might exert a powerful influence over human behavior was once a bitter ideological battleground; now there is more consensus, and the concept influences social policy from education to treatment of criminals.

The issue at hand is whether economic growth (as conventionally measured) can continue indefinitely or whether drastically lowered growth will be forced—by physical limitations or cultural attitude changes or a combination of the two. What can we conclude, when equally qualified "experts" examine the data through their individual perceptual filters and come up with such discrepant forecasts?

We probably need to separate the central issue into two types of questions. One set of questions centers around the physical limitations to growth and the capability of the economy to function under conditions of lowered growth. The other set of questions focuses on changing cultural attitudes and political will.

Regarding the first type of question, the prospect for consensus is not too unfavorable. There is fairly good agreement that although ultimate constraints to economic growth clearly exists, if there were the will to do so we would continue growth for quite some time before the physical limitations bring a complete impasse. Technological ingenuity in substitution and innovation has overcome barriers many times in the past; we have to assume that it still has vast untapped potentialities.

Regarding conceptual frameworks for understanding economic dynamics we have to be far more humble. The record of attempts to forecast energy prices, unemployment-inflation relationships, or almost any other vital economic variable has been so miserable that we must conclude our present conceptions of how the economy behaves are seriously inadequate. But here at least there is consensus on how to proceed. Do the models of economic system behavior fit reality? Do they allow us to predict and control? Obviously, they do not yet to a satisfactory extent. But at a minimum we agree on the criteria for judging scientific models and the procedures for improving them.

There is no serious disagreement about whether lowering the growth rate will bring increased unemployment—at least temporarily—and decrease federal revenues. The disagreements are much more about the implications of these consequences, about how people and institutions will respond. And this moves us to the second type of questions.

Are there indications of long-term changes in values, attitudes, and preferred lifestyles which not only will change tolerance for the consequences of lowered economic growth, but will actively conspire to bring it about? We now generally recognize that the primary force behind the development of industrial capitalism was not the availability of resources nor exceptional ingenuity, but rather a cultural change which supported the institutions of capitalism and, later, the industrial revolution. This shift in beliefs, attitudes, and values we sometimes refer to as the Protestant ethic, although that probably implies too simplistic an image. Fundamental attitudes toward work, material progress, man's relationship to nature, and individual life goals departed sharply from what had preceded, in the Middle Ages. This change made possible, or predetermined, the development of industrial institutions and revolutionary technological advance.

Thus, what is really at issue in the current growth debate is whether or not we are witnessing a fundamental shift in beliefs, attitudes, and values which will remove support from the consumption-and-growth ethic of modern industrial civilization. This in turn will determine the viability of a lower-growth future—even possibly a future in which economic growth ceases to have its present significance as a central indicator of society's "success."

Those who are interpreting the signs of the times as forecasting a fundamental paradigm shift, a basic metamorphosis such as happens only rarely in history, are including in their pictures a host of data that economists tend to consider irrelevant—data like the cultural reassessment of how much is enough, and what kind of society is worth working toward, and even reassessment of the "scientific" discounting of the spiritual nature of humankind. The situation here is somewhat like the case where two doctors examine the same external signs and one diagnoses "obesity" while the other, including a broader range of indicators, pronounces "pregnancy." There are tests that can be carried out to see if those additional data are accurately observed, and if they are relevant.

There is hope of consensus, then, because there are ways in which, through open inquiry and humble exploratory attitude, reality models can be tested. But the reconciliation of views has to be sought, not in disputes about the out-

puts of esoteric economic models, but by carefully observing indicators of shifts in attitudes, or reassessments of what is of ultimate value, of the changes that are taking place in people's hearts and minds. Economics is only a particular reflection of behaviors, which in turn reflect aspirations and motivations. If and as predominant attitudes and values change, present economic formulations will become even less accurate predictors of the future economic state.

(3) We have heard on the one hand that everything looks good for the next ten years, while on the other we have heard that the economic growth trip is over. We have been told that lowered growth is necessary because of physical limitations, yet we have been told that slower economic growth can do great harm to the economic system and be very costly in terms of its impact on human lives. What can we conclude concerning long-term growth prospects?

There are times when the most important conclusion is: We don't know, and we had better admit we don't know and proceed to find out—meanwhile proceeding extremely cautiously to avoid closing out options we may need later.

We can ill afford to underestimate the critical importance of guessing right. If the proponents of growth are perceiving clearly, then a drastic lowered-growth policy could wreck the economy and deprive the nation of needed capabilities in the future. On the other hand, if the limits-to-growth perception is accurate, continued high-growth policies could dangerously foreclose future options.

Of one thing we are sure—human social systems are extremely flexible in the long-term. Also, human societies in the past have been extremely diverse. There is no reason to suppose that a system with the characteristics this one presently has—that is, with essentially materialistic goals and a strong dominance of economic logic even over noneconomic issues—is the best suited to the future situation. Nevertheless, in the shorter term any basic change—even one toward a system that is ultimately more satisfactory—will bring a temporary deterioration of functioning.

With these observations as background, let me hazard a few conclusions that might be appropriate for the Committee:

(a) The people will pay the price of change (or of failure to change)—in unemployment, reduced quality of life, and other suffering. Thus it is the people who have to be the ultimate policymakers. They will make economic policy with their votes, their buying habits, their wage demands, their protests, and possibly their disruptive activities. There is a growing attitude that major economic policy is too important to be left to economists; that sophisticated economic logic which treats consumption as an unqualified benefit, and maximizes present return on investment with inflated rates of discounting the future, obscures the common-sense logic of carefully husbanding energy, mineral, and environmental resources to maximize future options.

(b) Thus it is desirable to take steps to provide numerous neutral forums for, and otherwise to encourage, open public dialogue on this critical growth issue.

(c) One important function of such forums would be to find out how people respond when they have available to them the best and most complete information obtainable about growth-related issues. Ask them.

(d) From this open dialogue may come the will to take steps toward sensible and just austerity, in order to keep options open until the longer-term growth picture clarifies. This austerity might include taking energy conservation really seriously; eliminating unnecessary expenditures of fossil fuels and materials; adopting an ethic of frugality and saving; combatting inflationary pressures by cultural sanctions against the "quick ripoff," exorbitant executive salaries and wage demands; taking serious steps toward income redistribution; simplifying lifestyle. We have ample evidence to show that people will willingly accept a great deal of austerity providing (1) the end is worthwhile in terms of significant values, and (2) they perceive fairness in the way the burden is distributed.

(3) Through the above actions would be gained (1) additional time for the picture to become more clear, and (2) development of political will to take legislative or other actions when it becomes apparent these are desirable or necessary.

(4) What are your one or two most fundamental recommendations to the Congress on actions to help shape the most optimal and beneficial economic growth path?

My answer to this follows from the argument just above:

(a) Take steps to provide the neutral forum and promote the public dialogue on the growth issue;

(b) Take steps to promote a just austerity to buy time and preserve options (i.e., neither destroying the capability of the economy by too sudden a reduced-growth policy, nor unnecessarily incurring the social costs of excessive economic activity). This austerity cannot be mandated; the motivation for it has to grow out of the dialogue. People are probably much more ready for it than the nation's leaders seem to think—provided they are convinced that the need is real and the burdens will be fairly shared.

(5) How do you view Professor Forrester's thesis of the system being governed by long-term economic cycles?

Some people interpret the phenomenon of catching cold as due to a virus; others in terms of "lowered resistance" of the body's immunity system; others in terms of basic emotional disturbances that brought about the lowered resistance; others in terms of biorhythms. Professor Forrester is a man. I incline toward the view that living and social systems are too complicated for any one explanation to suffice. We obtain different insights from different "explanations" (even when they appear contradictory). Forrester's rationale for these empirical cyclical behaviors is convincing enough that I believe they must be taken seriously as tendencies. That does not mean, of course, that when the societal biorhythms augur ill there is nothing that can be done to ameliorate the forecasted outcome.

(6) Do you agree with Mancur Olson that monopoly power of powerful common interest organizations such as unions and trade associations tend to lower economic growth?

Probably so, and contribute to inflation as well. But this is only one component of a larger picture. Power tends to accumulate. Power begets power; them as has, gets. Every society has to have some institutionalized ways of redistributing power, or else the redistribution attempt is made disruptively in revolution. Cultural forces in the direction of increasing decentralization and pluralism appear to be strengthening, and these will act (possibly through legislation) to limit the powers of big unions and trade associations—but for much broader reason than that they tend to lower economic growth. In other words, this is an interesting partial explanation for a complex phenomenon. I do not believe the evidence is sufficiently strong to recommend Olson's conclusion as the sole basis for an action against these common interest organizations.

Representative BOLLING. I understand that Professor Nathaniel Mass, Professor Forrester's coauthor, is here. If he is, perhaps he would come to the table and join us in the discussion.

There he is.

Now I can call on the members of the committee to begin the discussion.

Congressman LONG.

Representative LONG. Thank you, Mr. Vice Chairman.

Professor Almon, to what do you attribute the decline in productivity up to the present date in your continuing predictions of even more rapid decline in productivity?

Mr. ALMON. I have been puzzled to know to what to attribute it, to be quite frank with you. We have tried capital investment, hoping that we might be able to attribute it to that. We have tried capital labor ratios hoping we might be able to attribute it to that. We have tried newness of the capital stock hoping that we might be able to attribute it to that.

Representative LONG. Do you think it might be something that is out of the conventional economic sphere, and that it might be something comparable to what Mr. Olson was speaking of?

Mr. ALMON. I think that has a great deal to do with it. I think that it is not something which is easily measured in the ways which we have of measuring things. And in looking at the industries which have slowed down a great deal, one can't help but notice the presence of protectionism and high degree of unionization.

Representative LONG. Thank you very much, Professor.

Professor Olson, coming from the South, unlike Mr. Walker, the price that you are suggesting that is necessary for increased growth is one that I am not willing to pay. But I do think that your thesis is very interesting. I think it really bears a great deal of examination and a great deal of thought.

I have never heard it put specifically in those terms. How does it relate, speaking philosophically and academically now, how does it relate to Toynbee's views with respect to the history of civilizations and their decline? Have you made any attempt to go back to the decline of institutions with Mr. Toynbee and relate that to our modern time and your own thesis with respect to what is happening to the economic systems in the developed countries?

Mr. OLSON. I haven't specifically looked at Toynbee in this context. But quite a number of years ago I did some reading in Toynbee, and tried to relate it to my general framework of thought. There were a couple of things in Toynbee that I could not find acceptable. One thing was his emphasis on challenge and response, the idea being that if a society has the right challenge, it responds in a constructive way and things go well, but if it has too little challenge or too much challenge, things don't go so well. As you look at it a little more closely, you come to find—this is slightly unfair, but not very unfair—that it is at least partly true that he determines whether the challenge is of the right size by whether there was a constructive response. I think that aspect of Toynbee's work misleads us.

He was also, I think, a little too emphatic on the philosophical, cultural and religious aspect. As I look at many of the poor and underdeveloped countries that he looked at, I mean the European and Asian societies before industrial times, such as the Roman Empire. I find that a much more important consideration leading to the collapse of these societies was that they were too big for the transportation and communications system of the time. For example, for ancient and early medieval Europe. I have looked a bit at how much it cost to transport grain, say, 100 miles. I have forgotten the exact numbers now, but I think the cost was more than doubled if you transported it 100 miles on land. They didn't even have a horse collar at that time; when the horse pulled a load he was choked off by a belt around its neck. How you could run a large empire indefinitely with this kind of primitive transportation and communication is beyond me. And no large empire in fact has lasted in poor societies with primitive transportation and communication systems.

So I would say that I think the Toynbee argument, while suggestive, is wrong, and that we shouldn't be too quick to relate collapses in ancient empires to modern problems. It may be that the evil for modern society is that modern governments may be able to last even when they should collapse, rather than the problem of the Roman Empire that collapses and produces chaos.

Representative LONG. Thank you very much, Mr. Olson.

Mr. Leontief, I have not had an opportunity to read your full study that was made for the United Nations. I have read a number of press reviews in both magazines and newspapers on it. And I find it extremely interesting. I would hope that I will be able here in the next.

week or two to spend some more time on it, because as I say, I find it very challenging and very interesting.

If Mr. Olson's thesis with respect to the difficulties faced by the industrialized countries resulting from the development of special interest groups and the other institutions becoming inefficient—and that is a simplification of his thesis, and I recognize that it is—but if there is a validity to this thesis, what effect would that have, and to what extent did your group concern itself with the possibility of that in the study that you made, and to what degree do you subscribe to this as being perhaps one of the reasons for the current economic situation that we find ourselves in the world today?

Mr. LEONTIEF. Mr. Olson's argument I think is correct, that if you have many groups, each of which tries to use whatever power it has to advance its own interest—it is essentially an argument about monopoly, if you have a monopoly you can improve your position, and in this case you have many monopolies or oligopolies.

My feeling is that our reaction in this country forbade monopolies. We have antitrust legislation. I am very skeptical that you can by forbidding them, reconstruct again a perfectly competitive situation. Of course, with the technology and the organization of the modern world you just cannot say, let's have millions of producers competing with each other. You cannot increase the number of businesses too much.

My feeling is, the answer to this is organization. This is a matter of fact the reason why I argue both in public and in private, let's sit together and figure out how to go about it. As somebody indicated, I think, inflation results from labor asking for higher and higher wages, and they will not give up and just keep quiet. They say, we want a piece of the action, show us how it will be, let's sit down and make a blueprint. As a matter of fact, I go so far as to say, when we get together with the head of the department as coordinator, what we do is keep out of each other's hair. You don't mind my business and I don't mind your business. But this does not solve the problem. Because what I do in one department whether I know it or not will affect this business. And consequently all of us get together and develop common agreement and action. But in order to have agreement and action, you must know how the action will affect the situation, because that is what it is all about. So I think when you come back again you have to have some system, you have to have some kind of organization and an analysis which will show how certain actions of corporations will affect it, what they will bring about.

The same, I think, on an international basis. As a matter of fact now, the reaction from the point of view of less-developed countries in my study, which says that the situation is very serious, was very good. It did not say, all right, everybody must help us, just an aggressive attitude. It just said, give us the facts, and let's see if it can be done. My feeling is, the best way of fighting adverse relationships is to get together and not just talk, but to have some kind of a blueprint, see what will happen if you do this or that. Because developing some kind of blueprint will result in an agreement not to interfere, but actually will interfere. This is about what I could see.

Representative BOLLING. Could I interrupt long enough to say that if other members of the panel feel moved to comment, I would like

them to indicate their interest. We do want to generate a discussion, not just a formalized question and answer session.

Representative LONG. Thank you.

Representative BOLLING. I would like to comment, before I call on Congressman Hamilton, on an important matter that Professor Leontief talks about in terms of avoiding a purely adversary approach. Mr. Walker also discussed it. The reference is to one of two different ways to legislate. There are some committees that come out with a report for the majority, and then a report for the minority. And they are completely in conflict with each other. Normally, there are committees that have a great deal of trouble in getting a majority to support either position. They have a great many difficulties on the floor of the House.

On the other hand, there are committees that do an entirely different kind of job. They do not compromise away their differences, they harmonize their differences. Sometimes they can, but sometimes there are issues that cannot be dealt with in this fashion. It seems to me that the democratic process requires the attempt to harmonize, and if that is impossible, then as a last resort you come in with an adversary situation.

So I would suspect that the problems that we are talking about in terms of the real world of the United States and the world as a whole are not unlike the ones that we face legislatively in the House, and I am sure in the Senate.

Congressman Hamilton.

Representative HAMILTON. Thank you, Mr. Vice Chairman.

It has been a fascinating morning. The question that runs through my mind as I listen to all of the various statements is, what kind of steps should we be taking in the Congress now to encourage long-term economic growth. As I run down the statements that were made this morning, I must say I am puzzled as to what steps we ought to be taking. I was not here for Professor Forrester's statement, but I did have a chance to look it over. And with his emphasis on long-term cycles, the question that occurs to me is, What does the Congress do about long-term cycles, if anything?

Professor Olson talks about the institutions being the problem. If that analysis is correct, what can we do about that in Congress? Or can't we do anything about it? Do we just give up and say we can't do anything?

Mr. Harman's analysis was a noneconomic approach, but it interested me greatly. What you really seem to be calling for is a change of life style; you at least suggested that in your paper. You looked upon it as a systemic problem, not an economic problem. If it is that fundamental and basic, then there is just not an awful lot in Congress that we can do, it seems to me, to encourage or to develop long-term economic growth.

Mr. Walker, who has an appreciation of the immediate problems that confront the politicians, made some specific suggestions. But my question, Mr. Vice Chairman, after this rambling around, is what policies do these gentlemen recommend for us, not in terms, perhaps, of immediate and favorable economic developments for 1976 or 1977, but what are they suggesting that we do in 1977 for the long term?

Representative BOLLING. Professor Forrester.

Mr. FORRESTER. Congressman Hamilton has asked a most important question. If I understood the question, he is not asking, what do we do about the economy right now. Instead, how do we come to understand the economy better so that issues can be addressed not piecemeal but in terms of their interrelatedness.

I am struck in this morning's discussions by a very fundamental unity in what has been said. To be sure, there are substantial differences in what people expect to happen in the near future. But there is acceptance that we don't really understand what is going on, there is no consensus about what the nature of the economy is. There is also a fairly substantial agreement around the table that modeling is going to be necessary and useful, although, when you go beyond that point, there is disagreement as to what kind of modeling, and to what objective it be addressed.

The country has a precedent for unanswerable questions about how to proceed. I call your attention to the way we have handled technological uncertainties in the military arena for the last 20 or 30 years. When we have perceived a major military threat we accept it as a challenge, and we harness resources to deal with it. If there is disagreement about how to proceed, we strongly back a number of competitive and different approaches until the outcome can be demonstrated. Among the different views on modeling that have been mentioned, there will be no resolution by sitting here and debating, anymore than there can be a resolution of a debate about defense systems without building several prototypes and running competitive tests. Alternatives must be carried beyond the talking stage if they are to be evaluated.

It seems to me that the present threat to the country is more internal than it is external. The country is more in danger from social and economic stresses than it is from invasion. We ought to be treating internal threats like we treat military threats. We should think of addressing issues of social and economic change with levels of research that show the same concern and vigor as spending on defense. The amount need not be nearly as high but should not be negligible by comparison. If Congress were to set up several different, competitive, well-backed approaches to social and economic problems, probably five or six fundamentally different approaches would emerge. One should think in terms of \$5 million for each approach per year for up to 10 years. I think such parallel approaches would lead to objective results on which ones are effective. The uncertainties will not be resolved if we say we must have the answer this year and cannot take time to get a demonstrated answer. If we cannot afford to lay a foundation, then 10 years from now we will be in the same situation, we will still not have a basis for answering questions.

Uncertainties are more severe in social and economic issues than in technology. But, 30 years ago the differences of opinion in technology would have been just as debatable. Answers will not come from just writing papers. There must be a large amount of work. And different approaches must be followed until results tell the story and not promises. The cost is trivial compared to importance of the issues before the country. But the proposed budget of some \$25 million per year is tremendously larger than now being focused on such matters.



Representative BOLLING. Mr. Olson.

Mr. OLSON. Mr. Vice Chairman, I very much agree with Mr. Forrester that we need more research, including the type of research he has in mind.

At the same time it seems to me that in the Congress you ought to treat a professor or researcher who advocates more research, and especially more research in the line in which he is particularly qualified, as rather like the admiral who sees growth from the Soviet Navy. That is to say, we all have an interest in the expansion of this industry.

Representative BOLLING. Certainly you have much less consideration at this point than the admiral has.

Mr. OLSON. Thank you, sir.

Now, I would like to respond to Congressman Hamilton's question not only by saying we need more research, as I believe we do, but also by trying to talk about one problem out of many that it seems to me could be dealt with. And that is the problem of how we could stimulate more demand through our monetary and fiscal policies without getting the increase in the rate of inflation that most of us would like to avoid.

If my argument is correct, and we have strong organizations in our economy, including strong labor organizations, then one of the things we need to be alert to is the possibility that, for example, strong unions would demand wage increases, which wage increases in a period of full employment would ultimately lead to price rises and a higher rate of inflation than we would be willing to accommodate.

Now, it isn't in my mind a realistic or helpful suggestion to say that, well, that means you should destroy the unions or something like that. That wouldn't happen, and in my judgment indeed it shouldn't happen. But one can ask whether one can put forth legislation that would have the effect of preventing any large number of highly inflationary high-wage increases, yet let the organizations and institutions in the society continue to function. Let the union leaders continue to pound the table as hard as they can, because that is their job, that is what they must do if they are going to do justice by their clients.

So one could imagine a tax on the profits of large corporations, which tax would only come into effect if that corporation granted a wage increase above some guideline or target level, only an inflationary one.

This is not an original suggestion with me, I might add; it has come from other people before. But I think it hasn't been adequately explained.

The effect of this would be that the union leader who was an extremely good bargainer, would still get more for his people than the less able union leader.

No important class of the population would be left unemployed the way union leaders are left unemployed—I mean unemployed in terms of their function—if there are rigid controls. No group would be asked to give up its normal activity the way union leaders are asked to give up their normal activity if they are told to exercise restraint. That is like telling a Congressman not to represent his particular constituency in the interest of some larger national goal.

So by using the tax system we can let the organizations continue to function, but have them function in a way that is more desirable in terms of our interest and price stability and full employment.

Thank you.

Representative BOLLING. Mr. Harman.

Mr. HARMAN. I would like to make just two very brief comments in response to your question, Congressman Hamilton.

One has to do with the question that you asked more specifically. What steps can the Congress take to encourage long-term economic growth? I don't think it is just because I come from California that I believe there are some voters out there that don't think that is necessarily the right way to phrase the question. But in general the importance of raising this question of interpretation as I did is that the crucial determination depends upon the alternatives that we look at. If we look with a particular framework, we will see a certain set of available alternatives; with a different interpretation we expand the range of alternatives examined.

Let me go from there to talk about the model. I think there is an important issue here in that perhaps the modelers are at this point tending to move in the wrong direction. This statement is in no way to disparage the results that we have already gotten and the tremendous amount of work that has been done here.

But it is clear that some significant aspects of the situations being modeled are not ordinary quantifiable economic variables.

Now, there are two approaches to this. One is the tendency that I see prevalent, which is to try to quantify everything and get it into the model of the sort that we are presently using. This implicitly leads us to a view of the future that is like the past, only there is more of it. It limits the kinds of alternatives that you look at. Perhaps what we really need is something in a quite different direction, which is to take the clearly nonquantifiable aspects of the society, its goals and where it is headed—and handle those in a conceptual framework that is very different. As Mr. Leontief said, the purpose of a model is to be a framework within which you put information. If some of that information is distorted when we quantify it, then what we need to do is to carry along two complementary kinds of models, not try to squeeze everything in the one computer model.

Representative BOLLING. Mr. Leontief.

Mr. LEONTIEF. I think that the improvement would be achieved by introducing some little gimmick, some kind of a tax which will let the thing operate right. I think the approach you will have to take in order to get anywhere would be indeed to explore alternative developmental paths which you could follow, concrete paths, not just say, we should have some regulator which will bring it about automatically. It is not a problem of developing an automatic mechanism which will bring it about, let us explore where we can go. We know our technologies, our respective technologies, the way the consumers behave. But it should not be deterministic. Government is big enough to influence the situation, but not by command, and not by putting as some people do all the burden on the monetary manipulation. We use too much on the choke, and now are waiting until the carburetor

gets clean. We have got to open the hood and look under the hood in considerable detail, sector by sector, in this total relationship, and then try to make alternative scenarios, and not rely on possibility, make alternative scenarios. Each of them must be feasible. Too many promises are just not feasible. This is an entirely possible assignment to see, where would we be 5 or 6 years, and alternatives. We check our resources and our tax system, and then being a democracy, let us choose, possible compromising. But a compromise must not mean that we combine something that is not combinable.

In other words, I hate the word planning, but what I mean is, analyze alternative perspectives.

And then by the way, once we choose a perspective, let us use all instruments of the Government that we have to achieve that, tax policy, Government expenditures, fiscal policy, everything. I would not be so terribly choosy as to what we use, provided I know where we want to get. Instead of being very elegant. I use only one instrument to take us where we want to get. And I think this is terribly important. What can an ordinary person say? It is for the specialists. But if you just do it such and such a way employment will increase. And encouraging investment of business, possibly sometimes by subsidies. This would be my view of what the choke should do.

Representative BOLLING. Mr. Almon.

Mr. ALMON. In replying to Congressman Hamilton's question, I would like first of all to mention again what I said to Congressman Long, namely, the role of protectionism. In looking down our list of industries where there is a particularly low growth rate, you find protection from foreign competition. You observe it, for example, in apparel. It may be that apparel just cannot be adopted to modern technology. But in any event you also become very aware of the extent of protectionism whenever you import a suit from Hong Kong, and you have to go to the post office and shell out \$35 or so to get the suit. Likewise in the steel industry.

We know that there are restrictions on steel imports, and then you see a 1 percent rate of growth of productivity in the steel industry, and you wonder if there isn't some connection between the two. And so on. You can look down the list of industries which are protected and which are apparently enjoying that protection by not increasing their productivity. I think this is an aspect of Mr. Olson's argument.

Congressman Long asked me what I thought were the fundamental causes of the low rate in productivity. I realized later that my thought was running along capital and labor lines, and I really ought to tell you a little bit more of what I have, in my noneconomist hours, felt to be the causes. As a teacher I have not been able to fail to observe that students coming into the colleges today seem to have less imagination, and less capability of solving simple problems than they did some years back. And you have perhaps seen statistics on the decline in the performance of high school graduates on reading tests, for example.

Now, productivity in the industry comes from creative imagination and from know-how and will that gets imagination translated into a way to produce things.

I am not convinced that our public school system is doing all that it could be doing to promote productivity, to promote creativity. When I

have talked to public schoolteachers about the problems which they have, if you can get them to drop their guard and tell you what the problems are, you see that they are having that kind of problem. When they talk about what they are doing, I don't find very much that they are doing about it.

If you talk to private schoolteachers, independent schoolteachers, you can find lots of things being done to foster creativity.

Now, I think that our present educational system constitutes protectionism for State run schools, and that they have a monopoly, an established monopoly, they get support from the State. The independent schools don't. I realize that what I am talking about is political dynamite. But I can't help but tell you, if you ask me, that I think that a lot of the problem of productivity slowdown comes from a mechanized education. And we need to get away from it. I think the way to get away from it is through competition in education.

Representative BOLLING. Professor Fromm.

Mr. FROMM. Perhaps the answer to the productivity slowdown is the effect of noneconomic factors. One could name many more potential causes. But, Professor Leontief's caveat that one wants to be careful about spurious relations should be taken into account. With trends you can explain almost anything in that fashion.

I would like to point out to the committee that in my paper I did cite a study by an interagency task force, a U.S. Government task force, on U.S. productivity that is now going on which has not as yet been released. It, of course, focuses on economic factors. But it is able to explain the slowdown in productivity over the last 5 years by a slowdown in the capital-labor ratio, investment per worker as Mr. Walker put it, and also due to, in part, the unusually large number of young workers who came into the labor force.

It is clear that young workers—and it does not have to be a question of motivation or education—have less experience than people who have been in the labor force for some time. As they become a larger proportion of the work force, it would be expected, naturally, that the productivity of the entire work force, on average, would be somewhat lower. As these factors are reversed, which is the anticipation in the years ahead, then we should see a pickup in productivity.

If I may continue on one personal note, Professor Almon took issue with me on the impact of environmental controls. I did not say in my paper, at any point, that investment in pollution control equipment would lower productivity. What I did say, and I quote, is "Environmental regulations may have forced production cutbacks and modifications of procedures and equipment which might then adversely have affected output, and by implication, productivity."

Representative BOLLING. Mr. Walker, and then I want to recognize Congressman Rousselot.

Mr. WALKER. I will be very brief.

In answering your question, Congressman Hamilton, you suggest a rather long legislative agenda. Just let me hit a couple of high spots very quickly.

I do want to comment on Professor Olson's tax on profit. No, it is not a new idea. It was considered in the Treasury when I was there. I am not enamored of it. I think if we can establish good stabilization

policies and balance between consumption and investment, your labor problems will pretty well take care of themselves. Labor has shown a great deal of restraint lately.

Professor Almon says we have got to look at the whole thing and I agree, look at all the moving parts. And there are a few things that stick out like a sore thumb that I think you should pay attention to. As to a tax cut for stabilization purposes at this moment I am against it. I want to see more data. But I do think there is a very strong case for promoting capital formation through reducing taxes on investment. I think our tax system is biased in favor of consumption and against investment. I think more and more of the Members of Congress are recognizing that. I think the special task force of the Ways and Means Committee under Mr. Ullman will be coming forth with positive recommendations, first to reduce the double taxation of corporate dividends. I would hope that we can also move in the capital recovery areas—depreciation—closer to the rapid recovery that prevails in foreign countries.

I am relatively optimistic on this score. Some of the polls have surveys that I have seen giving views of Members of Congress are very encouraging about the recognition of this need.

So I would advocate broad tax cuts in the investor sector whether it is part of a general tax cut or not. Let the market allocate that in general. But then you have got to be more specific.

Let me take just one example—and this gets into energy. Geothermal development is not going to solve our energy problem. But it is going to be very valuable out in your part of the country, Congressman Rousselot, because I am told it could provide up to 8 percent of the need in California. But geothermal is not developing as it should, because right at the moment it is not competitive vis-a-vis strip-mined coal that is shipped in. Some simple changes in the tax law to allow for depletion will trim the cost in the geothermal area and could help promote its development.

In the energy area—you have heard this from economists from time to time who say, if Congress would let price do its work in terms of stimulating competition, it would go a long way toward solving some of our problems. But that alone will not solve problems. I don't think you are going to get the investment and work done in uranium enrichment or in synfuels, without some Government backing. And that did not get through the last Congress.

Finally, with respect to the railroad area, there is another sore thumb that sticks out, the need to rebuild the roadbeds. I think you should give serious attention to the creation of a 1970 model Civilian Conservation Corps, and get some of these young people out of the cities and out in the country in a half work, half study program. The work could be not just the railroads but other things. There are difficulties. But that is the very sort of thing that the leadership of our new President and our leaders in Congress should really home in on.

Representative BOLLING. Thank you.

Congressman Rousselot.

Representative ROUSSELOT. Thank you, Mr. Vice Chairman.

I am really tempted to dive in so many areas here that have been discussed and I am really terribly disappointed—of course we junior

members on the committee feel this way, by the time it gets our turn so much of the opportunity has passed, because we are pressed by time—there are so many things that each of you have brought out that really need further discussion. For that we are terribly grateful. And I know that a lot of our nonpresent members would be also tempted to jump in with each of you and probably have an hour discussion with each one of you, because you have really brought up so many things.

First, on this whole subject of models. In the House Budget Committee, we rely very extensively on models. And you say we need more facts. And that triggers more questions than it answers. I would really like to get into that with you extensively. I am sorry that we can't.

So I will move into another area.

Mr. Almon, you talked about education. We spent an awful lot of money on education here, and have told ourselves that we improved the quality of education. And you now come up with a very challenging thought about what we have really done in the field of education as it relates to the test scores and other things, and entering the labor market. Many of those young people don't have the creativity development that maybe they need. That is every bit as important as the capability to do a given job. It is tremendously challenging. And that triggers all sorts of questions that I am sure we would all like to get into.

I would like to refer to something that intrigued me tremendously, and I have tried to dig into it a little more. Three academic theorists called Lucas, Wallace, and Sargent come up, according to Business Week, with a new theory called rational expectations. Those of you who were here yesterday will remember I brought it up. It is a terribly challenging idea to me in many respects, because it relates to long-term policy planning.

Let me just quickly state it as they have said in Business Week. It says that this new theory of rational expectation says that in economic policy "Systematic policy changes can do little to increase employment and output because the public, that is individuals and institutions, take actions that offset the changes before we employ policies. Therefore, the most appropriate policy, maintains its proponents," state these three gentlemen and—"is that steady money growth and balanced budgets really become more important policies to us."

And then to summarize another part of it, they say that we, the policymakers especially at the Federal level, go wrong because they make decisions that fail to incorporate the fact that the public had already formed expectations about what the policy is going to be, and have already acted on these expectations.

One thing that was commented on yesterday was, for instance, President Ford's statement that he would clearly not have wage and price controls. Governor Carter, now President-elect, has said we may. And therefore the whole marketplace adjusted to that immediately in anticipation. And since we have also come to distrust our Government rather substantially, even though Governor Carter will say over and over again he will not have wage and price controls. President Nixon said he could use the power to do it, and Congress as a whole gave it to him and he used it anyway.

What are your comments, those of you who have studied this new theory? Is it real, or live, or good, or bad, or what? Or have you thought about it enough to comment?

MR. FROMM. I am afraid you could have an argument with a large number of economists from many different points of view.

Representative ROUSSELOT. I like those challenges.

MR. FROMM. One of the difficulties is that I believe all economists would say that expectations are terribly important, that they influence how people act. In the present, people's expectations are based on what they perceive the future to be, in part, and in part on what has happened in the past. On the other hand, it is going a bit too far, many economists would say, that simply because of the existence of expectations, policy makes no difference. They would deny that policy cannot counteract certain events that are likely to occur in the future simply because there have been widespread expectations that those events will in fact occur, or alternatively, that policy already has been discounted and, therefore, no matter what the Government does, a recession, for example, would come about in any event. This to me, as Charles Schultze put it in another forum some months ago, is the "irrational use of rational expectations." Policy can make a difference, and we should not simply, because of the existence of expectations, say that the only thing that the Nation can, or should do, is to pursue a steady state course for monetary policy, fiscal policy, and so forth.

Representative BOLLING. Mr. Forrester.

MR. FORRESTER. Our work suggests a grain of truth in the viewpoint you quote, but I would say for quite different reasons than stated from the irrational expectations viewpoint.

Social systems are highly internally self-regulating. Even if a set of policies are consistently followed at a large number of points in the system, the system is still capable of counteracting and defeating a policy change. This would be a pessimistic conclusion, except that in general there are high leverage policy points in the systems. And if one operates through those high leverage policy points, a change radiates through the system. But the high-leverage policies are usually very different from the policies through which government usually tries to act. People are conditioned since childhood to expect that cause and effect are closely related in time and space. If one burns his finger on a hot stove, he burns it now, and he burns it here. Cause and effect are very clearly related one to the other. However, as one goes to more complicated systems cause and effect can be very distantly related in both time and space. Causes may go back into far distant history, and come from sectors of the economy very different from where the symptoms appear.

Now, that itself would be misleading. But the system is in many ways even more devious. One will usually find in a system exactly what he is looking for in terms of apparent cause and effect being closely related to one another. One will find in the vicinity of a symptom something that is going on that seems to be a cause and is related in time and space. But in fact, the apparent causes are apt to be coincident symptoms. One is looking at two things that happen to be going on together and the cause for both are elsewhere.

When one moves into a system and addresses a pseudo-cause-effect relationship, the policies fail. I believe this process of addressing symptoms rather than causes characterizes a large number of failing policies in corporations and Government. It is the nature of systems of

which we are a part that our attention is attracted to places of low leverage. The system is capable of defeating policies, not, I believe, through an instantaneous recognition by individuals of what the consequences are, but from the dynamic structure of the system in the circumstances where people continue to follow their own policies, but the structure of the system is the thing that defeats the effects.

Representative ROUSSELOT. Why do you suppose we hold onto our failures so long?

Mr. FORRESTER. One often sees a situation in a corporation where there is a widely recognized difficulty; it is known inside the corporation, it is known in the financial district, it is discussed in the press. The difficulty may be loss of market share, it may be high instability of employment, or low profitability. These are big symptoms, everybody knows about them. One can go into such an organization and talk to people about what they are doing. One finds that Mr. A sees policies and structure in a certain way, and Mr. B sees them in the same way. A study will conclude that each person is seeing the nature of the system in the correct way. You don't need a psychiatrist's interview to know what each person is doing. He is doing what he says he is doing. And all are working to their best ability to solve the great problem. What they don't realize is that when a system dynamicist takes exactly the policies they have described, and put that policy structure together into a computer simulation model, the model will generate the same difficulties the company is in. In other words, the very policies the managers are following are producing the trouble.

Now, if the managers believe their policies will solve the problem, and they are not able to perceive the policies are making the problem, then the greater the difficulty the harder each person tries to apply his presumed solution. A downward spiral results that, unless checked, leads to the extinction of the organization. You will find self-destructive policies in most corporations that have gotten into deep difficulty.

I believe that many laws and programs that the country has engaged in during the last 20 to 30 years are in the category of actions that make the problems worse. We are probably on the verge of making matters worse in unemployment-inflation dimension. We become trapped in a characteristic that couples the nature of the system to the psychology of people and to the inability of the human mind to perceive what complex variations over time are doing.

Mr. FROMM. One might second that with regard to the economy. If you say a steady state path is a good strategy, if you pursue a weak steady state path, then you have a weak economy, and you clearly leave yourself open to whatever shock comes along, which could create a marked downturn. The question of instituting a tax cut now pertains exactly to this type of situation, which is what the economy has experienced over the last 3 to 6 months.

Government expenditures have been lower than was programed, there has been a weakening of consumer expenditures, we may be confronted with an OPEC price increase later this year, there will be some increases in social security taxes in 1977, and investment demand has been weak. As some analysts look at this situation, the economy now stands at a point where there is a danger of slipping back into the recession from which it has just come. The question is, What should



we do? The answer, for the viewpoint of rational expectations as you have given the hypothesis, is to do nothing, just stay on the path that we are on. I cannot, for one, buy that kind of a strategy. I think that if we are to pursue—

Representative ROUSSELOT. I don't think I said stay on the path we are on, it is a steady money growth and balanced budget.

Mr. FROMM. It is clear that if we move to a balanced budget now, we would throw the economy into a tailspin that would curl your hair.

Representative ROUSSELOT. That is the theory that has always existed.

Professor Almon.

Mr. ALMON. I was going to say that I think his case is best relative to the investment tax credit as an on-and-off countercyclical measure. If business expects the tax credit to come as the economy goes down, then they will wait for it to go down. That is the best case that they have. On the other hand, the case against tax rebates seems to me to be much less good. I don't think that my wife is likely to actually spend the rebate until it arrives.

Mr. LEONTIEF. My feeling is that we have a kind of a general idea, we don't demonstrate anything, it is like never being able to catch a chicken in a yard, because you chase it and it runs in another place. I am sure you can catch it. It takes a little more running and careful planning of the running. I think people might try to, but there is no general law that any action can always be defeated. So it is not enough. They have to prove that all actions which can be taken except a balanced budget will be defeated. It is like trying to find a new argument for old medicine.

Mr. FROMM. Could I interject one more point.

A balanced budget policy is exactly what was attempted in the 1930's. It is clear to most economists that this greatly exacerbated that downturn, and produced a 25-percent unemployment rate in 1932.

Representative BOLLING. Mr. Walker.

Mr. WALKER. I would like to make a couple of observations.

I happen to agree with the basic policy of relatively steady monetary growth. And I would actually prefer to follow the right path to getting an actual surplus for the Federal Government, the Government therefore being a net supplier of funds in credit markets. But not the day after tomorrow. That would be kind of tough.

The other point I would make has to do with what may be irrational expectations. I had quite a debate over the weekend with one of the senior economists from one of the Budget Committees. He was arguing that a tax cut that would increase the deficit \$10, \$15, or \$20 billion and should not be of any great concern to people in financial markets. He argues, as do many economists, that there is plenty of slack in factor markets to absorb the impact without more inflation.

And I said, well, I happen to think you are wrong substantively, but it doesn't make any difference whether you are. The people in the financial markets—people who control the flow of tremendous amounts of funds—are very nervous. So without saving who is right or wrong on that, and it may be irrational, that approach in January could really put us back in the soup. Interest rates could shoot through the roof.

Representative BOLLING. I think this is the time for us to recess, and I want to thank you all not only for your very real contributions in papers and for your presence here, but also for your patience.

I would like to add this as a final comment of my own. Once upon a time I undertook the task as the chairman of a subcommittee of this committee, the Joint Economic Committee, on economic statistics. I did it only to try to develop some lobbies on the south side that would encourage Congress to spend more money on the raw material of the decisions that we make, economic statistics.

I suspect that what I have been hearing today, the common threat to everything that I have heard, is that it would be well if Congress and the Federal Government would systematically apply more resources to the use of the human mind to solve problems. I think that is one of the areas where we don't really concentrate our best efforts. I also think that that would reconcile all the arguments and differences, because I think we would all agree to that.

I would also like to announce that when the hearing concludes, copies of the first volume of the growth study series which the JEC has released will be available. Professor Leontief's statement will be available. That volume I just mentioned contains the papers by Professor Olson and by Mr. Harman among others.

I thank you. The committee stands recessed until November 16 at 2 p.m.

[Whereupon, at 12:40 p.m., the committee recessed, to reconvene at 2 p.m., Tuesday, November 16, 1976.]

## LONG-TERM ECONOMIC GROWTH

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TUESDAY, NOVEMBER 16, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to recess, at 2 p.m., in room 345, Cannon House Office Building, Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representatives Bolling and Rousselot.

Also present: William A. Cox, Robert D. Hamrin, and Louis C. Krauthoff II, professional staff members; Michael J. Runde, administrative assistant; and Charles H. Bradford, minority professional staff member.

### OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative Bolling. The committee will be in order.

This week the committee's hearing on "Long-Term Economic Growth" will give special attention to three of the main contributors to the growth process: Today's discussion will deal with the role of capital formation; tomorrow we will deal with natural resources; and Thursday's session will consider the potential contribution of new technology in the next decade or two. At the final session on Friday we will discuss the preliminary report of the Advisory Committee on National Growth Policy Processes which has, over the last 10 months, been considering the possibilities of restructuring Government institutions to cope with the stresses and strains of growth policy.

There has been much controversy over the past few years about the existence of a capital shortage; that is, a shortage of funds and resources for new plant and equipment. Most economists seem to agree that investment is needed at substantially higher rates than in the past to provide the jobs, the energy, the pollution abatement, the technical progress and, in general, the higher living standards we all want. This appears to be true at least for the period of exceptionally rapid labor force growth occurring now and expected to continue into the early 1980's.

At present, however, there seems to be no shortage of capital but rather a shortage of investment. In other words, businesses and banks have adequate funds, interest rates are falling, but the desire to invest these funds in new productive capacity is lacking because businessmen do not foresee strong future sales prospects for their output. Thus, available capital is lying fallow, so to speak.

If and when the economy snaps out of its lethargy—and I fully expect that a new, more vigorous President will prescribe the needed

economic medicine—then investment also will recover. If this recovery is strong, capital may become scarce. At that time, Government should move to limit its demands on credit markets by shifting toward budget balance or surplus, and new savings incentives may be needed.

This is the way the present medium-term outlook appears to me. I am eager to hear the views of today's distinguished panel of speakers on how to coordinate capital formation with the needs of the economy not only today but in the longer run future when we can foresee that the labor force will be growing significantly more slowly than it is today.

Before concluding, I should emphasize that we wish to formulate the issues of capital formation to encompass not only physical plant and equipment, but also to include research and development activities, public, investments in transportation, health care and the like, and also capital embodied in human beings in the form of training and knowledge. One must not lose sight of these other vital forms of investment that often are excluded from consideration.

Our first participant is Edward F. Denison. It is entirely appropriate to open this afternoon's discussion by introducing him. He has done much of the seminal work in this field. Interestingly enough, the other people in the series on capital formation quote from his writings.

Mr. Denison is presently a senior fellow in the Division of Economic Studies at the Brookings Institution. He received his undergraduate training at Oberlin and earned his Ph. D. at Brown. He is also a graduate of the National War College.

Among his professional services he served as Acting Chief in the National Income Division of the Department of Commerce, and Assistant Director of the Office of Business Economics in the Commerce Department.

He was an economist for the Committee for Economic Development from 1956 to 1962, and has been at the Brookings Institution ever since.

He is the author of many works, which include "The Resources of Economic Growth in the U.S." and "The Alternatives Before Us," which he published in 1962; "Why Growth Rates Differ" in 1967; and "Accounting for the U.S. Economic Growth, 1928-1969" in 1974.

Before I recognize Mr. Denison, I would like to repeat the admonition or the request that I have made to all panels before, and will to all panels hereafter, that each panelist try to limit himself to around 10 minutes in the opening statement, so that we may have a discussion after each panelist has presented his views. But having set a very bad example by the extraordinarily long introduction, I am entirely at your mercy.

Mr. Denison.

#### **STATEMENT OF EDWARD F. DENISON, SENIOR FELLOW, DIVISION OF ECONOMIC STUDIES, THE BROOKINGS INSTITUTION**

Mr. DENISON. Mr. Vice Chairman, I was asked to write a paper which would draw upon my previous research to try to indicate the part that capital has played in the differential growth experience of advanced countries. Since I am a prolific writer I have written a great

many pages in the past, and the paper I have presented to the committee therefore is itself a short summary of a lot of material. It would consequently be quite absurd for me to try to summarize that summary in 10 minutes. Instead, I shall pick out a few points. Since the paper is in print, I am sure nothing will be lost.

Growth rates of net output vary substantially among industrial countries. The United States has experienced one of the lowest growth rates in the period since World War II. Capital accumulation is one of several major sources of output growth and differences in rates of capital accumulation represent one, but only one among several, of the main determinants of international differences in growth rates.

I suppose that last sentence is my main message.

International differences in growth rate span 6 or 7 whole percentage points, from a low of 2 or 3 percent a year to a high of 9 or 10 percent. Calculations based upon rates of return, or upon the weight of capital in total input, indicate that to raise the growth rate of U.S. net output by a single percentage point solely by the method of increasing private capital would require that something like an extra 11 percent of net output be saved and invested annually. Net private investment averaged only 7.2 percent of the Nation's net output in the postwar period so this would mean saving and investing about two and one-half times as much as in the past. This alone suggests that it would be quite impossible to explain international differences of several percentage points in growth solely or mainly by differences in investment.

From 1948 to 1969 the adjusted rate of growth of U.S. national income was 4 percent, of which my estimates indicate that 0.8 percentage points were contributed by increases in the amount of private capital, and 3.2 percentage points by other sources.

Of the 0.8 percentage points contributed by private capital, 0.3 points represented the additional services provided by a growing housing stock, 0.03 percentage points represented the increased earnings of investment abroad, and almost 0.5 percentage points represented the additional output provided by an increased stock of nonresidential structures and equipment and inventories.

The remaining 3.2 percentage points of the growth rate were divided as follows. The increase in employment, after allowance for changes in working hours and for changes in demographic composition, contributed 0.9 percentage points. The upsweep in the distribution of employed persons by amount of education—in some people's terminology, this is one aspect of the chairman's human capital—was responsible for 0.4 percentage points. Advances in knowledge, together with miscellaneous unmeasured growth determinants, contributed 1.2 percentage points. Improved allocation of labor was responsible for about 0.3 points. And gains from economies of scale which were made possible by market expansion contributed 0.4 percentage points.

That is the picture that my estimate provided for the United States in the postwar period.

Estimates of the sources of growth in 11 countries in various time periods permit international differences in growth rates to be divided among determinants on the basis of a full breakdown of growth sources. In the periods compared 5 of the other 10 countries, all of them among the larger countries, had growth rates well above the

United States. In two of the five, Italy and France, capital contributed the same or slightly smaller amount than it did in the United States, and hence it explains none of the difference in growth rates. In the other three capital contributed more to growth than it did in the United States. The difference in the size of the capital contribution is just over one-fourth of the difference in growth rates in the cases of both Japan and Germany, and just over a third in the case of Canada. The other large country, the United Kingdom, had a lower growth rate than the United States, and the capital contribution was smaller by an amount equal to less than one-fifth of the difference in growth rates. The sources of the remaining differences in growth rates are detailed in the article.

Growth rates of neither output nor capital stock can be properly understood or interpreted without consideration of the levels of output and capital prevailing in different countries, and of the reasons for international differences in output per worker. The United States has had a decidedly higher level of national income per person employed than any of the other countries.

Nearly all determinants of output per worker were more favorable to high output in the United States than in any of the other countries, except for the length of working hours. One of these favorable circumstances is that the United States has had more capital per worker, and it still does.

Japan was given special attention in the paper because it has had the fastest growth of national income and capital. As already indicated, capital accounts for about one-fourth of the differences between the Japanese and United States growth rates.

Any examination of factors underlying fast capital stock growth in Japan necessarily stresses a high and rising rate of savings. But fast output growth, most of which occurred for reasons other than capital accumulation, was also important because it served both to stimulate investment and to provide a sharp, steady rise in the amount of saving that would have been available even if the rate of saving had been constant. Also of great importance was a sharp decline in the price of investment goods relative to other goods. Both the relative price of structures and equipment and that of goods held in inventory declined greatly.

Capital has contributed to the changes that have occurred from time to time in the growth rate of potential national income in the United States itself. Thus the growth rate of potential national income—in 1958 prices—was 2.75 percent from 1929 to 1948, and 4.02 percent from 1948 to 1969. More than half of the difference, or 0.7 percentage points, is ascribable to capital.

Because the capital stock increased only slightly from 1929 to 1948 this is an unusual comparison. But capital contributed about one-fourth of 1 percentage point to the difference between the high growth rates of potential national income that were experienced in the 1948-53 and 1964-69 periods and the much lower growth rate experienced in the intervening period from 1953 to 1964.

The ratio of gross private saving to gross national product has been stable in the United States, despite major changes in rates of inflation, interest rates, the level and structure of taxes, real per capita income, retirement programs, and many other aspects of the economic

environment. This suggests that significant changes in the U.S. growth rate cannot be ascribed to changes in the private propensity to save, and that policymakers should be cautious in appraising their ability to influence private saving rates. There is no similar problem in raising Government saving if investment demand is known to be sufficiently strong to assure that a more stringent fiscal policy will not simply reduce production and investment—and tax revenues as well. But much of the time, I suspect, this condition is not met. Major changes in the growth of capital have stemmed from the investment side of the investment-saving education. It is probable that any program to stimulate capital stock growth over an extended period would have to rely on strengthening incentives to invest rather than to save. But I do not suggest that this is easy either.

I would like to summarize the ending of a book of mine, "Why Growth Rates Differ." In a little section called "Epilog for American Readers," it said: "The conclusion, I believe, is clear—" that is, the conclusion from the analysis in that book.

Although most of the European countries have achieved higher growth rates than the United States, this was not because they were doing more to obtain growth. They were able to secure higher growth rates only because they were operating in a different environment. Conditions were very different with respect to factor proportions; to misallocation of resources; to the existing level of technology, management, and general efficiency in the use of resources; and to economies of scale. Some have supposed that the United States could have matched the growth rate of European countries if only Americans had done as Europeans did: I conclude that this is simply not so.

Skipping to the final paragraph:

The performance of the American economy is not, of course, all that it might be. I doubt that inability to produce and distribute a large and rising total of goods and services—the aspect of economic life with which this study is concerned—should be listed among its defects. But an appropriate valuation would have to be based on a comparison of U.S. achievements with U.S. possibilities. It cannot be based on casual comparisons of U.S. growth rates with the rates of countries having quite different opportunities for growth.

I add one final sentence from my paper for this committee:

The fact that output and capital have grown less than in many other countries is no more a reason for dismay—or to suppose that other nations have found roads to success that we have overlooked—than the fact that our productivity is the highest of all large countries and our capital the most abundant is a reason for complacency.

I think that is sufficient.

Representative BOLLING. Thank you very much for a very stimulating beginning.

Mr. Barry Bosworth is our second witness this afternoon. He is also presently at the Brookings Institution, where he is a research associate. In his career he has been a visiting lecturer at the University of California at Berkeley, assistant professor at Harvard, and he served in 1968 on the staff of the Council of Economic Advisers. Among his many publications are "Analyzing Inventory Investments and Capital Needs in the 1970's."

His last publication in February of 1975 has added poignancy today. It is entitled "The Stock Market and the Economy."

Mr. Bosworth.

**STATEMENT OF BARRY BOSWORTH, RESEARCH ASSOCIATE, THE  
BROOKINGS INSTITUTION**

Mr. BOSWORTH. Thank you.

Since both as a student, not so long ago, and as a member of the staff of Brookings Institution, I have read Mr. Denison's books and his material on economic growth, I don't think it is surprising that I have learned from that, and that I have basically no quarrel whatsoever with anything he has had to say today. In fact, I find myself of a somewhat similar mind that the question of economic growth involves so many issues.

There are many questions that have to be answered—the process by which growth occurs, what role capital has in it, and whether it is even possible to stimulate capital formation, and how to define capital—that I am going to perhaps throw something of a cheap trick, I guess, this afternoon and try to duck many of these issues, and focus on a somewhat different issue than Mr. Denison has raised. Because I think that there are many aspects to the issue of the economic growth role of capital, or what has popularly become known in recent months as capital shortage.

There is first of all the discussion of whether or not, instead of going on as we have been going in the past at a rate of growth of real GNP in the neighborhood of 4 percent, the United States should attempt to try to achieve a higher rate than that by stimulating capital formation. And I think in particular that is the area where Mr. Denison's experimentation far exceeds my own, and I will not even try to address that question.

I really come to the issue of capital shortages with a somewhat different twist with the role that it plays in the inflation process. In other words, is there some reason for foreseeing that in the future that we cannot even go on as we have been going on, but somehow things have changed in just the last couple of years, particularly in terms of the shocks that our economy has gone through. That means that we are facing some new changes inconsistent with past behavior, and a need to change our policies with regard to capital formation. I think there are several aspects in which one might speak of a capital crisis. First, one could foresee a capital crisis or capital shortage in the United States in the sense there was a clear and well defined future increase in the magnitude of capital needs compared to what we have had in the past. Any attempt to try to forecast capital requirements in the future is inherently uncertain and unreliable. But many forecasts, particularly the one done by the Commerce Department of the U.S. Government last year, provide a range for the magnitudes of these new needs that we can identify. And I think the outcome of almost all the studies in this area have been that there is perhaps some justification for believing that capital requirements in the United States will rise over the next decade.

There is after all increased requirements in the area of energy, and increased requirements in the area of pollution abatement. But when one puts them in the context of the aggregate economy, I know of no forecast made by anyone that generates a set of numbers that is significantly beyond the range of the proportion of the GNP that we have



devoted to investment in the past. Pollution abatement, while a major problem, and very costly, is not in terms of overall economy that an expensive drain on the national resources.

So that at most one can foresee possible additions to the magnitude of investment as a share of GNP of about 1 percentage point compared to what we have had in the past. And this is well within the range of investment fluctuations that we have experienced in the past and have been able to adapt to, and I don't think that constitutes a serious problem.

The second way, however, in which we could think of a capital crisis is that investment needs stay about the same, but Americans no longer save at the same savings rate as in the past. We hear this frequently, I think, because of the move toward credit cards. Everyone has the impression that all Americans spend every dime that they earn and no saving is taking place.

Certainly credit cards and other such financial instruments have changed the pattern of savings that individuals undertake over their lifetimes. But, as reference to aggregate data of the U.S. national income accounts will demonstrate, private saving rates have not declined in the United States, they have remained amazingly constant, something that was once referred to as a Denison constant, in that private savings has changed so little. In recent years, in fact, household savings have gone up sharply. This has not changed private savings, because business savings have declined sharply. And that, I think, is a bit of a puzzle. Business saving has declined as a share of GNP, because business retained earnings has declined as a share of GNP, and in turn that has declined, principally because profits before taxes of American industry has declined.

It is somewhat surprising in that atmosphere, then, to think of a shortage of capital when the return on capital—profits—is declining, since one cannot see in a market economy of the United States any particular barrier to why, if there was a shortage, the return to capital would not rise. Now, certainly one can identify price and wage controls as one possible reason. But this decline, which has become more and more evident since 1968, was well underway before the period of price and wage controls, and continued for a period of time afterwards. Instead it would suggest the possibility that our demand for capital has become satiated.

I also find that equally difficult to believe. Instead, I think there are some relatively simple reasons for the decline of corporate profits in the United States, and some expectation that the decision has reversed. There are two major reasons that I would put forth. One is the overvaluation of the American dollar prior to 1971 that put many of our basic industries under severe price pressure because they were not competitive with foreign producers. This has been corrected by a move to flexible exchange rates. And the second one, I think is that American business has not understood and has been slow to learn how to appropriately do its pricing in a world of inflation, that it took American business a long time to adjust to the type of problems that one has in constantly evaluating pricing policy when the cost of goods and services are rising rapidly, particularly when they rely on outdated modes of accounting that give many business firm false signals about the true profitability of their enterprise.

I think that many of these pricing problems have been learned by American business, and this, too, has headed back in the direction of correction. I think you will find in the last 18 months, adjusted for the stage that we are in in the business cycle, a significant rise in the portion of business profits and therefore business savings as a share of GNP. So I expect that problem to correct itself.

I see no reason, in conclusion, to think that there is going to be any substantial decline in private savings. But if in fact it should occur for some reason, it seems to me there is plenty of time at that point to deal with the question of incentives, if they become necessary, and that there is absolutely no evidence at the present time that private savings are headed in that direction.

So I would conclude that neither the magnitude of the needs, compared to what we have had in the past, is out of line, or that for some reason the amounts of resources available for investment is drastically less than what it was in the past. Instead, I agree very strongly with Mr. Denison that if there is to be a problem of unsatisfactory performance in the area of capital formation in the United States, it will not be because of a shortage of resources made available to capital formation, and it won't be because the magnitudes are unachievable, but instead because the demand incentives will not be there to bring forth the investment that would be possible. Mr. Denison is quite doubtful about the ability to influence investment incentives directly. I think maybe the most positive thing we can do in this area is that the Government should do a better job of managing its own problems. It should stabilize its economic policy in the monetary and fiscal area, it should try to achieve a more stable rate of economic growth, so that expansion will be at a predictable, regular pace of the overall economy. The most effective policies are those that create a general economic environment in which private investment formation can be undertaken.

There is a third area, however, in which we could have a possible capital crisis. And that is that the amount of capital required is not out of line, the savings are adequate, but there is a problem of transferring the resources from savings to investors. In other words, difficulties in our capital markets of a structural nature which make it difficult to move the savings from the people who want to save to the people who want to invest. I think it is clear that the last decade has indicated that our capital markets do have some very serious flaws, principally because they were established and grew during a period of relative stability of overall price level. They are not well adapted in structure to the type of financial instruments and the type of financial institutions that we have to a world of inflation. But again I see very little need for any major intervention on the part of the Federal Government, because I believe again that the private market is demonstrating its power to innovate in this area, and it is self-correcting. A few years ago we heard talk that there would never be any equity financing by American business because equity financing was impossible. I think if you will look at the behavior of the capital market today you will see that equity financing has become a major

source of new funds for American business, and that the market has adopted to the changing situation. There have been many changes in the structure of our financial institutions and there has been talk of new forms of private financial instruments, better suited to an environment of uncertain future prices.

It seems to me that there are some problems of a more technical nature with regard to the Government regulations of financial markets, which I will not go into in detail, where there is a need for reform, but certainly not something that I would call a crisis.

Fourth, and the one that bothers me the most in terms of the very near-term outlook, is not that we have any aggregate capital problem in the United States, but that we have a very poorly allocated capital stock, that we find ourselves with some industries with large excesses of capacity, and other industries with severe shortages of capacity. I think those imbalances have been caused by the terrible instability of the economy and management of aggregate demand on the part of the Federal Government in the last decade. And this made it virtually impossible for businessmen with long leadtimes in the construction of new plants and new capacities to make reasonable projections of their future needs.

And second, the United States has gone through some very wrenching changes in its relationship with the international economy which have caused some disruptions and misallocations of resources. But again, if one looks at some of these basic industries, I believe that private market forces are basically directing these industries in the correct direction.

The profitability of investment is improving in industries such as aluminum, steel and other raw material industries. And again I believe that the outlook in these industries largely would correct itself if the Federal Government would focus most of its attention on the fundamental problems that still plague us, and for which capital formation or capital crisis is only a symptom. The United States has a fundamental problem with inflation and unemployment, and how to reconcile those two objectives. To focus on capital formation or capital crisis is to focus on but one of the symptoms of that illness within our economy, and to disrupt our attention from those more fundamental issues for which we have to find a solution.

Representative BOLLING. Thank you very much.

Next, Mr. Burkhard Strumpel.

He was born in Frankfort, Germany, and educated at the University of Cologne. During his professional career he has done outstanding work in economics, particularly in relation to social problems. He has been doing research and teaching in this country for over 15 years, and he is presently with the Institute for Social Research at the University of Michigan. He has also taught at the University of Cologne and Augsburg.

He has written widely on social welfare, economic development and the relationship of the tax system to the growth problems.

Mr. Strumpel.

**STATEMENT OF BURKHARD STRUMPEL, PROGRAM DIRECTOR,  
INSTITUTE FOR SOCIAL RESEARCH, UNIVERSITY OF MICHIGAN**

Mr. STRUMPEL. Thank you, Mr. Vice Chairman.

I would like to take up two threads that have been mentioned by both of the speakers before me. First, Mr. Denison's emphasis on the need to incorporate a changed perspective, to solve our problem, and second, Mr. Boswell's attempt to define a new situation that may directly affect the economy of our decade.

I indeed believe that the question of future needs for capital formation and investment have to be addressed in the broad context of economic and social changes of advanced industrial countries. Approximately with the early 1970's Western economies have entered a new era. The postwar decades were characterized by rapid industrial growth, unprecedented in economic history, and a great deal of harmony between popular expectations and the ability of the private economy to generate rising incomes and suitable employment. The present situation is characterized by a massive failure of the market to match available jobs with the skills and expectations of available workers and to reconcile people's demands for personal services and for a high quality physical and social environment with the imperatives of an economy based on perpetual expansion and change.

The stimulation of investment in tangible capital as masterfully developed by Keynesian economic thought and practice is a strategy designed to solve the production and employment problems of industrial growth. This strategy is geared to an economy the success of which is judged by its ability to extend the mastery of man over nature and to provide the bulk of the population with more consumer goods. The question is: Will the formation of physical capital be similarly successful in dealing with the challenges in the 1970's and 1980's? In particular, will it be effective in solving our gravest economic problem, the unemployment and underemployment issue?

The negative answer I give in my paper submitted to this committee for the study series "U.S. Economic Growth From 1976 to 1986: Prospects, Problems, and Patterns," is based on evidence from the United States and West Germany, two of the most important and most healthy economies of the West, and is probably applicable to other industrial economies as well. The following points deserve emphasis:

Employment in the manufacturing sector has been declining as a proportion of the labor force, and recently also in absolute numbers.

A growing proportion of investment in plant and equipment in West Germany, and probably also in the United States, has been of a labor displacing rather than of a job creating nature.

There are symptoms of overinvestment. The manufacturing sector as a whole has had increasing difficulties in earning profits on the existing stock of capital and this is shown in table 1. The rate of profit of large corporations has declined significantly since the early sixties. And I think the books are by no means closed as to whether the present recovery of profits, which has to do with the upswing in the economy, will show up also in a medium- and long-term context.

[Table 1 follows:]

TABLE 1.—MEASURES OF THE CLIMATE FOR BUSINESS INVESTMENT: UNITED STATES AND WEST GERMANY

[In percent]

	Profit after taxes <sup>1</sup>		Dynamic debt ratio <sup>2</sup>		Investment as share of GNP		Capacity utilization <sup>3</sup>	
	Capital, United States	Sales, Germany	United States	Germany	United States	Germany	United States	Germany
1961-65....	8.3	4.0	6.3	6.1	10.5	15.9	84	87
1966-70....	7.7	3.2	7.4	7.3	9.5	15.0	87	86
1971-73....	5.0	3.4	8.5	10.6	9.8	15.7	79	87

<sup>1</sup> United States data from William D. Nordhaus, *The Falling Share of Profits*, Brookings Paper on Economic Activity 1974, p. 180. German data from Horst Albach *Zur Entwicklung der Kapitalstruktur deutscher Unternehmen in Zeitschrift für Betriebswirtschaft*, Vol. 45, 1975, p. 9.

<sup>2</sup> Corporate debt-annual cash flow averaged United States data from Hyman P. Minsky, "Financial Resources in a Fragile Financial Environment," in *Challenges*, July/August 1975, German data from Albach, *ibid.*, p. 3.

<sup>3</sup> Manufacturing, mining construction in United States, manufacturing in Germany.

Mr. STRUMPEL. Lower profit rates have left their imprint on corporate balance sheets. Symptomatic is the deterioration of the ratio of debt to cash flow.

In the United States investment as a share of GNP stayed roughly constant but average capacity utilization had suffered even in the years before the recession set in. German corporations, in contrast, have suffered less decline in capacity utilization perhaps because they have reduced their gross fixed investment continuously over the past few years, from 17 percent of GNP in 1970 to 13 percent in 1975.

These problems and difficulties that are not confined to the American industry, can be traced to a number of sources, first physical constraints have emerged. Up to 1969, declining relative prices of energy and other raw materials benefited the production of material goods. Since then, the era of cheap energy and cheap raw materials appears to have ended. The relative prices of basic materials started to rise several years before the oil embargo. In addition, the environment is increasingly overwhelmed by the wastes and pollutants of a "throughput-intensive" economy that has been doubling its energy and materials use every 10 to 15 years.

Industrial expansion has become more time consuming and expensive, due to community resistance, in particular against new power plants, steel and paper mills, and chemical factories. Second, adaptation to the changed conditions, as for instance more restraint with capacity expansion, may have been delayed by both ideology and legislation. The present generation of high executives was raised and conditioned in a period when risky expansion by and large was rewarded by the market, prudent restraint was not. And overinvestment may have resulted from our tax laws: We raise a very large and rising part of public revenues for financing our social overhead burden through taxes leading to a continuous increase in the costs of the work hour, while at the same time subsidizing industrial investment through tax credits and outright grants.

Acceptable rates of unemployment can no longer be expected to result from economic policies that are oriented toward industrial expansion. Both in North America and in the member countries of the European communities during the last 10 years, employment problems have been increasing at the time of considerable growth. Further-

more, after the recent recession unemployment figures have responded only meekly to the recovery. To reduce unemployment to acceptable levels would require growth rates that simply are not in the cards. Correspondingly, strategies focused on specific areas are required that address the problems of the labor market.

These problems should be viewed more as being of a qualitative rather than a quantitative nature. The main difficulty is not a lack of jobs but a lack of good, acceptable jobs. There is a discrepancy between job characteristics and workers' preferences. For a long time it was assumed that economic growth and rising productivity would generate jobs that would demand ever more skills which in turn could only be acquired through longer and better education and training. The supposed congruence between popular demand for education and chances for its productive utilization no longer exists. Although the relationship between technological change and employment characteristics is by no means sufficiently explored, it is clear that much of the change in the manufacturing and service sectors has resulted in simpler, but psychically and physically highly demanding jobs. A rising share of workers, particularly younger workers, are no longer willing to accept dead-end, low skill jobs. Our interculturally comparative survey data show that within less than 10 years the most important occupational goals of both Americans and Germans have shifted significantly away from income security toward "intrinsic" rewards such as interesting work and sense of accomplishment. The changes are particularly strong for younger respondents.

It appears that overcoming the failures of our labor and commodity markets requires a vision of a new type of growth that emphasizes quality instead of quantity.

Qualitative growth should utilize a high proportion of skilled or educated manpower, it should offer intrinsically attractive jobs, and it should not be too demanding of material and environmental resources. There is little evidence that growth of this type is or will be held back by inadequate capital formation. Rather than stimulating investment in physical capital and in an ever more intensive use of natural resources, we should devise strategies that stimulate the use of human resources. In order to do so, we must move in a variety of directions: Upgrading the working conditions, both physical and psychic, and thus making existing jobs more attractive; reviewing our tax system and its effects on the substitution of labor by capital; and finally, creating public service jobs that satisfy urgent public needs and are managed efficiently.

Thank you.

Representative BOLLING. Thank you very much.

Next we have Mr. Carl H. Madden. He needs no introduction to most of us, since his many interesting activities have included a tour of duty on the Hill in 1963 as an economist with the Senate Banking and Currency Committee. He then went to the U.S. Chamber of Commerce to be the director of economic research, and became their chief economist in 1966, a position which he left only a few months ago to become professor at the American University.

Mr. Madden received his Ph. D. in economics at the University of Virginia, where he later served with the Bureau of Population and Economic Research.

After a stint with the Federal Reserve Bank in New York, he became dean at the College of Business Administration at Lehigh University.

And during this career he has found time to write six books, one with the apt title, "Decisions for the Seventies." A paper which he has written for this growth series shows that he is well aware of the real problems surrounding these decisions.

Mr. Madden, we are delighted to see you again on the Hill, and are looking forward to your thoughts this afternoon.

**STATEMENT OF CARL H. MADDEN, PROFESSOR, SCHOOL OF  
BUSINESS ADMINISTRATION, AMERICAN UNIVERSITY**

Mr. MADDEN. Thank you.

Debate about capital requirements in important part turns on a deeper question of the possibility and desire for economic growth which affects growth problems, prospects, and patterns. Seeking more labor intensity or exploring a "no-growth" society is not the issue. Rather, we need deeper understanding of growth and its twin resources, knowledge and enterprise. To argue this way is to offer an alternative analysis of capital needs, differing both from the approach of conventional demand-supply and of "no-growth."

The idea that growth is merely as "an increase of output per head of population" is absurdly too simplistic. Both logic and empirical evidence suggest a new concept. Growth is a vast and irreversible transformation process having integral social, political, and economic dimensions. Empirical evidence for this view is the authoritative work by Kuznets and others examining the "modern growth epoch" of the last two centuries. Hallmarks of the growth process are not only a rapid rise in per capita output and productivity. Also integral is rapid transformation both of society and the economy, growing world interdependence, ideological change, and a lag of about three-quarters of the world's population behind the rapidly growing societies.

The evidence supports the hypothesis that, despite the complex causation of growth, the advance of science was the great innovation propelling the astonishing growth record of the last two centuries. However, economists have neglected study of the impact of science.

Now, evidence abounds that the science itself in the 20th century is undergoing a revolution. The form of this revolution is to supplant earlier basic scientific assumptions about the nature of time-space, human life and its origins, the nature of organisms, the structure of matter-energy configurations, the structure of the universe.

Study of scientific revolutions by Whitehead, Kuhn and others concludes that these conceptual happenings change a culture's prevailing image of mankind and the basic tools of thought about reality. Of course, they also create ensuing advances of knowledge and new human insight. Twentieth century sciences rejects the earlier materialist and mechanistic view of reality as faulty and misleading. Processes and institutions patterned after these earlier ideas have encountered "failure of success." Economic growth as conventionally understood derives from earlier views and suffers from its own defects.

Apart from a small handful of intellectual giants, economics remains dominated in conventional thought and study by mechanistic

ideas that are analogies to 18th century physics and mathematics. They depict activity in terms of mechanistic balancing of forces, of "equilibrium states" of self-identical systems. Indeed, the logic of "limits to growth" models itself suffers from difficulties precisely associated in other sciences with the logical fallacies that have eventuated in anomalies, in observed behavior inexplicable in the terms of the pre-20th century theories or models of behavior. Furthermore, leading "no-growth" critics see growth in similar simplistic terms, so they reject the idea of using advances in knowledge to increase human effectiveness. They prefer "steady-state equilibrium." But it is a notion that hardly accounts for the brute and stubborn facts of irreversible evolutionary advance.

Twentieth century study of energy and its behavior in concrete processes has such general application that it illuminates economic processes and the idea of growth. After all, economic processes are energy processes. The laws of energy-mass conversion, conservation, and dissipation strongly support the idea that advancing knowledge and ordered structures are always threatened by inherent tendencies towards disorder and waste in all energy processes, including economic ones. Indeed, economic inputs are poorly depicted as capital, land, and labor. Rather, these sources are better understood as energy, knowledge, materials and organization. But since energy and matter are convertible, and since organization is itself a form of knowledge, these reduce to knowledge and energy.

To realize that knowledge and energy are key sources of wealth, that economic growth is a vast and irreversible energy transformation process, represents a fundamental change in the concept of growth. The realization sets in motion new trains of thought that recognize generally the integral and inherent role played by what conventional economics interprets only as "exogenous" forces or "externalities" often neglected or dismissed to other fields as being secondary to economic policy considerations, now held to be dominant and primary. It is time to realize along with Kuznets and 20th century science that those who want growth must also take urbanization, industrialization, increases in the scale of organizations, changes in the family, changes in ideology, problems of social complexity; and then they must use the fruits of growth to do something sensible about them.

Growth as transformation impelled by advances in knowledge and enterprise should accelerate no slow down, if knowledge keeps growing and enterprise is permitted to flourish. What future growth requires is steady infusion into social and economic processes of more new knowledge and understanding. Indeed, new and innovative economic processes are themselves an important aspect of advances in knowledge.

What surely is required is set new investment, both public and private, to imbed know-how into concrete physical configurations. Structural change ensues irrevocably. Therefore thought should be given to anticipating its benefits and costs. Basic economic concepts will change in content as new insights change people's perceptions and values. Above all, productivity flows, we learn, from healthy, vigorous, choiceful and free individual human beings possessing knowledge, understanding, skill and good will. Therefore, public



policy about education, jobs, and welfare is paramount. Increased effectiveness also flows from organization in free and competitive markets that test the survival value of competing technologies. But it hardly flourishes amid joblessness and welfare dependency.

Investment policy has to recognize that growth means changes in the structure of public and private processes, institutions, and industries. A strong case can be made that subsidizing real costs of existing industries amounts to slowing down the growth process, while policy that levies full real costs impartially speeds its up.

Policy fostering monopoly is likewise antigrowth policy, compared to fostering new enterprise and impartial competition. Vested institutional interests, both public and private, already have too many advantages over newcomers.

Finally, it is clear that we are lagging in the full use of knowledge—of science and technology—in many of our major institutions. Large net social benefits are available in innovative and large scale adaptations of knowledge in both social and economic processes, that would add to human wealth and effectiveness while sharply economizing energy and materials.

To be more specific:

1. Appropriate investment policy should emphasize investment in human capital. We need more rapid, widespread, and continuous improvement in people's knowledge and skill, to put the need paramount. Our view of formal education is far too narrow. Involvement in goal-setting is education; voluntary leadership is education; meaningful work is education. We need to infuse our society with concrete learning experiences for everyone, continuously, without outmoded and invidious distinctions between the employed and the jobless, the independent and the welfare dependent, the nonold and the old. We engage in gigantic and ignorant waste of human potential out of lack of imagination and outmoded ideology. But we need also to achieve widespread meaningful lifetime employment for every person wanting it and seeking it.

2. We need to change our overconsumption style, fostered by three decades of conventional growthmanship. To achieve capital needs while conserving resources, and to expedite the shift of capital and human effort from old to new processes, we need to generate more savings by rewarding it better. Shifting the tax base from income to a progressive consumption tax might be sound postindustrial investment policy for a people and nation of great wealth.

Investment policy should promote new forms of interaction between Government, business, and society to create new markets, set new standards, create supply for new life styles, and systematically address basic world goals by full and organized use of science and technology widely understood and of beneficent purpose. Then, enterprise can flourish and human effectiveness can advance. The issue before policy makers is not protecting vested interests, hurling outworn programs at old problems, abandoning growth, or creating make-work jobs for listless people on unproductive projects. The issue is a deeper understanding of growth all around and creative action in response.

Representative BOLLING. Thank you very much.

I am particularly pleased to welcome Mr. Wendell Gunn from the Chase Manhattan Bank.

If I am correctly informed, we are fortunate to have you here, because the stork arrived in time. I understand that your wife delivered a baby girl earlier this week.

There is another reason that I just discovered when I was looking over the vita. Apparently you went to the same school that I worked at once upon a time, Florence State in Alabama.

Mr. GUNN. That is right.

Representative BOLLING. I went there and was half teacher and half student. This was, I suspect, about the time you were born.

You started your professional career after your education there, and worked for 5 years as a chemist, which proves that we are interdisciplinary in our approach.

Mr. Gunn then went to get his PBA in finance at the University of Chicago. And before joining Chase Manhattan Bank he was a professor of business at Texas Southern University.

He is now a second vice president of the bank where he serves in a capacity quite relevant to our subject today as a commercial lending officer. He is a middleman between capital formation and investment needs.

We will be pleased to hear from you.

#### STATEMENT OF WENDELL GUNN, SECOND VICE PRESIDENT, CHASE MANHATTAN BANK

Mr. GUNN. In the midst of celebrating her Bicentennial year, America finds herself in a dilemma. Indeed a significant number of Americans find themselves in a state of crisis. Our recent experience with double-digit inflation and subsequent stagflation has left our economists baffled and our people suffering. Black Americans, because of their low position on the economic ladder, have suffered disproportionately, as unemployment reached depression levels in their communities and inflation cut into their already meager purchasing power. By any of the accepted indicators of progress, most of the gains that were made by blacks over the last decade were seriously eroded in 1975, and the future does not look promising.

We are here today to discuss "capital formation," an expression I never heard until recently. I must admit that I am a bit confused, since no one has told me what capital is, let alone how it is to be formed. Perhaps the proponents of the investment tax credit feel that capital is machinery and equipment. Alternatively, those who believe that Government spending and/or monetary expansion are the solutions to all economic problems perhaps think that capital is money, and hence is formed on the Government printing press.

But monetary expansion, Government spending and the investment tax credit have been around for a long time, and not only are we still pondering the question of capital formation, but our problem has become worse.

For purposes of my testimony, I shall define capital simply as productive capability. By this definition, it could very well be that America has all the capital she needs, but her capital is underutilized. America's capital exists in the minds and hands of her would-be entrepreneur, her would-be investors, her unemployed and underem-

ployed. The problem facing us today therefore is one of "capital activation," not capital formation.

Unfortunately, the economic theories of the past have failed us and their implementation has indeed contributed to our current malady. On the one hand, there are those who believe that inflation must be wrung out of the economy by increasing unemployment. Loosely translated, that means breaking inflation over the backs of the poor and underprivileged. Fortunately, this grossly inhumane policy does not accomplish the objective. The production of the laid-off worker drops to zero, but his demand for goods and services drops only to the level of his unemployment compensation or his welfare payment. Supply therefore falls relative to demand and inflation continues at a faster rate. On the other hand, there are those who believe that more Government spending and/or monetary expansion mean a better life.

But such policies are only useful as tools of income redistribution, not real economic growth. This latter group emphasizes employment, jobs creation, and the like. I agree that we need increased employment. But what we need more than increased employment is increased production. Lest someone be tempted to call this distinction an exercise in trivia, let me explain further. While it is true that in order to significantly increase production, employment must also be expanded, there are numerous ways to expand employment while achieving benefits which are at best dubious and at worst negative. We could begin by outlawing all labor-saving devices and shortening the work week. Then if there were any unemployment left, the Government could hire them to dig holes and fill them, or build walls and tear them down. However, no new production would result, only a redistribution of the fruits of existing production. In fact, the disincentives created by this invisible tax would cause a net decrease in production. If, instead, it became more profitable to produce, investors and entrepreneurs, in search of profits, would fill the void and new employment would result. In short, production should be the objective—employment should be the means. Ultimately, the only things that people have to trade for goods and services are the goods and services which they themselves produce. It is important therefore that they produce something that someone wishes to buy.

This is accomplished most efficiently in the private sector, provided, of course, the price system is allowed to work, with profit opportunities guiding would-be producers in the proper direction.

By far, the worst result of the two aforementioned schools of thought is that periodically, when one group falls out of favor, the other is called in to solve problems created by it and, in the process, creates new problems of its own. Then, after a little while, the process is repeated, and there appears to be no learning.

The one thing that both of these schools of thought have in common is that they virtually ignore the effect of taxes, direct and indirect, on economic behavior. Believe it or not, it is possible to tax the private economy literally out of existence. I am sure that everyone here will agree that if income tax rates were raised to 100 percent, all economic activity would cease. It is also true that whenever tax rates are increased, businesses that were only marginally profitable go out of business. It follows then that there is a range of rates within which an

increase in tax rates will lead to a decline in tax revenues. Simultaneously, unemployment results and there is new pressure for Government spending. In other words, the same action which leads to a decrease in the Government's ability to spend causes an increase in the Government's need to spend.

Our fixed, graduated income tax schedule really amounts to an automatic increase in income tax rates each year without new legislation. If we have now reached that prohibitive tax rate range, as I believe we have, the 95th Congress has a rare opportunity within its grasp—to do something that everybody will like. It was done in the early 1960's when there were sharp cuts in business and individual tax rates. Tax revenues increased and the prosperity which followed was something to be fondly remembered. I can only hope that this opportunity will not pass us by.

Representative BOLLING. Thank you very much.

Our next and last participant is Henry L. Duncombe, Jr., vice president and chief economist to General Motors. He joined the company in 1957 as a statistician, and was appointed director of economic studies for the financial office of GM in 1968, and appointed to his present position in August of 1972.

Prior to joining GM in 1957 he was an instructor at Northwestern University and the assistant dean and professor at Dartmouth's Amos Tuck School of Business Administration.

Mr. Duncombe did his undergraduate work at the University of Chicago and received his Ph. D. from Northwestern University in 1948.

Among his other professional activities in this area, he is chairman of the Economic Research Committee of the Motor Vehicle Manufacturing Association, chairman of consultants to the Business Council, member of the Council on Trends and Perspectives of the U.S. Chamber of Commerce, member of the Economic Research Committee of the Business Round Table, and economic adviser of the International Chamber of Commerce.

Mr. Duncombe.

#### **STATEMENT OF HENRY L. DUNCOMBE, JR., VICE PRESIDENT AND CHIEF ECONOMIST, GENERAL MOTORS CORP.**

Mr. DUNCOMBE. Thank you very much, Mr. Vice Chairman.

I am most appreciative of this opportunity to take part in the panel discussion. And I approach my role in it as more of a discussant of the papers you had commissioned than as an original contributor.

A host of issues bearing on capital formation and investment needs is raised by the four papers prepared for the committee. In the time available I cannot possibly do justice to any of them. Therefore, this comment will be limited to a few general observations.

Two of the papers before us, those of Carl Madden and Burkhard Strumpel, advance the thesis that it is necessary for the Nation to reorder its growth priorities to achieve whatever our national goals may be. Both seem to reflect the view, as summarized by Carl Madden that "The last 20 years of growthmanship has produced an overconsuming society."

In the Strumpel thesis, this seems to be more narrowly defined to relate to goods consumption. Although there are significant differences

in these two approaches, in essence they both seek a change in individual and societal values—in Madden's case toward the enlargement of our human capital; in Strumpel's case toward an increase in labor intensive Government-supplied services.

Obviously, both theses open up a wide area of discussion. There is no question that values do change as Madden's thesis asserts. Taking a long view, we have substantially increased our investment in human capital and no doubt the social dividend from this has been large. Also, consumers have been allocating a rising share of their incomes to services—both public and private. But in my view it is an open question whether a larger allocation of the Nation's resources to either or both of these through deliberate national policy will accomplish the growth or the improvement in the human condition we all seek. We seem to be constantly raising our sights with respect to the material conditions of life. To try to change this by Government directive is bound to be counterproductive.

I see no real prospect that our concern to improve material standards will change within the next decade. We have a rising population with expanding needs for both material goods and services. There are significant urban improvement objectives only now in the process of formulation. Beyond this are the capital requirements implicitly in our environmental and energy goals.

It is, as you know, extremely difficult to estimate the additional capital requirements for meeting these environmental and energy goals. This question was reviewed in the Annual Report of the Council of Economic Advisers dated January 1976. Based on their analysis—

Cumulative investment would have to rise 15 percent more than previously estimated, if the legal, technological, and energy related factors that raise investment requirements in the current decade are to be allowed for. Together these additional requirements add \$190 billion in 1972 dollars to the cumulative investment total for the decade 1971–80.

The Bosworth and Denison papers address some of the savings and investment questions related to these anticipated capital needs. Both are useful contributions to the analysis. Denison's review of the factors contributing to the differential rates of capital formation and growth between the United States, European and Japanese economies is helpful. I agree that we should not be dismayed because our output and capital have grown less than they have in many other countries. The fact, however, that their capital stock is more modern than ours does have a bearing on international cost and competitive relationships which may be increasingly important in the years ahead.

Both seem to agree also that aggregate savings rates are not the critical or limiting factor in capital formation and are not likely to be until the Nation reaches full employment of its resources. While interest rates are currently high by past standards, these reflect, in my view, inflation expectations, not any basic shortage of savings.

The critical issue today is one of incentives to accomplish whatever our goals may be. There is no question that the aftermath of the Vietnam war, of the disastrous period of wage and price controls, the explosive growth of Government regulations, and inflation not only affected business confidence but sharply reduced real earning power.

As Bosworth points out, while aggregate savings generally were maintained, business savings—the internally generated funds which business invests—declined.

Looking ahead, a basic requirement for private capital formation is the articulation of national monetary and fiscal policies geared to stability and long-term sustainable growth. Uncertainty about the direction of national policies only adds to the perception of risk by the private sector of the economy.

This issue is critically important at this stage of our national development. Questions of monetary and fiscal policy aside, private capital formation today entails greater risk than in earlier decades. Larger investments are required to achieve a given level of output in order to meet environmental standards.

The entire process of project approval is often subject to extended negotiation and delay, the result being that marginal projects may be put aside. With larger real investments required to achieve a given output, product costs are increased and this also adds an element of uncertainty to otherwise viable projects. In short, internalizing environmental costs does add a new element of risk to the usual commercial risks of innovation and investment.

While we can anticipate a continuing reassessment of our national goals, environmental objectives and energy needs clearly require that the rate of capital formation be increased beyond that we could foresee in their absence. To accomplish this—to cause a shift, for example of 1 percent to 2 percent in the share of output allocated to investment—will require that we move forward on a number of fronts. The rapid escalation of the regulatory activities of Government and uncertainty about the direction and nature of additional regulation is a major deterrent to private capital formation.

A most constructive first step would be a reexamination of existing regulations in terms of their cost effectiveness and benefit. In addition, proposed regulations should be subject to these tests before they are enacted. The types of problems currently faced by the business community are well illustrated by the uncertainties about vehicle emission standards for 1978 and subsequent model cars. Similar uncertainties are affecting private efforts to develop coal and nuclear power, and to expand manufacturing and other commercial facilities.

As I see it, in spite of the impressive reduction in poverty our economy has achieved, there remains, and always will remain, a backlog of unmet material expectations. Poverty is itself a moving target. Our expectations rise in lockstep with our accomplishments.

Similarly, full employment is a moving target requiring the continuing and substantial investment of funds to provide jobs for our growing labor force. In manufacturing, for example, it is estimated that in the area of some \$40,000 in investment is required for each new job created.

To accomplish all of this and to improve productivity will require that we reconsider the adequacy of investment incentives. In spite of the impressive recovery of corporate after-tax profits between the first quarter of 1975 and the second quarter of 1976, they are still in real terms 6 percent below the second quarter of 1973 and some 11 percent

below their peak in the first quarter of 1974. Improving corporate profit performance in real terms should clearly be a high priority objective of national policy. The adoption of proposals to make the investment tax credit a permanent part of our tax code is relevant in this connection as would be a reduction in corporate tax rates.

In addition, we need to consider new approaches to attracting equity—that is, venture capital. Bosworth's discussion of the need to reform the structure of the financial intermediary system in the United States deserves careful consideration. Beyond this, and in order to encourage a larger flow of equity funds, consideration should be also given to removing the double taxation of dividend income. In a nation with continuing high aspirations and large goals, we need, possibly more than ever before, the risk takers—the suppliers of venture capital—to accelerate the processes of innovation and capital information.

Thank you very much.

Representative BOLLING. Thank you. That is all.

Before I call on Congressman Rousselot, I would hope that each of you will find it possible to answer certain questions that we may submit to you in writing at a later date.

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF EDWARD F. DENISON TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 19, 1976.

Mr. EDWARD F. DENISON,  
*The Brookings Institution,*  
*Washington, D.C.*

DEAR MR. DENISON: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosures.

(1) How important do you feel capital formation will be as a source of economic growth over the next decade?

(2) Is our present economy too capital dependent? What are the possibilities for the U.S. economy to become less capital-resource-energy intensive and more labor intensive, a position supported in Dr. Strumpel's paper?

(3) It is often heard that patterns of business investment and economic growth must be altered in the future, in other words, that the U.S. can't grow exactly as it has in the past. Do you agree that the "way we grow" is becoming increasingly important?

(4) Do you feel that there is as much a frontier, providing as much potential employment, in the restoring, regenerating and rebuilding of resources as there has been in the "using up period" of the past?

(5) How should the U.S. move in the future in terms of its relative emphasis on, and incentives to, investment in human capital as opposed to physical capital?

(6) Will consumption have to give ground somewhat to an increased investment share in the future? If so, what government actions are necessary?

(7) If the ownership of capital were broadened, so that more lower and middle income individuals owned capital and received dividends from it, would this tend to stimulate economic growth more than the present pattern of highly concentrated ownership?

(8) Is it possible that a falling rate of return on invested capital may be a greater threat to future capital spending than a shortage of funds?

(9) In their paper for the study series, Jay Forrester and Nathaniel Mass argue that the recent recession was so severe, and the recovery period so relatively weak, because the U.S. is approaching the trough of a 50 year cycle known as the Kondratieff cycle. How valid is this argument? Is there a cycle that supersedes the shorter run business cycle that reflects much more basic, underlying forces in our socio-economic system?

(10) Are there forces now at work in the economy which may cause various major industries to decline or retrench over the next decade?

(11) Are rates of return in the corporate sector adequate enough to attract sufficient amount of new equity investment?

THE BROOKINGS INSTITUTION,  
ECONOMIC STUDIES PROGRAM,  
January 10, 1977.

Mr. JOHN R. STARK,  
*Executive Director, Joint Economic Committee, Congress of the United States,  
Washington, D.C.*

DEAR MR. STARK: Brief answers to the eleven questions posed in your letter of November 19th follow:

(1) Perhaps about the same as from 1948 to 1969, which would mean a contribution in the neighborhood of 0.8 percentage points to the annual growth rate of real national income in the economy as a whole.

(2) The United States economy does not use too much capital. It is unlikely that the ratio of labor to capital input will rise, and it is not desirable that it should do so.

(3) Patterns of investment, of sources of growth, and of uses of output, have all changed from period to period in the past and will no doubt continue to do so in the future. The "way we grow" continues to be important but I don't know that it is "increasingly so."

(4) The question contains implicit assumptions about the determinants of employment that I cannot accept, hence I cannot answer the question.

(5) If there is an imbalance in typical years, it is probably that too little is spent on research and development.

(6) If you take as the base an average period, rather than a recession year in which the share of investment is reduced, I do not think an increase in the investment share will be required. Certainly a substantial increase over an extended period will not be needed.

(7) It could do so only by improving attitudes toward work, and particularly worker cooperation in the adoption of more efficient methods, without introducing offsetting effects on saving or efficiency. I doubt that any favorable effect would be significant.

(8) Yes.

(9) This seems improbable.

(10) Only in the sense that this is always the case.

(11) No. But they probably would be if the economy were operating near its potential without serious inflation.

Sincerely yours,

EDWARD F. DENISON.



RESPONSE OF CARL H. MADDEN TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE  
COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 19, 1976.

Mr. CARL H. MADDEN,  
School of Business Administration, Hamilton Building, American University,  
Washington, D.C.

DEAR MR. MADDEN: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
Executive Director.

Enclosures.

(1) Would you agree or disagree with Dr. Bosworth's principal conclusion that the U.S. does not face an aggregate capital crisis? If you do agree, do you also accept his notion that "the problems in the area of capital formation are simply symptomatic of the difficulties in the more fundamental areas of inflation and recession?"

(2) How important do you feel capital formation will be as a source of economic growth over the next decade?

(3) Is our present economy too capital dependent? What are the possibilities for the U.S. economy to become less capital—resource—energy intensive and more labor intensive, a position supported in Dr. Strumpel's paper?

(4) It is often heard that patterns of business investment and economic growth must be altered in the future—in other words, that the U.S. can't grow exactly as it has in the past. Do you agree that the "way we grow" is becoming increasingly important?

(5) Do you feel that there is as much a frontier, providing as much potential employment, in the restoring, regenerating and rebuilding of resources as there has been in the "using up period" of the past?

(6) How should the U.S. move in the future in terms of its relative emphasis on, and incentives to, investment in human capital as opposed to physical capital?

(7) Will consumption have to give ground somewhat to an increased investment share in the future? If so, what government actions are necessary?

(8) If the ownership of capital were broadened, so that more lower and middle income individuals owned capital and received dividends from it, would this tend to stimulate economic growth more than the present pattern of highly concentrated ownership?

(9) Is it possible that a falling rate of return on invested capital may be a greater threat to future capital spending than a shortage of funds?

(10) In their paper for the study series, Jay Forrester and Nathaniel Mass argue that the recent recession was so severe, and the recovery period so relatively weak, because the U.S. is approaching the trough of a 50 year cycle known as the Kondratieff cycle. How valid is this argument? Is there a cycle that supersedes the shorter run business cycle that reflects much more basic, underlying forces in our socio-economic system?

(11) Are there forces now at work in the economy which may cause various major industries to decline or retrench over the next decade?

(12) Are rates of return in the corporate sector adequate enough to attract sufficient amounts of new investment?

## RESPONSE OF CARL H. MADDEN

(1) I agree. However, as my paper indicated, capital formation problems involve inadequate government policy of research and development to stimulate the needed shift of capital to growing, knowledge-based industries and government tax policy is inadequate to stimulate a faster rate of turn-over of existing physical capital.

(2) Capital formation is crucial at the rate and the structure of economic growth in any decade. In the next one, because of the quintupling of oil-based energy costs, the prospective shortage of some crucial materials at high levels of economic activity, the persistent problems and risks involved with nuclear energy safety and possibilities of terrorism, and increasing stringency of environmental standards, the structure of capital formation becomes even more important.

(3) In my view, the issue is not the capital dependency of our economy; rather, it is its dependency on capital designed to operate with expensive energy, little provision for internalizing external costs of waste and pollution, levels of knowledge not fully reflecting present competence, and inadequately acknowledging the changed nature and competence of today's labor force and consumer. I do not favor a naive change that moves towards more labor intensity for its own sake. That would be an error leading toward slow downs in productivity gains. I do not believe, for example, that every American family should have or wants a backyard vegetable garden or that the American people want an agricultural system with the labor intensity of the Chinese agricultural system. Our growth problem is misdiagnosed as being the problem of achieving more labor intensity. What is wanted is not more labor—intensity. It is the need to learn as to redesign industrial productivity and the process which produce them in such a way that the technology and the output are both more fully reflective of an understanding of the need to reduce the output—broadly speaking—if, waste and pollution of all kinds that are associated with given units of useful output.

(4) I do indeed agree vehemently with the increasing importance of appreciating that the "way we grow" will be more important in the future than "how much we grow".

(5) I do indeed.

(6) Since knowledge and its use, along with energy, seem to me to be the key sources of economic growth and of economic welfare; and since analyses of past growth, such as that of Dennison, already show the superior importance of human capital of investment in physical capital, I agree that the U.S. should move in the future to emphasize investment in human capital more so than investment in physical capital. This does not mean the neglect of investment in physical capital. This does not mean either the neglect of investment in the entire stock of human capital. Investment in human capital is not limited to formal education and training. It should include all of the resources of society, such as the policies of news media, the policies of television—above all—a better performance level in support of constructive family life for every family and better education of the disadvantaged.

(7) The issue is how the US can change from the goal of more and more consumption and what Daniel Bell has called "the psychedelic bizarre" to a style of living which in measured market terms, places a higher value on improvements in quality than it does on increased physical units of consumption goods. To the extent that people and businesses can be given incentives to consume a number of individual units of product that grows more slowly by being rewarded to save and invest more towards the objective of improving the quality and durability of physical output, the consumption share need not give ground to the investment share. Still, personally I would favor a move in that direction which would also cause the consumption share to give ground somewhat to increased investment. Our huge level of affluence and the urgent need to readapt our economic structure both recommend my position. The US taxes consumption less than its competitor nations having various forms of transactions or value-added taxes. Such taxes can be made progressive. I favor progressive consumption based taxation combined with higher rewards to savers (including a reduction in inflation) as the appropriate government actions.

(8) The present pattern of ownership is not described as "concentrated" given that perhaps 30 million people own shares directly and that millions of others in-

directly through pension funds. Instead, the difficulty is that (1) control of corporations lies in managements hands, and (2) ownership has ceased to have much meaning or relevance compared to its past role. Broadened capital ownership seems desirable to inculcate wide spread involvement of people in enterprise and to restore the portion of enterprise now eroded. Whether broadened capital ownership would stimulate economic growth is not a question I can answer.

(9) It is the falling rate of return on investment capital that contributes to the risk of a future shortage of funds. The fact of a falling rate of return on investment capital during the last two decades, construed broadly, threatens the existing structure of the economic system by weakening the incentive to private investment and strengthening the clamor for public investment.

(10) I thought the conclusion of Forrester's computer simulating was that he could demonstrate the existence of a 50 year cycle in a highly simplified model of our economy in which the cumulated impact of inventory cycles and capital investment cycles lead to 50 year ups and downs in the total economy. Modern experience with Kondratieff cycles is entirely too short. To make mere extrapolations of these cycles is logically or probabilistically invalid. Having experience with only at most four such cycles, how can we infer that another one is under way? However, Forrester's work here, as with respect to limits to growth, is extremely useful as a warning. The warning is that, if we do not take seriously the evidence suggesting the existence of such structural characteristics as the Kondratieff cycle, and if we do not undertake conscious policies to stimulate a more rapid replacement of bunches of obsolete capital that may pile up, then they will pile up and depress the rate of growth over appreciable periods.

(11) The empirical evidence of economic growth in market-oriented economy marked by mobility of the factors of productivity shows clearly that, in any such economies, some industries are growing and others are remaining stable or declining at any given time.

The classic empirical study of this phenomena is Arthur F. Burns's *Production Trends in the United States* (1936). Burns studied the annual growth rate of 102 United States industries over periods stretching back as far as data permitted. His conclusions support the thesis of Joseph Schumpeter that economic growth in such an economy proceeds through the "creative destruction" of the capital value of existing industries. The logic is easy to see. At any given time, there is a fixed quantity of the inputs to the production process. If 100 industries are operating and a new industry is introduced it must grow by competing away from one, or some, or all of the existing industries, some portion of their factors of production. To the extent that new industries compete away resources of production from existing industries, that tends to retard the rate of growth of those existing industries. To the extent that new industries produce substitutes for the output of existing industries, they compete away resources faster and tend to bring about the relative decline of such industries. This question is of major importance, because of the challenge and the threat facing the United States economy presently. The challenge is for the United States economy to move vigorously into the post-industrial age by maintaining leadership in adapting its economic processes to new knowledge of the earth, the solar system, the galaxy and the universe; of the biology, chemistry, genetics, socio-biology, and anthropology of human existence; and the relationship in all energy processes of the creation of waste and pollution as a necessary aspect of biological and especially of human life. The challenge, in short, is to use comprehensive understanding of universal principles revealed by my knowledge in order to "get more from less". This development requires the decline of existing industries and economic processes and the growth of new more adaptable industries and economic processes. The effect of conscious evolution of economic processes in conforming with new knowledge is an explicit growth policy. The threat is that the vested interest which now exists in industries of great past value and the vested interest in economic policies of great past value will blind and dissuade leadership from making the necessary changes that lead to adaptation. It is such a development in Great Britain between 1876 and 1976 that has reduced the standing of the United Kingdom in the leadership of world economy and political affairs, the British failed to grasp the underlying significance of the Industrial Revolution and did not appreciate the snowballing importance of widespread human knowledge, skill, and good health in the continued production of advancing human welfare.

(12) There is considerable empirical evidence that the rise of the not-for-profit sector of the United States economy, which now employs 1 out of 3 workers

in our economic system, is reducing the ability of the corporate sector to earn rates of return sufficient to attract enough new investment for growth in the "not-for-profit" (including government) sector. This development has occurred as Americans have sought goods and services under present policies which are not easily produced by private entrepreneurship. The interesting strategy with policy implications by Milton Friedman as well as others, as a means to broaden the market for private corporations, is the idea of "privatizing" the productivity of public goods and services. To take one example, if the U.S. postal monopoly were ended by a change in the postal law that would permit private competition to provide postal service, including a device for sharing among private producers the cost of marginal segments of the market, rapid innovation and reduced prices would result as private competitors explored new technology for transmitting information. The principle of privatizing the output of public goods is widespread in its application. It could extend to transportation to and from work, the building of parks and recreational areas, the provision of convenient communication and other human services, the provision of education through vouchers for students, the provision of health services through health maintenance organization and in many other ways. Evidence in the development in recent decades of other non-communist industrial societies seems to suggest that, unless such a strategy is undertaken with understanding and intensity, the not-for-profit sector is likely to continue to grow as a share of the total economy. Unless measures are introduced to improve the observation and measure of production gains in the service sector, especially government, the consequences to the society of such growth is likely to be a failure to measure or to perceive improvement in the rate of productivity gains in the production of goods and services in the not-for-profit sector. The big non-ideological advantage (leaving aside ideological advantages) of privatizing public goods production is the stimulus of entrepreneurial approaches to the production and measurable evaluation of effectiveness of production, which by and large is now lacking.

Representative BOLLING. Now we hope to have a discussion, and begin that process with Congressman Rousselot.

Representative ROUSSELOT. Thank you, Mr. Vice Chairman.

Mr. GUNN, I have taken the time not only to read your testimony, but also some remarks of yours that were put in the Congressional Record by my colleague from New York, Congressman Kemp, back in August of 1976. And you seem to put a substantial amount of emphasis in both your testimony today, and in the testimony that he placed in the record, on the subject of what you call an important part of capital activation on our tax policies. And you indicate in your testimony today that there is a range of tax brackets within which an increase in tax rates will lead to a decline in tax revenues. And you go on to say that you think we have reached that prohibitive tax rate range.

What do you think we ought to do about it as a Congress?

Mr. GUNN. Your question was, what do I think we should do about it?

Representative ROUSSELOT. The tax.

Mr. GUNN. The thing I would recommend specifically would be cuts in the marginal tax rates on businesses and in individual tax rates across the board. And in addition to that, an indexing of the personal income tax schedule, that is, the points along the income spectrum at which the tax rate rises, the marginal tax rate rises. They should be moved up by the rate of inflation, so that, to put it simply, if we had a rise in the price level of 10 percent, a worker only has to demand a 10 percent raise to offset the effects of inflation. With a graduated income tax schedule, if prices rise by 10 percent, it takes more than a 10 percent increase in pay to offset that.

So those three things, a cut in the personal tax rates, the marginal tax rate on business, and an indexing of the personal income tax schedule.

Representative ROUSSELOT. Some of my colleagues here would argue—and I don't say that I necessarily agree with them—that what you suggest would probably substantially reduce our income.

Mr. GUNN. Reduce whose income?

Representative ROUSSELOT. The Federal Government income. And consequently, we wouldn't be able to fund all of the wonderful programs we now have. And in addition to that, we would create additional deficits which could drain the money market to some degree.

Mr. GUNN. Well, I believe, on the contrary, that such a policy would actually decrease the deficit. You must agree that if tax rates were zero you would get no revenue, and if they are 100 percent you get no revenue, because no economic activity would occur, nobody works if they can't keep any of the profit. But in between you get something. So if we agree that you get no revenue at zero and 100 percent, somewhere in between you have to move toward 100 percent.

What happens as you raise income tax rates? You do two things. The thing that happens is that the producers that are least efficient simply have to go out of business, because they were only marginally profitable in the first place.

You reach a point where the increase in revenues from remaining producers is fully offset by the loss of revenues from producers that went out of business. So that revenues themselves can actually decline.

Now, if the companies that went out of business have to lay people off, you have people that are now out of work, and Government spending has to rise to take care of those people unless we want to let them starve to death.

So if that occurs, then it seems to me that it follows that if we go backwards from there, we will get opposite results.

It is like lowering the price of beans by 5 percent. If it causes an increase in the sale of beans, an increase that is greater than 5 percent, then your revenue from beans will go up. So in the tax cut case what happens is, your revenue will go up because other people will be employed, and because they are employed, they no longer have to be supported by the Federal Government. So you get a double shot in the arm in that you increase the Government's ability to spend and you decrease its need to spend. And it takes some of the pressure off the Federal spending so that you can fund those social programs that are considered vital.

To take the extreme case, just take the statement that I have in my testimony. If you raise the tax rate to 100 percent, revenues certainly will not go up.

Representative ROUSSELOT. I don't mean to sound like I am disagreeing with your policy of reducing taxes. But can you give us some specifics of what you thing, say, in the corporate tax field and the individual income tax field we should do to achieve what you suggest?

Mr. GUNN. You mean in terms of specific numbers? Well, it is a question of how much—I guess what we have to do is to decide how long that range is. I haven't come up with specific numbers. But we would go a long way just by indexing the personal income tax schedule, and perhaps lowering the marginal tax rate on businesses from, say, 48 percent, where it is right now, to somewhere in the neighborhood of 40 percent.

But before you put that number down I would be glad to put some work into it.

Representative ROUSSELOT. I haven't put it down.

Eight percent, then.

What about the personal income side, as a guess, as long as we are all speculating?

Mr. GUNN. I guess what I would have to do is—you see, it really doesn't matter which side it goes on, whether it is on the corporate tax side or the individual tax side.

Representative ROUSSELOT. But you did say both, didn't you?

Mr. GUNN. Yes; I did say both. But I think that it would work either way, because what I am really calling for is a decrease in the level of taxation on the private sector. Because if you lower individual income taxes, then we should see a softening in demand for wage increases. If on the other hand you lower corporate tax rates, many corporations would find themselves suddenly able to meet the wage demands that are being placed upon them. But either way, production should be encouraged by a tax cut on either side.

Representative ROUSSELOT. On the personal income tax side, what are you saying, a 5-percent or 6-percent reduction?

Mr. GUNN. If I am allowed to go to extremes, I would recommend a proportional tax rather than the graduated income tax.

Representative ROUSSELOT. I think in your statement that Mr. Kemp put in the record in August you were quoted as saying: "The only way for the Government to induce real growth of the private economy is by lifting from the private economy those burdens placed upon it by the Government itself." And obviously one of these you stressed was taxation. And you go on to say, "That that is what really produces long-run employment." Are there other areas besides taxation that we should look at that would encourage better growth?

Mr. GUNN. Well, No. 1, there are two kinds of taxation. There is direct taxation, which is cash taxes. And then there is a future tax to take care of current deficit spending, and the printing of money, which is monetary inflation. And then there is the indirect tax of Government regulation. It is going to tax me quite a bit this year just to be able to do my own income tax. I think I might have to go to H. & R. Block and get it done.

And there are other areas. And this one is kind of a touchy issue. And that is the minimum wage. I used to hire teenagers to rake my leaves. But now it costs too much. The Government won't allow us to strike a bargain at anything below \$2.60 per hour. So I rake my own leaves. So that says that for that young teenager that wishes to rake leaves at \$2 an hour the Government has imposed a 100 percent tax rate.

And then there is the peculiarly black tax—I won't attribute this one to Government, but a tax that nonetheless still exists in our society—and that is the tax of racial discrimination. As I mentioned a little while back. I believe that American capital exist in the minds and hands of its unemployed and its underemployed. And there are still remnants of a system of discrimination which years ago was a boon to the agricultural economy, but is a drag on the economy right now. What we need to do is foster policies that allow all of our citizens to reach the full level of their productivity capacity. And that is

another form of capital activation that has to occur. And discrimination is a tax on black people that is not being levied on whites.

Representative ROUSSELOT. Then do you think we would be ill advised to increase our Federal wage, which now covers 85 to 90 percent of jobs, to the level of \$3, or whatever Mr. Meany is recommending?

Mr. GUNN. I think that what happens is, when the minimum wage goes up, rather than the people's wages going up, if their marginal product is not equal to the minimum wage at that time, they lose their jobs.

Consider, for instance, the wife that goes to work to help her husband pay the bills. She has somebody come in and do her housework for a \$1.50 an hour, and she goes out and she works for \$3 an hour. So she makes a \$1.50 an hour net. And that is before we talk about taxes. And let's just assume that it is after taxes. Well, if the Government says that now you have to pay the person that comes in and does your work \$2.50, she now realizes that she works for 50 cents an hour, and she uses that up going to work and back. So what does she do? She quits her job and she fires the person that was coming in to do her housework. And two people are out of work because the minimum wage was raised.

Representative BOLLING. What I would like to do is say in general that the purpose of the format is to allow each participant to seek to involve himself when he wishes with regard to the other's remarks. If any of you have any comments to each other, we would be delighted to have you make them.

Representative ROUSSELOT. Mr. Gunn has certainly brought up some stimulating topics. I don't know how well they would go on the floor of the House.

Representative BOLLING. It seems to me you indicated that they had been brought up.

Mr. GUNN. I might add that the people most adversely affected by the minimum wage are people that are not very well off.

Representative ROUSSELOT. I would like to hear a discussion on the minimum wage. Mr. Meany suggested that that would be one of the first things that he recommends this Congress do, was increase the minimum wage to \$3 or \$3.20, that is really going to create a lot of prosperity.

Representative BOLLING. My slight problem with that as chairman of this session is that we should try to talk about capital formation. Everything affects that, of course, including the minimum wage. But I think we will have another forum where we might better spend time on that.

Representative ROUSSELOT. OK.

What about the tax cut?

Mr. MADDEN. I had a comment on the minimum wage which will be very fast. And that is the difference in the perception between the individual who receives it and the employer who pays it. The individual who receives it and has an after-tax income—let's say it is a \$2.60 per hour minimum, and after taxes it is something less than that. The employer, on the other hand, adding to his \$2.60 employment taxes and possibly some other benefits that are part of the contractual relationship, may find that his hourly cost is \$4, not the minimum wage. The employer perceives something less than the minimum wage on an

after-tax basis. The employer, by the time he has added in the various fringe benefits that may be part of the contractual arrangement, may be up to around \$3.50 an hour. So that there is a big gap between the perception on the employer's part of what the minimum wage is and the perception of the employee who receives the income.

Representative BOLLING. I would like to find out from Mr. Gunn what he means by a proportional tax more specifically.

Mr. GUNN. That is the same tax rate across all incomes.

Representative BOLLING. I see.

I have some questions, but I don't want to interrupt you, Congressman Rousselot.

The first one has to do with Mr. Boswell's paper and his discussion. He has a principal conclusion that the United States does not face an aggregate capital crisis. I am also interested in his other point that "the problems in the area of capital formation are simply symptomatic of the difficulties in the more fundamental areas of inflation and recession." What I would like to see, if I could get members of the panel to discuss it, is the general agreement or disagreement on the question on whether or not the United States faces an aggregate capital crisis. Then I would like to get their views on another point, which seems to me to be a point that would stand on its own, even if the first point were not agreed to. If we were successful at the Federal level in not doing the exact opposite of what we intended, if we were successful in maintaining a relatively stable economy—as I think it could be said was maintained through about 20 years, from 1946 to 1966—if the Federal Government succeeded in accomplishing its share of that task, would it then really actually solve most of the problems of capital formation if any exists—I would reverse the question, and I am interested in seeing what kind of reaction I can get to it, because it is fundamental.

Mr. DENISON. At the risk of sounding as if Mr. Bosworth and I had gotten together—which we did not—I must say that I substantially agree with what he said on both points, that is to say, on the absence of any kind of aggregate capital shortage and on the difficulties arising from inflation.

On the inflation point Mr. Bosworth referred, I think quite properly, to the problems of the individual saver in a highly inflationary society of finding an appropriate outlet in which to place his savings and to problems in transmitting savings into the investment which is needed.

Another aspect of inflation is a tax problem. Let me preface my remarks by saying that I am not one who is particularly in favor of subsidizing investment. In fact, if I had had my druthers we would never have had the investment tax credit. I wouldn't want to say that we should get rid of it now. But I think the justification for it, and for what it seems to me rather liberal provision for depreciation, is our failure to offset the effect on corporate and noncorporate business taxes of inflation. And if we are going to make any change in the tax structure, I think it should be to permit in one form or another revaluation of depreciation, and to make provision not to tax inventory profits.

Now, it is perfectly true that you don't have to be taxed on your inventory profits under ordinary circumstances. But this requires that



you use LIFO accounting, and sometimes there are problems. Many firms still don't use it. I am reminded of the Japanese experience with depreciation. The Japanese, I think around 1960 or 1961, put in a provision which allowed firms to use replacement cost depreciation. And yet most did not, for the simple reason that they would have had to do the same thing on their reports to stockholders. This would make their profits look bad, and they were more concerned about their stockholders than they were about their taxes. This problem needs to be solved.

I don't think that the tax structure necessarily is badly mistreating business in the aggregate, because we are a little generous in some other respects. But it is no answer to the problem to say that we overtax one corporation and undertax another and things cancel out. Overtaxation and undertaxation don't cancel out exactly in the aggregate, and they may not cancel out at all in individual cases.

In connection with what Mr. Gunn is saying about indexation, let me note that we had a very interesting conference at Brookings a year or so ago on the subject of "Inflation and the Tax Structure" which dealt with indexation, as well as with the effect on corporate profits of inflation. It will shortly result in a published book.

I think the subject is an important one and the Congress may find some interesting things in the volume. I myself did a paper on a rather technical aspect, which was: If you index the tax structure, should everybody use the same price index, or should each taxpayer use a difference price index? And, in either case, what price index should be used? But most of the papers were concerned with more general topics including foreign experience. I think the subject is well worth some study.

Representative BOLLING. Thank you.

Would anybody else like to comment?

MR. MADDEN. I would like to comment.

I think that in a short-run sense I would agree with Mr. Bosworth and Mr. Denison. But the problem we face as I see it is linking the short run and the long run in respect to the question as to whether ending inflation and recession would solve the capital formation process.

I would like to refer the committee to an article by R. B. Freeman entitled "Investment in Human Capital and Knowledge" that appears in a volume called "Capital for Productivity and Jobs" edited by Eli Shapiro and William L. White at the 51st American Assembly held in October of this year. Mr. Freeman calls attention to Denison's work—I want to be right here—"Denison accorded the rising educational attainment of the American work force a similar place in sources of economic growth, suggesting that upwards of 42 percent of increases in real national income per person could be attributed to the growth of schooling. Later, in a volume Denison published in 1972, his estimate was reduced, but it continued to be as or more important than capital."

Also Mr. Freeman states: A general finding emerges from studies of the growth consequences of research and development—that is not a quote; that is a summary of what he says. Here is the quote:

The great diversity in procedures notwithstanding, a general finding emerges. Virtually all analyses of the relation between R. & D. and productivity have found sizable returns to investment in knowledge. In industry perpetual rates of return range from 30 percent to 50 percent.

Now, when we look at that period of stability you cited, we tend to overlook the active role which the Government played in stimulating growth during that period. There was such a thing as the Interstate Highway System, which was financed 90 percent, I believe, by Federal taxation of gasoline and 10 percent by States. Is that roughly accurate?

Representative BOLLING. It is still being financed that way.

Mr. MADDEN. Yes. And it is the largest single construction project in the history of the world.

It does not regulate investment. It does not issue ukases about the construction of highways. But it does, I would say, gently stimulate the construction of highways.

We also had the space program.

Representative BOLLING. You say gently with 90 percent?

Mr. MADDEN. Well, more than gently.

Representative BOLLING. Excuse me.

Mr. MADDEN. We also had the space project. I have heard the first administrator of the space project, a very distinguished man who had much experience in Government, and was attributed as being the greatest manager of the 20th century on account of the scope of the space project, assert that a sizable proportion of the funds spent in the space project were spent on the expansion of basic research in key sciences which allowed the United States to reach further toward the frontiers of knowledge in basic materials, in miniaturization, in quantum physics, and weather observation, and a host of other such vital questions, than most people realized who examined the budget of the space project. And this was Mr. James Webb, who was a subtle and adroit and wise and effective administrator of this great cooperative project.

Representative BOLLING. If I might interrupt you, I would say that he is perhaps the greatest expert on the administration of large endeavors that I know, and not just from a governmental point of view. He has done more thinking and more research in this area than anybody I know.

Mr. MADDEN. If we take Mr. Bosworth's point about the distribution, the allocation of capital, and we also take Mr. Denison's point and Mr. Bosworth's point, I think, in agreement, if I am not mistaken, that inducements to invest may be more important than the availability of savings, then I don't know whether we have a capital crisis in the long run or not, even though we may have the same aggregate capital flowing. If that capital is not induced to flow into those areas which seem to bring these extraordinarily large returns on investments. And I would call your attention to the portion of my paper quoting the scientific and industrial statesman, Mr. Simon Ramo of Thompson-Ramo-Woolridge (TRW), who is certainly a champion of the private market, and a devotee of free enterprise, indeed he is a Westerner, which is a solid bloc in the support of free enterprise these days. And Simon Ramo points out that we are becoming more timid and less innovative in the use of science and technology.

So it seems to me that one could argue that in the long run there is no crisis, to be sure, just the crisis of slow decline, which doesn't take the form of vivid headlines— it didn't in England when it began in the third quarter of the 19th century. But nevertheless it is a matter

to be concerned about beyond the short term. And since we are entering a new political period, it is therefore a question that might interest the Congress as it attempts to formulate a strategy of development for the country, not to issue ukases, not to disband the market, not to threaten the market mechanism, but rather to guide it with that same enthusiasm that it guided the highway program and the space program earlier.

Representative BOLLING. As one who was present when we finally, after 2 years of effort, worked out a compromise between, as I remember, the Democratic Congress and the Eisenhower administration on the final version of the highway bill, I would have to confess that a great many of us went to the highway bill because we were unable to pass anything else like aid to education. But I think you would probably agree that one of the reasons we had that remarkable period of growth was something peculiar and accidental called the GI bill.

Mr. MADDEN. Indeed—of which I am a very appreciative beneficiary.

Representative BOLLING. I never got the benefit from it, but I helped others.

Mr. Strumpel.

Mr. STRUMPEL. There seems to be a consensus among the panel here that indeed the problem is not the availability of capital, but the inducement or the incentives to utilize and to increase existing capital. But here I think the consensus ends. As should have become clear—as probably has become clear from my testimony—I do not believe that the road to prosperity requires the strategy to increase corporate profits, not because I am against business, or because I do not believe that business had not a very important role to play in recovery, but because I believe that we might bet on the wrong horse here.

Given the signs on the wall that go much beyond the present recession we see structural changes that would lead to a misallocation of resources if we were to stimulate business investment artificially in order to try to solve our most important problems, particularly the employment problem. And I would like to call your attention to some of the catch words that I heard Mr. Duncombe refer to, which again reflect the difficulties of industry with one big firm with which he is associated. For instance, he referred to the greatest risk, investment risk in the present era. He also referred to the profit picture. And again these are factors that do not exist for the American economy alone, and cannot be attributed to special factors or to incompetency of policies, but that can be observed in a very parallel fashion in other industrial countries.

I therefore submit that if we talk about tax policies to solve our problems we should rather use a short cut, not to bet on the strategy of stimulating investment, particularly investment in fixed capital, but rather use tax incentives which stimulate employment directly, which favor, for instance, the substitution, or the marginal substitution of capital through labor, or at least prevent the speed of substitution from being as fast as it has been in the past.

Representative BOLLING. Thank you.

Representative ROUSSELOT. Can I ask you, Mr. Madden, if you believe we should have tax cuts?

Mr. MADDEN. In the short run I do believe we need them.

Representative ROUSSELOT. You mean 2 or 3 years?

Mr. MADDEN. I mean immediately in the next couple of months, I would favor a tax cut.

Representative ROUSSELOT. On a corporate tax level, what would you talk about percentagewise as in the way of a cut, that would be enough of a stimulation?

Mr. MADDEN. I am not informed enough to give an authoritative answer on that.

Representative ROUSSELOT. What is your guess?

Mr. MADDEN. My guess is somewhere between \$10 and \$18 billion. And I would think that—

Representative ROUSSELOT. What about on the personal income tax?

Mr. MADDEN. I am talking about a total tax bill of \$10 to \$18 billion. If I had my druthers as to taxes, I would favor the view expressed by the Administrator of the Environmental Protection Agency, Russell Train, who wrote a fascinating article in the Washington Post on taxes about 3 weeks ago in which he argued for a flat rate tax with a minimum of deductions and exclusions and credits, which would yield more revenue, or at least as much, at a lower rate than the present progressive tax system; which would reduce the complexity of the tax systems, and make it much clearer to everyone, no matter how much they were paying. And of course he said that most scholars support this, and most interest groups oppose it. And I think he is right. But that is my preference in some ideal sense.

Representative ROUSSELOT. Mr. Denison.

Mr. DENISON. I think the President-elect is precisely correct. There is no need to decide right now, and if I had my choice I would do exactly what he said he was going to do, which is to wait another couple of months, during which nothing is going to happen anyway, and take a look at the situation then. If it still looks like we are falling considerably behind the path of recovery which was projected earlier this year, I would say cut taxes. If not, I wouldn't.

Representative ROUSSELOT. So your suggestion would be very conditional.

Mr. DENISON. Yes, indeed.

Representative ROUSSELOT. Mr. Bosworth.

Mr. BOSWORTH. I will agree with that. I don't think there is any point to being terribly specific right now. But the evidence does seem to be mounting that purely from an advance point of view, the economy is going to need a stimulus at the beginning of the year. But we do have several months in which nothing can be done anyway, so there is no reason to make a final commitment on it. But we should be beginning to think in that direction. When it comes to how that tax cut should be put into effect, I think you opt for the very fastest way to do it.

And second, since the reason for the tax cut or consideration of it has been the weakness of business investment in recovering in this current expansion; I think that we do have to consider that business investment and incentives would have to be a part of that tax package.

Representative ROUSSELOT. Assume that the amount of so-called money not spent by the executive branch amounts to \$12 billion, or whatever the estimates are—the Budget Committee is going to meet next week on this subject—should we just rebate it immediately?

Mr. BOSWORTH. I think that specific one—what we are really saying—

Representative ROUSSELOT. I mean, if you were in our place would you rebate it?

Mr. BOSWORTH. I would rebate that.

Representative ROUSSELOT. The whole thing?

Mr. BOSWORTH. Yes, on the grounds that absolutely nothing has happened to the economy since the time that that fiscal policy was originally set that would lead you to want that more restrictive policy. What you have had is an accidental change in fiscal policy which you are now going to try to put back where it was before.

Representative ROUSSELOT. Mr. Gunn.

Mr. GUNN. Let me make something clear which we were talking about a little while before. I was not talking about the cut in taxes, but a cut in tax rates. And the distinction is critical, because when I hear tax cuts in the neighborhood of \$20 billion or \$30 billion, or whatever, I think about the calculation that the Treasury did back in the early sixties when they had the tax cuts. They made their calculations and came up with a deficit of \$90 billion. And in fact what happened was a \$50 billion surplus. I am talking about a cut in tax rates. I am a little bit of a fundamentalist. I don't believe that things happen out of the clear blue. I think that things happen for a reason. And therefore I reject the wait and see policy, because it sounds like, well maybe 8 percent unemployment is not so bad. But I know that the unemployment rate in my neighborhood is four times that amount. And people who are out looking for jobs aren't really as comfortable with waiting as we might be. And when I talk about cuts in tax rates, that specifically excludes tax rebates. Now, a tax rebate is not a cut in the sense that we are talking about. It is no more than any other transfer payment. In order to get any sort of production incentive from a cut in tax rates it has to be a cut in tax rates for next year, not a cut in tax rates for last year, unless we can produce retroactively, and I don't think we can.

Representative ROUSSELOT. A good point.

Mr. DUNCOMBE. I am not sure why you are asking the question. I am not sure whether you are asking, should we have a tax cut because we have what has been variously referred to as a pause, and you are thinking essentially about a short term—

Representative ROUSSELOT. I am really trying to look at the long range, I think.

Mr. DUNCOMBE. If you look at the long range, then I think that you do have the problem that Mr. Gunn has addressed, and others.

You are talking about a cut in tax rates, but you are also talking about tax reform, basic tax reform. And it seems to me that if this is what we are truly talking about, then we might begin to think about the nature of a tax reform program. But certainly it is not the sort of thing that we enact in the next months or two. So on that score I am in line with Mr. Denison's remark.

Representative BOLLING. Mr. Denison, you traced the components of U.S. economic growth since 1948 to various sources, the number of workers, educational works, allocation of resources, economics of scale, and the like. Some people feel that the economies of scale have been

largely exploited, indeed the scale has become too large in some cases. The economies for reallocations of labor come largely from transferring labor out of agriculture. And these have now been perhaps largely exhausted.

Now, there are some people—and I am not one of them—who believe that the labor force is overeducated, and that education will be less significant in the future and play a more modest role in the U.S. economy than it has in the past. How do you see the development of these main contributors to growth in the next 10 to 20 years?

Mr. DENISON. I guess I gave you that in my statement this morning. Let me just mention a few of them.

From the standpoint of a reallocation of resources, you are quite right. My estimate, speaking from memory at least, was that we were getting about 0.4 of a point in the growth rate out of this source from 1948 to 1953, which fell to 6.3 in the 1953-64 period, and 0.2 in 1964-68, and from 1969 to now. And we will round to zero next.

Education I think is quite interesting from this standpoint. My estimate is—let me for the moment talk about the nonresidential business sector, which is about 80 percent of the total, but which is the part that counts statistically. In getting the contribution of almost a half a point in the growth rate—and it has been very steady throughout the whole postwar period—if one takes the long sweep of history, or the wide range of geography, you see this is really an extraordinarily large number. It never was that big before 1929 in our history, and it has rarely been matched anywhere else. And it was this big not because education did anything magical in this country or this period, but because we had a truly massive upsweep in the educational level of the American work force. It was simply enormous in terms of the distribution by years of education, and in addition a year came to mean more days of education. We are talking remember, about the change from people working in 1929, many of whom were educated well back in to the 19th century, or 1948, to the people who have now replaced them and who were educated anywhere from the years before 1920 and the very recent past.

What about the future? It seems to me perfectly obvious that you can't go on adding education indefinitely to people, at least not full-time education. At some age they are going to have to do a little work so they can't go to school forever. And the interesting question is, should we anticipate a sudden drop or a gradual decline in the increases in education and its contribution to growth?

The case for a sudden drop may be made something along these lines. Richard B. Freeman reports a radical and sudden decline in the earnings differential between high school and college graduates. This implies a sharp decline in the rate of return to college education, or its marginal product, or whatever term you want to use. Then, if you want to make the case stronger, you pick up an analysis by Steven P. Dresch in a paper given, I think, before this committee. Because of this sharp decline in the earnings differential few people will go to college anyhow: it doesn't pay. So you get a double-barreled effect. The future increase in college graduates will be small, and even if it were big it wouldn't help because there is no more need for additional college graduates. The economy has ceased to move in such a direction that the need for education is constantly rising.

I do not myself expect a sudden drop. First of all, let's go back to the earnings spread. I think there is agreement that up to the 1960 census nothing much had happened; differentials had been quite constant for some time. The 1970 census, giving earnings data for 1969, I have analyzed in detail from this standpoint. I find that, in the business sector, nothing much happened to differentials within the very wide range from people with 5 to 7 years of elementary education all the way up to those with 4 years of college: in this range there was only a very trifling narrowing of differentials. There was some drop in the relative earnings of people with 5 or more years of college, and some rise in the relative earnings of those with no education at all or 1 to 4 years of elementary school. But these groups account for a very small part of the business employment.

To ascertain what happened after 1969 is tricky, because the main source of data available is the annual Current Population Survey, which reports income data. And this survey is a sample, and it has some very tricky little sampling fluctuations. It is mainly from this survey that Mr. Freeman gets this sudden decline in earnings differentials. I have looked at the same data, and I am convinced that they show no such thing, that the narrowing didn't happen in fact, and therefore that the rest of the story doesn't follow. However, to be sure we will have to wait for the 1979 census data, in which the sample problem becomes miniscule.

But there is another point. The rising ratio of the number of college graduates to the number of high school graduates is only a small part of the enormous upswing in the educational distribution that was responsible for the contribution of education to growth. For example, in just the 18 years from 1952 to 1970, the number of men in the business sector with 8 years of education or less dropped from 42 percent of the total to 21 percent. This is quite a drop in 18 years. So really college isn't all that important.

There is still another interesting point about education. In the post-war period up to today a big part of the increase in college graduates has been absorbed by education itself in the form of teachers. And they never entered into the business labor force. This is over. In fact, from now on we can anticipate that the number of college graduates available to business is going to increase faster than the increase in the economy as a whole.

We can expect a decline in the contribution of education, but one that is slow and gradual. To illustrate what I mean, the decline may be of the order of a tenth of 1 point in the growth rate per decade.

I forget what the other subject was.

Representative BOLLING. Economies of scale.

Mr. DENISON. Yes.

Now, I think this is an extremely important subject. It is also one of the most speculative, perhaps the most speculative of all topics in terms of my estimates.

I believe that economies of scale, governed by the size of markets, is an extremely important growth determinant. I use the term "economies of scale" broadly to include the size of industries and firms, the degree of specialization among industries and firms, the length of production runs, the size of transactions—which are very important in many industries, including wholesale and retail trade—and so on. These are important determinants of cost.

Now, are gains from economies of scale going to run out or are they running out? My view is no. This conclusion requires exercise of a great deal of judgment. And I can be wrong. But my belief is that as technology advances and the economy expands, the opportunities for economy of scale constantly are replenished. If you had a constant technology it is quite true, I think, that as markets grew and the size of operations grew, the opportunities for additional gains from economies of scale would constantly decline. This would be an adverse factor in growth and there undoubtedly is in fact a little bit of this. But what I think happens, by and large, is that as the size of a market increases, technology is developed and production is reoriented to accommodate that size of market. And you get the situation in which the opportunities are always there for more gains in productivity from expansion in that new technology. So you don't run out.

And for this reason I do not view economies of scale as a significant adverse factor.

Gains from economies of scale are related to the size of the total output of the country, the total market for goods and services. And I have estimated that in nonresidential business about one-half a point of the growth rate from 1948 to 1969 stemmed from economies of scale. My specific estimate or assumption in this calculation is that within nonresidential business, the situation is such that if you increase any determinant, employment or anything else, by an amount that would raise output by 1 percent under constant returns to scale, you can in fact expect about a 1.15 percent increase in output. That is to say, economies of scale are estimated to amount to about 15 percent.

An interesting point emerges. The contribution of economies of scale to the growth rate of output per worker is the same, one-half percentage point in 1948-69, as the contribution to the growth rate of total output even though the per-worker growth rate itself is much smaller. Thus it is a very important component of the growth in productivity if my numbers are anywhere near correct. Its size depends on everything that influences total output, and therefore it is affected by the growth in the labor force itself. So that fast growth in the business labor force is conducive to a fast rate of growth in productivity.

Now, what is going to happen to the labor force? What you have had is something like a 0.7 percent growth rate of potential employment in the business sector during the postwar period up to about 1964, suddenly jumping to 1.9 percent in 1964-69 and a peak rate of 2.6 percent in 1969-75. It will be coming back down henceforth, and constantly declining to 1990. I haven't anything further out. But even in the eighties the growth rate will be one and one-half times what it was in most of the post-war period, up to about 1964. So labor force growth will still be favorable compared to most of the postwar period. Hence, I don't feel that this is something that is going to have an adverse effect on growth and productivity.

I think I have covered the three topics that you particularly asked about.

Representative BOLLING. This business about the labor force relates to the question that I wanted to ask Mr. Strumpel.

You emphasized the need for economic growth that matches the economic resources. That seems to mean a more labor intensive form



of growth. We also hear a lot about the need for an appropriate rate of technology which means, at least to some, greater labor intensity. There are two aspects of what we just said about the labor force. In the light of the probable decline from current levels—

Mr. STRUMPEL. Decline of what?

Representative BOLLING [continuing]. Of the growth in the labor force.

Mr. STRUMPEL. We are not yet in that stage, right?

Representative BOLLING. We can anticipate it fairly realistically in this country—I think that is a fair statement and a fair assumption. If that is a fair statement—and perhaps it isn't, in which case you can obviously disagree and perhaps disprove it—then where would we be if we devised policies for greater labor intensity as we were going into a situation where the growth of the labor force shifted gears?

Mr. STRUMPEL. Indeed I have my doubts, Congressman Bolling, with regard to the validity of that assumption for the next 10 years. We are still in an era where the baby boom people are entering the labor force. The peak of the baby boom was in the late fifties. We are now in 1976. So we are now at the peak of the inflation of this group into the labor force.

In addition, we still have a rising labor force participation of women, particularly married women, and it is very hard to predict how long it will last.

So I think for the next 10 to 15 years—and the time perspective that I choose in my paper is exactly congruent with one that is the title of studies; namely, 1976 to 1986. And I believe we have these problems, and we must deal with them during this decade. Our policies, I think, are flexible enough so that as you get closer to the 21st century we will be able to effectively react again with different policies.

But there is also a quantitative aspect to your question. There is a question as to the extent the composition of the labor force fits with the composition of the jobs offered. And if I may add to the discussion or the conversation you had with Mr. Denison, the question is: To what extent are people indeed deterred by declining marketability of education from engaging in education? The evidence shows that there is very little deterrent effect on the rate of planning to engage in higher education, in other words, there is still a growing proportion of young people that intend to go to college. And then we face the very real risk of expanding our economy in a direction which is not any more geared to the skills and the preferences of the people who have higher education and who are simply not willing to accept the jobs offered. And I think one of the great challenges to public employment policies is to take account of the particular types of talents that are available and try to match them with the public needs that are indeed available in the same areas, but cannot be expressed on the same market, because many of these areas are really public sector needs that have to be provided by the public sectors, and are not easily fulfilled—for instance, the need for personal care, for fire and police protection. And I mentioned some other instance in my paper.

Representative ROUSSELOT [presiding]. Vice Chairman Bolling expressed his regrets that he had to leave.

Mr. Gunn, do you have an additional comment?

Mr. GUNN. I wanted to say something about the call for a policy to shift toward more labor intensity, et cetera.

Mr. Madden in his statement said:

A strong case can be made that subsidizing real costs of existing industries amounts to slowing down the growth process, while policy that levies full real costs impartially speeds it up.

I think that the private sector—and they have a very strong motive for doing this—does attempt to match talents with needs. And they do it in order to make or to increase their profits. But sometimes public policy can get in the way of that sort of matching, because—he has mentioned here—of subsidizing real costs. For instance, when we subsidize the purchase of certain materials by using artificial price restraints, we cause that material to be consumed more than it otherwise would be, and cause it to be produced less than it otherwise would. And if these kinds of restraints were removed, then the prices of those scarce materials that you are talking about, other than labor, would rise. And when they rise relative to the cost of labor, businessmen in search of a profit still, to the extent that the products can still be manufactured with less material and more labor, will make those substitutions. But when you artificially hold down the price of materials and artificially hold up the wage rates through such things as the minimum wage, that substitution simply will not occur, it will go in the opposite direction.

Representative ROUSSELOT. Mr. Strumpel, did I understand in your last comments that you feel that because there is this mismatch, that there tends to be a higher level of education and capability to the jobs that are coming on the scene and on the market at a given time, that maybe the Government ought to give greater consideration to creating higher level jobs, is that what you are saying?

Mr. STRUMPEL. Yes; I think there should be an attempt to identify the need for public services that are geared to the available educational levels.

I think one can easily misinterpret the situation of the labor market in one respect. It is often said that unemployment is most severe in the low socioeconomic strata, which is, of course, an indisputable fact. It, however, does not justify the conclusion that higher level of education would solve our unemployment problem, because our unemployment has the characteristics of trickling down from the highest educated—they do not become unemployed, but they become underemployed, they are relegated to the jobs that are not quite up to their qualifications, but are the second best jobs. In doing so they are driving out from the second best jobs those who have the qualifications sufficient for these types of jobs.

So we have here unemployment which really extends throughout the socioeconomic ladder, but, of course, becomes most severe and most tragic for the lower economic strata.

In creating jobs that are geared to higher educated people, at the same time we do something for the fuller employment of the lower educated people.

Representative ROUSSELOT. Since I am the only one left, does anybody have any additional comments or abstracts or additions or anything they want to make at this time? As a minority member of this

House it is unusual for me to be the only one left. They don't usually leave the chair to me. Does anybody have any comments?

If not, let me ask a quick question. We have had a lot of discussion during these hearings and in the recent political campaign about unemployment. And it came up last week in part of our discussion. We find that as to the time frame of unemployment that of those that are listed as unemployed, or that we considered unemployed, 37 percent of it lasts 5 weeks or less. And many times those people go back into the labor force, but perhaps not exactly where they want to be. But should we consider a person really unemployed if he is in a transition period for 2 weeks, quits or is between jobs?

Do any of you want to comment on that?

Mr. MADDEN. I would like to comment on it. I think it is a very important point. And I think that the issue is how to go about this rethinking of the nature of unemployment. I think that there are political obstacles to restructuring the unemployment rate in such fashion that it does not fully count those whom some group justifiably thinks are unemployed. And of course we have now got six different definitions of unemployment to deal with the problem of differing definitions by different groups.

Maybe it would be more constructive to go at the question another way. The longer I watch the unemployment figures the more I puzzle about our tendency in business—and I must confess I don't fully understand this, so I am taking the risk of sounding stupid, which is familiar to me—

Representative ROUSSELOT. It is familiar to us, too.

Mr. MADDEN. We arrange for a person to get a slip of paper which designates that person as unemployed. A business does that, a large business does that. He therefore is unemployed. Now, he continues to get a payment, half of which is financed by the Government, and half by the business, which is called unemployment compensation. And in some industries, if I am not incorrect, this payment is 95 percent of his pay. And I think it is less taxable, or perhaps nontaxable.

Mr. DUNCOMBE. Less \$7, 95 percent less \$7.

Mr. MADDEN. Ninety-five percent less \$7.

Now, it seems to me that we have the worst of all possible worlds. We have this person labeled unemployed. He gets into the figures. We are nevertheless continuing to finance his standard of living. Perhaps it increases. We do not give him any training. And insofar as he is in that unemployment figure he influences aggregate policy in a certain way. I understand that the Germans have got a system by which they shift this person for a few weeks to a training capacity.

Representative ROUSSELOT. Is that mandatory?

Mr. MADDEN. No; but it is possible. He doesn't get into the unemployment figures. Economic theory as best I understand it talks about something called search costs with respect to employment. And the proposition is that the reason that people are unemployed for 4 to 5 weeks in a free society is that information about alternative employment is not free, and how long one spends in searching for a new position depends on a tradeoff between how costly it is and how beneficial a better position than the one you think you can get would be.

I don't think that unemployment compensation would take into account that 37 percent you describe. And I don't think that we have a

sophisticated way of sharing the search costs, but providing an incentive for the search. Instead, we have a system which disemploys the person, as it were, and finances his lack of activity. And we feel that it is a matter of welfare to extend that period, which increases the likelihood that he will remain searching for the better job, because you have reduced the cost of search.

So I am saying, rather than attack the matter statistically, which raises hackles and causes political problems, why should we not explore an approach that restructures unemployment compensation so that we don't, as it were, to this person in this particular pigeonhole with the lack of thought it seems to me we now show in major business firms, and in Government itself.

So I agree with you wholeheartedly. And I offer that as a possible route to make the change that is more politically reasonable, and indeed more economically reasonable. But if it works I don't know. But at least it is a thought.

Representative ROUSSELOT. I appreciate your comment.

Anybody else?

Mr. BOSWORTH. A note of caution. If one is trying to say that the unemployment statistics reflect a lot of different people in different types of circumstances, that is true. On the other hand, if one wants to try to allege that something has fundamentally occurred in this economy since 1973, that suddenly there are 3 million people out there that don't want to work, I think that is false. We have an enormous amount of fully qualified people, perfectly capable of working, who were working a few years ago and are not working today. The appropriate level admitted of how far to reduce that unemployment rate—although we know it is far below where it is now—does proffer a difficult question. But I think many of these things can be overblown. We are talking about one industry that has 95 percent compensation, and it is a great mistake to believe that every automobile industry worker who was unemployed in 1975 got 95 percent of his salary, or even came close to that.

In the case of the unemployment insurance program, it is designed as a measure to try to get people through a difficult period. If we dumped all the people on unemployment insurance back out in the labor market, there are not those jobs in that labor market at present for them to find. Certainly there are ways to improve the performance of unemployment insurance to make sure that it does not have disincentives to find employment, a question on which I think most of the existing empirical work is very ambiguous. But I think if most of us considered trying to live on 50 percent of our income, which is about what unemployment insurance is, you don't find that that really creates a tremendous disincentive not to work. Most American people are not in a position that they can long exist at 50 percent of their incomes. The incentive for most people to find jobs is enormous. Contrary to what we expect, we do not find that people on unemployment insurance wait until the unemployment insurance runs out before they find a job. There is a clustering about the period of expiration, but the increased frequency is quite modest. We do find that 33 percent, as you said, of the unemployed are unemployed for less than 5 weeks. That means 60 percent of the work force that are unemployed longer than 5 weeks, or more than 1 month. That is a long period to try to find a job.

No one is trying to say that we would drive the unemployment rate to zero or try to do away with all types of unemployment. But we do think that in the present economy we have a tremendous waste of labor resources that can work and we should as soon as possible try to reduce that. That program improvement could be made at the margin I think goes without saying, and I think it should also be a proper focus of attention.

Mr. GUNN. I would like to address something that Mr. Bosworth just said, and that is about unemployment compensation at 50 percent of the wage.

If I understand correctly, I think that 50 percent is nontaxable. These numbers may not be exactly correct, but consider a case where one gets 50 percent. A man goes to work, and he is working for \$180 a week. When he has paid his Federal taxes, et cetera, maybe he is taking home \$140. That might not be the right number, but say that. It costs him \$20 a week to go to work and back. Now we are down to \$120. There are other miscellaneous things, so you might find that the difference between the 95 percent and what he gets after taxes is small enough so that he can barter it away by doing some of the work around his house that he would have had to pay somebody else to do, and he might indeed do quite well on 50 percent.

Representative ROUSSELOT. Because that is not taxed, and he doesn't incur the other costs.

Mr. GUNN. Because it is nontaxable.

Mr. BOSWORTH. If Mr. Gunn finds unemployment insurance that attractive, he might give it a try. There is an enormous variation from State to State in the particular circumstances in which you find people on unemployment insurance. So it is very hard to generalize. But what we would expect to find, if your characterization was correct, is that once a person went to unemployment insurance, they stayed on it until it expired. You are saying that there is no incentive to get off, and that shortly after it expired they would go out and find that job that was waiting for them all along. But I am saying that there is no pattern in the data that indicates that people tend to wait to find another job because they have unemployment insurance. Instead you find that the number of weeks to find a job doesn't differ that much between the group on unemployment insurance and the group off it.

Second, unemployment insurance is available to but only some of the unemployed in this country. Many do not get unemployment insurance. So again it is difficult to use the concept that everybody who is unemployed is being reimbursed by the Government. I don't think that is the pattern of unemployment that you see all over this country. The incentive problem is there, and I think should be addressed. But don't raise it to be the only problem associated with the unemployment difficulties we have. It is a significant problem, but not the only one.

Mr. MADDEN. I don't think anyone was suggesting that it was the only problem. I think the question is this. Some people assert that it is impossible through aggregative policy these days to get the unemployment rate much below five and a half percent.

Representative ROUSSELOT. I think President-elect Carter just estimated that, too.

Mr. MADDEN. The question that seems interesting is, what measures beside aggregative policy could be used to get that rate below 5 per-

cent. It seems to me that subsidizing search costs, that converting unemployment into training opportunities offer a promising avenue for further thought. I would be in favor of expanding unemployment compensation if it is demonstratable that hardship exists for those who don't receive it and have chronic unemployment.

But perhaps, Congressman Roussetot, we could ask the question of Mr. Bosworth, what measure would you proposed that would assure that the unemployment rate would be reduced to 4 percent or less without incurring the difficulty of stimulating further inflation? What would you propose here?

Mr. BOSWORTH. I don't propose that we just eliminate them off the unemployment insurance roles. I think you have to have positive incentives for firms to hire them. I think one thing that we can do is expand the manpower training programs that we have but there is little use in training people for jobs that don't exist.

One thing which I think deserves some attention that has been discussed in the last few months is that we might go to a wage subsidy program for people of particularly long-term unemployment, and encourage firms to hire such workers, up until the time, say, 2 or 3 years after working, that they have raised their qualifications up to the level of other workers.

Representative ROUSSELOT. Alice Rivlin of our Congressional Budget Office has suggested in testimony that the excessive unemployment compensation benefits account for 1 percent of 7.9 percent unemployment. That is her estimate on the basis of her statistics. I don't know where she got it.

Mr. BOSWORTH. I would find it hard to estimate. I would find that an unbelievable order of magnitude.

Representative ROUSSELOT. But do you disagree with her 1 percent estimate?

Mr. BOSWORTH. It is about that size.

Mr. GUNN. I think it is extremely interesting, though, that in recent years we have seen something appear in some labor contracts such that when there was a layoff, the man with the most seniority has the first option of getting laid off. I think that is most interesting. I don't think it is the level of unemployment compensation that is the problem. I think that it is the spread between being unemployed and being employed. So if we follow the policies that would allow real wages to rise relative to the compensation for being unemployed, I think that the objective would be accomplished still, because it is the spread that is the difference.

Representative ROUSSELOT. Does anybody else have any further comments?

Thank you all for participating. I appreciate it. And I guess that is it. The committee stands recessed until tomorrow.

[Whereupon, at 4:34 p.m., the committee recessed, to reconvene at 10 a.m., Wednesday, November 17, 1976.]

# LONG-TERM ECONOMIC GROWTH

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WEDNESDAY, NOVEMBER 17, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to recess, at 10 a.m., in room 345, Cannon House Office Building, Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representative Bolling.

Also present: John R. Stark, executive director; Michael J. Runde, administrative assistant; William A. Cox, Louis C. Krauthoff II, and Robert D. Hamrin, professional staff members; and Mark R. Polinski, minority professional staff member.

OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative BOLLING. The committee will be in order.

Today the Joint Economic Committee turns its attention to the influences bearing on the Nation's long-term economic development stemming from potential scarcities of and higher prices for the natural resources that our industries and consumers devour so greedily.

Something approaching consensus now seems to exist that the United States is facing diminishing returns in developing domestic oil and gas supplies. The experts feel that, despite the large price increases that have occurred for these fuels, it will prove impossible to increase U.S. output by very much or for very long, and that our oil and gas production will decline inevitably within a generation or two due to outright depletion.

If this is true, it will come as a disappointment to American consumers, who are paying radically higher prices for domestic oil and gas as a step toward what was touted as "energy independence." It also means that we must develop alternate domestic energy forms such as coal, nuclear power and solar energy on a large scale or else become very heavily dependent on energy imports at prices still higher than today's. Conservation should be given much more prominence in our energy policy strategy than has been true up to now, and this will be an important task of the Nation's new leadership. But even the maximum practical conservation effort, I fear, cannot alter the need for some tough decisions on new domestic production options.

Many people fear that cartels also could gain control of other important minerals such as manganese, chromium and the platinum group of metals, or that natural scarcity will drive the prices of many materials up at rates that will burden the economy and require adjustments for which we will be ill-prepared unless we anticipate them now. Indeed, natural scarcity is not implausible if we envision

success by the deprived three-quarters of humanity in industrializing their economies over, say, the next 100 years; and in reaching, say, our present living standards by that time. This would mean a many-fold increase in resources demands. And, finally, we must recognize a moral obligation not to squander the golden eggs hidden for our use by Mother Earth, for sooner or later our posterity will reap the consequences of our profligacy.

Clearly, the adjustment to any resource scarcity can take several forms. For instance, one could discourage consumption of resource-intensive products by fiscal or other means; alternatively one could accelerate the development and use of conserving product designs and means of production; or one could adopt a more positive approach of encouraging shifts in life style toward less resource-intensive modes by the many methods at society's disposal.

Today we hope to have a wide-ranging discussion of the adjustments that the members of this distinguished panel see to be necessary and of the means of initiating this transition so as to minimize any disruption involved.

I will once again, as I have to each panel, request that insofar as possible the members of the panel limit themselves to approximately 10 minutes. But I am going to use a 15-minute hourglass to indicate that we have some flexibility. We hope that that maximum will not become the minimum, because we really want to have, when we are through with the direct statements, an opportunity for discussion among the panelists and the members of the committee that turn up, which sometimes turns out to be as interesting as any part of the direct presentations.

So as I introduce each member I will start the hourglass and you can occasionally regard it as a reminder and not very much more.

Our first witness will be Prof. William Vogely. He is in the department of mineral economics at Pennsylvania State University.

Throughout his career he has been concerned with resource economics and mineral economics. He started out at Kenyon College and got his M.A. and Ph. D. at Princeton.

His professional experience includes 2 years as an economist with the U.S. Bureau of Land Management, and 2 years with the Rand Corp., which he left to go to the U.S. Bureau of Mines as Chief of the Division of Economic Analysis. He became the Assistant Director of the Bureau of Mines a few years later, and then went on to become the Director of the Division of Planning and Analysis of the Internal Revenue Service. After 2 years he returned to become Director of the Office of Economic Analysis at the Department of the Interior.

He has written on energy problems of the United States, technological changes and demands, the analytical use of energy balances, and the future of mineral supplies.

We want to thank you, Mr. Vogely, for the interesting paper which you contributed to our growth series. We are pleased that you are here to start off the discussion this morning.

**STATEMENT OF WILLIAM A. VOGELY, HEAD, DEPARTMENT OF  
MINERAL ECONOMICS, PENNSYLVANIA STATE UNIVERSITY**

Mr. VOGELY. Thank you, Mr. Vice Chairman.

I have carefully examined the papers by Long and Schipper and by Cloud to discover areas of agreement and disagreement among



them and my own presentation. There are several striking areas of agreement. First, the issue with resources is not exhaustion but has to do with the terms, including prices and political constraints, under which they will be available to the United States. Even Mr. Cloud, the most pessimistic in this regard, indicates that "we need not panic or rush headlong into 'solutions' that may be premature or unnecessary \* \* \*."

Second, there is substantial agreement that the process of materials and energy substitution is critical, complex, and very poorly understood. As stated by Long and Schipper:

We will emphasize how little is known about the technical basis of and potential for substitution and technological change and about the times required for these responses. Cloud, although he does not elaborate the point, recommends substantial support for materials science research aimed at more conserving use of or substitution for scarce raw materials.

Third, I find agreement with my statement:

Public policy must be based on our understanding of the complexity of materials issues rather than a commodity by commodity ad hoc approach. The objective is a healthy, dynamic adaptive technological system, rather than a piecemeal set of specific commodity programs.

These areas of agreement are very substantial and important to emphasize. However, there are significant deviations in the positions taken in the three papers.

One of the most significant is the different perception of the role of Government. I believe that Long, Schipper and I are generally together in that the role of Government is to provide better information, fund fundamental research, and undertake limited regulation. In addition, I specifically call for an examination of the question of stockpiles and of new policies directed toward politically based cartels. However, Mr. Cloud implies—maybe that word is too weak—the replacement of an economic system where investment and consumption decisions are made primarily on financial and consumer satisfaction grounds through a marketplace with one where such decisions are made centrally through some planning mechanism. He explicitly states, in detailing his view of the only kind of growth which is both beneficial and capable of being sustained, that his long list of goals is to be achieved "by legislating incentives and disincentives that will promote these goals."

While I am sure each of us would have areas of agreement and disagreement with Mr. Cloud on the specific set of goals that he has enunciated, I want to urge great caution in overturning a system of economic decisionmaking which has served the Western World so well for two centuries. The immense efficiencies which arise from harnessing the drives of mankind to better itself within an economic system which channels such efforts into productive activity rather than destructive activity are not to be ignored. Philosophers who have attempted to change mankind by preaching and to establish ideal communities based upon consensus rather than the channeling of these human desires have historically failed. The latest example is the very rapid dismantling of the Maoist philosophy in China. What is essentially involved here is the idea that some few people will have a conception of what is good for mankind and that conception shall be im-

posed through "legislative incentives and disincentives." I ask Mr. Cloud, who is to define "a closer approach to equity"? Who is to define "ample but not extravagant living conditions for all"? Who is to define "constructive types of activity"? What does society do with the worker who doesn't want to spend a year in college? I am facing that problem right now with a 17-year-old daughter and I am awaiting with some interest an answer.

I think the areas of substantial agreement indicate that we do not have a resource problem that calls for radical solutions. Neither Long, Schipper nor I have called for such solutions. However, I think they are implied by Mr. Cloud and, perhaps, this is the area upon which we should concentrate our discussions this morning.

Thank you.

Representative BOLLING. Thank you very much. I see that I am not going to have any trouble getting the discussion started.

Next, Mr. Preston Cloud, who is a biogeologist, and has earned distinction in other fields. He was the recipient of the Cressey Orrison prize in natural history in 1941 and the Rockefeller Public Service Award in 1956. He has been chairman and/or guiding light in many professional societies.

He did his undergraduate work here at George Washington University, and went on to take his doctorate at Yale, where he did some teaching before joining the U.S. Geological Survey. He has taught at Harvard, the University of Minnesota, and the University of California in Los Angeles and at Santa Barbara. He has written many articles, and is editor of the book "Adventures in Earth History."

We are glad to have you here this morning, Mr. Cloud. I want to thank you for your advance contribution.

**STATEMENT OF PRESTON CLOUD, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR; AND BIOGEOLOGY CLEAN LAB, UNIVERSITY OF CALIFORNIA AT SANTA BARBARA**

Mr. CLOUD. Thank you, Congressman Bolling, ladies and gentlemen, and fellow panelists.

And thank you, Mr. Vogely, for that free commercial.

I should add that my good friend Gerard Piel, editor of the Scientific American, refers to me as a happy pessimist.

I find myself largely in agreement with the views of Mr. Long as regards substitution. So I will focus on the resources themselves and not on substitution.

I must stress that I speak for myself alone. The views I may express have not been cleared with or approved by either the Geological Survey or the University of California.

Prediction is hazardous because the answers to old questions change with new situations. Like the drunk who was disturbed at getting different answers through the day to his repeated inquiry about the correct time, we may find the changing response to old problems a bit confusing. Still, we must try to look ahead and avoid foreclosing options best left open. At the very least we can look at current trends to see where they would take society if continued, and if the way ahead looks rocky, as it does to me, we can change or redirect the trends—although we may not choose to do so. While it is always

well to be aware of the past, we must be careful about how we extrapolate the lessons of the past to the problems of the future.

There is a parallel between the generals who fight the last war and the economists who fight the last recession. The present world situation is different from any that has existed in the past. The most important difference is that the number of consumers, their rates of consumption, and the quantities being consumed are larger than they have ever been before, with consequent shortening of lead times between general perception of impending crises and their onset. Combined with the long lead times required for various types of substitution envisioned, as stressed by Long and Schipper, this results in unprecedented opportunities for material shortages and resultant economic stress.

It is well to bear in mind, however, that the seriousness of mineral resource scarcity as a limiting factor in the economic health of nations is a matter of great disagreement and much confusion. Judgments expressed even by well informed and competent specialists may be colored by professional pride, a passion for seeing the world as one might like it to be, or a reluctance to be the bearer of unpopular tidings. Blind loyalty to a profession or an ideal may lead its adherents to claim virtual omnipotence with respect to multicomponent problems where geology, geochemistry, engineering, technology, economics, sociology, management, and jurisprudence all have something important to say.

The problem is aggravated by the brief time framework in which most political and business decisions are made, the absence of long-range planning organizations having either appropriate balance of expertise or influence, the rising tide of material expectations, the continuing worldwide growth of both populations and per capita consumption, and the common tendency in the United States to overestimate our ability to control external influences. A great hazard to future well-being is the enshrinement of material growth as a kind of sacred cow—seen as a basic good rather than as one possible means to unspecified ends. By this means we earlier brought the wealth of the continent into the service of society, and that was mostly good. Now it appears that continued material growth is primarily a means of deferring the cost of present local affluence to future generations that cannot even stage a Boston Tea Party on their own behalf.

The question usually asked about the economic future of the United States can be phrased in the form: "Can material growth continue in this country through the rest of the 20th century?" And the conventional answer is: "Yes," assuming, of course, that we have continuing access to foreign raw materials, there is no global war, and population stabilizes. Those are large assumptions. Our continuity as a Nation, and the interests of mankind at large, including posterity, would be better served by a different question: "Can mankind establish and maintain some kind of a dynamic balance with Earth's resources and environment, such as to assure a long and comfortable duration for our species on this planet?" The answer to that question also is: "Yes—if we are willing to reorder our thinking and actions to meet tough challenges, and if we start soon." Worldwide population control is the essential step, without which all other efforts fail. It should be a central aim of both domestic and foreign policy. Even

with good progress toward that end, however, lag effects assure that during some decades at least, there will continue to be substantial population increases, both abroad and in this country. In addition, now deprived sectors of humanity need to be better supplied with material essentials and opportunities.

That means that there will be continued and ever increasing pressure on our ability to supply raw and recycled materials to industrial society for some decades yet, perhaps for another century or more. Figures 4 and 7 of my study paper show that present reserves for all important metals and all mineral fuels except coal will be exhausted or nearing exhaustion by the year 2000. Geologists are sure that these reserves can be increased but not by how much—and they will not be greatly increased without a great deal more attention to geological research and exploration.

The best way to estimate ultimate potential mineral resources is in relation to their abundance in Earth's rocky outer crust. Because it is unlikely that we can extract from below the outer 10 to 40 kilometers of rock that constitutes the crust, we may call this the total stock. Factors such as physical accessibility, grade, price, and location play a large part in how much of the total stock may be thought of as a resource that will ultimately become a reserve. Such factors are summed up, in a sense, by how much energy it costs per ton to mine, extract, and deliver a given commodity to the marketplace. Energy costs per ton of metal rise with decreasing grade to some inflection point below which grade the energy requirements for metal production climb steeply. This energy barrier defines the cutoff grade beyond which fiscal, environmental, and social costs rise so sharply as to exclude further exploitation of a given commodity except by recycling.

The largest estimates by qualified economic geologists and geochemists such as Skinner and Erickson—cited in my study paper—indicate that, on an average, no more than about one-millionth of the total stock is likely to become part of the ultimate resource under any technological or economic conditions that obey the laws of science. Their estimates, which I consider optimistic, are substantially lower than those of Vogely or of Goeller and Weinberg, cited in the study by Long and Schipper.

The chemical elements are also very unequally distributed in Earth's crust. Over 72 percent—72.4—of the crust consists of oxygen and silicon, and more than 99 percent—99.23—is made of these plus the 10 other elements having crustal abundances greater than 0.1 percent—aluminum, iron, calcium, magnesium, sodium, potassium, titanium, hydrogen, manganese, and phosphorus. The other 76 naturally occurring elements are geochemically scarce, accounting altogether for less than 0.8 percent of the crust—yet all but a handful of them are used industrially, and many are critical to a continuance of high technology.

Thus, even high prices and high technology cannot eliminate some shortages. Only a few geochemically abundant substances are plentiful at grades well above the energy barrier and are so widely distributed that there is little danger they will cease to be available in a sane world. Iron, aluminum, magnesium, and the silicates are examples. An industrial society built on them alone, however, would lack many of the most highly prized characteristics of the present one—high speed

computers and advanced communications systems, for example. For many others, recurrent shortages, and for some, economic depletion can be expected within the first half of the 21st century. Petroleum, natural gas, and helium—except in the atmosphere—will be gone except insofar as withdrawn or stockpiled. Global shortages can also be expected for antimony, bismuth, copper, gold, and molybdenum. In addition to these, domestic shortages exist or can be expected with respect to fluorspar, tin, columbium, silver, strontium, the platinum group metals, mercury, sheet mica, commercial asbestos, and probably others. There is no prospect that the United States will ever be able to meet its current level of demand for domestic sources alone. Indeed, even with resources from the sea, its dependence on foreign sources, already high, will continue and increase until such time as demand decreases drastically or external sources are shut off. Maximal diversification of foreign sources would therefore, be a prudent precautionary measure, along with more intensive exploration for domestic reserves.

May I remind you too, that energy and materials are intricately interrelated. As it costs energy to produce materials, so it costs materials to produce energy—a fact all too widely overlooked. Our unwieldy society seems to require a crisis before it can initiate corrective action. We have overreacted in some respects, however, to the energy crisis, which was foreseen by geologists but not by political decisionmakers or their economic advisers. We should draw back from that overreaction to reconsider our energy options before continuing the headlong rush into an uncertain and hazardous fission economy. The next crisis may well come in materials if we do not now institute measures to monitor the material foundations of society—including energy materials—and take corrective actions where shortages or cartel actions can be foreseen.

Substitution, including recycling, is one of the roads that must be fully explored, as is being done so thoughtfully by Long, Schipper, and all too few others of their kind. Here I would remind you, however, that there are tradeoffs in every substitution and that, where consumption increases exponentially as it now does on all fronts, even total recycling accounts for only half of what is needed for the next doubling. In the end we must arrive at a steady state economy insofar as materials are concerned. Stabilization of world populations, probably at levels below the present, is essential if such an economy is also to be an economy of plenty.

I have made more explicit recommendations in my longer report, which I presume the staff of the Joint Economic Committee will make available to interested readers.

Thank you.

Representative BOLLING. Thank you very much, Mr. Cloud.

Next we have Professor Thomas Long. He is currently associated with the Resource Analysis Group of the University of Chicago. He is editor of *Resources and Energy*, a new interdisciplinary journal devoted to an examination of society's allocation of resources. Formerly he was on the faculty in chemistry at Penn State and the University of Michigan. He spent 2 years as visiting scholar in economics at the University of Michigan.

Mr. Long.

**STATEMENT OF THOMAS VEACH LONG II, PROFESSOR, RESOURCE ANALYSIS GROUP, UNIVERSITY OF CHICAGO**

Mr. Long. Vice Chairman Bolling, fellow members of the panel and ladies and gentlemen, I want to express my pleasure at being here today and having the opportunity to share my thoughts and those of Mr. Lee Schipper from the University of California with you. I also want to express his regrets at having a prior commitment that prevented him from attending today.

At this point, having heard two of my fellow panelists agree with what we had to say, I feel that I should simply point out our centrist position and let it go at that.

However, academics are never at a loss for words. So I will go on for at least a portion of the 15 minutes.

I think that it is perhaps desirable if I explain a little bit about where I come from, since everyone's perspectives are colored by his history and the work that he has actually engaged in. In an interdisciplinary field of this sort it is vital to know the sort of work that one is doing when he discusses as broad a topic as resource and energy substitution and its relationship to long-term growth in the United States.

The resource analysis group at the University of Chicago is part of a new committee on public policy studies that was formed only this year. The resource analysis group has a longer history than that, having begun over 5 years ago. Actually my colleague, Stephen Berry of the Department of Chemistry and I began work in this area 6 or 7 years ago. It turned out that we began a formal program at Chicago something like 12 days before the first announcement of the Arab oil embargo in 1973.

Since that time, if one separates the economic process in the traditional way into supply and demand, we have concentrated not on problems of supply, but on a detailed examination of the derived demand for resource use. We have been particularly concerned, as many of us have in this field, with energy resources—electricity and fuels—and developing methods for analyzing the way society really uses these, what happens to them. We are also interested in how to incorporate this information, which is physical type information, into a traditional economic decision framework that is somewhat modified to accept more information about the actual physical use of resources by society.

Having said that, I think I can move on to a discussion of our paper. I hope you will excuse me if I depart from the prepared statement, which of course you all can read, and discuss what I had to say there in a somewhat briefer and more informal way than it is there.

First, I would like to emphasize the need for that traditional growth in the United States; that is, growth in GNP per capita terms, over the next 25-year period. Why do we need to grow in this traditional sense? The reason, I believe, is that we need to insure that all elements of our society share in its bounties. I believe that the easiest adjustment pattern is through economic growth. This need not be as material and energy intensive a growth process as it has been, and it will not be, to the extent that we can make substitutions of other factors

for material and energy resources. But I feel that we do need it, and that we have to face the fact that it is going to continue.

I know that I have a great deal of contact with Europeans who are very critical of the American appetite for resources. To a degree this criticism is justified, because the structure of our economy has been such that we have used more physical units of energy and other resources to produce a physical unit of output than is done in European societies.

I will discuss this in greater detail later in my presentation.

As Professor Vogely and Professor Cloud have pointed out, I feel that the main issues are not supply issues insofar as supply bases go, but the price at which these supplies can be made available not only to the U.S. economic society but also to world society as a whole. I point here particularly to a recent article in *Scientific American*, which is a broad stroke article by Professor Keyfitz from Harvard, that looks at the impact which emerging economies, attempting to become middle class, will have on the total international resource base. We may have sufficient resources to furnish their needs for economic growth and ours also. But do the beneficiation facilities exist? Do the extraction facilities exist? Will they come on line in time to prevent shortages which will increase prices dramatically enough to impair a smooth economic growth trend for our economy?

These are unanswered questions. I point out that there is very little analysis of them being done or supported through Federal agencies insofar as I am aware at this time. I think that it is vital to know what the impact of emerging economics on the total resource base will be over the period between now and the year 2000.

Although this study series was originally directed to a much shorter time period, I think you can see that all of the panelists in their papers have taken a much longer term outlook, at least through the year 2000, if not through the year 2025, even though the difficulties in making predictions over that time period are great.

This is because all the adjustment possibilities which we have for our society are slow and accomplished over a long term. There may be a few instances in which we can measure adjustments in short periods of time. But historically this has not been the case for major adjustments in our economy.

I would also point out, in connection with the emerging nations of the world, that there will be continuing political constraints on our use of resources. This is a cost that is not usually incorporated into the market system, a cost that Congress and the other elements in government have to be sensitive to and see that in some way it is incorporated into our economic decisionmaking. There is going to be increasing pressure to go to a less materialistic society. But I believe this society can be achieved even with continued economic growth in traditional terms.

Finally, I would point out, as have my fellow panelists, the dangers that arise from sudden disruptions in supply. To put this in the economic terms that I usually like to use, we also have to face the fact that if we have sudden disruptions in supplies, there are large disequilibrium costs. The marketplace may eventually bring supply and demand back into equilibrium. But in the interim period when this is

not true, the costs can be large. Again it is a responsibility of government to recognize this, to analyze these possibilities, and through various mechanisms that are available to it, policy mechanisms, see that this information is translated into economic factors that individual participants in the market use in making their decisions.

Thus I am emphasizing again the role of government in disseminating proper information. The existence of this information is assumed, by economists when they argue that the market will take care of everything. This assumption is usually not one of the best, and the government has a large role in seeing that information is disseminated.

I would like to turn now just very briefly to the substitutional possibilities which were the main topic of our paper. Most of us are very familiar, for instance, with the possibilities for material substitutions, substitutions such as the substitution of synthetic rubber for natural rubber or one metal for another.

I would also like to point out a substitution mechanism with which we are less familiar, that of energy and materials for one another. They do this at several levels. Many times we consider a production process to have an ingredient list that cannot be modified: so many tons of this, so many Btu's of energy, so many tons of that. But in general, even with the same technological facilities, this list can be modified somewhat. Materials that are intermediate in the production stream, that is, which have already received an energy input, "embody" that energy—and I use the word embody in quotes—and carry it into the second and third stages in a production process. If you make a technological modification that uses less energy in the form of fuels and electricity but which uses more of a material input, or uses a material input at an even later stage in production than formerly, you may not be really saving energy. This is because all intermediate materials have incorporated within them the energy that was required to prepare them. Thus, it is very difficult to form policy options at the microeconomic level. We believe that we now have a method of assessing these energy material tradeoffs. However, I would caution that this sort of possibility—and this is an interjection—is just what makes it so difficult to legislate energy conservation standards for industry. I believe it is almost impossible to do.

Therefore I support heartily the voluntary industrial energy program which was incorporated into the Energy Policy and Conservation Act of 1975. I believe that the voluntary program is the only way to go, and that mandatory standards would be very difficult to formulate, and would be more difficult to enforce, and very easy to evade. Energy and materials substitution has other aspects which I will ask you to study in our discussion in the paper.

There is another form of substitution besides that of energy and materials. That is the substitution of capital for energy and materials. We think of ourselves as increasingly using energy in our society. Yet almost every basic industry has actually decreased their energy use per unit product, per unit output in physical terms, over the last 30 years. Therefore energy "productivity," to use a word which I do not particularly like, has increased in the same way that labor productivity has increased. To some extent we have been substituting capital for both labor and energy. We need to recognize that there has not neces-



sarily been a direct tradeoff of energy for labor, which is the traditional conceptualization. And this can continue.

I want to point here specifically to the value of international comparisons in understanding where we are. This is work that is particularly relevant to our discussion, and it is a field of major interest for both Mr. Schipper and myself. We possess a real economic laboratory for knowing about how capital tradeoffs for energy and other material uses. That is found in the technologies which exist in industry in other countries. They have traditionally faced, at least in some sectors, higher prices for energy and materials than we have. Their technologies, which are largely post-World War II for the European countries and Japan, are more advanced than ours, and are in better equilibrium with the current price schedules for energy and material resources. We have a lot to learn from them. To some extent we can transfer technology from them, and we will. But that is a slow process. We need not only to transfer the technology directly, which will be satisfactory in certain cases, but to look at the technologies that they use and leapfrog them, that is, to do even better. For instance, by adopting Japanese technologies in the production of cement we would be saving around 40 to 50 percent of the energy we now use. The use of energy in steelmaking can be reduced by about a third.

But I do not want this to sound like an indictment of American industry, which I find has done an amazing job. Capital facilities take a long time to turn over. We have to realize that we will be seeing the introduction of technologies as new capital facilities are brought on line.

There are possibilities for saving energy and materials through modification of what the consumer accepts as fulfilling his bundles of desired amenities, and through preference modification. Governmental initiatives should be directed toward the former, technological type of modifications, rather than toward stimulating consumer preference changes, which involve subjective and personal decisions.

Finally, I would like to point to what I see as possibilities for governmental action or concentration of governmental initiative.

First, there should be greater support of research in technological change. I believe that there is all too little of this, and that there is all too little long-term analysis within governmental research agencies. Also, I believe that there should be a plurality of policymaking organizations in the resources and energy field, because I think that is the best way of achieving good decisionmaking.

I think the Government needs to insure the existence of economic incentives which will turn our industrial structure toward less resource- and energy-using technologies. This is difficult to do, because energy and resources form so little of their economic cost. Capital and labor dominate. But we need to try to achieve it. There is, of course, the possibility of direct regulation. I have emphasized before the role of Government in transmitting information about total social cost and benefits of resource and material use.

Thank you, Mr. Vice Chairman.

[The prepared statement of Mr. Long follows:]

#### PREPARED STATEMENT OF THOMAS VEACH LONG II

Sustained economic growth over the next twenty-five years is a desirable national goal, to ensure that all Americans secure a standard of living that affords

them adequate supplies of life sustenance needs, and that is consistent with the basic requirements for human dignity. As argued fully in several papers in this series, natural resources are important ingredients in the growth process, and scarcities or supply disruptions can impair it. The crucial issues regarding resources concern the *rates* and *prices* at which they will be available and the political constraints to using them in ever increasing amounts. Increasing worldwide demand for resources may create supply-demand disequilibria. Although these will eventually be resolved by market forces, the additional costs during the periods of disequilibrium may be large and are to be avoided. While available market and policy mechanisms may well be sufficient tools with which to achieve an optimal rate of resource utilization, we know too little about how this optimal rate should be defined and evaluated.

To minimize the impacts of sudden resource supply disruptions, we need to increase the flexibility of our economic system to respond through broadening our understanding of and technical potential for resource substitution. This implies a need for the centralized assemblage of information regarding resource use, its careful analysis, and the development of contingency responses. These could then be instituted after brief reevaluation in order to reply more rapidly to unforeseen supply disruptions. Strategic stockpiling, of course, is one possibility that has a long history. Natural resource conservation through substitution is another important response mechanism. It should be viewed as the rational adaptation of producer and consumer to a change in the social costs and benefits associated with the use of a unit of resources, or to better information regarding these costs.

One point that should be emphasized is that major substitutions require long times for invention, innovation, information diffusion, commercialization and market penetration. The total time required for effective substitution via technological change rather than price induction—following identification of the potential scarcity and invention of the appropriate substitution technology—is on the order of twenty-five to thirty years when information diffusion is included. Governmental initiatives in the development appear to play a positive role in reducing the lag times.

What forms of substitution present themselves? On the production side of the economic ledger, there appears to be substantial potential for reducing our use of energy and natural resources through substitution by capital. International comparisons of energy requirements in industrial production show that there are many opportunities for energy conservation in the U.S. through the introduction of more advanced technologies. These would include more basic oxygen and electric furnaces in steel making, as well as direct reduction; efficient suspension pre-heater and pre-calciner kilns in cement production; and cogeneration of steam and electricity.

Little definitive information regarding the substitution of labor and natural resources is available. Prior to instituting policies that affect such substitutions, a much clearer understanding is required. At least a start in achieving this understanding could be made through examining both the historical evidence and the potential tradeoffs at an engineering level for specific major industries, such as iron and steel.

Substitution of one material for another are well catalogued, but the possibility of trading off energy and materials has only recently been emphasized. In assessing energy conservation options in the industrial sector, it is particularly important to recognize that intermediate materials "embody" the energy that has been used in bringing them to that point in the production chain. Consequently, a technological change that results in the use of smaller quantities of fuels and electricity at the expense of greater use of an intermediate material may actually be counter-productive from the viewpoint of total energy conservation. Policies designed to reduce energy consumption must evaluate this form of tradeoff in order to be effective.

Consumer substitution occurs at two different levels with possibly differing responses to price. On a technical level, a consumer will seek an identical amenity satisfaction through choosing a different group of goods and services that deliver an identical bundle of the desired characteristics. For example, a consumer who wants to be warm in his home may satisfy this desire by burning a given quantity of fuel, by wearing heavier clothing, or by burning less fuel with increased insulation. Alternatively, changes in relative prices may produce

a modification at the personal, subjective level, where a consumer modifies his preferred set of amenities—a lifestyle change. In parallel to the above example, the consumer might decide that the cost of the “warmth” amenity was sufficiently high that he would prefer to have less warmth and to devote the money saved to the purchase of other amenities, such as increased recreation. Policies designed to stimulate the former type of substitution rather than the latter are generally less socially manipulative, and for this reason to be preferred. Parallel comparisons of energy use in Sweden and the United States indicate that equivalent standards of living can be attained with remarkably different levels of energy use. Therefore, there does not seem to be an immutable direct proportionality between economic growth and growth in energy use. We can maintain an appropriate level of economic growth with reduced consumption of both energy and other natural resources.

Representative BOLLING. I am pleased to welcome a friend of mine this morning, Mr. Oscar Gass, who brings a special touch of international flavor to the occasion. Although he was born in this country, some of his studies were abroad. He was a Rhodes scholar at Oxford University for 3 years after graduating from Reed College where he is presently on the board of overseers. He served the U.S. Treasury in the area of both international monetary and domestic fiscal policy from 1938 to 1943, when he became a member of the planning staff of the U.S. War Production Board with responsibilities again partly international and partly domestic. Since 1944 he has been in private practice as a consulting economist, and most of his work has been in the area of development planning and its financing. His Government and international government clients have included the World Bank, the Embassy of Japan in Washington, the Government of Israel, and the Government of Indonesia.

His work for private clients has been mostly in energy economics. I know he has done a great deal of writing, because I have read some of it, in the field of politics and economics.

It is a pleasure to have you with us this morning. We are looking forward to your comments.

#### STATEMENT OF OSCAR GASS, CONSULTING ECONOMIST, WASHINGTON, D.C.

Mr. GASS. Thank you, Mr. Vice Chairman.

My name is Oscar Gass. I am a consulting economist, in private practice. The views expressed here today are solely my own.

On reasonable anticipation, the United States will be paying \$45 billion or more for imports of oil and gas in 1977. That is a greater dollar sum than the total year's value of U.S. exports as recently as 1971.

A new international economic power has emerged. Elements of the new power see themselves as spokesmen for a third world anxious to exploit other materials supplies as it has made use of oils, to gather to OPEC in 1976 an oil income of \$115 billion.

Our American practices of government have not proven compatible with speedy action on the problems that have confronted us in energy supply. It seems not improbable that, if the North Sea had been an American lake, with no significant oil find before 1968, this lake would not now be endowed with the oil and gas installations of a major world oil province. Its future would still be in litigation in the courts handling a variety of environmental protection suits.

We have no current basis for believing that our U.S. economy, in 1976-86, will be fueled with greatly different energy sources than those for which we have developed inadequate supplies in recent years.

The plutonium economy—accepted or rejected—relates to later years.

Fusion power may never work physically and can be no current reliance economically.

Solar power may never, in our time, develop beyond an expensive regional auxiliary.

We have done too little, up to now, with liquids from shales, coals, and tar sands to be able to rely upon them heavily for the next decade, though I personally would have opted for doing vastly more.

Internationally, we must expect the kind of pressure for which OPEC is the brilliant success symbol to be repeated wherever foreign suppliers find it possible.

This pressure reflects a simple claim of the materials suppliers. "Buy more of our materials. Pay higher prices. This is our preferred method of approaching—or surpassing—our customers in income and wealth."

In this claim Norway will not lag behind Nigeria.

We have many problems of price and tax policy with respect to oil, gas, and energy materials. I have views on each of these problems but will not attempt to cover them in these introductory 10 minutes.

If we have had some thread of general national energy policy, it was to expand our production of coal and of nuclear power, so that these base heat sources—under domestic control—could take the load off the domestically scarcer oils and gases. More than half of our natural gas and at least a third of our oils were formerly used for generating electricity and supplying industrial heat, where they have no great inherent advantage.

However, this thread of energy policy has been weakly developed. In 1976, nearly three-quarters of our energy consumption is still being supplied by oil and gas—and these increasingly imported.

Our domestic institutions have failed particularly with coal. Six years ago a President of the United States announced grandly that the United States contains one-third of all the coal in the world. Yet, even in 1976, production of bituminous and lignite together, entirely free of price controls, is not likely to come up to 12 percent above the 603 million tons produced in 1970.

With respect to increasing coal putput, every level of local, State, and Federal Governments—and now especially the Federal courts—have said, again and again: "Slow. Wait. Let us once more consider the consequences." The problem of energy supply is eminently one for the entire Nation. Yet the Congress and the Executive have not found it possible to establish an authoritative legal framework within which a Federal executive agency could see to it that our national coal production was promptly doubled.

Our failure with nuclear energy is no less serious. The Nation has paid for most of the basic research. The Nation owns the only operating uranium enrichment facilities.

It was, I suggest, preeminently a Federal responsibility to establish uniform safety standards; accordingly to approve or disapprove nuclear generating sites; and to provide a national system of nuclear

waste disposal or reuse. It was also for the national authorities to answer every question of entry or nonentry into the use of plutonium for electricity. We have not yet been able to do these things.

In 1969 the Atomic Energy Commission estimated that U.S. nuclear generating capacity in operation at the end of 1980 would be in the range of 130,000 to 170,000 megawatts. These nuclear generators were expected to supply roughly 30 percent of the electricity the country was then estimated to require in 1980. That nuclear supply would also amount to about 9 percent of the Nation's entire energy requirements.

In 1976 however, our operating nuclear generators are supplying less than 10 percent of the gross utility kilowatt hours of the Nation. This year, nuclears will contribute substantially less than 3 percent of our national energy consumption. And it now seems unlikely that nuclears will contribute so much as 5 percent to our national energy requirements in 1980.

No success with nuclear power has emerged to offset our failure with coal.

In oils, we do not know the possible contribution of domestic supplies, because we have only barely begun to work in our frontier provinces. We have much more exploratory work to do in Alaska, and especially in Naval Petroleum Reserve No. 4. And we are only now opening up the Atlantic and the deeper offshore of the Pacific.

Greatly larger domestic conventional oil supplies are not today dependent on higher oil prices. Some did indeed begin the 1970's with great oil price illusions. In February 1970, a Presidential task force advised that a practically unlimited supply of imported oil could be delivered in southern Louisiana for \$2 per barrel. The task force reported confidently: " \* \* \* the landed price of foreign crude by 1980 may well decline and will in any event not experience a substantial increase". This \$2 commodity is the same crude oil for which the U.S. will be paying over \$14 in 1977.

In 1974 the United States already paid an average over \$10 and in 1975 over \$12 for "new" domestic crude oils. There is no present evidence that exploration of our frontier provinces requires still higher prices. Had we allowed our domestic new crude oil price to rise to \$14 we would have merely encouraged the OPEC group to raise their price the sooner, perhaps now to the equivalent of \$16 or more per barrel, delivered to U.S. ports.

It would be a great folly to suggest that the slow pace of our energy expansion would be overcome by the mere establishment of a new Department of Energy, collecting all the agencies which deal with the several fractions of the energy problem. Such a department might be given mere housekeeping functions. Then it would be practically worthless.

A valuable Department of Energy would have to be given control, under law and budgetary process, over general policy, over senior policy personnel, and over the department's funds.

Such a department would require lawful authority both to formulate general guidelines and, where need be, to make particular principled decisions. Obviously, decisions are not rightly made without general objectives and without the deliberate weighing of multiple benefits, some of which—in individual cases—pull in opposite direc-

tions. An effective Department of Energy would need the lawful authority itself to weigh conflicting benefits and to come to decisions, not checked and balanced by the unlimited right of innumerable authorities and interests, each with a power to halt decision with unabridged "due process" litigation.

Rather than an immobilized Department of Energy, it would be better not to pretend to have one. Then we can muddle along as we have, up to now.

Representative BOLLING. Thank you.

Our next panelist is Mr. John Sawhill, former Administrator of the Federal Energy Administration, and now the president of the New York University.

I hesitate to raise the question as to which is the more difficult job in the modern era.

Mr. Sawhill got his Ph. D. at New York University, having graduated from Princeton. He worked for Merrill Lynch here in Washington before becoming the associate dean and professor of the New York School of Business Administration in 1960. In 1963 he became credit research and planning director for the Commercial Credit Corp. in Baltimore, where he later became a senior vice president. He returned to Washington to become an associate in McKenzie & Co. and then joined the OMB as the Associate Director in 1973.

It is good to have you with us again, Mr. Sawhill. We look forward to sharing your thoughts at this continuingly critical point in our resource and political history.

**STATEMENT OF JOHN C. SAWHILL, PRESIDENT, NEW YORK UNIVERSITY AND FORMER ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION**

Mr. SAWHILL. Thank you very much, Mr. Vice Chairman. I am delighted to be here.

I found much to agree with in the discussions so far, and I will keep my statement very brief so that we can get into the more interesting part of the session, which is the discussion.

I believe that there is something of a consensus in papers prepared for today's discussion on scarcity and substitution in natural resources and energy. The consensus is that for the most part we will approach social, political, and psychological limits to economic growth faster than we approach physical limits of material or energy availability. The United States and much of the rest of the world has a short-term imbalance in the supply of and demand for particular energy resources. The world may have a very long-range problem with both types of resource after about the first quarter of the next century, and may be troubled by shortages in a few important minerals before then, as Mr. Cloud pointed out, unless new technology is perfected and diffused in time. But in the intermediate term—the period until the turn of the century or beyond, which we can see most clearly and have the time and the knowledge to do something about—the situation is by no means beyond our control.

With respect to energy resources, the area I know best, I am convinced the problem is soluble if we define it clearly, create a compre-

hensive and coherent energy policy, and move in time to reflect the fact that major substitutions of materials or technologies require long lead times to progress from drawing board to commercial availability to widespread commercial use.

During this time, as we devise ways to utilize untapped coal reserves, extract natural gas and oil from the Outer Continental Shelf, harness nuclear energy more safely and begin transition to the next generation of energy resources such as solar energy and geothermal steam, we must take two other key actions. One is to stockpile oil, to protect against short-term disruptions in foreign supply. The second, and in my view the most important, overdue and do-able of the interdependent actions that will solve our energy problem, is a comprehensive program of energy conservation.

Conservation can buy the time to develop new resources. By and large it is also cheaper to save a unit of energy than to produce a new unit which was confirmed in the recent ERDA plan. While certain interdependencies of energy, materials, capital and labor mean that some types of energy saving are more economically valuable overall than others, we need not worry about being insufficiently selective in our efforts. For the American array of inefficiency and wasteful energy use is broad indeed. We rank near the bottom of the list of industrialized countries in our conservation efforts to date, as I am sure all of you are aware.

Finally, we can learn from countries like Sweden and West Germany, as was previously pointed out, that healthy economic growth does not depend on profligate energy use. These countries actually have higher per capita incomes than our own, with roughly similar economies and comparable degrees of industrialization.

Energy conservation cannot only help fill the supply/demand gap while new resources are developed and new technologies come on line. In the long run if we can reduce energy demand growth below historical levels, we can slow down or reduce the scope of efforts to exploit new energy resources. These efforts will be highly capital intensive. But, even if the strain that such projects will place upon the capital markets is manageable—which I believe to be the case, notwithstanding dire predictions to the contrary in the past few years—we have every reason to minimize the capital expended on energy development. We have a long agenda of unmet national needs in health, in education—as I am learning—in the quality of urban life to which capital could be usefully diverted if we did not need to pour it into energy projects.

There are a number of points I would like to make about the proper role of Government both in mounting national conservation efforts and in exploiting new energy resources and new technologies. I by large agree with the comments that have been made about the difficulties of regulation. But rather than make them in what I know you hope will be a short opening statement, let me simply assure you that I will do my best to inject them into the coming discussion.

Thank you.

Representative BOLLING. I have had a concern about energy as a Member of Congress for quite a long time. I was one of the relatively rare politicians that anticipated what happened, because I had the good fortune not to be very busy when I was a new Congressman. I

read the various reports which were commissioned by Mr. Truman long ago which clearly proved, as far as I was concerned, that at some point in the not too distant future we were going to be in a great deal of trouble.

The statements that have been made highlight to a degree the areas in which agreement is relatively easy, and areas in which agreement as to an approach has been virtually impossible by politicians. In part that is because of at least two factors. One is the lack of agreed upon facts. The other is the difference in approach that even scientists have to social problems.

What I am interested in hearing this panel discuss is, not so much the disagreements about technical difficulties, which are more than technical, they are disagreements in perception—but how the Government should proceed. Given a new opportunity for the politicians at the Federal level to deal with this problem, which we dealt with in such an extraordinarily dismal and ineffective fashion—for reasons that partly have to do with the organization of Congress as well as with the politics of divided Government—I would like to see if I could get a discussion about how to establish better agreement as to what the facts are: The costs of conservation as compared to the costs of development, the utility, in a time frame, of nuclear versus coal versus other similar ways of turning one thing into something else, with the various social costs. If we can get any kind of a discussion on that, I would then inquire as to what kind of part the Government should play in setting up such entities.

There was one point made, I think by Mr. Long, about research. And there has been a recurring hint in all panels as we deal with all kinds of different problems. On the only subject that we have dealt with that affects growth, there is a very serious dearth of knowledge, an inadequate fund of basic knowledge.

What I would really like to get you to do is to take your disagreements and argue about them, if you will. I don't want to try to prevent that, because that is to a large degree the social component of your view, or the political component, plus your perception of the facts. But then tell me, as one politician who has been concerned for a very long time, and has had the misfortune to have to preside over the conferences in the House of a whole series of disastrously considered energy bills, how we should start developing the materials that we have to have in order to bring together a country that is very complicated and very divided on this subject.

Mr. Sawhill.

Mr. SAWHILL. Let me make a statement which I think will be somewhat in disagreement with Mr. Gass, for example. And that is that one of the best ways to get better agreement on the facts is to focus attention in the Federal Government on the forums where the facts are discussed and debated.

I was at a meeting in ERDA this morning. And the Deputy Administrator said he had testified before 56 different committees. I myself, when I was Federal Energy Administrator, in less than 1 year testified over a 100 times before numerous congressional committees.

In the executive branch there are numerous spokespeople for energy from a variety of different agencies and regulatory bodies.



I don't believe that organization will solve our energy problem. But I do think that better organization both in the Congress and in the executive branch might enable us to obtain better agreement on the facts, so that the American people don't constantly see testimony before such a wide variety of different congressional committees, by such a wide variety of different executive agencies, that the picture becomes very confusing. And without belaboring this point, I think that if the Congress could organize itself so that energy and environmental questions were debated before a fewer number of committees, perhaps even as few as one or two, one in each House. I also believe that the congressional structure could be supported by some kind of analytical group, in an analogous fashion to what Congress has done in the budgetary area where it has created a Congressional Budget Office to provide informed analytical support for the Congress in the budgetary area. A congressional energy committee might establish a congressional energy office or energy materials office that could begin providing better analytical data for Congress to use in analyzing the problem.

At the same time, in the executive branch, we should create some kind of a department of energy and natural resources, with perhaps the addition of a White House energy policy unit. Such an organization would simplify the executive branch structure and focus the debate.

So again I don't make great claims that organization will solve our problems. But to try to answer the question that you posed to us, how to obtain better agreement on the facts, I think those are some steps that we should consider.

Representative BOLLING. Mr. Gass.

Mr. GASS. I think we might turn as examples to cases where national policy has been reasonably effective after long periods of ineffectiveness. One I would like to cite is the problem of the Alaska pipeline. That was in a position where the sponsors were prepared to order and did order in 1968-69 steel for laying the pipeline. The discussion might have gone on interminably. Various jurisdictions would have legislated, would have gone to court, would have litigated. But, at the time of the 1973-74 embargo, at least 4 years having already passed, the Congress took upon itself the responsibility for making the decisive judgment. With the limitation of the mere issue of constitutionality, then very closely constricted, the Congress said: "We are going to sit in judgment on the facts of something which is not essentially a legal question, but a question of social policy, namely, environmental impacts, on one side, and the need of the oil in question to the national economy on the other." The Congress made a decision within a narrow framework.

Similarly, but not quite so clearly, something of the same kind has been done and scheduled in the issue of the delivery of gas from Alaska. A framework has been set, a final schedule has been set, for the cooperation of various factors within which decisions have to be made.

Now, I would suggest that had there been in the area of expansion of our coal supplies a similar concentration of authority, not excluding any kind of consideration which came into fair consideration, we might be very, very much further ahead in our coal development

than we are today. No other country which has succeeded in energy development has set up a whole chain of conflicting agencies each of which has a right to stop the activity of the other.

I do not in any way disparage the value of the kinds of things that the Environmental Protection Agency is seeking. But I wish to underline the point, there does not exist an independent authority like the Environmental Protection Agency in any other major government of the world.

Representative BOLLING. Anybody else?

Mr. Long.

Mr. LONG. Yes; I would like to comment.

I find myself somewhat in disagreement with Mr. Gass's emphasis on the need to develop our energy resources in such an accelerated fashion. I believe we should take the utmost care in making energy decisions and resource decisions that will have a long-term impact. Our society probably does have the time between now and the year 2000 to make these decisions. Therefore I am in agreement with Mr. Sawhill's approach, which is for more analysis. I realize that we can analyze things to death, and it sometimes seems like another way to avoid the real problems. But the fact is that we do not have the proper data on which to base decisions, much less assemble it so that it is accessible to decisionmakers.

I was happy to hear that you read the Paley Commission reports very early on. You are one of the few people whom I know to have read them, although they are often discussed. In line with Mr. Sawhill's suggestion for a congressional office for resource analysis, it might be desirable to consider setting up something like a Paley Commission on a continuing basis. This would furnish a mechanism for contingency planning—not economic planning—but contingency planning that would allow us to respond more flexibly as a society to resource and energy problems.

I am concerned that while on the supply side of the ledger there may be great merit in putting the decisionmaking apparatus into the hands of a single agency, this could be dangerous when we turn to decisionmaking regarding more socially oriented aspects of energy and resource use. I believe that the United States has correctly maintained through its 200 year history an emphasis on checks and balances when social problems were involved. The social aspects are the ones that are of concern when we talk about conservation and demand manipulation. For this type of decision we need to maintain a plurality of interests, having inputs perhaps to one central body such as a congressional analysis unit that could make some judgments or at least put the information into a form in which it can be used for decisionmaking. I can't emphasize this strongly enough, because it is my feeling that we make sometimes important decisions for society by adopting energy and resource policies, and these should be thought out quite well. I call the attention here to a decay in the Government's ability to do this exact thing, in the form of the effective shutting down of the National Science Foundation's Office of Energy Research and Development Policy at exactly the time when it is needed as an unbiased agency for examining the tools and materials of resource policy.

I would also point to the fact that the data required for resource policy formation—for instance, that on energy and materials use as

collected in the census of manufacturers and the census of minerals industries—while it may be of better quality, has certainly decreased in quantity between the 1964 census and the 1972 census—the 1967 census is somewhere in between the two. This comes right at the time we need such data. Again we need better data and better analysis.

Representative BOLLING. Would you expand a little bit on the way in which you maintain the plurality of approach? I am sure I understand what you mean, but I wanted the record to show what kind of diversity you hope to retain.

Mr. LONG. Well, I think that it would be very appropriate, for instance, to maintain the ERDA—Office of Energy Conservation Policy. I think that it has great potential, and particularly it could be valuable in forming short-term policy. ERDA's concerns have been more short term, because so many of the solutions which they see as available to us are short term.

I don't find in this area of resources and energy an equivalent group which is devoting itself to the analysis of the medium-to-long term. I just don't think it exists in Washington today. Maybe it does. I have tried to remain isolated from Washington in order to be able to reflect on these things from a distance. Consequently, I don't know the names of every agency and haven't come in contact with everyone working in this area, so I may be very wrong about these issues. But that is my perspective.

Representative BOLLING. Thank you.

Mr. VOGELY. Mr. Vice Chairman, I want to throw in a word of warning.

Every effort has been generated by the Federal Power Commission, by the Federal Energy Agency, and by Congress over whether or not the reserves of oil are 30 billion barrels or 32 billion barrels or 34 billion barrels. This is an essentially useless figure if you have it. It is not data or datum that we need for better policy. It is an understanding of the processes involved which allows us to predict better.

As Mr. Long pointed out in his paper, and as Mr. Cloud pointed out in his, there are orders of magnitude of difference between analysts who look at the resource base and try to estimate that unknown area of the resource base. Now, you are not going to get better data on this. What understanding you are going to get is through advances in the geological sciences, through advances in institutional analysis, through advances in the economic sciences. You are going to begin to understand the process whereby materials existing in the Earth's crust become discovered and become utilized by man.

This is not a census type question. You don't go out and request people—one of the famous examples here is that Oscar Morgenstern, a dear friend of mine, in writing on the accuracy of economic observations, said, if you don't know the height of the emperor of China because he has never been seen, simply ask 5 million Chinese and average the answers.

This is what we do when we get statistics. Statistics and data are not at the basis of this problem. If we had available to the U.S. Government very bit of hard statistical data existing in all of the industrial concerns—in other words, if we had a complete census of everything—I don't think we would have a proper basis for de-

termining, without a great deal of uncertainty, what proper energy policy is.

So I urge that we don't go down the road spending vast amounts of money and vast amounts of time in the collection of materials which will turn out to be useless, irrelevant and perhaps misleading.

Representative BOLLING. Mr. Cloud.

Mr. CLOUD. In some sense I agree with all pervious speakers. Although not in detail. I would particularly emphasize what Mr. Vogely has just said about understanding what your information means. We don't understand what the information we now have means. The decisionmaker unfortunately faces the dilemma that he must always make decisions based on insufficient information. That is just the nature of decisionmaking.

Representative BOLLING. Holmes said something about that. He said that a politician in effect had to make decisions like a combat officer, without adequate information.

Mr. CLOUD. That is true. So you are never going to have completely adequate information to look with wisdom down the next 1,000 years and make the right decisions for the future.

But I think we can do a better job than we are doing. I think we have enough information and enough understanding of that information to make better decisions than we do. What we lack now primarily is communication, and the translation of this information to effective legislation. I stress legislation because I don't really believe that very much happens on a purely voluntary basis. I am not suggesting meddling legislation, but broad steps like, for instance, limiting the weight and horsepower of automobiles, which would conserve a great deal of energy materials and save lives. I think there are a variety of things like that which can be done. But two obstacles thwart the achievement of the understanding and the communication.

One is the fractionization of the professions, including politics. We all talk with one another. I talk with geologists, you talk with politicians, economists, and so on. We don't have enough cross communication. I think that the economists would perhaps vary their outlook on mineral economics if they spent more time talking with geologists and geochemists who really understand something about the nature of mineral resources. You can't blanket resources under one umbrella. For some, even though the reserves appear to be small, we know because of their geological and geochemical relationships that in fact we have much more than might appear to be the case. For others, reserves in sight may approach likely obtainable resources.

In the case of oil, gas, and coal, apart from improved tertiary recovery factors, for oil and gas, we can estimate rather closely how much is still left in the ground. It is an interesting observation that all of the estimates of these resources that have been made, even the ones that are farthest apart, are well within an order of magnitude. There is only about a threefold difference between the most optimistic and the most pessimistic estimates.

So there is an area where we have some real information.

As for iron, aluminum, and some other metals and minerals that are related to very regular geochemical configurations in the Earth's crust, we can make fairly close estimates of likely resources.

But for other things it is much more difficult.

So there is a varying degree of certainty or uncertainty of information within the resource field.

I think that what is needed—you asked first about information—is to create some kind of an organization or structure where the kind of communication I have been talking about can go on, where geologists and geochemists and economists and engineers and technologists and lawyers and social scientists can talk together about problems, exchange information, and get to know one another and understand some of the subtleties involved so that we are not constantly confronting one another over semantic or other trivial differences.

It would be interesting to have a Council of Resource Advisers that would be available to advise both the executive and the legislative branches of Government. Such a Council of Resource Advisers should be sufficiently diversified and have a large enough staff and a sufficient degree of continuity that it could gather in the information, bring together the people who understand its implications vis-a-vis other professions, and then have a series of briefing sessions of 2 or 3 days' duration for Members of Congress and Federal administrators who, like you, are really interested in this very fundamental problem.

You asked what part the Government should play in resolving the problem. Again, it is a matter both of communication and of understanding the information we already have. As I said, I think we know enough now to do a better job than we have been doing. In the end I think that whatever we do has to have a legislative underpinning to be effective. And it is important in formulating that legislation that you have feedback from all the constituencies in the Nation, and not from scientists, technologists, and economists alone, although such as they provide expertise of special relevance to the problems of resource use and conservation. Along this line of thought, are you the only member of the committee here this morning?

Representative BOLLING. That is correct.

Mr. CLOUD. Where are the rest of them? Why aren't we talking together?

Representative BOLLING. Maybe I should preface this by saying that not only was I the final author and floor manager of the Budget Act, but I was also the chairman of the select committee that recommended to the House that we have one committee on energy and environment, which recommendation, among others, was shot down in large part by environmentalists, who felt that they would lose their clout with their pet committees. The other people who shot down those recommendations were the people equally objectively concerned in the overall approach. All they could see was through their particular small tunnel.

The other members of the committee are probably attending to the multifarious and miscellaneous duties of a modern Congressman or Senator. The dilemma of organization, as was first brought up by Mr. Sawhill, is absolutely the crucial question to the survival of the congressional system, because today a normal Senator will have somewhere between 16 and 18 committee assignments, and a Congressman may have 5 to 10. I have been here quite a long time and I have never been able to keep up with two. I am on this committee and one other

legislative committee which has no subcommittees. The organizational dilemma with which Congress has burdened itself makes it almost impossible for the kind of cross-fertilization—which is maybe the wrong phrase, but the one I have used all along—of ideas and disciplines. I have always thought that this was a committee that could perform a useful role in that. But the dilemma, when you look at it from my point of view as the chairman of the committee as a whole as we discussed the energy bill, is the inability, even by Congress, to pull together the parties of interest, starting with those who study the matter objectively and seek to be objective on it, and ending with those who have a very narrow particular economic interest.

I am not going to go on long on this, but energy is perhaps as good an illustration of the futility of a disintegrated approach, a non-communicating approach, as is an issue that everybody in this society now recognizes as fundamental, the financing of health care delivery.

The first conversations on that began in the early part of this century. I have been in Congress quite a long time. I was a supporter of Mr. Truman's health insurance program. We now have about four rival bills in Congress, one supported by the insurance companies, one supported by the AMA—they all have a different guise—and one supported by the public interest group, so called, and the labor unions, and one supported by somebody else. Probably there are four or five others. At no time to my knowledge—and this is the component that we have left out so far—has anybody ever been able to get the major parties of interest in that conflict together in the same room to discuss the minimum that the insurance companies feel they have to have, and the minimum that the public interest groups and the labor unions think they have to have. There has never been an effective attempt in any form that I am familiar with to pull together all of the different interests. And to my knowledge, it has never been done in energy.

Mr. CLOUD. If it has never been done, maybe this is the time to start it.

Representative BOLLING. I think clearly it is. I don't want to close that conversation off, but I think we have arrived at something like an agreement that there has to be an organizational change, and there has to be a great deal more intercommunication among disciplines, among groups, and among interests, and a variety of other things that have not been done up to this moment in dealing with this particular subject.

Mr. CLOUD. May I say just a word in defense of environmentalists?

Representative BOLLING. I am not attacking them. I am one myself.

Mr. CLOUD. I would like to have it on the record though, because it has been mentioned several times that they are a retarding influence in meeting our national problems. And to be sure, there are "eco-nuts" just as there are other kinds of nuts. But I think one has to think of the environment itself as a resource, the preservation of pristine areas where you might need to go for seed to restock a devastated area, or just as a place for peace and recreation.

An interesting question involves one of the largest undeveloped porphyry copper deposits in the Nation, which is in the middle of the magnificent Glacial Peak Wilderness Area of the Northern Cascade Mountains—State of Washington—and about which there

has been much discussion. Really, if we need copper bad enough to go in and deface the Glacier Peak area to get that copper out, then we are in really bad shape for copper.

Mr. SAWHILL. I don't think the issue is that the environmentalists are holding up particular pieces of legislation or particular activities, the issue is, are they prohibiting the kind of organizational forum in which these issues can be debated. And that is what we need so badly.

Mr. CLOUD. They should be brought into the discussion.

Representative BOLLING. The people that were involved in this particular legislative endeavor certainly didn't represent all the environmentalists, that was just a particularly narrow lobbying-point of view. I certainly don't mean what I said as an attack on the environmentalists, because I think I have been one for most of my life—well before I became an adult.

If it is suitable at this time, I would like to turn to two questions that I would like as many members of the panel to discuss as are willing. I would like to see if we can get some specifics as to what should be done in addition to what has been done, and what priority, if that is possible, should be given to conservation. Congress has done some things. Obviously we don't think these are very adequate. But we have tried to institutionalize energy conservation, mandatory fuel efficiency standards for automobiles, which is in effect an auto-efficiency tax. It has resulted in some increase in efficiency in the use of gasoline. There is a nice optimistic prediction. I think, that gasoline consumption will begin to decline in 1979 or 1980.

Incidentally, in that connection there is something that politicians, or at least Presidents, can do—and this may or may not be accurate. But I was informed at the time that the President indicated the energy crisis was over, that those who enforced speed limits found it much more difficult to enforce them practically the next day. I don't know that that is a fact, but my own experiences as a driver would indicate that people behaved rather better in staying within the speed limit when they are concerned than when they stopped being concerned.

Also we have authorized the National Bureau of Standards to provide a set of national standards with energy efficiency built in, loans and loan guarantees, and so on. Home appliances will have to have energy efficiency labels soon. And so on. We have done some things.

Now, what are the things we ought to do next?

Mr. VOGELY. Congressman Bolling, I emphasize very strongly that what needs to be done is to separate in our mind and in our policy those issues which have to do with equity and those issues which have to do with resource application. The best way to get energy conservation is to have our institution so established that the consumers of energy are paying the full cost of that energy. If you do that, then the consumers of energy will effectively and efficiently use it. But all of our policies are directed at not doing that. We have the price of natural gas at well below its market clearing level. We have price controls on oil which keep the price of oil at well below its market clearing level. We are trying to achieve lifetime rates of electricity to charge major segments of our society well below the cost of that electricity.

Let's try to separate the problems of equity. If the elderly have insufficient incomes, let's handle that directly. If the oil companies are

making excessive profits, let's handle that directly. Let's not try to achieve it through an interference with a system which does work. The information on lower energy consumption in Sweden comes about because the price of energy has been higher in Sweden. And so the best thing that the Congress can do to foster conservation is to establish an institutional system whereby the prices of energy reflect its full cost, including environmental costs.

Representative BOLLING. I assume that would include eliminating all so-called tax expenditures?

Mr. VOGELY. Yes, sir.

Representative BOLLING. With regard to the production of energy?

Mr. VOGELY. Yes, sir.

Representative BOLLING. Mr. Sawhill.

Mr. SAWHILL. Let me just underscore what Mr. Vogely said. I think most economists would completely agree that we have to separate the equity considerations from the considerations of permitting markets to work. Where we restrict market operation, we will not only retard production, but we will excessively consume. Certainly that has been well demonstrated if we look at the history of energy consumption in this country.

In addition I would cite just a few other examples of things Congress can do. If we look at the major energy consuming sectors, for example the residential sector, Congress could establish incentives for the retrofitting of existing buildings through a system of tax credits.

In the transportation sector, Congress could go beyond doing what it has already done, and gradually increase the Federal excise tax on gasoline in order to provide a greater incentive for energy conservation. There could be rebates built into such a scheme so that it would not hurt low-income consumers. And, the revenues from such a tax could be used to improve public transportation and finance the major expenditures on energy research and development that I think we would all agree would be needed.

In the industrial sector, I agree with the earlier comments that mandatory regulatory activities would be a mistake. I believe that merely permitting prices to rise to their economic cost would accelerate the kind of conservation in the industrial sector that is necessary.

One additional thing that might be done would be to strengthen the research into conservation technology in the Energy Research and Development Administration in order to provide the technological base for industry to become more energy efficient.

Finally, I think there could be incentives created for greater recycling and reuse of materials. It only takes about 20 percent as much energy, for example, to recycle aluminum as it does to make it from raw ore. I believe that Congress could well consider banning non-returnable bottles. I think there could be tax incentives and other kinds of monetary incentives given to cities and other communities to burn solid waste.

So these would be over and beyond some of the items that have already been mentioned.

Representative BOLLING. Mr. Gass.

Mr. GASS. I think what is essential, in qualifying the statements that we have heard, is that we think of the considerations that we are



talking about in terms of time and other economic circumstances. To emphasize the general principle that equity and costs should be separated sounds very well. I would like to make the point that if, for the sake of illustration, I take the price of gasoline at 60 cents a gallon, if I take the price of our other fuels which average out in petroleum, including gasoline—taking off the 12 cents tax—to about 40 cents a gallon, if you raise the price of petroleum in the United States today by as much as 1 cent a gallon, you raise it rather more than \$2½ billion a year. It might very well be that you would find an equation between cost and demand at a price rise of 40 cents—bringing gasoline to a dollar. To do that you would have to raise taxes by \$100 billion per year on petroleum products alone.

Now, what I am suggesting is that we have problems of timeliness in these things. In a time like 1977, with our level of unemployment, with our level of inadequate demand, with our level of inadequate use of our facilities, the notion that we can go to full alternative costs in our fuel supply is a notion which needs to be thought of in terms of very long periods. It is the kind of long period which perhaps others here have been thinking of. It is not, I submit, a judgement which gives us guidance for conduct in 1977 and in 1978.

Representative BOLLING. Mr. Long.

Mr. LONG. I would like to just emphasize a different facet of the discussion which has been going on here about allowing fuel and electricity prices to rise to their full cost—really two facets of it.

First, it may be desirable that they rise eventually even above what the prices that would be set in a static, perfect market. The reason for this is that these materials, these minerals, may be more valuable to future generations which do not have a vote in the present economic market than they are to us. The only way that they can participate in the decisionmaking is through our own benevolence. We have to recognize this and Congress has to recognize this. As an illustration of this, hydrocarbons that we burn for heat, combust, furnish only a part of this usable value in that way. This is a technical point, but it is true. They are more valuable in a scientific sense as feed stocks for polymer production, and they use more of their energy content in that way than they do when they are combusted. So, we are dealing with a problem in which we are not necessarily taking into account, even in a perfectly operating market, the full cost of energy and other materials.

Now, as to conservation options, we have heard the usual economist's argument—and I say usual, because coming from Chicago I have heard it time and time again—that questions of equity must be clearly separated from those of market efficiency and the efficient allocation of resources. That is certainly true. It takes two policy tools to achieve two different aspects of policy. To achieve more desirable distributive impacts requires a separate policy tool. Certainly a smoothly operating price system is probably our best instrument for efficiently allocating resources. But we must recognize that there is also the question of tying the equity aspects into legislation. They are too often neglected after we try to correct to a more perfect market operation. For Members of Congress, they may be the most important question, because they form the question of political feasibility. If we neglect them then we are probably neglecting the most important factor in the congressional

decisionmaking process. When legislation is proposed that affects energy prices, its impact upon income distribution and other social factors should be simultaneously investigated. If a separate policy instrument is required to make an adjustment that leads to a fairer distribution, it should be formulated simultaneously. Congress and economic decisionmakers have to face up to that.

Representative BOLLING. I think that is one thing that you can be sure the Congress will do—at least it thinks it is taking that into account.

If I may, I would like to change the direction a little bit to ask all of the panelists to give me their judgment, including the time factor and given the present state of their information about substitute energy sources, of alternatives such as nuclear, coal, shales, sands, and so on. If I have left out something critical, let's get it in, too. But I have been very confused in listening to politicians talk and also in listening to people who are not politicians talk about what the time frames are, what the stages are. I realize that you would have to reply imprecisely and perhaps unscientifically. But what kind of an approach should we be pursuing in terms of alternate sources of energy? I have watched us defeat virtually every attempt to do anything so far for one reason or another. It has always been for good reasons.

Mr. Gass.

Mr. Gass. The coal and nuclear fission options are short-term options. The coal one is disputed on grounds of the transformation of the social and economic character which will necessarily take place in areas which are subjected to major coal development which have not had that industry before. Our great impacted situation with respect to coal now is what we loosely called the Northern Plains case. But if we are talking in terms of a resolution which on the one hand thinks of and preserves the environment, and at the same time goes ahead in mining coal, that is a short-term option.

Similarly, with respect to fission nuclears, provided we are willing to accept one or another of the alternative solutions of what we are going to do about the nuclear wastes, bury them or reuse them, take the plutonium out of them and reuse it or not. That again is a short-term option in the sense that it is susceptible of short-term acceleration.

With respect to the other things, all of our other options are longer term and more uncertain. If we talk about our great oil provinces, I think it is possible that we will find that Naval Petroleum Reserve No. 4, to the west of Prudhoe Bay, may just turn out to be the greatest oil province that has ever been discovered in the United States. The people who worked there many years ago thought it much more promising than the Prudhoe Bay area. We do not know what we shall find offshore in the Atlantic and in certain areas of the Pacific; we don't know any more than we knew about the North Sea in 1968. Those must be great question marks. We don't know what those areas will yield. But they may yield substantial resources in what I call economic time, that is, the time in which I think the judgment of the economists is worth anything. I think after we talk about periods of 25 years, the judgment of the economists are worthless. They must sometimes be utilized because we make decisions that go beyond that period. But, in general, economists have very little to contribute to judgment about such long runs.

Now, when we are talking about oil shales, which I believe should have been developed with the sponsorship of the Government of the United States at whatever immediate cost, if only for the great value it would have in expanding our knowledge and deterring the increase of prices which are taking place by cartels and their followers all over the world, or when we talked about oil from coal, we know less—we are less certain as to what our costs will be, and what the ultimate provision can be. Similarly, I think we should have, with any degree of cooperation with Canada that is necessary, done more than we are doing at the present time with tar sands. We should have done more with these different things if only for the value in our national independence and in our foreign policy. I think the value might have been very great.

But we must distinguish these things and say: Some of them, coal and fission power, if we accept it, are short-term remedies. The other things that we are talking about are at best long-term remedies. Others which I have not even named are, I think, even more long term.

Representative BOLLING. Mr. Cloud.

Mr. CLOUD. Mr. Gass' remarks remind me of the story about an economist, an engineer, and a geologist who were shipwrecked on a small island in the Pacific with no food, tools, or equipment of any sort. After awhile a can of beans floated ashore, and they had a large argument about how they were going to get the can of beans open. Finally the economist said, "Well, he could settle the problem of opening the beans. First, however, he would assume a can opener."

Prudhoe Bay is a big field. It is one of the giant fields. But it is a relatively small among giant fields, perhaps 10 billion barrels. Alaska as a whole may produce 25 or 30 billion barrels. If I may use the expression in view of the impending change in administration, this is peanuts among giant fields. And so is the North Sea.

The continental shelves and slopes may be something different. But the prospects that they will add significantly to the lifetime of petroleum in terms of doubling times are very slight indeed.

We must look at oil and natural gas as disappearing resources. Production of petroleum in the United States peaked in 1970, and new reserves that we may prove are not going to change that basic peak. At best they may lengthen the downhill ride. In the world as a whole petroleum production will peak in about 1990 or perhaps 2000. After that the world will be on a downhill grade as far as petroleum production goes. The great future resources of petroleum appear to be in the Middle East and in the U.S.S.R., in Siberia. And, if the present rates of increase in consumption of petroleum continue, the world will be using the entire productive capacity of the Middle East in about 10 years.

So there is no way out of petroleum depletion. As Mr. Long suggested, it might be better to conserve some of that oil for petro-chemical feed stocks for future generations.

Coal does offer a way of gaining time so that we can make appropriate studies of the entire spectrum of energy possibilities.

Most of all, however, I would join Mr. Sawhill in stressing conservation. We can certainly greatly cut down very significantly on our energy requirements by relatively simple conservation procedures.

Among other procedures I would include the installations, as rapidly as possible, of solar energy for space heating and cooling. About 25 percent of the current national energy budget is now represented by space heating and cooling. We can probably pick up most of that with solar energy.

You asked about dangers, and coal of course is dangerous stuff. When you look at the hazards of nuclear energy versus other forms of energy, the nuclear safety record so far is better than that of most conventional energy sources. There is a big difference, however, in the nature of the hazard. In coal mining the miner, although he may have little choice, knows he is assuming a danger. But the kinds of dangers that nuclear energy present are inflicted on the population at large with little choice in the matter, except insofar as they may vote for nuclear initiatives.

It may be that eventually we will have to turn to nuclear energy if we insist on increasing our rates of energy consumption or even maintaining them.

But I believe that we could gain several decades before that decision must be made. If, for instance, the entire energy burden was placed on coal alone, it would probably last for about 140 years. That would allow some decades of grace during which we could develop solar energy, continue research on nuclear energy, study the problems of nuclear waste disposal and the hazards of how to control reactors, and try to develop a workable fusion reactor which, as Mr. Gass points out, quite possibly may never be possible, because of the sustaining high temperatures that need to be achieved.

Thus, although we have a wide variety of energy options, we do not understand how best to use them. I think we ought to make a very careful study of all of those options before we decide whether or not we wish to commit ourselves to a growing dependence on nuclear fission with all its hazards and uncertainties.

Mr. SAWHILL. I can't add a great deal to what has already been said, but I might just make a few points for your consideration.

First, one of the important near-term options is the enhanced recovery of oil and gas from existing fields. And this is where the price considerations we talked about earlier are so important, because unless the price rises to a level to make that enhanced recovery economically feasible, it just won't be done. And if it is done, it does give us a bridge energy source that we can use until we can bring in these additional technologies.

As far as coal is concerned, there are really two issues here. One is, how can we use our existing resources more effectively, and what do we have to do in order to permit coal to be an important resource in the longer term?

I think one of the things we have to do if we want to see coal production increase is to remove the uncertainty surrounding coal. One of the uncertainties surrounding coal is what kind of regulation we are going to have over strip mining. Until Congress can pass and the President can sign a strip mining bill, I think it is going to be difficult to expand coal production significantly.

Second, we have to get an agreement on what levels of impurities we can tolerate from burning coal and have a consistent and reasonably long lived set of environmental regulations.

As far as using coal more efficiently in the longer run, we do have technologies available to us now for liquifying and gasifying coal. They are not technologies that can be exercised immediately and have a significant impact in the near term, that is, the next 10 years, but certainly in 1985 to 2000 they can be important.

Finally, on nuclear energy, I think the real issues here are not so much the issues of safety and waste management. More needs to be done. We are doing more. But that is a problem that is solvable within the existing institutional framework that we have. I think the real issue is the problem of proliferation of nuclear weapons as more and more countries get access to this technology. There have been recent statements in the election campaign addressed to this problem. It is clearly going to be an issue that Congress will have to consider more carefully.

Representative BOLLING. Thank you.

Gentlemen, I am very grateful to you all. We wonder if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions so we can have a complete record.

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF WILLIAM A. VOGELY TO ADDITIONAL WRITTEN QUESTIONS POSED BY  
THE COMMITTEE

*Question 1.* Is it necessary or at least desirable to restructure economic norms, values, and habits to move away from the economic model that encourages increased consumption of resources toward a model that limits growth and such consumption? Should the United States begin limiting consumption of, say, the 25 resources critical to the preservation of industrial society, through such means as natural resource depletion quotas?

Answer. The price system, if it is operating within the ball park of full information and workable competition, will efficiently allocate all productive resources and will efficiently determine the time stream of use of an exhaustible mineral. There is no evidence that the structure of this economic model will lead to misallocation. The United States should assure that there is an adequate flow of information to the public concerning minerals, that the markets for minerals are workably competitive, and that external costs are adequately reflected in market prices. If this is done, it is neither necessary nor desirable to "restructure economic norms, values, and habits."

*Question 2.* Are current government practices in the resource area taking sufficient account of resource requirements to foster future economic growth and in what ways should these government practices be changed to better reflect such long term requirements? For example, should government policies be changed to encourage market decisions in favor of conservation rather than consumption of energy and resources?

Answer. Current government practices in the resource area are not contributing to efficient allocation of resources through time. The government through price controls is maintaining the price of energy well below current world market prices. Through percentage depletion and other direct and indirect subsidies on supplies, the government is preventing full costs from being charged to consumers of minerals. Externalities such as environmental damage are not reflected in energy and material costs because of such practices as rolled-in-pricing, average costing, and the like. Government policies should be changed to assure the goals stated in answer to question 1.

*Question 3.* Will the drag on economic growth come from increases in costs rather than exhaustion of important minerals or fuels? Will the increases in costs in obtaining raw materials that will inevitably occur mean that the United States cannot expect to experience future patterns of growth which are similar to those which have prevailed? Please be specific in citing how rising costs, and

possibly shortages, may bring major changes in patterns of resource use and alter the direction of future economic growth.

Answer. I do not believe that there will be any significant increase in costs of obtaining raw materials for at least fifty years. This includes energy. There is no reason from the point of view of resource exhaustion or increase in resource costs for the United States to expect anything but future growth in real per capita income. Resource exhaustion or high resource costs are myths. Society is overreacting to a monopoly pricing of oil by a cartel which may be in the process of disintegration. I know of no reputable commodity-by-commodity study which reaches a contrary conclusion. On the other hand, the Boyd Commission and the current Congressional Commission on Shortages has said as I stated above; i.e., the problem is institutional and market organization—not technological and geological in nature.

*Question 4.* In his paper, in volume 4 of the study series, Prof. Kneese argues that the natural resources policy of the United States is "inconsistent, often outdated, and grossly overdependent on direct regulation vis-a-vis modifications in our defective system of economic incentives." The result, he maintains, is "an excessively rapid rate of resource extraction, too much discharge of residual materials to the environment, and an over dependence on foreign sources of supply of some natural resources." Are the present policies really that bad that they lead to such results?

Answer. Professor Kneese is correct. He states his argument somewhat strongly, but on the whole our present policies are really that bad.

*Question 5.* The primary theme which Mr. Cloud presents in his paper is that "we need to generate a less material-consuming set of demands while striving to satisfy genuine needs." Do you agree with this assessment?

Answer. I find Mr. Cloud's presentation very difficult to understand because I do not know what he means by "genuine needs." So long as we improve the markets and assure proper pricing, reduction in material demands below those that would result can only be achieved at the cost of reduction of real income. Nothing is free—especially conservation as defined by Mr. Cloud. I do not believe that any group in society, be it the President, the Congress, or Mr. Cloud, should determine for me my "genuine needs." This society will exist as a free one only so long as I am allowed to pursue whatever legal means available to me for obtaining income and I am permitted to expend that income to meet my own perceived needs. Any limitation on this freedom results in misallocation of resources and reduction in real income.

I realize that this answer sounds very much like that of a nineteenth-century philosopher. I see no evidence, however, that any other method of economic organization has produced the kinds of results that the market system—with all of its imperfections—has produced in the United States. To paraphrase Winston Churchill, "The market system is the worst economic system ever devised by man, except for any other that has been tried."

*Question 6.* You seem to disagree on a very fundamental point with Mr. Cloud. He maintains that for many minerals, recurrent shortages and for some economic depletion can be predicted within the first half of the 21st century. You maintain that in the period 1975–2025, physical constraints on production of materials are not a threat to continued economic growth. What is the basis for these differing opinions? Is it basically a "lack of accurate data" problem?

Answer. The difference between Mr. Cloud and me relate to the methodologies available for predicting the results of exploration. It is not "a lack of accurate data."

There are three general methods available to estimate the extent of undiscovered deposits which are as good as those we are mining today. Mr. Cloud discusses some of these, specifically that of the USGS, in his paper. My results reproduced in the table attached to my paper are based on an improvement of the USGS methodology and estimates of world consumption based upon high growth in both population and per capita incomes. This examination shows that without recycling and without any technological advance there are sufficient mineral deposits equal to those in use today remaining to be discovered to meet demands through 2025. The remaining stocks of such potential deposits will still be very large at that date.

Very substantial research is required (as I stated in my paper) on the understanding of the occurrence of mineral deposits and the processes by which they are discovered. Mr. Cloud and I simply will not be able to convince each other until we have a much better understanding of the physical and economic phenomena involved.

*Question 7.* As Mr. Cloud has emphasized, it is important to diversify our suppliers of minerals for which we are heavily import-dependent. It is my impression, however, that our Government has taken little or no initiative toward this end but has left mineral prospecting to the mining companies. Do you think it is necessary for government to pursue supply diversification more actively? If so, how do you propose that we do it?

Answer. Diversity of supply is a desirable objective; however, I believe it would be more cost effective and better public policy to embark on a well-defined stockpiling program to assure continuity of supply rather than a Government directed supply diversification program.

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RESPONSE OF PRESTON CLOUD TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

*Question 1.* Is it necessary or at least desirable to restructure economic norms, values and habits to move away from the economic model that encourages increased consumption of resources toward a model that limits growth and such consumption; Should the United States begin limiting consumption of, say, the 25 resources critical to the preservation of industrial society, through such means as natural resources depletion quotas?

Answer. My intuitive response to both questions is a simple yes, but the alternatives are not either/or. In my view it will shortly become necessary to limit growth in material consumption, and it would be highly desirable to move in that direction now, while we can still exercise a degree of control over directions and rates of movement. Limiting consumption does not necessarily mean limiting operations if they can be performed less wastefully. We are concerned primarily about the rate of removal and dispersal of new virgin raw materials from decreasing grades of ore, leading toward both economic depletion and growing environmental deterioration. Also about environmental impacts from wasteful use and obsolescence. I think depletion quotas are not a bad idea, but imposing them would be a step in the direction of increased governmental intervention that, while it may well become necessary, should not be undertaken until other means of control have been tried. While I consider the idea of the "free market" to be a form of mythology and do not have the same degree of faith in market controls that Prof. Kneese professes, I think that, at the very least, an appropriate first step would be to remove all the subsidies, price controls, environmental laxities, and shipping regulations that now encourage wasteful use of raw materials and discourage recycling. The results should be carefully monitored, and if, after a reasonable trial interval of say 3 to 5 years, they do not show hopeful trends, resource depletion quotas should be imposed.

*Question 2.* Are current government practices in the resource area taking sufficient account of resource requirements to foster future economic growth and in what ways should these government practices be changed to better reflect such long term requirements? For example, should government policies be changed to encourage market decisions in favor of conservation rather than consumption of energy and resources?

Answer. My considered response to this question is an unequivocal yes to the second part. I stress, however, that by conservation I mean conserving, efficient, nonluxury use—not untouched preservation, except in areas specifically set aside for other values. The latter should be large, of limited access, and sacrosanct to the extent that mankind does not need to call on them for a new start following destruction of present high-technology societies.

*Question 3.* Will the drag on economic growth come from increases in costs rather than exhaustion of important minerals or fuels: Will the increases in costs in obtaining raw materials that will inevitably occur mean that the United States cannot expect to experience future patterns of growth which are similar to those which have prevailed? Please be specific in citing how rising costs, and possibly shortages, may bring major changes in patterns of resource use and alter the direction of future economic growth.

Answer. The drag on economic growth will come about not from any specific factor but from a combination of them—increased cost both for materials and environmental protection and cleanup; increasing dependence on foreign sources with accompanying balance-of-payment problems; increasing environmental deterioration as the mining of larger volumes from lower grades expands the

area mined, the volume of wastes, and the rate of emission of noxious extractive chemicals and byproducts to air and water; and the exhaustion of economically workable minerals and fuels, not in the sense of disappearance from the earth, but in the sense that they are worked down to grades below the level of the energy barrier discussed in my paper in volume 4 of the Joint Economic Committee study series on "U.S. economic growth, etc."

The above factors together, on a finite Earth of increasing populations and expectations, surely mean that U.S. consumption of newly mined mineral raw materials cannot continue to increase at anything like the rates that have prevailed in the past. They must eventually stabilize and decrease. Thus, to the extent economic growth is contingent on raw materials, it too must slow down and eventually stabilize or become negative. The service component of present economic growth—taking in one another's washing, education, entertainment, increasing costs of Government and social and urban services, and so on—is the main non-material way in which the economy can continue to grow but even this must have its limits. There is no longer any serious argument about there being limits. The only question is where they are. We can discover them by running full speed ahead until we crash into them or, more prudently, by beginning to apply the brakes now so that we can negotiate a position of stability and avert the crash.

*Question 4.* In his paper, in volume 4 of the study series, Professor Kneese argues that the natural resources policy of the U.S. is "inconsistent, often outdated, and grossly overdependent on direct regulation vis-a-vis modifications in our defective system of economic incentives." The result, he maintains, is "an excessively rapid rate of resource extraction, too much discharge of residual materials to the environment, and an over dependence on foreign sources of supply of some natural resources." Are the present policies really that bad that they lead to such results?

Answer. While I do not agree with Professor Kneese on all points, I do find merit in his analysis, which he has preceded with a clear and simple discussion of the theory of competitive markets. In particular I concur with many of his 4 recommendations on pages 123 to 124 of Volume 4 of the study series. And I suspect that if Professor Kneese and I, or a group of like-minded economists and resource-oriented scientists were to consult together over a period of time in the leavening presence of a few steady state economists such as the perceptive Nicholas Georgescu-Roegen, we'd probably narrow our areas of disagreement and broaden those of agreement.

The principal point at which Professor Kneese and I depart involves what I consider to be grave flaws in the theory of competitive markets—all of which, by-the-way, are acknowledged by him. In particular I take exception to the value judgment involved, and clearly stated by him on page 126, that: "the personal wants and preferences of the individuals who constitute the present members of society (emphasis mine) should guide the use of that society's resources."

This Nation began with the cry "no taxation without representation." A terrible tax is being levied, without representation, against future generations. This tax takes the form of resource depletion, environmental degradation, and the unasked custody of the noxious residues of a growing fission economy. Those injustices must be charged to the so-called free market. For total freedom of markets can only apply where supply greatly exceeds demand as it did during the first century and a half of this Nation's history. When demand approaches and then exceeds rational supply process, as it has in recent decades, markets must be controlled in some ways. I would not care to suggest those ways in detail without much fuller discussion involving all constituencies of the republic, including attention to the needs and likely problems of that larger constituency yet unborn. When we examine carefully and humanely the likely consequences of the continuation of present trends, I suspect that an enlightened society would wish to devise ways to protect themselves against emergency and their descendants against undue austerity. The ways devised might well include depletion allowances and mineralized regions set aside as federal resource reserve.

I join Professor Kneese in his endorsement of the idea of a Department of Natural Resources—a department that would logically include activities now encompassed by Interior, Agriculture, the Environmental Protection Agency, and other parts of the federal bureaucracy. The American people should be able to look to such a department for the safeguarding of resources, including wilder-



ness and other "common property" resources, for their future and that of their children and grandchildren in the same sense they look toward Defense, State, and Commerce for security in the present.

*Question 5.* You seem to disagree on a very fundamental point with Professor Vogely. Mr. Cloud, you maintain that for many minerals, recurrent shortages and for some economic depletion can be predicted within the first half of the 21st century. Professor Vogely seems to maintain that in the period 1975-2025, physical constraints on production of materials are not a threat to continued economic growth. What is the basis for these different opinions? Is it basically a "lack of accurate data" problem?

Answer. There is, of course, an insufficiency of data for unequivocal and final answers to the problem of resource sufficiency, or insufficiency, as there is in any area that involves so many imponderables. But the differences between Professor Vogely and me arise more from the fact that his data are primarily economic and mine are primarily physical, plus differences in our assumptions. Neither of us can clearly foresee what technological advances will do to present physical constraints, or how demographic trends and preferences will affect demand. I doubt that there is a technological fix to the problem of the energy barrier (see figure 2 of my report) for many minerals or that such things as improved secondary and tertiary recovery or recycling will make much difference if present growth trends continue. Neither improved recycling nor doubling of recovery would greatly increase mineral lifetimes at present rates of exponential growth.

As I have explained in my paper in volume 4 of the study series, the absolute limit of recoverability is orders of magnitude less than the total stock of a mineral or element within Earth's crust. Professor Vogely's estimates of that recoverable amount are simply higher than the most optimistic estimates of informed geochemists and much higher than those of the U.S. Bureau of Mines (see table 1 and figures 6 and 7 of my report). I have tried to present the evidence available as fairly, balance it as evenly, and interpret it as optimistically as prudence, geological factors, and energy considerations would allow. Unless a turnaround in demographic and demand trends occurs soon, I would not be surprised to see the anticipated shortages occur sooner and on a larger scale than my provisional projections imply.

*Question 6.* As you have emphasized, it is important to diversify our suppliers of minerals for which we are heavily import-dependent. It is my impression, however, that our government has taken little or no initiative toward this end but has left mineral prospecting to the mining companies.

Do you think it is necessary for Government to pursue supply diversification more actively? If so, how do you propose that we do it?

Answer. When I write of import diversification I do not refer to mineral prospecting, which should be left to the mining companies, aided where appropriate by long range basic research and mapping by the federal Geological Survey to define target areas. I refer rather, in this instance, to direct but informed federal control of import sources involving negotiation and, if necessary, imposition, of import quotas to supplier nations in such a way that resources of every commodity for which we are heavily dependent on imports come from a sufficient number of independent sources that we are not helpless in the face of cartels, arbitrary actions of foreign governments or producers, or national emergency.

Thus I do think Government should pursue supply diversification more actively. A preliminary step would be the long overdue establishment of a strong group of geologically informed mineral attaches in the State Department (the present group is inadequate in number and responsibility and few are well-informed geologically). After appropriate study, State, in full and continuing communication with Commerce and Interior, should then recommend action or legislation aimed at safeguarding against surprise cutoffs or blackmail—with due regard to the proper aspirations and needs of supplier nations.

Let me add one final suggestion. In addition to repealing the discriminatory practices that favor new over recycled materials and levying emission taxes, I would propose a heavy tax on all newly mined raw materials. The purpose of this tax would be (1) to stimulate recycling, (2) to stimulate more conserving use, and (3) to obtain revenues earmarked for support and increase of services that will be involved in the expanded federal program of research, geologic mapping, and surveillance that will be needed to establish new target areas for exploration and to maintain the kind of overview that can identify impending materials crises and propose action to avert them.

RESPONSE OF THOMAS VEACH LONG II TO ADDITIONAL WRITTEN QUESTIONS POSED  
BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C. November 19, 1976.

Professor THOMAS VEACH LONG II,  
*Resources Analysis Program,*  
*University of Chicago,*  
*Chicago, Ill.*

DEAR PROFESSOR LONG: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosures.

FOLLOWUP QUESTIONS FOR NOVEMBER 17 HEARING

(1) Is it necessary or at least desirable to restructure economic norms, values and habits to move away from the economic model that encourages increased consumption of resources toward a model that limits growth and such consumption? Should the United States begin limiting consumption of, say 25 resources critical to the preservation of industrial society, through such means as natural resource depletion quotas?

(2) Are current Government practices in the resource area taking sufficient account of resource requirements to foster future economic growth and in what ways should these government practices be changed to better reflect such long term requirements? For example, should Government policies be changed to encourage market decisions in favor of conservation rather than consumption of energy and resources?

(3) Will the drag on economic growth come from increases in costs rather than exhaustion of important minerals or fuels? Will the increases in costs in obtaining raw materials that will inevitably occur mean that the United States cannot expect to experience future patterns of growth which are similar to those which have prevailed? Please be specific in citing how rising costs, and possibly shortages, may bring major changes in patterns of resource use and alter the direction of future economic growth.

(4) In his paper, in volume 4 of the study series, Professor Kneese argues that the natural resources policy of the United States is "inconsistent, often outdated, and grossly overdependent on direct regulation vis-a-vis modifications in our defective system of economic incentives." The result, he maintains, is "an excessively rapid rate of resource extraction, too much discharge of residual materials to the environment, and an over dependence on foreign sources of supply of some natural resources." Are the present policies really that bad that they lead to such results?

(5) The primary theme which Mr. Cloud presents in his paper is that "we need to generate a less materials consuming set of demands while striving to satisfy genuine needs." Do you agree with this assessment?

(6) One of your conclusions is that "international comparisons of energy requirements in industrial production show that many opportunities exist for energy conservation in the United States through the introduction of more ad-

vanced technologies." Will these new technologies be adopted through natural market forces or is there a role for Government in promoting the adoption of energy conserving technologies?

(7) As Mr. Cloud has emphasized, it is important to diversify our suppliers of minerals for which we are heavily import-dependent. It is my impression, however, that our Government has taken little or no initiative toward this end but has left mineral prospecting to the mining companies.

Do you think it is necessary for Government to pursue supply diversification more actively? If so, how do you propose that we do it?

—  
THE UNIVERSITY OF CHICAGO,  
Chicago, Ill., January 31, 1977.

Mr. JOHN R. STARK,  
*Executive Director, Joint Economic Committee, Congress of the United States,*  
*Washington, D.C.*

DEAR MR. STARK: Below are responses to the questions contained in your letter of November 19, 1976, a copy of which finally reached me on Friday, January 28, 1977. Your letters to me since October 29, 1976, have been lost because the street address that you have is incorrect. Apparently, someone garbled the zip code to produce a new street number. The correct address is given above.

Question responses:

(1) Conservation of critical resources implemented through the price system is preferable. Legislation that encourages pricing of resources to reflect their total social costs should be pressed. If we err in pricing, let it be by pricing on the high side, since we should operate as a risk-averse society with respect to nonrenewable resources. If the use of critical natural resources is to be restricted by quotas, much more information and analysis is needed. The roles of and impacts on imports and exports must be carefully evaluated. Quotas could be feasibly implemented, if at all, at the mouth of the extraction facility. Even this limitation would encourage owners of the resources to extract only the best ore grade in a deposit and leave the marginal deposits behind. Regulation at the entrance to industrial facilities would require a government agency of several times the size of the World War II allocation agency.

(2) As stated above, I believe that the role of Government is to ensure a price regime that reflects as accurately as possible the total social costs of resource use. This would definitely include an evaluation of the resource positions of future generations, perhaps discounted at a rate less than that of the short-sighted market rate.

(3) Economic growth will be affected, perhaps to equal extents, by increasing costs of resources; by sudden supply disruptions due to political, climatic, or other noneconomic factors; and, in particular sectors, to the exhaustion of specific resources (e.g., natural gas). Rising costs, including risk premiums paid in the face of possible input shortages, can affect economic growth in four ways:

(a) If all costs, technologies and demands are frozen, the total output must decrease.

(b) The economic system will eventually adjust by introducing less resource-intensive technologies. These technologies can be both more capital and more labor intensive. There will also be shifts from production techniques that use scarcer or more unstable resource supplies to those that yield the same item for final consumption using more plentiful resources, such as iron, aluminum and silicon.

(c) The economic system will adjust through the consumer's decision to shift from the purchase of a good that utilizes the high-cost resources in its production to those that consume lower cost, more plentiful materials if the original item is not an essential. If substitutes for the higher cost goods exist, they presumably will be purchased on (nearly) a one-to-one basis. If they do not, the consumer will still decrease his consumption of the high-cost good, shifting to other purchases that provide the same degree of want satisfaction, though perhaps for different wants.

(d) A final result may be that there is a greater effort of nations to "specialize" in the production of finished goods in which they have a competitive advantage because of their natural resource position.

(4) Kneese's views reflect the usual economist's position, with a basic orientation to market allocation. There is more than a grain of truth in his argument, and I am basically sympathetic, as detailed in my response to question (1). However, the issues are, where does one go from here legislatively and how fast? One factor that economists often omit when arguing for less regulation is that regulation is an attempt to adjust market prices for real social costs that would have to be borne by specific groups in our society. A refreshing way to look on regulation is to consider it to be a means of assigning a good an infinite price. In the absence of other mechanisms to protect impacted sectors of society, regulation could be the most desirable means of adjusting prices to reflect true social costs. Consequently, we first need an ongoing research agency that will examine the distributive impacts of resource pricing and policy on every sector of economic society. This agency should study not only the problem of compensating the lower income groups for increasing costs of necessities, but also methods of smoothing and speeding transitions of industrial sectors to a capital structure that is more in equilibrium with current and projected resource prices. With suggested substitute measures in hand, it should then conduct a comprehensive review of regulatory practices vis-à-vis natural resource use.

(5) Strongly agree, being time risk-averse.

(6) Natural market forces will play an important part, but Government can assume a stimulative role by improving the collection and dissemination of information regarding extant foreign technologies; by supporting research aimed at leap-frogging these technologies to ones that will be even more efficient in a world with even higher relative resource prices; through positive measures in capital markets; through reexamining its position relative to American industry to enhance efficiency at the government-industry interface; and through reexamining our concepts of proper industrial structure, which date from the late 19th century, questioning if more resource-efficient structures are possible (even if a degree of vertical and horizontal integration is implied). For example, would industrial "cooperatives" for small entrepreneurs furnish the same aid that farmers' cooperatives have? The role of government in regional industrial planning should also be increased.

(7) Diversification is definitely one means of paying the costs of insurance against supply disruptions and should be explored. One possible mechanism, which needs a thorough, perceptive and no-holds-barred evaluation, is the creation of public corporations that would compete with private firms in the resource market place, without subsidy and with the requirement that they earn a prescribed internal rate of return. Aside from the costs of entry into free competition, there should be no burden on government funds, and all economic efficiency criteria are met. Indeed, to the degree that such a corporation is successful in competing for and exploiting public resource holdings, all their economic rent is captured by the public rather than by private entrepreneurs.

I hope that this has answered your questions in some depth, given the time constraints imposed by the late receipt of your request.

Cordially,

THOMAS VEACH LONG II.

Representative BOLLING. I would like to close by telling you a true story which may console you a little as to how few Members of Congress were present at this session.

A long time ago I had the opportunity to spend about 1½ hours with a man who was on the verge of becoming President. He had been a member of the Joint Economic Committee and had never come to a single session. In that 1½ hours I discovered that he knew a great deal more about a whole series of studies that I had been responsible for on a variety of subjects that I remembered. He had found the documents useful, and he had read them and remembered them. Their effects showed in his short Presidency in his whole approach to tax policies based on what he had learned from reading documents. And, of course, it was President Kennedy. And that was in 1960.

So we hope in this committee that our endeavor to bring you together and to have a conversation will have a good deal more long-range effect than it does short-range effect. But I can say that I for one have very much enjoyed this panel. And we thank you again for being here.

And with that, the committee will stand recessed until tomorrow morning.

[Whereupon, at 12:15 p.m., the committee recessed, to reconvene at 10 a.m., Thursday, November 18, 1976.]

# LONG-TERM ECONOMIC GROWTH

THURSDAY, NOVEMBER 18, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to recess, at 10 a.m., in room 345, Cannon House Office Building, Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representative Bolling.

Also present: William A. Cox, Robert D. Hamrin, and Louis C. Krauthoff II, professional staff members; Michael J. Runde, administrative assistant; and George D. Krumbhaar, Jr., minority professional staff member.

## OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative BOLLING. The committee will be in order.

Today's hearing is the last in this set of hearings to examine the key issues related to U.S. economic growth over the next decade. I am pleased to say that we have not limited our examination to only the economic related variables that affect economic growth. Rather, we have also examined in yesterday's hearing the question of energy and resources availability and substitution possibilities as well as other noneconomic forces in the hearings last week such as changing values and attitudes. This certainly is necessary as these most assuredly will have a major effect on our growth rates and patterns of growth.

Tomorrow, we will focus on the types of growth policy processes that may be needed if the United States is to deal in an effective manner with these many issues related to economic growth. We need to examine what types of processes could be established that could take into account the effect these longer run, often basic, structural forces will have on our economy and our society in general.

Today, however, we must cover two very important and closely inter-related areas that as much as any will determine what rates of economic growth the United States can anticipate as well as the emerging patterns of growth. The issues are productivity and technological change.

In the past three decades, the United States pretty much took for granted that productivity increases would be occurring each year and that technological change would always be a major stimulus to growth. We have heard and seen in recent years that such assumptions may be unwarranted. Today we have with us the authors of the two papers submitted to the study series on future productivity prospects. The

conclusions they reach are strikingly different—one postulating a brighter future and the other claiming that productivity may decline to zero. I look forward to a stimulating discussion on this issue today.

Technological change is another area upon which there has been much disagreement in recent years. On the one hand, you hear that the United States no longer is the acknowledged leader in many technological areas and that it may have reached a technological plateau. On the other, you hear of many new products coming on the market which are claimed to be the wave of the future and thus that there is much technological dynamism today. Again, this is a basic issue on which I hope we can reach some consensus today.

The issues are critical ones and complex but I am confident that the panel members today, which represent a variety of perspectives, will provide us with many new insights.

And I cannot resist also adding at the beginning of this session a quote from a book:

One peculiarity of this age is the sudden acquisition of much physical knowledge. There is scarcely a department of science or art which is the same, or at all the same, as it was 50 years ago. A new world of inventions . . . has grown up around us which we cannot help seeing; a new world of ideas is in the air and affects us, though we do not see it. . . . If we wanted to describe one of the most marked results—perhaps the most marked result—of late thought, we should say that by it everything is made “an antiquity”. . . . Man himself to the eye of science has become “an antiquity”.

I imagine that if Walter Bagehot were alive today he would be amused by what he said a 100 years ago, because clearly the developments of the last 20 years would make what he saw then seem a relatively minor phenomenon.

Our first witness this morning, Mr. Kendrick, is the Chief Economist of the Department of Commerce. Before that he was a professor of economics at George Washington University, and at the same time he was a consultant to the Office of Statistical Standards, Bureau of the Budget, and a member of the Advisory Committee on Economic Studies of the National Science Foundation.

Mr. Kendrick received his various degrees at North Carolina, the University of Chicago, and George Washington University.

He served as a business economist in the Office of Business Economics of the Department of Commerce until 1953, at which time he took a position as the President's staff economist for the National Bureau of Economic Research.

He has written widely in the field of productivity, his most recent publication being a paper that he prepared for this series.

We are very glad to welcome you here this morning, Mr. Kendrick. Will you please start off the discussion?

I will give my usual and not very meaningful admonition. We hope the panelists will try to stay somewhere within 10 or 15 minutes in their opening statements.

#### **STATEMENT OF JOHN W. KENDRICK, CHIEF ECONOMIST, DEPARTMENT OF COMMERCE**

Mr. KENDRICK. I will take less than 10 minutes.

First, I will summarize my paper, “Productivity Trends and Prospects”, which was printed by this committee on October 1 as part of

your series on economic growth from 1976 to 1986. I might say that I wrote this paper before assuming my present post in the Department of Commerce. It really reflects my own views prior to June. My comments here are in my personal capacity rather than as a spokesman for the Commerce Department.

Representative BOLLING. We thank you for your presence.

Mr. KENDRICK. Thank you.

I will comment briefly on the paper by Mr. Renshaw and that of Mr. Rosenberg. Unfortunately I had not seen the technology paper until last night so I did not include comments in my prepared statement.

In the paper for the committee I analyzed the reasons for, first of all, productivity growth, and then for the productivity slowdown during the past decade 1966 to 1976. I appraised the outlook for the decade ahead. My conclusion is that productivity, whether defined as output per hour work or output per unit of total factor input—total factor productivity—will grow somewhat faster during the next decade 1976 to 1986, than in the past decade. But I don't think it is going to return to the old trend which prevailed up until 1966. So I am both optimistic and pessimistic, in that I don't visualize our getting back to the old rate of  $3\frac{1}{3}$  percent on output per hour, or  $2\frac{1}{3}$  percent on total factor productivity.

Incidentally, this is more or less the same conclusion that was reached independently by Jerome Mark of the Department of Labor and Edward F. Denison of Brookings Institution in papers which they prepared two days ago at a symposium on "The Future of Productivity" sponsored by our National Center on Productivity and the Quality of Working Life. Denison went through his growth accounting framework and tried to quantify the major causal factors and came up with the rate of growth for the next 10 years which is not back to the long-run trend rates.

Acceleration of productivity growth in the decade ahead compared with the past 10 years seems likely, however, due to the probable reversal of some of the negative factors which caused the deceleration after 1966. In particular the proportion of the labor force 16 to 20 years of age will be decreasing rather than rising. We think the fall in the youth labor force did have a depressing effect on productivity, not just because average pay and product per worker are lower in that early age group, but less experience means somewhat less productivity. With that reversing itself, since fortunately youth is a condition which cures itself with time, we would expect an improvement from that point of view in the coming years.

Two, the inflation rate is not expected to accelerate to the same degree as it did between 1966 and 1974. The accelerating inflation had various negative consequences, including reduction of the real rate of return on capital, which tended to slow down investment to some extent.

Three, the rate of utilization of plant capacity and of human resources is expected to be higher in the target year 1985-86 than it has been in the past year 1975-76. This is part of the cyclical kicker that we get through recovery to relatively full employment with respect to productivity.

Four, Government intervention in and regulation of the economy is expected to be somewhat less during the next decade—this is just my



own judgment—and/or somewhat more rational with respect to regulation in the past decade.

Five, values and attitudes may be more conducive to increasing efficiency, because certainly some of the negative social tendencies of the late 1960's associated with involvement in Vietnam are already beginning to dissipate, and I think there is a somewhat more positive social scene, which I would hope will continue in years to come.

And six, as the rate of increase of the labor force slows down during the decade ahead—which, as you know, it will, due to the drop in the birth rate beginning in the late fifties—the rate of growth of real tangible capital goods per worker will accelerate somewhat, since the growth of labor will drop.

There are two major reasons why I do not expect productivity advances to return to the 1946–66 trend rate of around  $3\frac{1}{3}$  percent with respect to output per hour during the next decade. One is the tendency toward diminishing returns in extractive industries, which is catching up with us. And that will be heightened by efforts to achieve greater national energy independence as we push production of oil and gas to a greater extent and various other energy materials into deposits in which productivity would be lower.

And two, there will be a slower increase in the stock of knowledge and know-how, and thus in the rate of invention and innovation during the next decade, since NSF, for example, projects that the ratio of R. & D. to GNP will be around 2 percent in the coming decade. That contrasts with a rising ratio in the 1946–66 period which peaked at around 3 percent. I think a major reason for the deceleration in productivity of the last decade was the drop in R. & D., and thus a slowing down in our growth of knowledge and know-how with respect to science and technology, which impacted negatively on productivity. I should say that the major source of productivity advances is, of course, technological progress. So any factor which slows down the progress of technology would show up in slower growth of productivity.

I do think that Mr. Renshaw is unduly pessimistic in projecting an average annual rate of increase in real GNP per person of only about 1 percent in the next couple of decades, with little or no increase thereafter. The chief support for his position is the scarcity of natural resources, particularly energy materials. That is one reason that I don't expect we will get back to the old trend. But I think he underestimates the potential of scientific and technological advance for overcoming developing shortages. His assertion, or his quote—I guess he quoted someone else who asserted that there are limits to knowledge, absolute limits to knowledge—is certainly a questionable one. I would think in the infinite nature of the universe there is no limit to the boundaries of knowledge. Even if there were some ultimate limit, I do not think that it would impose limits on useful applications of knowledge within relevant time periods.

Further, even if productivity in extractive industries were to level out and to decline gradually, because of the small weight of extractive industries in the GNP national productivity could still rise significantly as it continued to increase in the nonextractive industries, and indeed as we tended to shift production more toward services and other areas in which materials are not a major input.

Actually, I do not consider it to be out of the question for the United States to return to the pre-1966 productivity trend rate if appropriate policy measures are taken. In particular, it is important that the Federal Government develop a rigorous and coherent set of policies to promote science and technology and the tangible investments in which technological innovations are embodied, and needless to say, to continue to advance education and training, since technology as know-how is embodied in people as well as in machines. The reestablishment by the President in August of this year of an Office of Science and Technology Policy—as you recall, Guy Stever was confirmed by the Senate as the head of that Office and Science Adviser to the President—will provide a focal point for the development of, I hope, a comprehensive science and technology policy for the country. In this the Science Adviser to the President will benefit by the sensible suggestions offered by Professor Nathan Rosenberg in his paper, and by the suggestions of many other qualified persons in and out of Government whose advice will doubtless be solicited. I would think that optimal policies would call for a reversal of the declining ratio of R. & D. outlays to GNP by a combination of increased Federal funding and possible incentives to privately financed R. & D.

Elsewhere I suggested that the investment tax credit be extended to R. & D. as a means of stimulating more basic research, applied research.

Incidentally, in trying to stimulate R. & D. I believe that Professor Renshaw is in agreement on this, although he doesn't say it would provide as much of an offset to the resource problem as I think it could.

Although increased R. & D. tends to elicit increased private fixed investment in plant and equipment, I also think that additional incentives to plant and equipment outlays should be legislated, such as the integration of the personal and corporate income taxes, which would eliminate the double taxation of dividends. In my paper I list a number of options, some of which have been proposed by the present administration but have not yet been enacted by the Congress.

Representative BOLLING. Thank you.

Next Mr. Edward Renshaw.

Mr. Renshaw's paper on productivity is published along with that of Mr. Kendrick in volume 1 of the Joint Economic Committee's study series "U.S. Economic Growth From 1976 to 1986: Prospects, Problems, and Patterns." Mr. Renshaw is professor of economics at the State University of New York at Albany. He did his undergraduate work in Washington State and received his M.A. and Ph. D. at the University of Chicago. He has taught at the University of Chicago, at California at Berkeley, North Carolina, and California at Los Angeles.

He was a member of the staff during program evaluation of the U.S. Bureau of the Budget in 1967 and 1968.

He has received a variety of honors.

He has written many books and articles.

It is good to have you with us this morning, Mr. Renshaw. We are looking forward to your statement.

**STATEMENT OF EDWARD F. RENSHAW, PROFESSOR OF ECONOMICS,  
STATE UNIVERSITY OF NEW YORK AT ALBANY**

Mr. RENSHAW. Thank you, Congressman Bolling.

First, I would like to express my appreciation to the Joint Economic Committee for soliciting divergent points of view.

In the late 1950's Professor Robert Heilbroner noted in his book "The Future as History":

Amid the general acceleration of the prospects for continued growth something very much akin to the faith of the early classical economists in the inevitability of progress has come to pervade the atmosphere. There has been a change from the skeptical, no doubt too skeptical, attitude of the late thirties, to mid-forties to an attitude which now seems reluctant to probe for anything which might throw a damper on the prevailing enthusiasm.

While there has been a notable slump in productivity in recent years, and one can detect a certain amount of uneasiness among certain growth minded businessmen, there still seems to be a reluctance on the part of the economic profession—and I would say Professor Kendrick in particular—to probe for anything of an enduring nature that might throw a damper on the prospect for productivity and continued growth.

To most Americans the idea of a no growth economy is very much like death—something they recognized as perhaps being inevitable in the more distant future but not something that they would prefer to talk about. This, however, in my judgment, is a head in the sand attitude that could easily turn out to be ill advised when formulating long-run economic and budget policies. Retarded growth in output per person has already made it far more difficult to control inflation and if the productivity slowdown continues, Government will be further constrained in its efforts to solve other problems.

The growth rate of output per hour for all persons employed in the private domestic economy slumped from an average increase of 4.1 percent from 1947-53 to 2.1 percent from 1966-73 and has since increased at an average rate of only about 1 percent per year. When this slump in productivity is examined from the perspective of natural resource scarcity and such basic dimensions of economic progress as the speed, scale and efficiency of converting inanimate energy into useful working effects it becomes even more clear that the prospects for further improvements in labor productivity are limited. My own guess is that real GNP per worker in the United States will never again increase by more than about 30 percent and that most of the remaining increase will occur in the next two decades.<sup>1</sup>

It should be noted that the more industrialized nations of the world are now more than 90-percent dependent for their energy on fossil fuels and uranium. The prices and costs of these fuels can reasonably be expected to appreciate in real terms by from 10- to 100-fold or more in the next 1,000 years. Whether the United States will be able to preserve an affluent way of life when our existing and yet to be discovered reserve of naturally occurring oil and gas are largely exhausted is uncertain.

<sup>1</sup>For a further elaboration of this view see the attached appendix titled, "The End of Progress Hypothesis Revised" and my recent monograph, *The End of Progress: Adjusting to a No-Growth Economy*. North Scituate, Massachusetts: The Duxbury Press, 1976.

Productivity until fairly recently, has been almost synonymous with improvements in output per unit of labor input. As we near the limits of technological progress, however, it will not be possible to increase one kind of productivity, without a sacrifice of some other kind of productivity. In the future much more attention will have to be paid to the productivity of other factors of production such as energy and capital even if it means a fairly substantial sacrifice in the growth of labor productivity.

Our knowledge with regard to the effective promotion of improvements in productivity in my judgment is meager. The large amounts of unemployed resources which currently exist in the United States, and the high degree of positive association which has existed over time between changes in productivity and changes in total output, would suggest, however, that the most effective way to increase productivity in the short run is to adopt these fiscal, monetary, price and wage measures that are likely to be the most effective at reducing unemployment.

Of particular concern, not only in the short run, but also in the long run, is the severe depression that still exists in some of our capital goods industries. Our gross national product in constant dollars was 3.5 percent less in 1975 than in 1973. The main reason for this decline was an even more precipitous drop of 33.5 percent in the real value of gross private domestic investment.

Real GNP recovered to a new historic high in the first quarter of 1976. Gross private domestic investment, on the other hand, was still 19 percent less than in the second quarter of this year than in the fourth quarter of 1973. The poor recovery in capital spending has now slowed the GNP growth rate to the point of being insufficient to insure a steady decline in unemployment.

The emerging question, it would appear, is not whether the new Congress should adopt tax and expenditure policies which are more stimulative, but what kind of policies are most appropriate. While practical politics may dictate other types of solutions, there is not much doubt that our economy would be more productive in the long run if Congress were to emphasize policies to first stimulate and then stabilize the growth of capital spending. In 1975, for example, almost 45 percent of our total gross savings were used up and in a long-run sense, largely wasted by the Federal Government in its effort to ameliorate the human misery associated with the severe slump in private investment.

There are numerous programs to cope with the problem of unemployed workers. It is hard to find any programs, however, that are expressly designed to stabilize aggregate investment spending. The recent extension of the 10-percent credit on new equipment through 1980, for example, may actually be counterproductive, since it eliminates the incentive to buy new equipment now for fear of losing part or all of the existing credit in the near future.

If the purpose of the tax credit were to stabilize investment spending and reduce the risk of inflationary booms followed by serious recessions, that purpose could be served more efficiently by linking the amount of the tax credit to a countercyclical index such as the percent of the labor force that is unemployed, on the average, during either the year or the accounting period in which the investment is made.

A formula which I find appealing would make the investment credit, in percent, equal to two times the average unemployment rate minus two percentage points. This would imply an investment credit of 14 percent when the unemployment is 6 percent, and a credit of only 6 percent when unemployment drops to 4 percent. Such a formula would provide entrepreneurs with a fairly strong financial incentive to invest now rather than wait until 1978 or 1979 when the economy has recovered to a condition of reasonably full employment.

If separate tax credits were computed for investment in different regions and labor markets with above average employment, a generalized system of investment credits linked to unemployment could serve other worthwhile purposes such as helping to revive depressed areas and rebuilt central cities with deteriorating factories and office buildings.

Another serious problem to be faced in the next decade is our prodigal use of energy. Belgium, Norway, Denmark, Britain, Sweden, Austria, and West Germany have all reduced their consumption of primary energy per unit of real GNP by from 5 to 10 percent since the oil embargo of 1973. In the United States, on the other hand, there was no reduction in the use of energy per unit of aggregate output from 1973 to 1975.

Domestic oil production reached an historic peak in 1970 and has since been declining at an accelerated rate. In 1975 our consumption of petroleum products was 18 percent greater than in 1970 while domestic crude oil production was down 13 percent on the average. Imported oil, as a consequence has soared from only 21 percent of U.S. consumption in 1965 to almost half of our present consumption. We are now more than twice as dependent upon Arab oil as was the case at the time of the oil embargo of 1973.

Mark Seidel, an economist at the Federal Power Commission, has estimated that from \$50 to \$100 billion might usefully be invested in increased insulation and other kinds of home improvements that conserve energy. If the investment were made over a 5-year to 10-year period, the annual cost would be about \$10 billion and the number of jobs created would total almost 1 million. Since much of the labor could be supplied by unemployed construction workers, apprentices and persons with relatively little training, it seems clear that a major conservation would not only help to increase the productivity of existing buildings but would also go a long way toward helping to solve a serious unemployment problem.

In New York State alone, more than 40 percent of all housing units have no insulation and most of the rest have inadequate insulation. The time has come, it seems to me, when Congress should not only enact a massive program of low interest loans and special tax credits to encourage the retrofitting of old buildings with a socially desirable amount of insulation but also seriously consider the possibility of imposing stiff penalties on those property owners who do not properly insulate their buildings by say 1980.

Thank you.

[The attached appendix to Mr. Renshaw's statement follows:]

## APPENDIX TO STATEMENT OF EDWARD F. RENSHAW

## THE END OF PROGRESS HYPOTHESIS REVISITED

In 1963 this author examined various factors which have contributed to a dramatic "Substitution of Inanimate Energy for Animal Power," noted that none of these factors seemed to be open ended or exempt from the law of diminishing returns, and suggested that real wages, which had doubled, redoubled and then doubled for a third time in the space of about one century might "never double again".<sup>1</sup>

In the ensuing decade from 1963-73 real hourly earnings in the private non-agricultural sector of our economy only increased 17.5 percent compared to 25.9 percent in the preceding decade. During the more recent period the national fertility rate also dropped from about 2.5 children per woman in the child bearing age range to only 1.9 children. A fertility rate of 2.11 would be required in the long run to prevent our total population from declining if there were no immigration or change in average life expectancy. The surprisingly small advance in real earnings especially in the latter half of the 1960's, and our apparent nearness to a no growth population has led this author to go even further and suggest that the United States and some of the more advanced industrialized nations of the world may already be more than halfway to the end of economic progress.<sup>2</sup>

This can be interpreted as implying that real GNP, as presently measured will never double again. It might be noted that our own gross national product has doubled five times in the last century and is now more than forty times greater than in 1873. One does not have to assume a very sharp departure from the post World War II trend in output per worker, however, to support the notion of a rapid end to economic progress.

The most dramatic way to illustrate this point is to divide the 25 years of change from 1947-73 into three subperiods which bridge years of peak prosperity and then decompose the average annual growth rates for real GNP into that component part which can be explained by an increase in total employment and that part which results from an increase in real output per member of the employed labor force. This is done in Table 1 for the three subperiods, 1947-53, 1953-66 and 1966-73.

Total GNP and GNP per worker both increased at very rapid rates of 4.8 and 3.6 percent, respectively, in the first subperiod as American enterprise began to replace worn-out equipment and benefit from unutilized technology which had been developed during World War II and the depression of the 1930s. Since this was a time of catching-up, a slump of more than one percentage point in both of these growth rates to 3.6 and 2.2 percent was perhaps to be expected in the following subperiod from 1953-66. Of far greater concern is the fact that the GNP growth rate continued to decline from 3.6 to only 3.3 percent in the more recent subperiod from 1966-73.

This decline is particularly puzzling in view of the fact that the growth in total employment increased from 1.4 percent to 2.1 percent per year. With other factors remaining the same, the GNP growth rate should have accelerated by seven tenths of one percent. This acceleration was more than offset, however, by an additional one percentage point decline in real output per member of the employed labor force. In the last two decades the growth rate for real GNP per worker has fallen from 3.6 percent to an average increase of only 1.2 percent.

TABLE 1.—AVERAGE ANNUAL GROWTH RATES FOR REAL GNP, TOTAL EMPLOYMENT AND REAL GNP PER MEMBER OF THE EMPLOYED LABOR FORCE IN THE UNITED STATES FOR THE SUBPERIODS 1947-53, 1953-66, AND 1966-73

Subperiod	Real GNP	Total employment	Real GNP per worker
	(1)	(1)	(3)
1947-53.....	4.8	1.2	3.6
1953-66.....	3.6	1.4	2.2
1966-73.....	3.3	2.1	1.2

<sup>1</sup> Journal of Political Economy, June 1963, p. 292.

<sup>2</sup> Edward F. Renshaw, "The End of Progress: Adjusting to a No-Growth Economy." North Scituate, Massachusetts: Duxbury Press, 1976, p. 3.

As we look to the future it seems clear that a maturing baby boom has given the United States the potential for increasing its employed labor force by two percent or more per year for the rest of this decade. This growth rate is not likely to be sustained much beyond the early 1980s, though, since the number of live births reached an historic peak way back in 1957. By the late 1960s our total population growth rate had slowed to about one percent.

It should also be noted that the large reservoir of adult women who are not in the labor force may soon be exhausted. Female workers comprised less than 20 percent of the U.S. labor force in 1900. This proportion has since risen to over 40 percent. A participation rate of 50 percent is possible but perhaps not too likely if most women drop out of the labor force for a time to have children and if some women continue to prefer the profession of homemaker.

The past World War II bulge in the number of young people seeking employment and an increasing proportion of the female population looking for work, however, would suggest that total employment in the United States will increase from 30 to 40 percent in the future even if the fertility of American women remains at or below a replacement level. If real GNP is not to double, the implication is that total output per member of the employed labor force will not increase by more than about 25 to 30 percent.<sup>3</sup> When real GNP is expressed in 1972 dollars, this is equivalent to saying that future GNP will not exceed \$19,000 per member of the employed labor force.

To better understand why this might be the case it is helpful to examine the U.S. economy from the perspective of a simple aggregate production function which does a remarkably good job of explaining changes in real GNP per worker from perhaps colonial times until the present.

The pioneering work of a number of economists suggests that a large part of the secular increase in measure national income, perhaps as much as 50 percent, cannot be accounted for in terms of an increase in conventional factors of production, such as labor and capital. This impression disappears, though, if capital is measured on the basis of available horsepower. In 1928 C. R. Daugherty and others noted:

It is manifestly impossible or at least impracticable to make a census of machines. They change and become obsolete too rapidly, and they cannot be reduced to any satisfactory common unit. But there is one way whereby an index of the installation of machinery may be obtained—by ascertaining the total horsepower of the engines that drive the different kinds of machinery. The engines may be of many different types but their ability to operate machines may be expressed in terms of a single unit, the horsepower. . . . It is recognized that improvement in the technique of production or in transmission mechanism may increase the amount of machinery which can be operated by the same amount of horsepower. Nevertheless, it is believed that this difference is not large enough to impair the use of total horsepower as an index of the relative amounts of machinery in use over a period of years.<sup>4</sup>

This sentiment was again echoed in 1956 by Seymour Melman:

The horsepower rating of electric motors used for direct machine drives or as prime movers, is a good average indicator of the degree of mechanization in manufacturing as a whole . . . It is not implied that this criterion of change in production methods is effective apart from new organization methods, application of new raw materials, or qualitative improvement in given equipment. Rather it is the case that, on the average, increased horsepower per worker had accompanied such changes. They are two aspects of the same development.<sup>5</sup>

The horsepower of electric motors and other installed prime movers and the work performed by prime movers are among the few inputs of economic con-

<sup>3</sup> In a recent paper on "Productivity" for the Joint Economic Committee this author has gone on record as indicating that "My own guess would be that real GNP per worker in the United States will never again increase by more than about 30 percent and that most of the remaining increase will occur in the next two decades."

<sup>4</sup> C. R. Daugherty, A. H. Horton, and R. W. Davenport. *Power Capacity and Production in the United States*. U.S. Geological Survey Water Supply Paper No. 579, 1928, p. 13.

<sup>5</sup> Seymour Melman, *Dynamic Factors in Industrial Productivity*, Basil Blackwell, 1956, p. 109.

sequence that have increased more rapidly over time than total output.<sup>6</sup> In 1850 there was only about one third of a horsepower of prime mover available in the United States per person. See Table 2. More than 70 percent of this horsepower was in the form of work animals which are now an insignificant part of our total prime mover. By 1974 the total number of horsepower available per person had increased more than 300 fold to about 116.

When the horsepower of trucks, buses, motorcycles, and private automobiles is subtracted from total prime mover, we are left with an input series that has increased only slightly more rapidly than real GNP during this century. See Table 3. The more recent observations, however, are not inconsistent with the law of diminishing returns. Fitting a parabola to the observations for 1960, 1969, and 1973 gives us an equation with the following coefficients where  $RGNP_w$  equals real GNP per worker in 1972 dollars and  $NAHP_w$  equals non automotive horsepower per worker.

$$RGNP_w = 642 + 1339NAHP_w - 26.2NAHP_w^2$$

TABLE 2.—HORSEPOWER OF PRIME MOVER AVAILABLE PER PERSON IN THE UNITED STATES, 1850-1974

	Total horsepower per person	Nonautomotive horsepower per person
1850.....	0.36	0.36
1860.....	.44	.44
1870.....	.42	.42
1880.....	.52	.52
1890.....	.70	.70
1900.....	.85	.85
1910.....	1.50	1.23
1920.....	4.26	1.62
1930.....	13.51	1.93
1940.....	20.99	1.98
1950.....	31.96	3.05
1960.....	60.92	3.55
1970.....	99.60	5.29
1974 (preliminary).....	115.71	6.12

Source: U.S. Statistical Abstract and Historical Statistics of the United States: Colonial Times to 1957: A Statistical Abstract Supplement.

In col. (3) of Table 3 we present estimates of the difference between actual and predicted GNP per worker when this equation is used to predict labor productivity in the preceding sixty year period from 1900-60. It will be noted that the equation does a relatively good job of explaining earlier observations.<sup>7</sup> Actual GNP per worker is somewhat below predicted GNP in 1920, 1930 and to a lesser extent in 1910 and 1950. These discrepancies may be partly the result of teething problems associated with very large percentage increases in non-automotive horsepower and associated machinery in the preceding decade. Some of this equipment may not have been very reliable and at other times—especially during the depression year of 1930—may not have been utilized to full capacity.

Data compiled by Murray Foss suggest, in any event, that electric motors and other installed prime movers were utilized from one-third to one-half more hours per day in the mid-1950s than during the 1920s.<sup>8</sup> Stabilization in the amount of work performed per horsepower of non-automotive prime mover, with

<sup>6</sup>In addition to my own article on this subject, see Murray F. Foss, "The Utilization of Capital Equipment," Survey of Current Business, June 1963, pp. 8-16 and G. S. Maddala, "Productivity and Technological Change in the Bituminous Coal Industry, 1919-54," the Journal of Political Economy, August 1965, pp. 352-65.

<sup>7</sup>The model also explains Kuznets estimates of GNP per worker quite well for the period 1869-89. While comparable estimates for GNP are not available prior to the Civil War it seems likely that early American settlers with very little horsepower would have had to produce almost \$600 per gainfully employed worker in order to survive in the new world. To earn more than this sum without any supplementary horsepower would not be an easy task even today as is attested to by the very low levels of GNP per person in some of the less developed nations of the world.

<sup>8</sup>Murray Foss, op. cit., pp. 8-16.



perhaps some decline in the average utilization rate in recent years, may help to explain the increasingly dismal trade-off between additional horsepower and output per worker since 1960.

TABLE 3.—REAL GNP IN 1972 DOLLARS AND NONAUTOMOTIVE HORSEPOWER PER WORKER, SELECTED YEARS, 1900-1973

Year	Real GNP per worker (1972 dollars) (1)	Nonautomotive horsepower per worker (2)	Actual minus predicted GNP per worker <sup>1</sup> (3)
1900.....	\$3,833	2.35	\$189
1910.....	4,454	3.24	-251
1920.....	5,135	4.24	-713
1930.....	5,958	5.21	-949
1940.....	7,263	5.52	28
1950.....	9,058	7.88	-508
1960.....	11,198	9.74	0
1969.....	13,849	13.35	0
1973.....	14,614	14.61	0

<sup>1</sup> Estimated on the basis of the following equation:

$$RGNP_w = 642 + 1339NAHP_w - 26.2 NAHP_w^2$$

Another factor which helped to boost the productivity of non-automotive horsepower and obscure the law of diminishing returns from 1930 to 1960 was a tremendous substitution of trucks, buses and automobiles for railroads. In the period from 1910 to 1930 more than 45 percent of all non-automotive horsepower was used to propel locomotives. In the next 30 years the railroads' share of this total declined to only 7.3 percent. In absolute terms the amount of railroad horsepower declined from 112 million horses in 1929 to only 47 million in 1960. In the more recent subperiod from 1960-73 there has been a modest increase in the amount of horsepower employed by railroads.

When equation (1) is differentiated with respect to non-automotive horsepower and the resulting expression is set equal to zero we obtain an implied upper limit to GNP per worker equal to \$17,750 in 1972 dollars. This figure is only 21.5 percent greater than the amount of GNP produced per worker in 1973.

A parabola, of course, is not the only production function that could be fit to the historical data. Some well-known production functions, such as the logarithmic or Cobb-Douglas production function have no ceiling as far as output per worker is concerned. At this juncture it is still too early to tell what kind of production function will provide the best long run description of the historical tradeoff between output per worker and horsepower per worker. One would hope that equation (1), which fits the historical data a little better than other functions,<sup>9</sup> maybe overly pessimistic and will not do as good a job of bounding real GNP in the future as in the last 75 years. When labor productivity is examined from the perspective of such important dimensions of economic and technological progress as speed, scale and the efficiency of converting inanimate energy into useful effects, however, it is hard to be optimistic about the prospect for major gains in aggregate output per worker.<sup>10</sup>

*Efficiency.*—The amount of coal required to generate a kilowatt of electricity, for example, has declined from more than ten to less than one pound in this century. The efficiency of converting fossil fuels and other sources of potential energy into electricity and useful effects, however, is inherently limited to something less than 100 percent. In those instances where heat is used to operate steam turbines and internal combustion engines, the efficiency of conversion can be expected to remain below fifty percent.

<sup>9</sup> Statistical tests are not of much value in differentiating between hypothesis that pertain to data that are extrapolated way beyond the ranged of observed observations. In this case the important test is one of reasonableness rather than statistical confidence.

<sup>10</sup> For a more detailed discussion of these and other factors limiting improvements in output per worker see my paper on "Productivity" to be published in 1976 by the Joint Economic Committee in connection with its study series, U.S. Economic Growth from 1975-1985: Prospects, Problems and Patterns.

*Scale.*—It is now possible to team together hundreds of mechanical horses in a smaller space than was formerly required to house one live animal. The compactness of the mechanical horse has profoundly affected the scale of many productive operations. While the cost of adding additional mechanical horses at the design stage, and especially the cost of housing, caring and driving them after they have been incorporated into an engine are, within wide ranges, less than proportional to the number of horses added, this is not an open ended source of economic progress. Many machines have already been developed which are too big and too unwieldy to be of economic value except in very limited applications.

*Speed.*—Speed is not only symbolic of a progressive economy but one of our more important sources of productivity as well. On the basis of changes which have occurred in the transportation industry, it is not unreasonable to suppose that between one-third and one-half of all improvements in labor productivity in this century may have been either directly or indirectly the result of faster travel times and speedier production processes. One only has to examine accident statistics, however, to know that there is a problem of speed which is both unsafe and wasteful of our energy resources.

Limitations with regard to speed, scale, conversion efficiency and problems that have been encountered in the mechanization of work activities that have not yet been automated have already led to a noticeable decline in the amount of additional horsepower employed per worker from .40 additional non-automotive horses per year from 1960-69 to only .32 additional horses per year from 1969-73. During the same period of time the additional GNP per worker slumped from an annual increase of \$295 to an increase of only \$191 per worker in 1972 dollars. The percentage decline in additional horsepower was only 20 percent compared to a 35 percent decline in the annual addition to real GNP per worker. This would suggest that it is becoming more difficult to invent new machines and to discover new work processes that can employ additional horsepower effectively. The disproportionate slump in output per worker may also have been partly the result of an increasing propensity to use additional horsepower at central electric stations to provide electricity for air conditioning and space heating rather than to operate bigger, faster and more efficient machinery.

Suppose that the annual addition to real GNP per worker continues to average the same \$191 per year in 1972 dollars, as was observed for the period 1969-73. With no further impairment in the growth of labor productivity it would still be 20 years (1996) before real GNP per member of the employed labor force has increased 30 percent and exceeds \$19,000. If limitations with respect to speed, scale and conversion efficiency have not brought the upward surge in real GNP per worker to a halt by that time there is a possibility that natural resource scarcity will accomplish the same end. Of particular concern is whether the United States can continue to support more than 100 horses per person to operate trucks, buses, motorcycles, and private automobiles.

Automotive horsepower was negligible at the turn of this century. It has since exploded to the point of constituting almost 95 percent of all prime mover. The explosive growth in cars and trucks has not only helped to increase worker mobility and output per person but to an increasing extent has made our own prosperity dependent upon political events and pricing decisions which are made by other countries and beyond our own immediate control.

Domestic oil production reached an historic peak in 1970 and has since been trending down at an accelerated rate. In 1975 our consumption of petroleum products was 18 percent greater than in 1970 while domestic crude oil production was 13 percent less, on the average. Imported oil, as a consequence, has soared from 21 percent of U.S. consumption in 1965 to almost half of our present consumption.

The sharp and perhaps irreversible decline in onshore oil production in the 48 contiguous states had led to some dramatic reappraisals of our off shore oil potential. Between 1972 and 1974 the U.S. Geological Survey reduced its estimate of the oil resource potential of the Atlantic outer continental shelf from 114 billion barrels to an estimate ranging between 8 and 16 billion barrels. There is no assurance that even this much oil will be discovered. Some 60 exploratory wells have already been drilled in sedimentary basins east of Nova Scotia and south of Newfoundland with only one minor oil deposit being discovered.

In early 1975 a panel of experts sponsored by the National Academy of Sciences noted that our proven reserves of oil were approximately equal to 37.5 billion barrels and suggested that increments to these reserves might increase the supply of recoverable oil from already discovered oil fields to 54 billion barrels. The committee did not expect more than 113 billion additional barrels of oil to ever be recovered from as yet undiscovered petroleum deposits. If these estimates are correct, all of the known and yet to be discovered oil in and adjacent to the 50 United States could be used up, at least in theory, in less than 28 years at the 1975 rate of consumption of about 6 billion barrels per year and in less than 16 years if consumption were to grow at the seven percent annual rate of increase which occurred from 1969-73.

The United States does have large reserves of coal and rock from which synthetic fuels and shale oil might be extracted. In January 1974, after the price of imported oil was raised more than three fold by OPEC to over \$10.00 per barrel government officials optimistically estimated that the United States would be able to obtain synthetic crude oil from domestic shale and coal at prices ranging from \$6.80 to \$7.70 per barrel. In March 1975, however, Federal Energy Administrator Frank Zarb indicated that a more realistic estimate for exotic fuels such as gasification, liquefaction, and shale oil will probably be in the range of from \$14 to \$22 per barrel. The implication would seem to be that imported oil is not over priced in comparison to man made substitutes and that the price of oil will probably continue to increase at a fairly rapid rate.

When our attention shifts to the price of gas and electricity, which are needed to operate most of remaining horsepower (not fueled by oil), the economic outlook is almost as disheartening. Consumer prices for natural gas and electricity increased more than twice as much in 1974 and 1975 as they did during the entire previous quarter century.

The Office of Research for the New York Public Service Commission has noted, in connection with electricity, that the construction of additional and replacement capacity of generating plants and transmission and distribution lines is anticipated by power companies to be about \$1,000 per kilowatt of capacity in the near future. This represents a 500 percent increase over the 1973 average embedded costs of only \$200 per kilowatt of existing capacity.

During the first seven decades of this century wage rates increased much more rapidly, on the average, than the price deflators for capital, oil, gas and electricity and in so doing provided an ever widening economic incentive to substitute more inanimate energy for muscle power. In the last few years, however, there have been significant increases in the prices of new structures, equipment, fuel and power relative to the price of human energy. See Table 4. This, of course, has made it less profitable to employ additional horsepower and may be at least partly responsible for the deepest and most prolonged bear market in real capital spending by business since the great depression of the 1930's.

While horsepower is not only input of economic consequence we can still conclude that of the factors that restore one's faith in the law of diminishing returns, none has been more neglected by economists than the substitution of inanimate energy for animal power. It more than other technological variables provides an understandable basis for expecting an unexplained increase in measured output, a basis for suggesting that technological improvements can be reduced or classified in terms of a few salient dimensions, and a basis for guessing that we are probably much closer to "the end of strictly economic progress" than most living economists would have dared to suppose a decade ago.

As far back as 1857, however, John Stuart Mill noted: "It must have been seen, more or less distinctly by political economists, that the increase in wealth is not boundless; that at the end of what they term the progressive state lies the stationary state, that all progress in wealth is but a postponement of this, and that each step in advance is an approach to it".

Speaking before the Institute on Man and Science in 1970, Dr. Rene Dubos gave voice to a growing number of scientists and humanists who feel that the times have caught up with John Stuart Mill:

The ecological constraint upon population and technological growth will inevitably lead to social and economic systems different from the ones in which we live today. . . . Whether we want it or not, the phase of quantitative growth which has prevailed throughout technical civilization during the 19th and 20th centuries will soon come to an end.

TABLE 4.—FACTOR PRICE INDEXES AND RATIOS, SELECTED YEARS, 1974-75

Year	Implicit price deflators (1972=100)		Wholesale Price Index for fuel and power	Adjusted hourly earn- ings private nonagricul- tural	Relative price ratios		
	Nonresiden- tial structures	Producers durable equipment			Structures: Col. (1)÷ col. (4)	Equipment: Col. (2)÷ col. (4)	Fuel and power: Col. (3) ÷col. (4)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1947.....	43.7	48.5	64.8	30.9	141.4	157.0	248.9
1953.....	56.8	63.7	78.1	43.3	131.2	147.1	180.4
1957.....	64.4	75.4	83.6	51.0	126.3	139.4	163.9
1960.....	63.1	79.3	81.0	56.9	110.9	139.4	142.4
1969.....	81.1	90.0	85.1	82.2	98.7	109.5	103.5
1973.....	108.0	101.8	113.2	106.4	101.5	95.7	106.4
1975.....	141.7	127.7	206.7	125.3	113.1	101.9	165.0

Representative BOLLING. The next person we will hear from is Mr. Nathan Rosenberg, who is a professor in the department of economics at Stanford University.

He received his undergraduate education at the University of Rutgers, and went on to receive his M.A. and Ph. D. at the University of Wisconsin. He studied at Oxford for 3 years, and returned to this country to lecture in economics at Indiana University for 2 years.

Mr. Rosenberg subsequently became assistant professor at the University of Pennsylvania, and then Purdue, and in 1966 was appointed professor of economics at the University of Wisconsin.

He has written extensively on the institutional aspects of the wealth of nations, and capital formation in undeveloped areas, among others.

We are glad to have you with us Mr. Rosenberg.

#### STATEMENT OF NATHAN ROSENBERG, PROFESSOR OF ECONOMICS, STANFORD UNIVERSITY

Mr. ROSENBERG. Thank you very much, Congressman Bolling.

Since the central focus of my paper is upon the possible benefits of technology, I think it may be appropriate to begin on a cautionary note.

I think it is potentially dangerous to pin our hopes for the future too exclusively upon technology alone. Over the long term, technological change is probably the most important single source of economic growth. However, it is not a panacea for all social problems. Moreover, even where technological "fixes" are available, they usually take a long time to institute, and there are often more effective alternative actions which can be taken in the short run.

If we are too bedazzled by the prospect of technological solutions to our problems, we may give insufficient consideration to other courses of action. For example, it has recently been argued, persuasively I think, that there are greater improvements in the health of the American population to be achieved by immediate changes in life style than through further expenditures upon the development of new and highly expensive medical technologies. These changes include such things as the elimination of smoking, more physical exercise, and greater attention to dietary matters in order to reduce obesity and other infirmities which are linked to patterns of food consumption.

In our preoccupation with possible dramatic breakthroughs in medical technologies we should not lose sight of other readily available ways of improving the quality of our collective health.

In the post-World War II period up to the early 1960's, it was almost universally believed that the United States enjoyed a decisive and unassailable technological superiority over the other highly industrialized nations of the world. Although the notion of a technological gap was never very precisely defined, it was widely accepted that the United States possessed an unquestioned technological superiority, and that this superiority was fraught with the most dangerous economic and political consequences for other countries, particularly those of Western Europe. At the very least the view was widely held in Western Europe that only a drastic overhauling of political machinery would make it possible to face up to what Servan-Schreiber called in his book "The American Challenge," which was published in 1968. Failing some decisive action, Western Europe, according to this view, was destined to slip into the status of an American colony totally dependent upon the United States for both economic and technological leadership.

The speed with which these views were displaced by something approaching their polar opposite was breathtaking. Within a couple of years the view of American technological hegemony gave way to the view that the United States was being overtaken through the wide range of high technology exports—and even many low technology exports—by the burgeoning economies of Western Europe and Japan.

By 1974 a distinguished American economist, Charles Kindleberger, published an article bearing the somewhat ominous title of "American Economic Climateric?", and he proceeded to suggest an affirmative answer to his question.

I think a more judicious view would begin with the recognition that the extraordinary circumstances of World War II and its aftermath made it possible for the United States to increase its technological lead over Europe, a lead which unquestionably persisted between, say, 1940, and 1960. After 1960 the gap began to narrow. Characteristically, Europeans began to articulate their concern over American leadership at precisely the time when they were making significant inroads into that leadership. But it should be apparent that American technological leadership could not possibly persist across the board. Indeed, I think it reflects an extraordinary national conceit in the first place to regard such American technological dominance as being in any sense natural.

I would suggest that the increasing effectiveness in recent years of European and Japanese competition reflects not only the resurgence of their economies after the cataclysmic events of World War II; from a longer historical perspective of a century or more, American's great success as an exporter of manufactured goods was solidly based on an unsurpassed endowment of natural resources. This endowment was far superior to that of any other industrial nation. We are now observing, it seems to me, the effects of a narrowing of factor price differentials between the United States and Europe, especially the end of the historical cheapness of American raw materials as compared to labor and capital. A century ago American labor was very expensive relative to raw materials, and America's technological direction

needs to be understood as an exploitation of the comparative advantage which flowed from this situation. More recently, rising labor costs in Europe and the rising cost of raw materials in America have been leading to a convergence in relative factor prices between the two continents. We are in this sense observing some of the consequences of America's loss of its earlier great natural resources comparative advantage. The sudden Arab oil embargo and the quintupling by OPEC of oil prices only dramatized from this perspective a longer and more pervasive transformation. Ironically, therefore, whereas many Europeans were only recently complaining of the Americanization of Europe, the reality of the situation could be more accurately described as the Europeanization of America.

To be sure, we continue to retain some very important advantages, such as those provided by our large endowment of high quality agricultural land, which still provides the basis for the export of resource intensive products. But our position of overwhelming natural resource superiority is now, I think, largely a thing of the past. Nevertheless, our preoccupation with high technology products should not blind us to the wide range of economic opportunities which are still available to us in more traditional areas. Our capacity to export large volumes of agricultural products, as the Soviet and Chinese grain failures in 1972 served to remind us, is likely to remain one of our most decisive assets in the international arena in the years ahead.

Let me now address myself briefly to the role technology can play in the years ahead in dealing with the problems posed by growing natural resource scarcities. We ordinarily think of technological improvements as beneficial because they raise resource productivity, that is to say, they allow a greater output per unit of input. I have no complaint with such a view, except that it represents a limited perspective. The statement is, first of all, excessively static in nature. It fails to take account of the fact that the very definition of the word "input" in this context is not an immutable one. Our natural environment is fixed, at least in a geological sense, but it is not fixed in terms of its potential economic significance. Indeed, it is one of the most important features of technological change in America that it has continually expanded the resource base of the economy. Advances in technological knowledge have led to the development of techniques for the exploitation of materials which were formerly unexploited. Uranium was only a resource in the geological sense and not the economic sense as recently as 1940. The same was essentially true of even easily accessible petroleum deposits in, say, 1850. The point is that natural resources possess economic significance only as a function of technological knowledge, and improvements in such knowledge have regularly led to an expansion in the resource base of the economy.

Another dimension of this process has become particularly conspicuous in the 20th century as the supply of high quality resources have been gradually exhausted. A major thrust of the 20th century technology has been the development of techniques for the exploitation specifically of low grade resources.

For this reason the question which we often heard asked, "How long is it going to be at present consumption rates before we run out of resource X, Y, or Z?" Is not really a very interesting question. Thus the

gradual exhaustion of the high grade iron ores of the Mesabi Range was followed by innovations such as methods of concentration and beneficiation, as it is called, which made possible the exploitation of the immense deposits of hard, low grade taconite ores which were previously unused.

It would be easy if time permitted to compile a very long list of ways in which new technologies have already made possible a shift from high quality to the utilization of low quality resources.

Doubtless a persistent thing in the future will be the search for technologies which will make it possible to expand reliance upon highly abundant low quality resources for the supply of essential materials. Important harbingers of such shifts in the 20th century are the nitrogen fixation process which fixes nitrogen from the atmosphere, and the increasing interest in seawater, already a source of magnesium, as a source of numerous other mineral inputs.

So that a basic function of technological change as I see it has been to widen in the economic sense the resource base of the economy. It has done this primarily by developing methods for the exploitation of low quality resources, resources which at an earlier period were regarded as uneconomic. It seems apparent that the successful functioning of the American economy with its immense resources requirements will turn in the future upon our capacity to develop techniques for the exploitation of the more abundant of the materials which make up our natural environment. The financial support of research which holds promise of widening our scientific and technological capacity to utilize abundant natural materials should thus be accorded a high Federal priority.

Let me now turn very briefly to a couple of comments on policy considerations.

The first thing that needs to be said is that the rate and direction of technological activities in our society are highly responsive to market forces. Governmental policies toward technology therefore need to be formulated in terms of the impacts which they will be likely to exercise through the market forces of demand and supply.

For the past couple of years we have been treated in some important areas to what I would regard as the rather unedifying spectacle of Government by exhortation. The public has been urged to alter its behavior in ways which will more directly accord with a changed definition of the national interest. At the same time, however, very little has been done to provide the public, industry as well as households, with economic incentives to bring about the desired modification of behavior. There is much talk of energy conservation, but fuel prices remain artificially low, largely as a result of Government regulation. Indeed, some of the goals, such as energy conservation, pollution control and safety, often involve mutually conflicting policies. Automobile emission control devices reduce pollution, but raise energy consumption. Heavier cars are arguably safer to operate, but also raise energy consumption. The goals being laid down by a growing number of Government agencies are often inconsistent, but even more often they fail to enlist the self-interest of the individuals concerned. The result more often than not is a growing sense of cynicism and frustration which contribute to an increasing degree of hostility to and alienation from the Federal Government.

On the macroeconomic level it needs to be emphasized that innovative activity is not likely to flourish in a stagnating or slowly growing economy with a substantial unemployed or underemployed labor force and an underutilized capital stock. Under these conditions the incentive to undertake innovative activity will be weak, and the incentive of workers to oppose the introduction of inventions, especially labor saving devices, will be strong. Monetary and fiscal policies which will assure a sustained high level of economic activity will therefore strengthen both the incentive of business to introduce inventions as well as the willingness of workers to make the necessary accommodations involved in their introduction.

I think this point deserves particular emphasis, because as a result of the preoccupation in recent years with growth accounting, and the attempt to measure the contribution of technological progress to economic growth, there has been a serious neglect of the reverse relationship, that is to say, the contribution of economic growth to technological progress. There seems little doubt that the contribution has in fact been a powerful one in the past, and that expectations of continued high rates of future economic growth have provided highly favorable environments to the willingness of individuals to commit resources to those activities which generate technological progress as well as to the rapid adoption of an invention once it has been made.

In some respects I think public policy toward technology may be more effective if it addresses itself more energetically to rather modest goals and issues in addition to just the big ones. We devote a large part of our concern and public dialog to such big questions as fossil fuel versus nuclear versus solar energy, fission versus fusion and so on. In our preoccupation with the big questions we neglect the fact that there are literally hundreds of things which we can do right now with our present technology to reduce fuel expenditure. While no one of these make a decisive difference, cumulatively they could be of enormous importance. Getting people to respond to these possibilities for fuel savings requires a combination of forceful political leadership together with the introduction of incentives into our economic lives to induce people to reduce fuel consumption—smaller cars with less performance, more extensive use of home insulation materials, substitution of glass bottles for beer cans, and so on. These and innumerable other possibilities for fuel savings are already available with our present technology. What is required is a readiness to induce people to behave in energy conserving ways by a more systematic exploitation of marketplace incentives, including in some cases a further strengthening of the incentives to socially optimal behavior by a selective resort to taxes and subsidies. The obstacles appear to be primarily political and not economic or technological. While one may reasonably anticipate eventual technological solutions to these problems, such solutions are likely to occur only in the long run. In the short run we can take far more effective steps within the framework of our present technology.

And finally, to make a closely related point, the Federal Government in the energy field has in the postwar years poured a massive amount of money into the development of nuclear energy. I am not concerned for the moment to question the wisdom of that decision,



or the manner of its execution. I do, however, want to point out the unfortunate consequences of having placed all the energy eggs in a single basket, especially a source plagued with numerous uncertainties, and almost totally neglecting all other options. It is truly astonishing that we still know so little in serious operational detail about the technological possibilities of energy alternatives such as shale oil and coal gasification and liquefaction, in view of America's abundant endowment of the appropriate resources.

But although the problem has recently arisen and presently confronts us most urgently in the energy field, I am anxious that my point not be confined to that context. The general point to be made with respect to Government technology policy is that the national interest may require that we develop a capability for shifting to alternative sources of materials in various areas. The point is to be sure one which is more urgent in an international environment where access to vital raw materials is likely to be manipulated in response to either political considerations or the prospect of exploiting some monopolistic or oligopolistic advantage in world markets. Therefore our interests in many areas, it seems to me, dictate the wisdom of maintaining a capacity at least for flexible policy responses to changing conditions. And this is especially true when the productive activity involved is one which is characterized by long lead times, and contains important elements of what we might call technological uncertainties. Such flexibility in turn would require some minimum ongoing research activity at the engineering and technological levels, and possibly even some support of pilot or demonstration plant projects in specific cases, in order to facilitate our capacity to move to alternative technologies more rapidly than appears to be possible at present. In a world of heightened political uncertainties it would seem doubly important that we should as a matter of national policy develop a capacity to reach specific goals via a diversity of routes.

Thank you very much.

Representative BOLLING. Thank you.

Next, Mr. Joseph Coates, who started his career as a research chemist with the Atlantic Refining Co. and then moved on to be chief chemist at the Onyz Chemical Co. In 1961 he became the staff scientist of the Institute of Defense Analysis, and from 1961 to 1970 he served as project manager at the National Science Foundation.

He taught at the American University, George Washington University, and has been an Assistant Director of the Office of Technology Assessment here in Congress since 1974.

It is good to have you with us this morning, Mr. Coates.

**STATEMENT OF JOSEPH F. COATES, ASSISTANT TO THE DIRECTOR,  
OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS**

Mr. COATES. Thank you, Congressman Bolling. It is a pleasure and privilege to participate in this seminar.

My paper emphasizes structural changes in American society over the past 30 to 40 years, and projected into the next 30 to 40 years. It highlights the central conclusion that business as usual is not appropriate over the next few decades. In pointing out business as usual is obsolescent, I attempt to highlight some central roles for Government in dealing with technological change in the future.

Over the next three decades we may anticipate major technological advances and changes in American society in the area of electronics, automation, information handling, food, and biological manipulations, as well as in the more common-place areas of industry, commerce, and domestic devices and appliances. Dominant elements driving these changes are fundamental shifts in the availability of energy and materials which will stimulate major innovation in substitutions, extended service life, and easier maintainability and the increasing role of science as a wellspring of new technologies. It is worth noting with regard to the substitution, which is a central concept in technological change, that some substitutions are straightforward, at the materials level—aluminum for copper, glass for steel, for example. But as we move up the substitution ladder and move away from materials and begin to substitute components, or substitute subsystems, or substitute major social alternatives—for example, substituting nonreturnable bottles for returnable bottles is a system substitution, substituting biomass energy for coal or for nuclear are system substitutions—as we move to these more flexible substitutions, the role of Government becomes increasingly important, and the role of traditional market forces becomes decreasingly important.

Other long-term factors are influencing the future. The increasing role of science as a source of new technologies will undoubtedly continue.

Furthermore the movement of U.S. society into a post-industrial society with its emphasis on knowledge based industries will stimulate major shifts in the nature and location of work, land use, and information associated technologies. My own estimates, for example, are that now roughly 50 percent of the American labor force is in the information business, in the business of gathering, generating, collecting, restructuring, regurgitating, processing, and handling information in one form or another. That fundamental structural change has almost totally eluded serious policy consideration for the American economy over the next three or four decades. But the implications on the nature of work alone are profound for public policy.

Going along with these shifts over the next few decades will be the flourishing, not only of physical technologies, but the flourishing of new social, institutional and psychological technologies.

I think it is important to recognize that technology is not limited to automobiles, electric lights, hybrid corn and pacemakers. Technology also applies to any conscious use of our skills or arts or sciences to achieve a goal. So, for example, the formation of Comsat, in contrast to some other form of institutionalization, is an example of social technology. The development of medical procedures involving biofeedback, and their various institutionalizations, are examples of both psychological and institutional technologies. Certainly the biofeedback question creates interesting public policy issues as a competitor with traditional therapeutic practices.

Market forces will play a dominant role in the realization of these new technological developments. In addition to these forces, technological needs and opportunities will arise which are outside the market system. Such developments, for example, as earthquake control, weather modifications, and other geophysical manipulation are

almost certain to be outside the market system and require significant Government intervention. For example, I estimate that if one wished to control earthquakes and reduce the risk of a major earthquake at a Richter scale value of 8.3, by conducting a series of earthquakes at, let's say at Richter value 3 over a period of 50 years, in other words, a strategy for saving San Francisco, one would literally be stimulating small earthquakes on a day to day basis. The problem of institutionalizing that potential benefit is enormous.

To take another example from the geophysical area, we know that there are hot water deposits all around the world, including under the ocean. We know that we have vast sterile areas in the ocean where the nutrients in one level can't reach the sunlight at a higher level. Thermal upwelling, the generation of heat creating turbulent cycles, could bring about the opening of vast new resources for food from the ocean. One possible technique is to punch holes in the ocean floor to allow this heat to escape and generate the upwelling. We know extremely little about the feasibility and plausibilities of this and certainly have not given much thought to institutionalizing the system.

The principal role of Government is assuring continuing benefits from technology is in guiding the socially effective interplay of the basic variables of land, labor, capital, resources availability, and knowledge. I cite knowledge as a separate category because it is becoming an increasingly significant element in its own right. To be socially useful the interplay must be future oriented, flexible, and information driven. One specific role for Government, therefore, is setting reliable boundary conditions on private and public endeavors with some clarity and incisiveness to permit market forces and non-market forces to operate. Put differently, a principal role of Government is the more effective management of uncertainties with regard to future potential opportunities and risks in order to encourage new and needed developments.

Let me cite, for example, the case of geothermal energy, which is again in no way unique, but rather clear as an example. The primary driving force in the choice of fuels by public utilities is the reliability of supply. They want a 30- to 40-year guaranteed fuel supply. If one considers the integration of geothermal energy into the fuel picture, one finds that there are at least two, possibly three, major uncertainties which may inhibit that exploitation. First, we don't have adequate knowledge about the extent of energy in the geothermal field. And second, we don't have adequate knowledge about the optimal rate of withdrawal. That ignorance would clearly put industry in the position of being unable to determine the optimal investment size, and might lead one day to a plant being high and dry. Clearly the implications call for some kind of actions which will reduce that uncertainty assuming for the moment it is socially desirable to promote geothermal energy development.

The geothermal energy picture may be confounded further by the random processes by which it is now being categorized as either a mineral or water resources, rather than being treated in its own terms. Forcing it into older categories may act as substantial inhibitors to enjoying the potential benefits of geothermal energy. Again one sees a central role for Government in the future management of technology

is setting fairly clear boundary conditions in order to permit market forces and nonmarket forces to operate and innovate.

The principal limitations on technological and scientific decision-making is the inadequacy of knowledge gathered and organized for the purpose of illuminating public policy. Meeting these information needs is a second specific role for government. Since most information is collected for other purposes, modifications which explicitly generate policy related information could bring about a major improvement in both public and private decisionmaking.

The wider practice of the concept of technology assessment as a strategy for getting at issued options, alternatives and consequences for new technology should in general be encouraged in and out of government as one means of improving our knowledge base.

Many major regulatory agencies of government reflect needs and problems decades old which are no longer of primary importance. Consequently, a third specific role of government in guiding technology is the reform of the regulatory agencies through their restructuring. Primary candidates for this specific role of government include agencies regulating communications, drugs, banking, securities, energy, health care, transportation, and marine and oceanographic affairs.

The fourth major role for government, research and development, should be driven by several convergent factors. There are opportunities for new and expanded technological developments with respect to the wiring of metropolitan as well as rural areas for more effective telecommunications; the introduction of major new energy sources such as solar, geothermal and ocean technologies, the reformation of education technologies; welfare and health delivery systems; and the reconstruction of cities and other habitats.

Furthermore, the economically mature society implies not less but different technology, emphasizing social and biological as well as physical technology, personal improvement and human fulfillment. Accomplishing more with less, may very well be the major concern of our society over the next four decades.

There are numerous problems of a high growth society, such as the propensity to maximize on bureaucratic efficiency at the expense of social effectiveness. This opens up again a major opportunity for beneficial changes in and by government by shifting the criteria of bureaucratic performance to effectiveness measures. Problems of the alienation of workers, adverse effects of excessive size and integration of our organizations, and societal needs not accommodated by market forces, as well as the negative side effects of technology, all suggest major changes in goals which will stimulate technological change. These problems could be profoundly influenced by research and experimentation.

I believe it is important to note that as the systems of society become more complex, the random intrusion is not necessarily effective or good. One way to reduce random intervention is through systematic large scale experimentation on problems of great importance where there is little basis for policy choice.

Thank you.

Representative BOLLING. Thank you.

Next is Hazel Henderson, who is the codirector of the Princeton Center for Alternative Futures. This is, I quote, "a deliberately small think tank and private conference center for exploring alternative futures for industrial countries, and explanatory context of human interdependence."

She is a well-known author, lecturer, and scientific activist. Her works have appeared in many publications worldwide.

Among her most recent honors is being named a member of President-elect Carter's Task Force on Economic Policy in September—I assume that is an honor and not just a problem.

She is on the board of directors of the Council on Economic Priorities, a widely known institution, and serves on the advisory board of the Institute for the Future, Environmental Foundation of the National Council of Public Assessment Technology.

Ms. Henderson, it is nice to have you with us this morning.

#### **STATEMENT OF HAZEL HENDERSON, CODIRECTOR, PRINCETON CENTER FOR ALTERNATIVE FUTURES, INC., PRINCETON, N.J.**

Ms. HENDERSON. Thank you very much, Mr. Vice Chairman.

I am going to limit my comments to this panel's subject, "Productivity and Technological Change," since I have addressed more fully the issues of the future of the U.S. economy in my other writings and in my own paper submitted for the study series entitled "Economic Growth: A View From Beyond Economics."

I am not an economist. I consider myself a futurist, and a professional critic of economic and science policy.

I am going to summarize some specific issues and propositions that we consider crucial to understanding the future options for our socio-technical system.

One, we are already encountering social and conceptual limits to growth and international political limits to growth in terms of the new demands for a new economic world order well ahead of actual depletion of specific material resources. Our conceptual crisis involves the limitations of economics in mapping the immense structural changes that have characterized the technological developments of industrialization since its beginning in 18th century England, first described by Adam Smith. His equilibrium model of supply and demand still underlies most of our economic policymaking, and the so-called neoclassical Keynesian synthesis, which ought to incorporate Keynes' disequilibrium view, never actually occurred. Therefore Keynes' macroeconomic management tools were applied, but without updating of the old statistic equilibrium model. This has given rise to today's confusion among economists, who tinker endlessly with our structurally transformed, evolving disequilibrium economy, while still visualizing it as a fluid, equilibrium system which can be changed with the simple hydraulics of aggregate supply and demand. The structural nature of our economy is at last beginning to be recognized, but the problem is that at the moment we have a lag in that we are still using obsolete conceptual models which now map a vanishing system, monitor wrong variations, and are generating many of the statistical illusions. In short, we are drowning in irrelevant data, inappropriately

collected, using old models based on confused goals. All mature industrial economies are in the process of transition from their maximizing of material production, consumption and throughput, based on renewable resources, to economies based on minimizing materials throughput, more recycling and product durability, and the use of renewable resources, and managed for sustained yield productivity.

Therefore our more urgent task is to remap our economy, account for its structural evolution, and redesign other models and indicators more in accordance with today's realities. A key proposition is that this task is interdisciplinary, and given the lag in the economics discipline, insights from other disciplines, general systems theory, thermodynamics, game theory, biology, anthropology, psychology, and technology assessment must now be called upon by all economic policy units in Government, including the Joint Economic Committee and the Congressional Budget Office. Economics is not a science, and economic policy is now too important to be left to the economists.

Two, because techno-economic systems are continually evolving and changing their structure, often irreversibly, there is no possibility of turning back the clock to the simple atomistic world of small producers governed by competition and the invisible hand as in the past.

Therefore the current debate about deregulation is extremely unrealistic. Each order of magnitude of technological mastery and managerial scope inevitably dictates an equivalent order of magnitude of Government coordination and control. Therefore deregulation can only be imagined if we are willing to simplify, reduce the impact and decentralize our technologies themselves so that their effects would be less interlinked and pervasive. This course is unlikely, even though many excessively centralized, over-coherent technologies can be uncoupled, and many clear diseconomies of organizational scale can be decentralized, and probably should be.

Nevertheless we cannot hope to repeal much regulation, only to restructure it and understand its function better.

Three, a sure symptom of conceptual crisis is the proliferation of apparent paradoxes. Today paradoxes abound.

First, the paradox that advancing technological innovation in a free society systematically destroys the conditions required for free markets to function. This is of course because of the scale and the interdependencies it creates. And it systematically destroys the conditions required for voters in a democratic society to master sufficient technical information to exercise well informed votes, that is, the inherent complexities of some advanced technologies, for example, nuclear power, cannot be fully mastered by Senators, Congresspeople, or even the President, let alone the average voter. Therefore such technologies become inherently totalitarian. Worse, their very scale requires social investment and taxpayer subsidies at the same time that they preclude full participation and representation in the direction of technological innovation.

The second paradox is that in mature, industrial societies with highly complex technologies, free markets, laissez-faire policies become unworkable, while at the same time that this private choice system is eroding, we humans have not yet devised public choice systems adequate to manage the complexity we have created, and we

clearly have not yet learned how to plan. Facing this paradox squarely will now be necessary before we can proceed with the tasks of devising a "third way."

The third paradox—and there are many in economics—signals the collapse of its traditional models. The most glaring of these is the inadequacy of the Phillips curve formulation of a supposed tradeoff between unemployment and inflation. Even Phillips never postulated a Phillips curve, but only described in his 1958 paper a tentative hypothesis based on scanty data. It is now possible to prove that the Phillips curve is inoperative, and that there are many other sources of inflation beyond wage costs. For example, the consumer price index, I believe, severely understates inflation. It doesn't take into account the tremendous rises in taxes at all levels of government, and what I call the "vanishing candy bar" inflation syndrome, where the products are all a little shoddier and a little smaller. And you have the same "vanishing candy bar" syndrome in the services in the public sector, whether it is curtailed postal service or what have you. And the CPI seriously understates these kinds of inflation.

But there are two new sources of inflation that are now best understood from beyond the disciplinary view of economics. The first arises from the unmodelable, unmanageable complexity of our society and the soaring unanticipated social costs it is now generating, which are still added to the GNP as if they were real products, and which culminate in a meta-level tradeoff between specialization and division of labor on the one hand, and the soaring social costs and general transaction costs of maintaining coordination on the other. Rather than the much vaunted "post-industrial state" of Daniel Bell, I have described this syndrome as the "Entropy state," where the heralded tertiary, knowledge-based, service sector that Bell envisions is really nothing more than the growing social cost sector.

The second cause of inflation is rooted in our declining resource base and the worsening population resource ratio on the planet. We must now cycle ever more capital back into the process of extracting our energy and raw materials from ever more degraded and inaccessible resource deposits, with ever declining net yields. We believe that the theory of continual substitution is overoptimistic, and does not deal with simultaneous rates of depletion across a whole range of resources, thus reducing substitution options. This type of declining productivity is beginning to manifest itself as a "capital shortage," and exerts a multiplier effect throughout the economy. Since it also involves declining productivity of energy, it is better modeled by using thermodynamics and net energy analyses than traditional economics.

I was happy to note that both Mr. Kendrick and Mr. Renshaw have knowledge of this type of productivity problem based upon the declining resources.

These problems underscore the inadequacies of our measures of productivity, which usually involve measuring output per employee hour, or labor productivity. We now need much better measures of capital productivity and energy productivity to correct this overemphasis on labor productivity and the pervasive drift to excessive capital intensity that it, together with tax credits for capital investments, has now created. We must now corroborate with new indicators the overuse of capital and energy that our old statistics and policies still

encourage and subsidize, as well as the rising efficiency of labor in hundreds of processes which is still masked by linear projections of past labor costs relative to past cheap energy and resource inputs.

Another paradox is that of greater microefficiency in production, but less and less social efficiency and less individual consumer efficiency, which is now leading to widespread social alienation. This indicates an inadequate modeling of efficiency criteria, since efficiency is a meaningless subjective concept unless time horizons and system levels are specified.

And I have a little diagram here, Mr. Vice Chairman, which I have included, which is offered as a corrected model of efficiency where such coordinates are provided to clarify efficiency criteria.

[The diagram follows:]

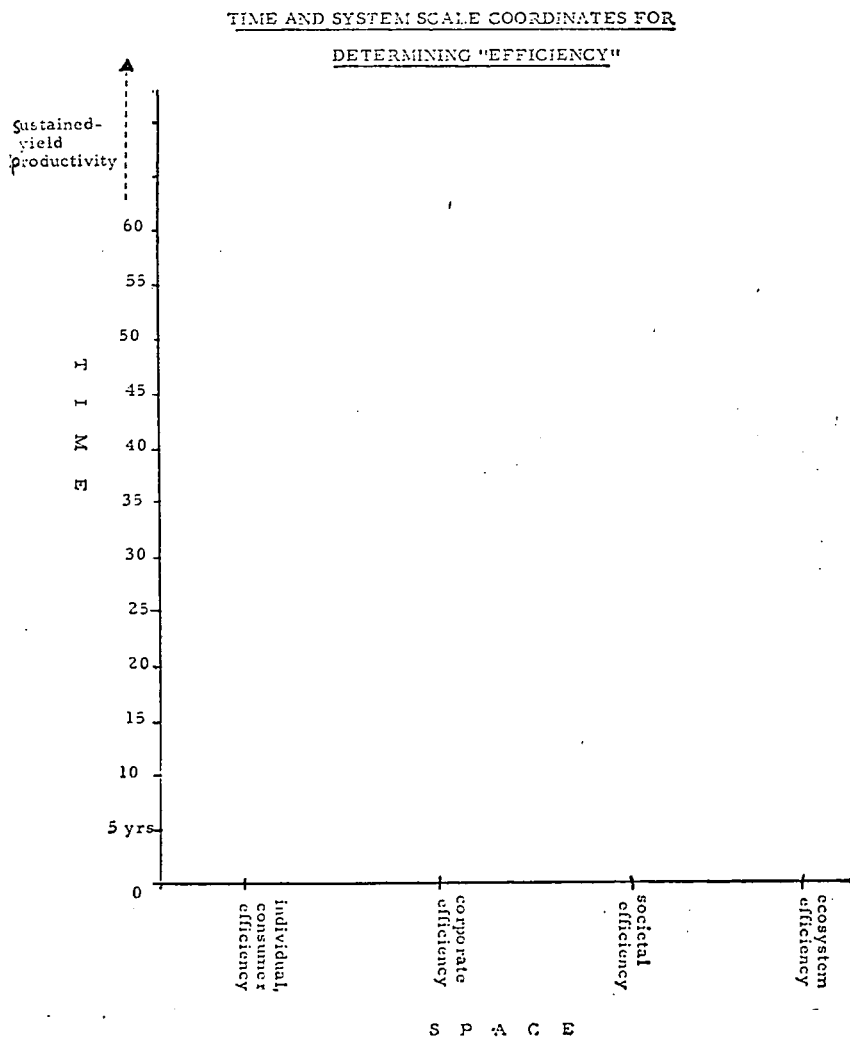


FIGURE 1



Ms. HENDERSON. Similarly, the term "ephemeralization," or doing more with less, is vague unless submitted to similar criteria. The essence of the matter in both terms is "efficiency for whom?" For example, efficiency is assumed to be the goal of increase in productivity. But it cannot be as casually assumed as it is today that such increases in productivity will be shared on an average per capita basis, nor that the inevitable costs and dislocations incurred will burden us all fairly. Furthermore, we now need an average productivity measure to augment the usual microapproach which examines specific products processes using the labor productivity measure and thus demonstrates spectacular productivity increases per worker in such capital and energy intensive processes, while overlooking that many workers are shaken out of the bottom and join the ranks of the structural unemployed, while their productivity falls to below zero, and they show up on the social cost side of the economy as welfare recipients.

Another important example of our curiously inaccurate view is that we do not bother to assign economic value to work performed by volunteers or in households. And yet according to economist Scott Burns in his study, "Home, Inc.," the total amount of work done by men and women in the household would equal in monetary terms the entire amount paid out in wages and salaries by every corporation in the United States. Burns also points to the unfairness of the tax system in permitting corporations tax credits for their capital investments, while forcing householders to treat their own capital equipment—freezers, ovens, sewing machines, power tools, storm windows, yogurt makers, and other productive assets—as if they were consumer goods.

Another paradox is the increasing production and economic growth which now co-exists with structural unemployment and the significant and stubborn proportion of our population remaining below the poverty line. This paradox relates to the obsolete modeling of the production process as if individual input factors—capital, land, labor—could be specifically related to their proportional share of output, and thus yield an objective formula for distributing the fruits of production. Yet, in a technologically complex society, production becomes a similarly complex social process, where such neat causal relationships of inputs and outputs can no longer be established, and therefore yield no clear formula for fair distribution. Therefore not only are our models inadequate for analyzing the relative productivity of the various factors of production, but they are no longer useful in determining equitable private distribution, nor in designing public sector transfer programs, nor in assessing technological developments and public works projects by traditional cost/benefit techniques of averaging costs and benefits per capita.

To sum up, in the intervening decade since structural unemployment and hard core poverty were first addressed by the President's Commission on Automation, Employment and Economic Progress in 1966, little has been achieved conceptually in remapping our society. In hindsight we can see two erroneous assumptions made by the Commission, that although automation and the drift to capital intensity did create structural unemployment, the Commission assumed, one, that essentially perfect labor markets would redeploy workers with little disruption, and two, that any workers that remained unemployed, would be absorbed by a continually growing economy. Today we are

less sanguine as we try to address the new worldwide disease of stagflation.

Today's choices are no longer the simple choices of yesteryear. They involve higher technological stakes and graver human risks than every before. These meta-level tradeoffs involve not simple choices between energy options of coal, solar or nuclear, transportation options between autos and mass transit, or between the usual menu of public and private goods and services. These meta-level tradeoffs involve choices between the societal specialization and division of labor versus its social transaction costs; between centralization and decentralization of production and population, and between capital and energy intensity versus labor intensity with a much more complex reckoning of externalities and societal impacts. Since rationality now dictates that we conserve our scarce and costly capital and national resources, we must now fully utilize our human resources.

We must run our economy on a leaner mixture of capital and energy and a richer mixture of labor. Such a resource, conserving full employment, less inflationary economy, would of course be an environmentally benign economy also. Capital should now be viewed as our last source of cheaply won flexibility. And we must learn that flexibility is a meta-level resource, just like coal or oil. The new meta-level choices we are now called upon to make consciously in our own generation are usually made by other biological species through eons of evolution and genetic changes. All these evolutionary meta-choices, including those we must now make, involve the "economics of flexibility", that is, spending flexibility now, versus storing future flexibility. We see this in our own technological choices today, investing now at the risk of hard programming our future into irreversible paths, such as perhaps the commitments to nuclear energy, versus keeping our options open and funding a diversity of approaches, even in the face of diminishing resources. As in genetics, timing is all: if adaptation to change is too rapid, this may only mal-adapt us for the subsequent changes we must make. The imminent paradox for the human race is that nothing fails like success. We may have exhausted the evolutionary potential of our GNP measured industrialization path, and the next adaption will be in a new dimension for which new measuring rods will be needed.

Our values will change. Perhaps now is the time to recognize that the real factors of production are energy, matter and knowledge, and the output is human-beings.

Thank you.

Representative BOLLING. Thank you.

Next we have Mr. Rabinow, who is currently Chief of the Office of Invention and Innovation of the National Bureau of Standards.

He received his B.S. at City College of New York, and his engineering degree at Columbia. He became an electrical engineer for the Federal Power Commission in 1937, and later became a mechanical engineer at the National Bureau of Standards from 1938 through 1953 after which he became a consultant and president of his own firm. He then went to work for Control Data and became vice president in 1968.

He has won numerous awards. And his work has included the design of electronic equipment, the design and development of guided

missiles and fuses, and patents on special cameras, watch regulators and headlight dimmers.

It is a great pleasure to have you with us this morning, Mr. Rabinow.

**STATEMENT OF JACOB RABINOW, CHIEF, OFFICE OF INVENTION  
AND INNOVATION, NATIONAL BUREAU OF STANDARDS**

Mr. RABINOW. Looking at the organization of this group, I have decided that Congress thinks that technology and productivity is much too important to be left to technologists and productivity people. And in this case I agree with Ms. Henderson that economics is too important to be left to economists.

I speak for myself. This morning I am not working for the Bureau of Standards. I arranged this because I am partially retired. So whenever I say something that the Government may not approve, I automatically say I am not working.

I read some of the papers that have been given before us today. And of course I disagree violently with Mr. Renshaw when he says that we are near the limits of technological progress, and that everything which can be invented essentially has been invented. This reminds me of a Commissioner of Patents some years ago who felt that he should resign from his job because all the things that needed to be invented were invented and there was no point to having a Patent Office after that.

I think we are in trouble, but I think the trouble is not due to the fact that technology has reached its limit, or that our inventors have invented all the things that can be invented.

I generally like very much Mr. Rosenberg's paper, partly because he made few predictions. Perhaps he did so because he analyzed the subject best, at least in my opinion.

I don't like predictions. I have lived through too many. For example, I have here a book—The World of 1975, published in 1964, by the Stanford Research Institute. It tries to predict what the world of 1975 would be like. I looked it over a couple of days ago. It was written by good people, it was written on magnificent paper, with beautiful drawings. But it is all wrong. It missed the energy problem, and it shouldn't have, because it was obvious long before the oil embargo that we would run out of oil. It predicted that inflation would rise at 1.5 percent per year, and that employment would go down because of automation, and many other things. I suggest that if you have nothing better to do you read this for fun.

I remember a prediction that we at the Bureau of Standards made about computers. We bought the first Univac. And we made some of our own computers. I was involved in this. This was 1948 or 1949. And being very innovative, we decided to figure out how many computers would be needed in the next 20 years. The Census told us how many people compute. bookkeepers, engineers, accountants, and so forth. So we multiplied everything out very carefully and assumed that everybody works 8 hours a day, and multiplied by three or four just to make sure, and it came out that in 20 years 20 Univac I's would do all the computing for the United States. In 20 years there were 60,000 computers, each of which was something like a thousand times faster than the Univac I. We were off by a factor of 1 million

Now, this is not unusual. This has happened before.

I do not say that we are not in trouble. We are in serious technical trouble. Our civilization may go down, but not because we run out of energy. We may go down just like Greece went out, but not because the scientists had no more questions to ask. And this was true of the Roman Empire, the Arabs, of Spain, wherever you look. Their great civilizations went down for social and economic reasons. Someone once said that Rome went down because the rulers of Rome ate from lead dishes, and it made them stupid or crazy—as good a reason as any. The fact is that we, too, are in serious trouble.

I would like to say this, that I don't like too many predictions. I think that we can predict short term things, we can predict short term technology reasonably well, but we cannot predict the results of science, because of the nature of the beast.

We should support science, particularly the research under science by Government "R" grants. The question then arises: How much of this should be supported, and who should do it? The support of science has to be done as an act of faith, you cannot do it by any logic at all. You have to decide that 1 or 2 percent of the national growth product, or whatever you think you can afford, should be put into the basic sciences. And it is not a subject that can be analyzed.

You can go by experience. I once asked an economist, how much should we put into R. & D.?

And he said, "Well, zero is no good, and 100 percent you can't afford. The correct amount is something inbetween."

So you could look at past history and say, "Maybe 2 percent is good." And the question is, who should do it? And it should not be done by readers and writers of proposals. That is a tragedy of modern times, the business of writing proposals for something you don't know about. I think research should be done by the best people. There is no other good way. You can give money to university professors and university directors and let them spend it as they see fit. Certainly I know no one Government who knows how much money should be given to a great, or even a good, scientist. If you don't like this idea you should give money to somebody else. You will do no more than the present system where you try to analyze the scientific results ahead of time. I am not sure that deciding the distribution of support by lot would not be acceptable. Frankly I think it is as good a system as any.

Who should direct the scientists?

The scientists, Mr. Meese, a former director of research at Eastman Kodak, said in a paper on R. & D. that the individual worker knows more about what he is doing than anybody else, and the higher up you go in the management, the less they know, and when you get to the chairman of the board he knows nothing.

I think this is essentially correct.

What you should do is select good people. How do you do that? Ask other good people. You select them the same way you select good artists to paint or musicians to make music. It is the same kind of thing.

We are in trouble today for many reasons. Our companies are getting very large. And when you get very large you get conservative. I worked as a consultant for some of the largest corporations in

America. And I was a vice president of one of the largest. And I can tell you that when you have 40 or 50,000 technicians, thousands of salesmen, and millions of customers spread all over the world you think twice before introducing a new product or new process. And you are perfectly right in thinking twice.

And the larger the corporations become, the more conservative they must be. And this means they don't want innovation. They say they do, but this is out and out nonsense, a bunch of lies. Large corporations would like to make the same products continuously, with little change.

Look at our automobiles today. They are essentially the same cars as we drove 30 years ago, the changes are trivial. Just imagine if General Motors came out with a turbine driven car which has to be serviced by men in white smocks and white gloves in air-conditioned rooms. I can just see my mechanic putting on a white smock and putting on a white hat and white gloves, and not touching the ball-bearings with his fingers when he changes them. The picture fascinates me.

So when you are General Motors you would like to make the same car in the same way.

Our innovations come from small companies, all the great innovations of today—that is, not the day of the younger people here, but of the day of the older people who were born say, from 1900 to 1915—all came from highly trained technical people who did not work for large corporations. This includes things like radar, computers, atomic energy, space technology, laser, xerography, color photography, jet engines and many others.

There are several exceptions—and very few, by the way. One was the transistor, which came out of Bell Labs. And I doubt that that is a private company. And the other is television as we know it. Actually television was invented in 1860, and scanning, as we know it today was invented by a Pole in 1890. But television as we know it today was developed under the direction of David Sarnoff of RCA. I don't think he knew how successful it would be. But outside of a few such breakthroughs all the great inventions were made outside of large corporations.

And there is a moral to this. That doesn't mean the large corporations don't make the ultimate money. They produce the invented products cheaper than anybody else can do it. But if you want innovations—and that is all of the main goal of civilized society—I think it is, although there are some differences of opinion—you have to support the small private companies, and I don't believe in government tax laws to do this.

A friend of mine by the name of Joseph Pechman, who is an economist at Brookings once told me that every time we legislate a tax benefit for someone for some social purpose it becomes a loophole for a lot of other people. He says that if you must support somebody, give him the money directly. In that way you know what you are doing, and you can stop it when you have to. But stopping taxes is much more difficult. So I think that low interest loans to small high technology companies, if innovation is what you wish to promote, would be a much better way to do it than to change the tax laws.

I think you have to support university R. & D., because universities

are not "out for the buck," and they should be able to afford to do the training of our young people in scientific research.

Another reason universities must be supported in their basic research is that if you support them to do the present things, the things that OMB wants now the quick payoff, you will then get students that will be out of date by the time they become managers. The universities have to be supported now in "blue sky" work because their students someday will be important people and by that day the "blue sky" science of today will be the current state of the art.

I think that we are in trouble for other reasons. The large corporations are no longer run by the founders, they are now run by "professional managers." I use the words with contempt. The professional managers like only to make money. And their benefits, their salaries, their stock options, depend on quick returns. If you are interested I can cite papers by conservative writers that prove that large corporations do not want to make large changes in present production and do not want big innovations, because that way they make profits quicker.

One of the best ways to make money is to cut down R. & D. because that money comes off the top, and it doesn't hurt, if you cut it down, for the next year or two. But in 20 years the company goes down the drain. In the meantime the professional manager makes out very well indeed.

I do not say that we should destroy large corporations, we need them, but give them competition from smaller, innovative, companies. And this means that risk capital has to be provided, which is no longer available from Wall Street.

In the 1950's and 1960's it was the fashion that you had to do a great deal of R. & D., even if you didn't know what you were doing, because Wall Street said if you didn't spend five percent on R. & D. you were not a "growth company." So companies did R. & D. without knowing what they wanted to do. They just hired people to do R. & D. I don't think that is the way to do research.

I think that we are in trouble also because our patent system is under attack. I am an inventor and I have some patents. I do not like the Antitrust Division of the Department of Justice. It doesn't like monopolies, nor do I. But this organization would like to destroy the patent system because patents seem to them to be monopolies.

The patent system of the United States is under attack also because some large corporations don't particularly care for the patent system. I have been told by the vice presidents of three of the largest corporations in America that they would be better off if we had no patent system. They do not depend on royalties, they depend on their market position. Their market position is such that the patents are insignificant, and are just a nuisance. They cost money to obtain and administer.

Our Patent Office has serious problems. Patents are very important to investors and small companies. The work of the Patent Offices in getting more difficult. The arts are getting more complicated, the searching of prior art is much more extensive. I don't think that it can be done well enough with their present staff. I would like them to get larger appropriations. But I would like to make sure that the Antitrust Division separates the question of the monopoly from the patent laws and stops its attacks on our excellent patent system.

I don't think you can make long term science plans. I think Government by crisis is probably as good a way as any. I believe you can plan short term things. But I think in the long term, but the plans have to be flexible. Everybody talks about flexibility. That means not being too sure what you are doing. That means you don't plan 30 years ahead, except where things are very clear, like the running out of oil. But for many things I think planning is as likely to be as wrong as right.

I would like to see the Government change its composition. With all due respect to Congress—and I have a very great respect for the Government in Washington, because I have been here so long—I find that most Congressmen learn very fast, they are very bright people. But it would be nice if Congress had some scientists among them, some economists, God help me, and some futurists.

It would be nice if Congress weren't composed, as it is, almost exclusively of lawyers. Our society demands very difficult decisions, in very short order, on scientific matters. And I think that even though the Congress does have advisers on scientific matters, it would be better if some of you were scientists. I don't know why you are not. Perhaps scientists don't like to run for political office. And I have no suggestion as to how this can be done. It would be nice if Congress really had a truly representative mix of people in its makeup, because otherwise we shall have more problems. And it may well be that democracy will not work ultimately, because society is too complicated. Certainly you can't expect the people at large as Ms. Henderson said today, to make decisions on things like nuclear energy. And I wonder if the Congress can make the correct decisions on nuclear energy unless some of them were high level scientists.

I understand that the new President is an engineer. I hope that he has had more working experience than some other engineers in Congress.

I don't know how to fix these things. But these are the things that bother me.

Thank you very much.

[The prepared statement of Mr. Rabinow follows:]

#### PREPARED STATEMENT OF JACOB RABINOW

I am highly honored to be invited by the Vice Chairman of the Joint Economic Committee, Mr. Richard Bolling, to participate in this round-table discussion. I have been privileged to have the opportunity to read the drafts of the preliminary statements by four of the five announced participants. I am particularly pleased by the fact that in such an important discussion of productivity and technological change I was chosen to represent the technologists and perhaps the producers. As unequal as I am to the task of representing all of them or even many of them, it is obvious that the Congressional Committee considers Productivity and Technology far too important to be left only to technologists. I cannot refrain from commenting that in my opinion, economics is much too important to be left only to economists.

I would like to insert for the record and I want it clearly understood that I speak as a private citizen and not as a representative of the National Bureau of Standards or any other organization.

As one who has lived a reasonably long time and has seen many changes in the technology of this world, I was startled, but not surprised, by the tremendous difference of opinions presented in the four papers that shall be discussed today. The papers prove something that many of us know, or at least suspect from past experience—that predicting technological change is not only hazardous but probably impossible. As I write this, I have before me a beautifully printed and

illustrated book entitled "The World of 1975," prepared by the Long Range Planning Service of Stanford Research Institute, and published in 1964. The report was prepared by eminently qualified people and is probably no worse or no better than predictions made today. For example, on unemployment it states:

"The effects of automation upon unemployment are widely debated and the outcome is not yet clear. However, it appears highly probable that the worst fears will not be realized. For one reason, excessively high unemployment rates would undoubtedly result in strong remedial action by the government. Perhaps more important, automation seems to have built into it a self-correction mechanism that tends to create new nonproduction jobs."

On page 4, we read: "Ample production capacity plus a plentiful labor supply should also prevent this buoyant growth from turning into destructive inflation; prices are projected to increase no more than an average 1.5% a year."

Technical predictions are no better: "Between 1970 and 1975 many voice operated cash registers may be installed. They will enable the check-out operation to become more efficient and economical, since the checker can place both hands of the merchandise simultaneously."

The prediction on computers didn't work out. Mini and micro-computers were not anticipated and, of course, nobody predicted the rise of the pocket calculator; nor did anybody anticipate the rapid growth of fiber optics technology. The report predicted that by 1975 there would be over 30,000 computers installed. The word "over" should have been underlined because the prediction was off by an order of magnitude.

Does this mean that we should not make predictions and not try to regulate our future? The answer is certainly "No." It does mean that more Government regulation and control of science is only possible at the end result of the R. & D. spectrum; that is, we should try and predict only that about which we know something quite specific. The further up we go into the pyramid of science, the less we should interfere because interference with the top is deadly.

The question then is, "Should research be supported?" The answer is, "Yes, it should be supported as an article of faith." We should agree that a certain percentage of the Gross National Product should be spent, one way or another, for science for its own sake.

"Who should do it?" The answer is, "The best qualified people."

"How do we select them?" There is no good way. We can assign money (once having decided how much money should be spent) to scientific research and science education. We can give the money, in proportion to their staff, to universities and research institutes who have demonstrated ability. If we don't like this, we can set up a lottery. In my opinion, this would probably be better than the dishonest nonsense of writing and reading proposals which forces our professors, scientists and researchers to live under the doctrine of "Propose or Perish."

I do not mean to imply that the direction of science cannot be influenced by the expressed desires of society or by the climate in which the scientist and researcher operates. Both the direction and output would undoubtedly be the subject of society's influence, in a large measure by the atmosphere in which he or she lives. This atmosphere consists of the society's needs, of past history, of cultural development, of competition from his peers here and abroad, and above all, on the genetic and training accidents in the make-up of the researcher.

I believe, as many of the participants here do, that not only does science affect technology but that technology affects science. Since I believe that a society, which consists of Government, industry, and the rest of our organizational units, can and should direct technology, this will feed back into science and effect it also. For example, if a great deal of our effort goes into energy-related developments, the science world will undoubtedly channel some of its thinking and work in that direction also but it would be foolish for the Government to tell the basic scientist that he should work on energy-related problems and not on something else. This "something else" may be a laser, a new theory of matter, or a new explanation of the development of life. The discoverer of a new scientific principle, or the inventor of a new theory, is the only one who has the right to make the decision of what he or she may be able to think about.

In my opinion, technology in the United States is in trouble. It is in trouble because our industry units are getting larger and larger. As they become larger, they become more conservative and in my opinion, for good and sufficient reasons. While they become more efficient in production because of the advantages of scale, they become more conservative and more opposed to major innovations in



their fields. The worst example of this, of course, is the large organization of the production units of the Soviet Union, where innovation is almost disastrous, particularly in consumer products. For those interested, I refer them to a study made by Dr. Herbert S. Levine of Stanford Research Institute, Arlington, Virginia.

Another problem that we must face is that most of our large corporations, and many of the small ones, are no longer run by their founders. These men had not only an economic but also an emotional involvement with their products. Our rewards for modern, professional managers are more and more geared to short-term profits. This mitigates against long-range development and high-risk undertakings. Even our Government R&D is required to show "quick returns." It is more and more difficult to undertake high-risk projects where the payoff will not only occur after a long time but may not occur at all.

Our Patent System, and the inventors whom it serves, are under attack both from the neglect (perhaps justified) of many of our large businesses, but also from the attacks on the system by the courts, by the Antitrust Division of the Department of Justice, by the sheer technical difficulty of searching the prior art consisting of prior inventions and prior literature of the entire world, and by the realization by our shrinking number of inventors that the probability of getting an economic return on the great efforts involved in converting an invention into an innovation is too small.

In conclusion, I would simply like to say that the vast majority of inventions made during our lifetime were made outside the laboratories of our large corporations. I will name just a few :

Atomic energy ; computers ; radar ; microwave technology ; inertia guidance and space technology ; Xerography ; laser ; and hundreds of others of equal importance. That doesn't mean that these innovations did not either become big businesses or were not absorbed by large industry but the important thing that I as an inventor worry about is the start of an industry, the basic innovation. If society wants such things to happen, it must develop mechanisms to help small, innovative, organizations to stay alive when they are very young, and the largest single obstacle today is the lack of risk capital. This is a field where the Government can play an active and very crucial role.

Representative BOLLING. Thank you, Mr. Rabinow.

I would like to give you some encouragement from the point of view of an old Congressman who is not a lawyer. I find that the interesting thing that is happening with the newer group of Congressmen is not that there are just a very few scientists or a few other nonlawyers, but that they believe as you do in the ability of the individual human mind to deal with problems. And the reason I am impressed by the people that have come to the House of Representatives in the last 6 years perhaps more than the ones that came when I did is that they link with that conviction—they appear to have some kind of responsibility to something beyond themselves. I think if you had the opportunity to spend some time with our newer Congressmen, as I have, you would be encouraged, because they have a commitment to individualities, to intelligence and to public service. I think those are the combinations that you are suggesting we need more of, if I understood you.

Mr. RABINOW. I did not mean to imply that the old Congressmen didn't have these qualities.

Representative BOLLING. I didn't either.

Mr. RABINOW. I was very happy to hear what you said, but I certainly think that these problems are difficult, and that we need a better mix.

Representative BOLLING. I think that is correct. And I think we are beginning, and only recently beginning, to get a better mix. The explanation of why we have had a certain kind of person run for office in this society is more complicated than I will attempt to explain here. But the reason we have had so many lawyers is not difficult to understand, if one knows about running for office.

There are so many things that are raised here that I am sorely tempted to say, since I know you must disagree with each other, let's start an argument. That is really what I would like to do. But I suppose I have to try to stimulate it a little.

One specific before I get to that—and what we want here is an interchange, we don't just want a series of very excellent statements and then a collapse—I would like to ask you, Mr. Coates, although it may not even be fair, since you have had a little to do with the establishment of the Office of Technology Assessment, I am just curious to get your view of what the Office has been able to accomplish so far. That is not a question to which I have an answer myself, but I am curious to know what your view is.

Mr. COATES. Shall I take 1 or 2 hours?

Representative BOLLING. You can use very clear self-restraint and try to give us a capsule.

Mr. COATES. Basically the Office is working for the working units of the Congress, namely, the committees. And what we have done in terms of our published, released reports, I think has had a measurable effect on the deliberations of each of the clients we have served.

Let me give you one illustration to show you what we have done.

We looked at ERDA in three different ways. First, we assembled a group of 14 experts to supplement our own staff, and did a review and analysis of the ERDA budget in April 1975. That resulted in the raising of some issues for clarification about some points in the budget. Some 200 diagnostic questions were posed by OTA which the 3 committees in oversight over ERDA subsequently asked.

This helps set the pattern, I believe, for those committees, the pattern of expectation for what they wanted in the major ERDA document at the end of June, the ERDA plan and program.

We next were asked to launch a major review of the ERDA plan and program involving, I believe, well over 100 experts of all sorts. And in our operation we put a very high premium on meeting three criteria. Timeliness, quality work, and credibility of or lack of bias. So we brought in people from industry, universities, and so on. For example, three university groups literally dropped what they were doing and came to us as background staff support.

The crucial thing that came out of that study was a detailed analysis of the ERDA plan and program. But what is particularly gratifying in the work that was done—I wasn't involved in it, so I can celebrate it to some extent—was that we went beyond simply an analysis of what was put forward by ERDA and identified two crucial shortcomings in the whole ERDA strategy, such that if they were not corrected the ERDA program could come to nought. First, the study highlighted that ERDA had emphasized technical options and not solutions to the Nation's energy problem. This incidentally ignored the mandate of the Congress.

The second major way in which our work went beyond an examination and critique of what ERDA offered was to highlight that ERDA was giving overwhelming emphasis to technical options on the supply side of energy. This was at the expense of an address to the demand side. Particularly neglected were nontechnical, social, and institutional measures relating to demand for energy. In the short

run in the way of dealing with a new energy crisis the principal options are all on the demand side not on the supply side.

The third wave of activity in relation to ERDA represents an interesting innovation oversight. OTA was asked some 8 months later to review the modified ERDA program (ERDA-76) and answer the question, to what extent had the will of the Congress been implemented in the modified ERDA plan. And we came out again with a document which said, progress has been made, but additional improvement was urgently needed—that is perhaps the clearest example of one of many ways we can assist. Basically we pointed out that ERDA is not in the business of putting the Government in the energy business. Its goal is the development of new knowledge that will assist the private sector in the energy area. In the ERDA plan commercialization had been so neglected that there was little hope that the ERDA research could in fact be used. An immediate sense of what the commercialization requirements are is necessary so that in 8 or 10 years the research and development results could be usable by the private sector.

Representative BOLLING. What I then want to ask, before I get into an entirely different field, is how effective their technique was in taking the place of having a Congress which is more representative? Because this is part of the reason for the Office of Technological Assessment, it is the recognition by at least some people in Congress that we really don't have a technical capacity, and we are trying to set up support groups that will, if not perfectly, somewhat adequately make up for the failure of the political process to produce the right mix of expertise. I think this relates to something that Mr. Rabinow said, and I am curious as to how well that works.

I have one more question that is really too specific for the whole panel. But I can't resist the temptation.

Mr. COATES. Let me stick with the example of what we did with ERDA.

In each of our waves of deliberations over the ERDA documents we had the committee staff, and in some cases members themselves, sitting in on the discussions. That was an opportunity to do two things. First, one could witness the experts in their discussion about the issues. Second, the staff and occasionally the members did illuminate the issues from their perspective. What they saw to be important sometimes contrasted with what the technical people might have preferred to focus on. This mutual education was very important.

The second element on which I put strong emphasis is credibility in congressional terms. We bring into these study processes not just people of academic excellence, but we bring in people from all the parties at interest—the labor unions, utilities, industry. State and local governments, and so on. Thence, the process by which the work is executed and the process by which the work is reviewed and evaluated internally, helps assure a wide diversity of balanced inputs, and evenhanded analysis.

The third point I would mention is that when the study of the ERDA plan and program was complete, the ERDA document went out to some 130 people and groups for review. All of that is part of the process of bringing technical excellence and a high degree of credibility to our products.

Furthermore, all along the way we interacted with ERDA itself. Let me point out another peripheral benefit. We effectively opened a bureaucratic window to the Congress. As you know, in any bureaucracy ideas come in at many levels. As they move up the system, many of them are killed or modified. In working with ERDA we invited extensively engaged with people from the administrator on down. This had the refreshing effect, I think, of giving many of these people a second day in court, an opportunity to present an idea which for good reasons presumably had been overlooked, bypassed, or modified in the internal ERDA process of planning.

Representative BOLLING. In other words, what has been achieved, at least in this specific case is not necessarily a new social mechanism, but a new technique as far as the Congress is concerned. I think that is self-evident, although I am aware that similar things have been done in isolated circumstances.

As you know perhaps know, I am very much concerned about the organization internally, and not incidentally, of the support groups including the Office of Technology Assessment, the GAO, and the Congressional Research Service, are all support groups of Congress in one way or another.

One of the things that has bothered me is the question of the coordination among the support groups. Would I be wrong in suspecting that that was, as is everything else, still imperfect?

Mr. COATES. I think everything is permanently imperfect.

Let me describe as I see it why coordination may not be as critical an issue as it might superficially seem to be.

Consider with the work strategies of the four support agencies. Basically what we bring to the problem, which is different from the other support agencies, is what Alvin Toffler called "ad hococracy". We attempt to approach whatever the problem is in a comprehensive holistic way, bringing the best possible combination of resources. We have few constraints as to who or what we draw upon for assistance. We have no preestablished work force or preestablished study strategy. In every one of our studies, however, we do make as extensive use of the CRS background material as is appropriate. We draw on it the same way everyone else on Capitol Hill does. Automatically, as part of doing the job, we coordinate not just with those agencies, but with many others. So that comes about as part of just doing high quality credible work.

On the other hand, as with any other enterprise, a little diversity is a good thing to get more than one perspective. But the coordination is built right into our work.

Representative BOLLING. Thank you.

Now, I will get back, having gone off on an individual excursion, to the hearing.

I guess this question is addressed to everybody, but in particular to Mr. Kendrick and Mr. Renshaw. I am very interested in the basic conclusion that each of you presented to us.

Mr. Kendrick, you conclude that the overall rate of productivity increase over the next decade will be about 1.7 percent, the annual rate of 1966-72 average.

Professor Renshaw, you on the other hand conclude that the rate

of productivity increase will gradually decline to zero and perhaps even become negative before the turn of the century.

Each of these implies a very different future for America as a Nation, for each of its citizens. Thus who is right is extremely critical. How does the committee or the Congress go about deciding which is right? I guess that is the question.

Mr. KENDRICK. Are you asking any of us?

Representative BOLLING. I am asking any of you. I particularly give you two the opportunity to start.

Mr. KENDRICK. Let me say that there are always disagreements among professionals in any field, and economists are no exception.

I think you really have to base your judgment on your evaluation of the evidence presented by the individual witnesses or economists who are cited. In this case I mention my view that there would be some improvement in productivity gains in the next decade compared with the last is supported by other well regarded economists such as Edward Denison and Jerry Mark of the Labor Department. I think that Mr. Renshaw is in a very small minority in expecting little productivity gain and the leveling out and possible decline within the foreseeable future.

Let me mention one other thing in connection with productivity. I am sorry that Ms. Henderson wasn't acquainted with the work on productivity of the National Bureau of Economic Research. In my 1961 volume called "Productivity Trends in the United States". I related output not only to labor input, but to manmade capital and to natural resources, to all the factors of production, and indicated that since the 19th century we have saved not only labor, but also there has been to a lesser degree a saving on capital, manmade capital per unit of output, despite heavy substitution of capital for labor, which has helped to increase so-called labor productivity. We also have saved heavily on natural resource input per unit of output. I believe Professor Rosenberg gave a good many examples of energy saving innovations and other resource saving innovations. I am certain that these will continue, and probably accelerate if we allow the price of energy materials to rise as supply and demand conditions would indicate because, of course, the rise of price encourages conservation, it encourages exploration for new sources, substitutions of more plentiful energy sources for those that are not plentiful, and so forth.

So that I believe in our studies we have looked at all of the basic factors of production in relation to output. The only reason I refer to output per hour is because the Department of Labor develops only these so-called labor productivity measures. It would be good if they did include the others.

Just one further comment on Ms. Henderson, if I may, while I have the floor. And that is that whereas I appreciate her role as a critic, which is always stimulative, I think she is not very well acquainted with the last generation of economic thought, in which we have paid a tremendous amount of attention to economic growth and development, to cyclical fluctuations and to other dynamic and structural changes in the economy. I consider that we economic statisticians are a form of institutionalists—and we go back to Thorstein Veblen and others who have always been very interested in structural changes.

Our national income and product accounts document the changes with respect to the changing proportion of various industries in the economy, of various occupations in the economy, changes in the relative demand for different goods, and so on.

Now, let me hasten to say that I am the first to think that the national income and product accounts should be expanded and improved to give more socio-economic information. If I could put on my hat as Chief Economist for the Department of Commerce a moment, let me say that my boss, Elliott Richardson, is very interested in that, and has asked the Bureau of Economic Analysis to look into the possibility of further expanding the economic accounts in the way of including imputations for services of housewives and other unpaid household workers, the opportunity costs of students, the implicit rental value of consumer capital, and many other things which would help the accounts become more useful for analysis. But in the meantime private investigators like Professors Nordhaus and Tobin have developed estimates of net economic welfare in which they tried to take account of social costs, take accounts of changes in environmental quality, in order to give us a better measure of what our economy has done in welfare terms, although I think we can never pin it down precisely into any one unitary welfare measure.

My final remark is that I think the issue that was raised also, I believe, by Ms. Henderson as to technological unemployment is really a red herring. There is really no such thing as technological unemployment, only technological displacement. Actually when I first appeared before this committee about 15 years ago before you it was on this subject and I pointed out that when technological advance accelerates it usually is associated with more investment in new plants and equipment, which through the multiplier effect gives us a faster rate of increase in income. I had statistics showing that in such periods of more rapid productivity gain unemployment rates are lower. When productivity slows down you tend to get higher unemployment.

Of course, what we need are Government programs to aid in the retraining and relocation of workers. We have it to a certain extent under CETA, the Comprehensive Employment and Training Act of 1973, which had its origins in 1962 in the Manpower Development and Training Act. I think Congress has been quite solicitous as to the human costs of technological advance. Actually most of the adjustments are made within firms that retrain workers and reassign them as technology advances. But to the extent that workers are displaced, obviously they alone should not pay the costs. We do have social programs that I hope will be expanded and improve. So I am not afraid at all of more rapid technological advance.

And let me in conclusion say that whereas I propose incentives to R. & D., I don't necessarily think these need be tax incentives. In response to Mr. Rabinow, they could very well be subsidies or low interest loans. I think the important thing is that we increase the spending on R. & D. faster than GNP gains, because economists have estimated rates of return on R. & D. as being quite high. People like Yale Brozen at the University of Chicago and Nestor Terleckyj here at the National Planning Association, and others—and this has been summarized in an NSF report—conclude that the returns to R. & D. are

higher than on plant and equipment, and others have concluded the same thing about education. So I think that economists lend support to the idea that we should, if we wish to get back to a higher productivity trend, devote more to these intangible investments.

That is enough for now. I could go in extenso, but I will stop.

Representative BOLLING. Mr. Renshaw.

Mr. RENSRAW. I think Mr. Kendrick is right in suggesting that you are going to have to consult other people. Both of us are locked into a box, I suppose, on an historical basis. I arrived at my vision of an end to economic progress more than 15 years ago. This vision should be considered somewhat different from an end to technological progress. In going to the Moon we developed a lot of technology that was new and innovative and necessary to get to the Moon, and which certainly represented progress. The point is, it didn't have much economic spillover. you can apparently have a lot of technological progress without that necessarily being the kind of progress that has economic value to be employed in the civilian sector.

With respect to who you should talk to, I would suggest as a starting point that you obtain "Sustaining a Balance of Expansion," which was published by your own Congressional Budget Office. It has a section on the recent productivity slump, which everyone agrees has occurred. There has actually been two or three slumps depending on how you measure them. After 1966 there was a small slump, and an even more pronounced slump from 1969-70. We had some recovery through 1973, and then another slump.

People who have studied the slump as far as I can tell—and I am not so familiar with Denison's calculations which are probably more elaborate than most—are coming to the conclusion that you can't explain the recent slump entirely on the basis of factors which are of a temporary nature. There is recognition, for example, that we have had changes in the composition of the labor force toward more teenagers who aren't as accustomed to working. This may have cut down productivity at various times. And of course with the baby boom over, there is hope that there will be some snapping back there.

However, one ought to recognize that we have been moving in the direction of proportionally more women. This trend may continue for sometime. To the extent that they are less productive and work part time and intermittently, that could lower productivity in the future as well as the present.

Representative BOLLING. Before I go to Ms. Henderson, let me ask a long question, which perhaps doesn't require a terribly long answer, that directly relates to this discussion.

In the early part of the century the major advances in technology seemed to be largely found in manufacturing. And your comment on the limits of the speed scale and energy efficiency of industrial machinery are very well informed and interpretive. But I am intrigued at Mr. Coates' statement that one-half of the labor force is now involved in information handling, technicians, bureaucrats, data processing, and so on. He also emphasizes that the continuing revolution in computers and telecommunications promises very large future opportunities to boost productivity in this broad field. Isn't it true that

the possibilities here have hardly been scratched; that although we have developed huge machines to substitute for physical labor, we are just beginning to develop technology to ease the labor of the mind? I just wonder if you thought that had some significance?

Mr. RENSRAW. We should take one specific example like the checkless society. People have been speculating about it for a long period of time. We do have the technology to make a transfer of funds instantaneously to pay bills. There is a problem, however, in keeping track of how much money you have on balance so that you don't over spend. For that reason you almost have to have duplicate records. Moreover, with respect to some of this information it is more costly to put on cards and get it into the computer than to process it in the ordinary fashion. So there really haven't been the spectacular gains and benefits that one might imagine. At various times in recent years people have actually tended to hold proportionately more cash and there have even been suggestions that people who pay cash for goods ought to get a discount, because there is less recordkeeping, computing and processing-costs involved. A lot of new technological possibilities have been opened up, but in my judgment they probably aren't going to have nearly as big an impact on productivity as the harnessing of horsepower in manufacturing. We still have a mushrooming growth of demand for secretaries in spite of computers and improved type writers. I believe this does represent a basic difference in the potential for productivity growth in the service sector versus the manufacturing.

Moreover, it should be stressed—and this is one factor that Mr. Kendrick notes in his paper but doesn't emphasize—that in the past as we have moved millions of people out of low productive jobs in agriculture, that has boosted our growth rate for output per person-hour by as much as 0.3 percentage points per year. In the future, if we continue to move people out of agriculture as we have in the past, within 15 years we would have no farmers. That doesn't strike me as being too plausible. As a matter of fact, most analysts are not optimistic that there is going to be much further improvement in productivity as a result of a transfer of workers from low productive jobs to high productivity employment. That means that we have lost three-tenths of a percentage point of long-term improvement. And this would have to be made up by some new or otherwise unexploited avenue of technical progress if productivity were to fully recover from the recent slump.

Representative BOLLING. Ms. Henderson.

Ms. HENDERSON. I would just like to respond to Mr. Kendrick. I hardly know how to respond. I would suggest that if he would read some of my papers maybe that would be easier for him to understand where I am coming from than a debate of this sort where there is far too little time to go into this. But I would say that I disagree with practically all of the terms he uses. I think he uses extraordinarily simplistic definitions, as most economists do.

Economics is really politics in disguise. I think that it is useful for us to look at the difference between Mr. Kendrick's view and Mr. Renshaw's. One of the aspects of the limits of growth debate is that it is merely resource politics. In other words, if one happens to be a heavy resource-using corporation, or country, nation, state, then it



would behoove one to commission a great many think tanks to produce a blitzkrieg of computer printouts, which would say that everything is all right, don't worry about it. And the fact that we are first in line at the resource trough needn't worry you people who are backed up in the queue behind us.

On the other hand, if you have very little hope of ever being dealt into the system, you may be less sanguine, and you may start raising the alarm the way the Third World nations are doing at the moment.

For example, this slump in productivity that we are all talking about, first of all I was amazed to see productivity measured by compensation. And of course the compensation, the wages that people earn, is not really a very good measure of their productivity. It may be their relative power in the marketplace, or it may be their relative hunger, their relative need to take any kind of a job, however low the wages are.

The assertion that there is no such thing as structural, technology-related unemployment is astonishing, particularly since we see even the unemployment statistics are being called into question themselves.

I think that the special problem areas, even in regions of the economy of the country, where unemployment in some States is still at 13 percent—and I heard Hubert Humphrey talking about this on a platform a few months ago—and how was it that this all averaged out to 7 percent, whereas in the places that he went the specific figures in these States were up in the double digit range. And of course the glib sort of dismissing of the problem of structural unemployment as simply being able to be taken care of by retraining programs, and this kind of thing, assumes that the economy is capable of providing enough jobs for everybody. A very interesting thing to me is the acknowledgement now of the structural nature of both inflation and unemployment—which I know and I agree that Professor Kenrick, has been studied in the ivory towers of academe—but I was talking about the economic policy debate, as it goes on at this time. And I think you will agree that there is a great difference between the kind of economic studies that go on behind the walls of academe and never get into the larger society, and the kind of economic debate that is normally conducted.

And I think also one of the most serious problems that we have is that external effects are still more or less treated as an aberration. And what I am trying to say is that the external effects that we are now experiencing in this kind of economy are themselves becoming structural. And I think if one wanted to one could also do a model of the social costs in the economy and almost plug them back into the areas of the private sector which are generating them. It would be sort of a mirror image of the GNP. And I think that sooner or later we are going to have to start doing that.

And basically I think that Mr. Kendrick is simply making a case for the traditional business view of the private sector of the economy being the golden goose. And this implies that this private sector golden goose creates all the wealth—all the golden eggs, and then some of it gets transferred to the public sector, and pushed around to the "unproductive" and used for social projects and one thing or another.

And I think that what people are beginning to wonder now is that we have noticed that the golden goose has been on a life support system ever since the Employment Act of 1946. It has had to be pumped up with adrenalin, or macroeconomic management tools. And we have also noticed that although this golden goose is still excreting, that it may not always be laying golden eggs.

And the other thing that I think we are beginning to worry about is that this golden goose demands a richer and richer diet of tax subsidies, and is asking the public to absorb more and more of the risks and costs. And yet the golden goose demands that the profits remain and the decisionmaking also remain in private hands. And I think that this is the old model. And it probably did hold true, but I think we now have to look at that model again and see whether that golden goose isn't something very different.

Representative BOLLING. I am not going to pursue this particular line, because I can tell you where it is going. But my discipline before I was rudely interrupted by World War II was history. My only comment on the golden goose is that it was rather better fed in the 19th century by Government than it is even now. And I don't disagree that the Employment Act has some beneficial effect on the golden goose. But I am terribly tempted to ask—but I won't—what your definition of politics is.

But I see someone who would like to get involved.

Mr. RABINOW. Several comments. One can't help but believe, first of all, that flying to the Moon, for example, will produce useful future results. I suggest that it is too early. If Einstein had said in 1905 that he has a new theory of matter, that he had determined that light bent toward the Sun during an eclipse, he would have had trouble in explaining that it was of any use to anybody. And at that time it was of no use to anybody but the scientists. But it has changed the world considerably.

If one came here and said that we should study black holes in space and we suggested it to the OMB that we need several millions of dollars to do this, I don't think they would want to support it.

We should ask, what do we get for our scientific funds? And I think we will get useful results from going to the Moon. But what they will be I don't know. When we came out with the printed circuits for proximity fuses during World War II no one could tell what they would be used for. But now they are universally used.

The work on atomic physics has produced work on atomic energy. I was interested in Ms. Henderson's remarks about the golden goose. Apparently she said that a pure capitalist society doesn't make much sense, except that the alternatives are rather bad. Perhaps it is not a very good system, but the other systems are so much worse. The Russian system plans all the time, and it stinks. Now, obviously the problem is, how much planning should we do? I agree that you cannot leave society to the business firms. They will throw people out of work if they can. They don't care about it, because it is not their business to worry about it. The question is, Who does? When we automated equipment in the post office I was asked, doesn't my conscience bother me? I said, I do that on my own time after 5 o'clock.

I don't think it is as much of a problem as Ms. Henderson implies. You have alternatives. You don't have to substitute machines for

human beings, you don't have to throw people temporarily out of work who are doing that particular work. You have the alternative of doing everything inefficiently. And because I have lived in Siberia where everything is done by hand, I don't think it would be a very good idea.

Ms. HENDERSON. That depends on the definition of inefficiency.

Mr. RABINOW. I don't care what definition you use. Human labor to pull water out of wells is not a very good system. The whole world would like to live like the United States. Apparently people think it is better to have a pump and attack the unemployment problems separately.

I don't think that the unemployment problem cannot be solved. I think the Government is lax in not doing the kind of thing that should be done to employ 7 million people. People say, what can you do?

I say, there are many things you can do such as save the environment, many other things.

I agree that the capitalist system has problems. It isn't a free capitalistic society, and hasn't been for a 100 years. I think the golden goose should be watched closely as to the kind of eggs it lays and where it lays them.

I think the competition with various countries is very severe now. They are competing with us. I watch technology carefully by reading the patent decisions. I am dismayed that many of our inventions have been preempted. My wife, sitting in the back, once said to me what do you care if Japan gets rich? My answer is, I don't care if Japan gets rich, but I don't want to be poor.

I also think that if there were no war, we wouldn't have to sit here and debate this issue. What difference does it make where in the world stuff is produced? The fact is that there may be wars, and we have to keep up to a certain level of technology to defend ourselves. Our technology is slipping in many cases. If a war breaks out tomorrow and if it is not a nuclear war, and it does last for some time, we are not well prepared in many fields, and we will be very badly off.

Representative BOLLING. Mr. Rosenberg.

Mr. ROSENBERG. I would like to say a bit about the kind of general point of view which is underlying a lot of this discussion. There seems to be a lot of impatience with the way this system presently works, and a notion that somehow or other we can be much more efficient if we simply planned things better. Planning of course is a good word, we are supposed to speak in favor of it. Yet there are certain things that are by their nature just very difficult to plan. By the way, I must at least throw out a cautionary note to Mr. Coates and some of the technology assessment work. He sent a shiver down my spine when he referred to one of the things off in the future as a possibility of setting off small earthquakes to prevent large ones. In fact, he called it the saving of San Francisco. Well, I live 40 miles south of San Francisco, and I think he may be regarding me as somewhat expendable. My house is literally on the San Andreas Fault, which runs somewhere between my kitchen and living room. Even a small earthquake will hurt me.

Representative BOLLING. Would you rather take a chance with nature than planning?

Mr. ROSENBERG. I would prefer taking my chance with nature rather than what he regards as a small earthquake.

Representative BOLLING. He will have a chance to come back.

Mr. ROSENBERG. The question that bothers me, I am not opposed to planning, and I certainly don't want to sound complacent, but reading history makes me very humble about our capacity to plan intelligently for the future where technological matters are concerned. I am terribly impressed with how time and time again we failed, completely failed to assess, for example, the potential economic importance or usefulness of something because those inventions interact with larger social systems, which are extremely complex, and therefore extremely difficult often to anticipate in a well ordered and systematic and well planned way.

Thomas Edison—who after all was a great inventor—when he invented the technique for recording sound, his biographer reports that Edison thought that the usefulness of that device would be largely confined to recording the wishes of elderly men on their deathbeds. When the radio was first developed its use was thought confined to places which were inaccessible by direct wire, to ships at sea and other places which were inaccessible by the standard wiring techniques of the day. And similarly with respect to the automobile. If we were sitting around here in 1905 trying to plan the new society in terms of how it will absorb the automobile, I just wonder how skillful we would have been at anticipating the myriad of ways in which the automobile has changed our lives and our society.

Basically I am simply saying that I am very skeptical of our capacity to plan the future intelligently.

Representative BOLLING. Mr. Coates.

Mr. COATES. I am tempted to say I disagreed with both Mr. Kendrick and Mr. Renshaw. As I see it they were really talking in the same conceptual framework, and that the differences that they expressed are essentially trivial. While the sense of their differences may point in different directions, I find two fundamental defects which force them into the same category. They both overlook two crucial things in our world. First, there are fundamental defects in the measures that we bring to economic analysis. Really, there is something wrong with a system that counts cleaning up the garbage as a benefit, and doesn't quite know how to count avoiding the garbage in the first place as a social cost. There is something wrong with an accounting system that counts as a benefit having to travel an hour a day in an automobile through a congested city to get to work, but doesn't know how to count the benefits of traveling 15 minutes on a bicycle and being able to have lunch at home.

The present metrics were appropriate during a period of industrialization, when they reflected accurately the sound view of 40 to 50 years ago, that increased productivity will have enormous spillover benefits. In our world there is something wrong with these measures. They are no longer measuring progress quite as fully. The more fundamental difficulty I see with both of their positions is that neither of them have a cogent sense of the future. I sense that neither of them has an image of what the future could be like, much less an image of

what the future ought to be like. As I see it the only way one can get an image of the future 30 or 40 years ahead of us is to begin to take a structural look at what the forces are now in action, and where they could drive us. From that, one can see the enormous number and range of choices open to the Government. For example, neither one of them have chosen to address the implications of the central change of the work force toward an information manipulation work force. They have not addressed the implications of that in conjunction with women's entry into the labor force, and the probable associated effects of land use planning. They do not seem to be aware of the cornucopia of benefits likely to come from biomedical developments. The possibility of manipulating people, not just the things that people interact with, puts us right on the brink of a new human technology.

I find a very strong note of antiintellectualism, running through the discussions by the three economists as well by Mr. Rabinow in terms of, how we possibly can come to grips with the future. How can one possibly say anything that isn't either useless or frightening? The examples that were just cited about the automobile, about Thomas Edison, and so on, are ancient history. Since World War II, particularly in the last 10 years, we have developed institutions, skilled people, techniques for beginning to anticipate and forecast the future. We have developed sets of tools that literally didn't exist 50 or 60 or 70 years ago. So when one talks about, can we anticipate the future, and bring in these ancient examples of the failure to look ahead, that is about as irrelevant as one can get.

Let me give you the other side, the positive side of the story. There are now underway a substantial number of studies which are attempting to look to the future. It seems to me that there is a substantial confusion in the discussion between predications and forecasts. Prediction is the estimation that some specific event will happen with some probability. Serious futurists forecast. They look at what might happen, the full spectrum of alternatives and attempt to feed back to the decisionmaker what the implications of those possibilities are. So the emphasis is not on getting it right as identifying a most probable future. The emphasis is on getting a sense of the future that usefully reflects back on decisionmaking. If one sees the study of the future in those terms, it undercuts much of the "it can't be done", "it is of no value", "it is frightening" sort of thing.

Let me finish with one last point. And that is in terms of the specific example of earthquake control. I don't think there can be much doubt that geophysics is moving in the direction where we will have the capability to influence earthquakes. The public discussion, it seems to me, should be couched in terms of what would be useful to do with that growing knowledge, to what extent that knowledge should be encouraged, and how might it be institutionalized. It may well turn out that it isn't practical or useful to induce earthquakes. It might be that the social costs are great. But one can't preclude the possibility inducing earthquakes being useful on the basis of an offhand remark. It has to be the subject of a comprehensive, extended continuing examination. And avoid that examination could be a social disaster.

Representative BOLLING. I will recognize Mr. Rabinow and Mr. Kendrick. And then I think we will have to close up.

Mr. RABINOW. First of all, Mr. Coates, I think you have confused precision with accuracy. I have read your paper. You made the point about studies and more information collection and so on. When I came to the Bureau of Standards in 1938 I was told that precision was a different thing from accuracy, precision is making a lot of measurements, and getting 65 decimal points and still not having an accurate answer. I could give you illustrations, but I will skip it. The fact is that you put too much faith in measurements and thinking if you collect more and more information somehow or another that will give you a better handle on the future. I may agree with you that it may be necessary to make small earthquakes to stop big ones.

I also agree with Mr. Rosenberg that I would rather not have the San Andreas Fault in the middle of my kitchen. I think I would take a chance on the ignorance of the subject. But I object to this business that if you only study a great deal, therefore you can give some useful information to the future. I think the future cannot be studied. And I object to the statement that one has no right to look at the predictions of the past, because the past experience in the prediction don't mean anything. That is nonsense. When I went to college if somebody came to me and told me that someday I will fly to London with 450 people aboard and there will be three movies and there will be dinner and breakfast and that I will stay overnight and I will come back the next day, and I shall do it at the speed of sound, and I will be too bored to look out of the window, because there will be nothing to see, so that I will take an aisle seat—if anybody had told me I would be doing that I would have told him he was crazy. But I have done it several times. I think it is important to look back in history to see what we would have done if we had had your office making studies for us in 1930 or 1940. Would you have predicted the rise of nuclear energy, or travel to the moon, or of the airplane as we know it today, or the communications industry, or the banking business that we have today, or the credit sales or any of the other stuff? It is very important to look back at that and say, how smart were we then? We were just as smart then as we are today.

We haven't changed our intelligence. I think today we have to be very humble when we try to predict 20 or 30 years into the future and say, no, if we had only had more information, and collected more data, and analyzed it carefully, somehow we will be wiser. We are not any wiser. I agree with Mr. Rosenberg that one should be very careful when we attempt to predict the future.

Representative BOLLING. Mr. Kendrick.

Mr. KENDRICK. Just a few brief comments on the remarks by Ms. Henderson and Mr. Coates.

Let me say that much of economics is analytical in nature. Now, it is true that to be relevant we have to analyze particular economies in particular institutional frameworks. This doesn't necessarily mean that we approve of all aspects of the institutions which are in the economies we are analyzing, although I personally think our enterprise system is a rather efficient instrument for producing the goods and services that people want. But I might call attention to the fact that in my study on page 18 I suggest that it would be desirable if Congress creates an instrumentality in Government for more specific long-range projection and, within limits, long-range planning, which

I think would be desirable, although I am not endorsing the Humphrey-Hawkins bill. But I do think that in addition to the Council of Economic Advisers we need a group that will be more concerned with the long-run developments in economy, since the Council's efforts are directed mainly toward the short run and recommendations for trying to maintain relatively full employment.

In that connection let me say that I agree with the remarks that have been made here that returning to relatively full employment will certainly help productivity and technological progress. I would say that if we get back to that point we will see that much of the so-called structural unemployment is going to evaporate, that at a sufficiently high level of demand private firms will employ an lot of people that we might have called structurally unemployed and will pay them, retrain them or relocate them themselves. And for those who can't be so accommodated through the private economy, I think that it is a social responsibility to provide the retraining or even employment if necessary.

With respect to the matter of measurement of output, I pointed out that national income accountants are trying to further elaborate and improve our measures. However, I should point out that overcoming "illth" or offsetting a negative, is not a nonproductive activity. Much of what we do involves removing something that we consider undesirable. Even eating is in order to get over hunger pangs. But in the process there is a positive pleasurable component to it. But much of what we do is to offset negatives. And I don't think we can say that that is not productive. But I do think that we need to work further on our measures of production, which we are doing.

As far as the charge that Professors Renshaw and I are somehow myopic by not trying to visualize what the future ought to be like, let me say that one reason that I don't try to paint a picture of what the future ought to be is that I am an old-fashioned liberal who believes in the freedom of choice of individuals. I would hope that in the future we will have a society which will try to help individuals realize their own goals, and certainly those individual goals are going to gradually change over time with new generations, and there will be new aspirations. But I think the most important thing is that we maintain a society with Government providing a framework for individuals basically to seek what they themselves want.

Representative BOLLING. Mr. Kendrick, I regret that I am going to have to exercise the prerogative of the Chair. I am cutting off everybody, including you, because I have another engagement. I apologize for doing it.

Mr. KENDRICK. That was a good place to stop.

Representative BOLLING. But I would like to make a very brief comment. We structured the conflict on purpose. I suppose I am most responsible for doing it that way. That was the sense in which the use of a considerable amount of paper was a success, because in this panel we got some disagreement and we got some rather well articulated expressions.

I think that one of the things that bothers me as a politician who was initially trained in archeology and anthropology before I moved to the short range of history, is that I am rather more aware than some that the future means entirely different things to a great many people.

A large number of the people that I represent do not have any view of the future beyond a very simple thing. They would like for the first time in their whole lives to have some prospects of having a job. That vision of the future is terribly simple. Probably not as edifying as the view of a variety of other people that I also admire and respect who live in a different part of town whose view is that there should really be no regard for that particular group, but that the environment ought to be kept perfect for them. Now, those are two different visions of the future, neither one of which is in any way complete. It doesn't in any way suggest not only that we should look back, but that we should also look forward and try to master our environment as best we can. It also means that the politician's problem gets a little bit more complicated as time goes past. Anything that benefits us as representatives of all those different points of view, of having a better notion as to what we ought to do next, is helpful. All of you have been helpful in that respect today. And we thank you.

And with that the hearing is over.

We will meet tomorrow.

We may submit some questions to you in writing here, and we hope you will feel disposed to respond.

[Whereupon, at 12:45 p.m., the committee recessed, to reconvene at 10 a.m., Friday, November 19, 1976.]

[The following questions and answers were subsequently supplied for the record:]

RESPONSE OF JOHN W. KENDRICK TO ADDITIONAL WRITTEN QUESTIONS POSED  
BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 19, 1976.

Prof. JOHN W. KENDRICK,  
*Chief Economist, Department of Commerce,*  
*Washington, D.C.*

DEAR PROFESSOR KENDRICK: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosure.

FOLLOWUP QUESTIONS FOR NOVEMBER 18 HEARING

(1) One often hears the argument that the lower rate of investment in the U.S. contributes to our diminishing superiority in productivity. Is there merit to this?

(2) There are three factors which have often been cited as forces or trends that may tend to restrict productivity gain. Could you indicate whether you



basically agree or disagree that these have retarded, or will retard, productivity advances: changes in the composition of the labor force (more teenagers and women); dramatic advances in agricultural production no longer occurring; increased expenditures for pollution control.

(3) Will future increases in productivity depend on the speed with which costs of energy, materials and pollution are high relative to the value of the output to where this relationship is low?

(4) Is there a federal role in improving productivity? If so, what is of first priority?

(5) Is defining productivity primarily in terms of labor productivity outdated, especially in light of the argument that labor now appears to be in relatively abundant supply and there is a comparative shortage of such things as capital, energy and non-renewable resources?

(6) Will it be necessary to rely on high technological products and services for a new wave of economic growth? What technologies are already on the horizon which might provide the major forces of economic growth for the next decade?

(7) Will acceleration of technological advances require substantial increases in private industry R & D expenditures? What can the federal government do to stimulate technological progress as a spur to future economic growth?

(8) Professor Renshaw makes the rather challenging statement that "as we near the limits of technological progress, it will not be possible to increase one kind of productivity without a sacrifice of some other kind of productivity." Do you agree with this?

(9) Another particularly critical charge Professor Renshaw makes is that "the evidence would strongly suggest that it is becoming far more difficult to invent new products and discover new productive processes that are unambiguously superior to existing products and production techniques." What are your observations on this statement?

(10) In your paper, you state that the basic forces in the economy that condition productivity growth are more favorable now than those prevailing during the preceding decades of relatively strong productivity advance, 1946-1966. These basic forces are "the human factor and the legal and institutional framework of the economy. Aren't these types of factors peculiar ones for an economist to cite as they can't be easily measured and they are subject to rapid and highly uncertain change? Could you expand a bit on this point?"

(11) You mention in your paper that a productivity payoff from antipollution, health and safety, and energy conservation programs will emerge? What do you mean by this and when may we expect this payoff?

(12) Do you agree with Professor Renshaw when he states that "the most effective way to increase productivity in the next year or two will be to adopt those fiscal, monetary, price and wage measures that are likely to be the most effective at reducing unemployment"?

(13) Professor Rosenberg expresses the opinion in regard to technological innovation that government "can contribute more by providing a suitable environment for the operation of market incentives than by specific measures to aid particular industries or interest groups." Mr. Coates, on the other hand, calls for a much more activist role for government, citing four major areas that government should be involved with in guiding what he terms the "socially effective interplay of the basic variables: land, labor, capital, resource availability and knowledge." Which of these views on government's role in technological change do you subscribe to?

#### RESPONSE OF JOHN W. KENDRICK

(1) Yes; since fixed investment is a carrier of technological progress, the rate of investment affects the rate of technological change. It also affects the average age, and therefore the efficiency, of structures and equipment. Also since changes in output per hour are related to changes in real capital per hour, a faster rate of growth of the latter affects the rate of productivity advance.

(2) With respect to the three factors cited:

(a) Changes in labor force mix were a significant factor reducing the growth of output per hour during the past decade. During the coming decade this factor will be working in the opposite direction since the proportion of youth in the labor force will be declining.

(b) The reduced rate of shift of workers from agriculture to nonagricultural industries will tend to dampen the rate of increase in output per hour.

(c) Increased expenditures for pollution control tend to lower the rate of increase in productivity as measured, since these expenditures increase real costs and inputs, but not output as measured. If the benefits of environmental protection programs could be measured, it is possible that they would not impact unfavorably on productivity.

(3) Since the degree of resource mobility affects productivity growth, obviously the speed of economic adjustments to high and rising energy prices will be a factor in future productivity change.

(4) The Federal Government obviously has a central role in improving productivity in its own house, through appropriate cost-saving innovations and investments, improved management techniques, etc. But beyond that the Federal Government affects productivity in the private sector through fiscal policy, by the types of taxation, and by the types of expenditures (some of which are productivity-enhancing tangible and intangible investments).

First priority should be given by the Federal Government to establishing the organizations and mechanisms for reviewing the productivity impacts of existing and proposed measures, and recommending policies to promote productivity. Possibly, the National Center for Productivity and the Quality of Working Life, an expanded Council of Economic Advisers, or some new agency could fill this need. With respect to specific programs, I would give priority to the formulation of a dynamic science and technology policy, discussed under point seven.

(5) Output per hour and other partial productivity ratios are useful for measuring economies achieved in the use of particular inputs per unit of output. But in my own work over the past 25 years I have argued in favor of total productivity measures relating output to a weighted average of all associated inputs—labor, produced capital goods, and natural resources, with resources broken down between energy and other materials. The total productivity measures indicate the net saving of resource inputs per unit of output, and thus the increase in productive efficiency. The partial productivity ratios additionally indicate the effects of inter-factor substitutions.

(6) Since cost reducing technologies advance is the main factor behind increasing productivity in the long run, and productivity advance is the chief element in economic growth, obviously an expansion of high technology products, processes and services is vital to strong economic growth. Not being an engineer, I will leave to others a catalogue of technologies on the horizon which will undergrid productivity advance for the next decade. But I will note that the many small refinements and improvements made on major technological innovations are as important to productivity advance as the major inventions are over intermediate time periods.

(7) Acceleration of technological and productivity advance will require substantial increases in private industry R. & D. expenditures, not only absolutely but at least proportionately to GNP. There has been the drop in the ratio of R. & D. to GNP during the last decade that was an important explanation for the slowdown in productivity advance. If the decline in the ratio is not only halted but reversed, the prospects for faster productivity increase would be even better.

A positive program for the Federal Government should be formulated as soon as possible by the Science Adviser to the President and his Office of Science and Technology Policy, which was reestablished last August. The proposed program will undoubtedly be broad and complex. However, I would think that increases in Federal support for R. & D., plus tax incentives to stimulate private R. & D. and tangible investment, would be part of the package.

(8) I do not agree that there are limits to either scientific knowledge or technological progress that would be reached during the lifetime of human kind. But resources are limited, so in order to increase one kind of productivity more it may be necessary to increase another kind less—whether with respect to productivity of particular inputs, industries, or sectors.

(9) I believe that the burden of proof is on Professor Renshaw to support his statement. I see no reason why technological progress could not continue at a reasonably steady trend-rate apart from cyclical variations. It should be remembered that the invention industry can be expanded at least in proportion to overall economic growth.

(10) There is no reason why economists cannot venture informed judgments about forces that may be difficult to measure. I would also not agree that the legal and institutional framework of the economy is subject to rapid change, although individual laws and institutions are. Actually, I was comparing the coming decade with the past decade (rather than the 1946-1966 period) with

respect to the forces cited in the question. With respect to the legal-institutional framework, one improvement I foresee will be the absence of price controls. This point was recently affirmed by President-elect Carter with respect to the next four years, short of an emergency. I also think that the maze of regulatory rules and practices which have grown up in recent years, will gradually be rationalized in response of the sharp criticisms that have been voiced. I also see the creation of the National Center for Productivity as an encouraging sign of increasing concern with long-run productivity and production trends.

With respect to human resources I would hope the substantial progress towards realization of equal rights for all help to release the productive and creative energies of increasing proportions of the population. Projections of continued increases in outlays for education, training, health, safety and mobility suggest that the quality of human resources will continue to rise. Further, I think that social attitudes have been gradually improving since the phasing out of the Vietnam conflict. I hope that we will be able to quantify these forces more adequately in future years through expansion and improvements of social indicators.

(11) I believe that the negative effect on productivity of the mandated social programs mentioned in the question will be reduced as the required investments can be integrated as parts of total systems of production, rather than as add-ons. More importantly, the beneficial effects of an improved environment and greater health and safety should have some positive productivity impact during the decade 1976-1986 and beyond.

(12) During the next year or two, it is quite true that increasing rates of utilization of capacity associated with further recovery up to the full employment range will add a cyclical booster to the trend rate of productivity growth. But for the long run, it is even more important in the next few years to adopt the basic policies suggested in my paper to enhance technological progress and economic efficiency.

(13) I do not think that the viewpoints of Messrs. Rosenberg and Coates are necessarily mutually exclusive. Professor Rosenberg's view that government must provide a suitable environment for the operation of market incentives is, of course, basic. Nevertheless, in some areas such as space, oceanography and energy, governmental programs may be necessary to accelerate progress. These are the areas in which externalities, degree of risk, size of undertaking and other factors may deter private enterprise from undertaking activities in pursuit of socially useful goals.

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RESPONSE OF EDWARD F. RENSHAW TO ADDITIONAL WRITTEN QUESTIONS POSED  
BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
Washington, D.C., November 19, 1976.

Prof. EDWARD F. RENSHAW,  
*Department of Economics,*  
*State University of New York, Albany, N.Y.*

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Thank you and best wishes.

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JOHN R. STARK,  
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Enclosure.

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## RESPONSE OF EDWARD F. RENSHAW

(1) Has the lower rate of investment in the U.S. contributed to our diminishing superiority in productivity?

Yes, but only to a very modest degree. The best answer to this question is provided by Edward Denison in his paper on the contribution of capital to the postwar growth of industrial countries. He estimates (p. 48) that an extra one percent investment and saving rate would increase the national income growth rate by .08 percent or less than one-tenth of a percentage point. This estimate assumes a constant marginal product for additional investment. If the law of diminishing returns is assumed to apply on balance, the net impact could be even less, assuming that all resources are fully employed.

In a world where all resources are not fully employed, however, extra investment might be expected to have a sizable multiplier effect in the short run as well as add slightly to the long run growth rate. Since the historical evidence strongly supports the notion of a short run annual investment multiplier equal to about 2.0, I believe there would be an extremely high payoff from new Federal policies to first stimulate a recovery of real capital investment, which is now down about 20 percent from preceding highs in both the public and private sectors, and then stabilize the growth of investment spending. Particular emphasis, it seems to me, should be given to investments which will tend to conserve energy.

(2) (a) Have changes in the composition of the labor force (more teenagers and women) retarded the growth in productivity?

Yes, to some extent. Adjusting labor inputs for wage differences, however, leads to little change in the overall slowdown of productivity growth. Calculations by the Congressional Budget Office reported on page 52 of *Sustaining A Balanced Expansion* (August 3, 1976) which incorporate wage differences in the estimates

of productivity suggest that less than one-fifth of the decrease in the factor productivity growth rate is due to changes in the composition of the labor force. The percentage of teenagers in the work force will soon begin to decline owing to a peaking out of the number of live births in 1957. The percentage of women in the labor force, on the other hand, will probably continue to rise throughout the next decade and perhaps offset any gains to be expected from fewer teenagers.

(b) The impact of agriculture on overall productivity.

From 1947 to 1967 about half a percentage point of the average increase in output per employed hour in the private economy can be explained by a shift of labor out of agriculture into more productive nonagricultural employment. From 1967 to 1973, however, the shift only accounted for about 0.1 percentage point or about one-thirtieth of the total annual rate of increase in output per hour (see *Monthly Labor Review*, June 1974, pp. 3-9 for calculations by Norsworthy and Fulco). I would expect this shift effect to continue at a more modest rate of somewhat less than 0.1 percentage point during the next decade.

Crop production per acre has been on a plateau since 1972. I would expect some recovery in the growth of output per acre in the next decade as relatively less marginal land is brought back into cultivation, but not at the very high rate of 2 percent per year which was experienced from 1963-72.

(c) The impact of pollution control expenditures. On pages 35-37 of my paper on productivity I cite a number of reasons for supposing that the environmental revolution may not have lowered overall productivity so far. Most economists, including myself, are in general agreement that there will be a modest net reduction in the growth of productivity in the future, however, as pollution control facilities, to an increasing extent, are placed in operation and utilize resources that do not add directly to real output as presently measured.

(3) Will higher relative prices for energy and materials due to natural resource scarcity and the demand for a cleaner environment slow the growth of productivity?

Natural resource scarcity is a comparatively new phenomenon as far as the United States as a whole is concerned. I do not believe that it exerted a measurably negative impact on the U. S. productivity growth rate prior to the oil embargo of 1973. The wholesale price index for fuel and power has more than doubled since 1972, however. This, combined with the recession of 1974-75, has greatly moderated the growth of electric power and, by making higher operating speeds less economical, may be partly responsible for both the productivity and real capital investment slump which has occurred since 1973. Both of these problems can be overcome to some extent in the short run by emphasizing home insulation and other types of investments which conserve energy.

If more emphasis is placed on energy conservation I do not believe that natural resource scarcity will have a powerfully negative impact on overall productivity until after 1985, when it becomes necessary to replace naturally occurring gas and oil with capital intensive synthetic fuels and electricity. By the end of this century, however, I would expect pollution and natural resource scarcity to be serious enough to offset most, if not all, of the remaining gains to be expected from technological improvements.

(4) Is there a federal role in improving productivity? If so, what is of first priority?

I believe that all of the economists on our panel were in agreement that the first priority, at least in the short run, should be those monetary and fiscal policies that are most likely to be effective at stimulating a fairly prompt return to a condition of reasonably full employment since this will tend to boost productivity directly and also create an environment that is more favorable to the development and use of new capital goods that incorporate technological advances. There are many other ways in which the Federal government might be able to improve productivity in a modest sort of way. Each of these should be carefully evaluated on its own merits, however, since partial productivity ratios and even total factor productivity are not something that most economists would choose to maximize.

(5) Is defining productivity primarily in terms of labor productivity outdated?

I believe that more attention will be paid by economists to other kinds of productivity such as the productivity of capital, energy and non-renewable resources in the future. It might be noted that there has already been an effort to capitalize educational investments and estimate the financial return on different amounts of education. It should also be noted that there are some conceptual difficulties

in applying the capital concept to human investments and in determining an appropriate depreciation rate for both human and nonhuman capital. There are also serious problems of determining the relative worth of new knowledge, compared to old, and of assessing the worth of capital goods with different life expectancies. The many serious difficulties that are encountered in measuring capital stocks lead me to doubt whether there will be a popular swing away from partial indicators of factor productivity, such as labor productivity, to broader indexes of total factor productivity. Our more immediate economic problem is not just a surplus of labor but a surplus of unused industrial capacity and energy conserving appliances and investment goods that are not being purchased to a socially desirable extent.

(6) Can high technological products and services be relied on for a new wave of economic growth?

As far as consumer goods are concerned I don't believe that there is a sizable backlog of new high technology products and services that can be relied upon to produce a new wave of economic growth or insure a favorable balance of trade. Higher energy prices have already shot down some of the newer, faster, and fancier technologies which were on the horizon for this decade, such as the supersonic transport. Since it will be several years before American automobile manufacturers are able to shift gears and develop the newer, lighter and more efficient vehicles that will be required in the long run, one can easily image an economic hiatus while technological resources are shifted in the direction of more appropriate horizons.

In the case of new technologies that grapple directly with the problem of natural resource scarcity it is important to realize that such promising innovations as fuel cells, solar cells, breeder reactors, synthetic fuels, and fusion reactors still have a long way to go to become fully competitive with naturally occurring fossil fuels at present prices. There could be a great deal of technological progress in these areas, in other words, without a noticeable impact on economic activity in the next decade. In the areas of agricultural and human health, scientists are going to have to work very hard to develop substitutes for wonder drugs and pesticides that have been rendered less effective as a result of a build-up of immunity on the part of some harmful bacteria and insects. When Federal R & D is viewed from this perspective it seems clear that the promise of new technology is not so much the prospect of a new wave of economic growth but the preservation of the affluent society.

(7) What should the Federal government do to stimulate technological progress in the private sector?

While it might be appropriate for the Federal government to provide industry with financial grants and special subsidies to develop new technologies which conserve natural resources, reduce the social cost of pollution or, in other ways reduce the undesirable side effects of existing technologies, I would be inclined to oppose tax credits and R & D subsidies of a general character for not all R and D can be considered socially desirable. On an historical basis, at least, much R and D has been devoted to the development of new products and energy converters which have added to pollution and hastened the depletion of some of our natural resources. This could very well continue to be the case if cost sharing on the part of government is not limited to projects which promise more in the way of long run social benefits.

(8) Professor Rosenberg expresses the opinion in regard to technological innovation that government "can contribute more by providing a suitable environment for the operation of market incentives than by specific measures to aid particular industries or interest groups." Mr. Coates, on the other hand, calls for a much more activist role for government, citing four major areas that government should be involved with in guiding what he terms the "socially effective interplay of the basic variables: land, labor, capital, resource availability and knowledge." Which of these views on government's role in technological change do you subscribe to?

Government clearly has an important role in the financing of basic research. Where social costs are involved, or where important inputs such as domestically produced oil and gas are under priced in relation to imported fuel, it is not enough to subsidize new technology. To insure a social optimum, government must either impose pollution taxes and an offsetting excise tax on old domestic oil and gas, or regulate consumption by setting stringent environmental and energy consumption standards.

The economics profession (including Professor Rosenberg) has a strong preference for free markets and effluent taxes became regulation tends to be costly

and because free markets tend to be much more efficient at maximizing social welfare, if income is fairly distributed, than non price rationing mechanisms. In a world where pollution is difficult and costly to measure and where income may not be distributed in a fair and reasonable manner, I believe there may be a stronger case for regulatory standards than is commonly supposed by economists. It seems clear, however, that part of the productivity slump in recent years may be the result of over regulation of private industry by government. How to draw the line between a free market solution to social problems and a more activist role for the Federal government is a difficult matter which should be decided on a case by case basis, in my opinion, rather than on the basis of economic or political ideology.

(9) Is it realistic to suppose that real GNP can increase at an average annual rate of six percent per year during President elect Carter's first term in office?

No. Revised estimates of the average annual percentage change in real GNP published in the October 1976 *Survey of Current Business*, p. 27, show that six percent growth rates were only attainable in the last two and one-half decades during years following a serious recession such as 1955, 1959 and hopefully 1976. One does not need to believe that there has been a productivity slump of an enduring nature to question the realism of a six percent growth rate for the period 1976-80.

(10) Output per hour for all persons employed in the private economy only increased by about one percent per year from 1973-76. Do you believe that there will be some improvement in the growth of labor productivity in the next decade?

Yes. I am only about half as optimistic about the next decade as Professor Kendrick, however. My guess is that the growth in output per hour will turn out to be much closer to 1.5 percent than the 3.0 percent or more than Professor Kendrick believes might be possible under appropriate government policy. This conclusion is based partly on observable limits to the speed, scale and efficiency with which inanimate energy can be converted to useful working effects. It should also be noted that resource shifts from low to high productivity industries, which may have added half a percentage point or more to the overall productivity growth rate in the first two decades following World War II, will not be contributing importantly to productivity advance and may on balance have a negative influence in the next decade. Natural resource scarcity and the operation of pollution control equipment by private industry can also be expected to have a negative effect on productivity.

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RESPONSE OF JOSEPH F. COATES TO ADDITIONAL WRITTEN QUESTIONS POSED BY THE COMMITTEE

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C., November 19, 1976.*

Mr. JOSEPH F. COATES,  
*Office of Technology Assessment,*  
*Washington, D.C.*

DEAR MR. COATES: On behalf of the Joint Economic Committee, I want to thank you for your very helpful testimony at our recent hearings examining issues related to U.S. economic growth over the next decade. Both your prepared statement and your comments in the discussion period served as an important supplement to your paper. All this material will be of considerable value to the Committee in the coming weeks as it prepares its report on future U.S. economic growth prospects.

At the hearing, you were asked by Congressman Bolling if you would be willing to answer further questions in writing. We would appreciate your cooperation in providing written answers to the questions appended to this letter.

The Committee would like to receive this information as soon as possible so that it may be used in the drafting of its report as well as being included in the hearing record. A full set of the hearings will be sent to you as soon as they have been published.

Thank you and best wishes.

Sincerely,

JOHN R. STARK,  
*Executive Director.*

Enclosure.

## FOLLOWUP QUESTIONS FOR NOVEMBER 18 HEARING

(1) One often hears the argument that the lower rate of investment in the U.S. contributes to our diminishing superiority in productivity. Is there merit to this?

(2) There are three factors which have often been cited as forces or trends that may tend to restrict productivity gain. Could you indicate whether you basically agree or disagree that these have retarded, or will retard, productivity advances: changes in the composition of the labor force (more teenagers and women); dramatic advances in agricultural production no longer occurring; increased expenditures for pollution control.

(3) Will future increases in productivity depend on the speed with which costs of energy, materials and pollution are high relative to the value of the output to where this relationship is low?

(4) Is there a federal role in improving productivity? If so, what is of first priority?

(5) Is defining productivity primarily in terms of labor productivity outdated, especially in light of the argument that labor now appears to be in relatively abundant supply and there is a comparative shortage of such things as capital, energy and non-renewable resources?

(6) Will it be necessary to rely on high technological products and services for a new wave of economic growth? What technologies are already on the horizon which might provide the major forces of economic growth for the next decade?

(7) Will acceleration of technological advances require substantial increases in private industry R & D expenditures? What can the federal government do to stimulate technological progress as a spur to future economic growth?

(8) Professor Renshaw makes the rather challenging statement that "as we near the limits of technological progress, it will not be possible to increase one kind of productivity without a sacrifice of some other kind of productivity." Do you agree with this?

(9) Another particularly critical charge Professor Renshaw makes is that "the evidence would strongly suggest that it is becoming far more difficult to invent new products and discover new productive processes that are unambiguously superior to existing products and production techniques." What are your observations on this statement?

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CONGRESS OF THE UNITED STATES,  
OFFICE OF TECHNOLOGY ASSESSMENT,  
Washington, D.C., December 16, 1976.

Mr. JOHN R. STARK,  
*Executive Director, Joint Economic Committee,*  
*Washington, D.C.*

DEAR MR. STARK: With regard to several of the questions, I have no useful or interesting contributions to make and will, therefore, pass over them.

Reply to Question 1: (No Reply.)

Reply to Question 2: Estimates and anticipations of productivity advances with regard to the composition of the work force, advances in agriculture and expenditures for pollution control are all dependent upon the framework in which the analysis occurs. Consider, for example, the thesis that "dramatic advances in agriculture production are no longer occurring." This may be true within the framework of agriculture as it has evolved and stabilized over the last 30 years. However, if one considers the high potential for a major scientific breakthrough in photosynthesis on an artificial or non-animate base, one immediately sees that the nature of agricultural production may undergo a totally unheralded revolution in which food and fodder may be grown in systems, in locations, with resources, labor, manpower, and technologies almost beyond present conjecture. Similarly, if one looks at the opportunities latent or just barely visible in the applications of molecular biology and genetic manipulation to plant genetic materials, one can anticipate that even in the framework of now established agricultural processes that major benefits may be yet ahead of us. Manipulating genes to increase plant productivity, quality, food value, pest resistance, and a number of other desirable features seems quite likely. I believe that imminent scientific breakthroughs (over the next two decades) can only



make one enthusiastic about the impending revolutions in agricultural practice. The dislocations implicit in these new technologies may themselves be of major societal significance. But every revolution brings about radical change.

With regard to the question of increased expenditures for pollution control retarding productivity, one must acknowledge that if all assumptions remain the same and the cost of one element of the process goes up, the cost of that product, hence the productivity, declines. But if one looks at the question of the pay-offs of pollution control in reduced social costs, it is not at all clear that the productivity will not increase. The fundamental policy question is determining the proper conceptual framework for the analysis.

An analogous argument applies to the question of benefits of having more women and more teenagers entering the labor force. The possibility of a happier, less disaffected work force, improved home life, greater discretionary income with its multipliers, and greater discretionary income from multiple family members working, reduced medical and health costs and so on, all need to be integrated into the benefits measures.

Reply to Question 3: (No Reply.)

Reply to Question 4: As suggested in my paper, two of the principal Federal roles are first managing and discharging uncertainty and secondly providing a better base of policy-related information. With regard to any sector in which is desired to stimulate productivity, the key issue for government is to remove the confusion as to what the social goals are, by setting useful credible rules, regulations, standards, requirements, etc., which those with responsibility in the private sector can accept with some confidence of stability. For example, if one wishes to improve productivity in the fishing industry one would presumably want to set a series of constraints which made it clear in which way investments could go into improving the technology, the efficiency of the operation, stabilize markets and so forth. If one wishes to promote urban mass transit at the expense or as a complement to automobiles or suburbanization the clarification of what money, for what purpose over what time frame, for what objectives, under what regulations, with what regulatory constraints would go a long way toward drawing the forces for improved productivity into action in that sector.

Reply to Question 5: It seems to me that the question of productivity being measured in terms of labor productivity is not an obsolete concept but rather one which needs to be complemented and augmented by other measures. Measures in terms of capital requirements, energy and resource expenditures are good. Another item to add to the list of new metrics is, of course, the externalities and the social costs. However, it is not at all clear how these new metrics might be generated and what use or misuse they might serve. For example, consider the case of beginning to measure productivity in energy terms. If one just did this in terms of simple-minded energy expenditures, one might get a set of measures which could be strongly misleading. Just measuring the calories consumed in a process or product might involve mixing relatively cheap and expendable low-grade heat energy with very versatile, highly socially valuable electrical or chemical energy. One needs to consider not only the absolute amount of energy, but the quality of that energy in such metrics.

Reply to Question 6: The text in some detail goes into the question of the future economic growth technologies and these are summarized at the beginning of the paper.

Reply to Question 8: The basic assumption which I believe is totally without practical, empirical or theoretical foundation is that we are in anyway "near the limits of technological progress." If anything, the evidence is entirely in the reverse direction. Every field of science is beginning to spawn new opportunities and new practical developments. The complexity of our society and the subtlety and diversity of technologies already available are spinning out opportunities for new technological developments. Consequently, the question being premised as a counterfactual assumption merits no further attention.

Reply to Question 9: The point made is correct only if one assumes a conceptual framework or makes a set of assumptions which make it correct. For example, the chemical industry, largely based on the exploitation of petroleum as a source of organic chemicals may be running out of opportunities. Even that assumption, however, is questionable. If, however, we move into any significant development of forest products for energy purposes or if we develop photosynthesis as an inanimate technology, this would open up whole new classes of chemical compounds for new productive processes that might in turn

make petroleum products as obsolete as petroleum made coal-tar products. Incidental to that point with the resurgence of interests in coal, we may find a resurgence in the interest of coal-based chemicals. I find the conceptual framework and assumptions underlying the proposition to be so at odds with the realities as to be incorrect. Each new invention will in itself stimulate a wave of a process improvement. At least that has been the historical experience.

Yours truly,

JOSEPH F. COATES.

# LONG-TERM ECONOMIC GROWTH

FRIDAY, NOVEMBER 19, 1976

CONGRESS OF THE UNITED STATES,  
JOINT ECONOMIC COMMITTEE,  
*Washington, D.C.*

The committee met, pursuant to notice, at 10 a.m., in room 210, Cannon House Office Building, Hon. Richard Bolling (vice chairman of the committee) presiding.

Present: Representatives Bolling and Pike.

Also present: William A. Cox, Robert D. Hamrin, and Louis C. Krauthoff II, professional staff members; Michael J. Runde, administrative assistant; and George D. Krumbhaar, Jr., minority professional staff member.

## OPENING STATEMENT OF REPRESENTATIVE BOLLING, VICE CHAIRMAN

Representative BOLLING. The committee will come to order.

Several years ago when the country was in the midst of a serious petroleum crisis people began to wonder whether the kind of national crisis that results from the dwindling of domestic petroleum supplies and growing foreign dependency could also, in a few years, extend to other commodities and whether a variety of complications of comparable magnitude could eventually undermine the base of the United States economy. Against this type of contingency, very little was being done in this country in the way of economic foresight.

Early in 1974, Senator Mansfield pointed to the need to improve mechanisms of the Federal Government to coordinate information and national policy with regard to such economic difficulties.

Following this, with the cooperation of the joint House-Senate leadership and the executive branch, the 93d Congress established an independent Commission on Supplies and Shortages which is composed of Members of Congress, relevant executive branch officials, and representatives from private sectors. To aid the study of the Commission, Congress decreed by law the establishment of an Advisory Committee on National Growth Policy Processes to look into the institutional changes needed to be made to improve Federal coordination in this sphere and to translate such improvements into Federal policy.

For this reason Mr. Arnold Saltzman, an industrialist with policy level experience in the Federal Government was chosen to head up this important effort. He and his Committee of prominent American leaders representing labor, business, and State and local governments, the academic world and citizen and consumer organizations have developed recommendations regarding a new process and structure within the Nation.

They are scheduled to present their report to the National Commission on Supplies and Shortages at the end of the year and have been in touch with them during the work of drafting such a detailed report. In the course of this effort they have held more than 10 open sessions of the full committee and they have held numerous smaller meetings between ad hoc subcommittees of their own to smooth out differences in an attempt to reach a consensus so as to have the most meaningful report possible. The Chairman and several of his most active members are here with us this morning to discuss an interim report which he has submitted to the Joint Economic Committee as his individual observations as Chairman as of this date.

I and other members of the JEC have read this very interesting report, as has Mr. Jack Carlson, the recently appointed Chief Economist at the Chamber of Commerce of the United States. In our session here this morning, Mr. Saltzman is going to lead off and explain a little about the committee, what it has done, and why it has done it. Mr. Saltzman will discuss in general terms the conclusions at which they have arrived so far. Then he will speak to one particular section of the report which proposes a "National Growth and Development Commission." After this, Mr. Neustadt will discuss the relationship, as he sees it, between this Commission and the executive branch, and then Mr. Widner will talk about the intergovernmental and State relationships which would be involved in the creation of such a Commission.

It seems to me that the recommendations will make it possible at the highest levels of our national life to think ahead, to think long range, to analyze in a methodical way the full spectrum of problems and opportunities that lie before our Nation in the years and decades ahead.

Mr. Saltzman, we are very pleased to welcome you here this morning. As you know, for almost a year I have been following very closely the interesting work of your committee.

Mr. Saltzman received his education in New York and graduated from Columbia University.

His career includes Government service as head of the Military Pricing Branch of OPA, a member of the National Mobilization Committee, and a member of the staff of AID. He is a director of many companies, and since 1961 has been the chief executive officer of the Seagrave Corp.

Welcome to the final session of this series of hearings on long-term growth, Mr. Saltzman. What you have to say will have a great deal to do with how we get to the bottom line of this week's discussion on capital formation and investment, resources and energy, and productivity and technological change.

You may proceed as you wish, and at which length you wish.

**STATEMENT OF ARNOLD A. SALTZMAN, CHAIRMAN, ADVISORY COMMITTEE ON NATIONAL GROWTH POLICY PROCESSES; AND CHAIRMAN, SEAGRAVE CORP.**

Mr. SALTZMAN. Thank you, Mr. Vice Chairman and Congressman Pike.

Beginning with September of 1971 in testimony before this same committee, then chaired by Senator Proxmire, I have urged legislative

action to meet the Nation's need for a rational system of foresight in dealing with major national problems rather than the wasteful hit-or-miss-crisis-action and then-forget syndromes which have been and still are typical of much of the Federal approach.

The Advisory Committee on National Growth Policy Processes, as explained by the vice chairman today, Congressman Bolling, was established by law and charged with developing recommendations:

\* \* \* as to the establishment of a policymaking process and structure within the executive and legislative branches of the Federal Government as a means to integrate the study of supplies and shortages of resources and commodities into the dual problem of balanced national growth and development, and as a system for coordinating these efforts with appropriate multi-State, regional, and State governmental jurisdictions.

So that we are charged with the responsibility of not looking at any one individual problem, but rather the whole concept of how the Government can go about doing this task and create major policy decisions in a more useful and more productive fashion.

In the minds of those who established the committee, the object of its work and its recommendations is to "make it possible at the highest levels of our national life to—think long range, to analyze in a methodical way the full spectrum of problems and opportunities that lie before our Nation in the years and decades ahead."

In regard to the first problem, or the first condition or first change, we are a smaller, more accessible world, but the benefits have been obscured by the willingness of nations—particularly of emerging or relatively underdeveloped nations—to use their sovereignty as a nationalistic economic sledgehammer. Growing world trade has spurred the prosperity of recent decades, and cemented global interdependence. Between 1960 and 1974, the U.S. gross national product tripled, but the value of its imports and exports multiplied sixfold. Whereas in 1960 exports and imports each totaled approximately \$25 billion, 14 years later both exceeded \$140 billion. Today, 10 percent of all American-produced goods and services are destined for use overseas, and 10 percent of what Americans consume originates outside of our borders. It is symptomatic of the changing world that transnational corporations have recently grown at an annual rate of 10 percent, twice that of the world's economies taken as a whole. By 1980, it is expected that sales of transnational corporations will constitute 16 percent of the gross world product.

Trade expansion contributes to American prosperity, but it has also increased our vulnerability to foreign economic and political pressure. And simultaneously there has been an increased American dependence on imported raw materials. A recent analysis by the U.S. Geological Survey identified 29 minerals required in significant amounts to produce and transport energy. The United States depends on imports for more than half of its supplies of 14 of these minerals. Foreign sources now supply about 40 percent of the petroleum consumed in this country. Since the Arab oil embargo demonstrated our dependence on foreign oil in 1973 and the Nation embarked upon "project independence" to free us from reliance on foreign energy sources, oil imports have increased by 25 percent. The world does not face an imminent shortage of natural resources, but American dependence on imports and the willingness of producers to form cartels or to use materials to promote im-

mediate national objectives may combine in the future, as they have in the past, to create domestic shortages of necessary raw materials or sudden artificially high prices.

Our foreign policy has not adequately understood the potential danger from suppliers, or competing allies as well as adversaries. Military or political considerations and solutions are increasingly unreliable in the world that economically has grown both more interdependent and more disorderly.

Moreover, the growing importance of world trade complicates the Government's desire to achieve balanced national growth largely through the expansion of the free market economy. It implies a removal of a good portion of economic decisionmaking authority from private firms to the Government, both because foreign trade is more regulated than internal commerce, and because most nations expect and demand greater government participation than we do in economic affairs. The reluctance of our Government to intervene in transactions between foreign central governments and American firms, or foreign firms backed by this Government, occasionally puts American industry at a severe disadvantage. This suggests a more aggressive role in international economic affairs consistent with that of other industrial nations.

Because it cannot unilaterally make and enforce rules to govern international trade as it does to govern commerce at home, the growth of international commerce inevitably lessens America's control over its total economic destiny. The American people understand, if they don't fully accept, the complications of solving our international economic problems. What the American people and their leaders have understood even less clearly are the domestic changes that have diminished our ability to manage and improve our economic well-being.

And so the second cause or the second major change that relates here is that, as in the notorious Russian wheat deals, the economic and social structure of the United States has been profoundly transformed since the end of World War II, and even since the early 1960's. Many believe that after successively (1) filling the Nation and commencing development of its natural resources, (2) industrializing the Northeast and Midwest, and (3) becoming a largely urban society, America has entered on a fourth stage in its national development. Beginning in the late 1960's, this new era has been marked by an end to the exodus of rural population to the cities, the resurgence of the South and Southwest, less manufacturing employment relative to service employment, decentralization of financial and corporate enterprise as the tie between manufacturing and the cities is severed, and the decline of older metropolitan areas in the Northeast and industrial Midwest. Government programs and priorities have lagged behind these developments. The Federal Government continues to return 60-80 cents to Northeastern and Midwestern States for each dollar they contribute to Federal coffers while the booming South and West receive 120 to 170 percent of their tax dollars back as Federal assistance of various kinds.

The "post-industrial revolution" has been considered by many as a phenomenon with a potential impact the same order of magnitude as the agricultural revolution of 10,000 years ago and the industrial revolution, now two centuries old. The earlier revolutions witnessed successive transformation of society's economic base from hunting and

gathering to agriculture and towns and then to industrial manufactures, each accompanied by a tenfold increase in median per capita income. The latest upheaval is marked by still another shift, this time from industrial production to services. In 1947, over 50 percent of all American workers were employed in the production of goods. By 1980, two-thirds of the Nation's manpower will be concentrated in service industries such as transportation, trade, finance and Government, raising the specter of permanent inflationary pressures flowing from lower productivity.

Two of the most important aspects of economic transformation are the declining influence of market forces and the growing interdependence of sectors and regions. The former has been aggravated by industrial concentration—the 200 largest manufacturing corporations in America controlled 48 percent of all manufacturing assets in 1950, 56 percent of such assets in 1960, and 60 percent of those same assets in 1970. The latter is a function of the complexity of our society and the specialization within it.

The emerging post-industrial order has had profound effects not only on the American standard of living, but also on the psychology of the American people. Advancing technology has both sparked the need for the environmental movement and also made possible many of its successes to date. For the first time in its history, this Nation is engaged in a debate over national growth and development, pitting those who unreservedly favor such growth, and the industrial development which fuels it, against others whose view is that sometimes "less is better." American attitudes change to reflect changes in the world. As in the cases of the transition from a world view of limitless resources and opportunities to one in which both are limited, the shift is often slow, painful and accompanied by alienation and unease.

How has the Government responded to the changing world? The Government today has greater responsibilities, but present Government institutions do not effectively carry out these responsibilities. It is not so much a question of individual competence, or a lack of human or material resources as it is one of structural inability of the Government to confront changing needs in a timely and cohesive fashion.

It is simple to deal with the implied benefit of timely or early grasp of a potential problem and thus minimize it. But the price we pay for failure to integrate our policymaking is less clear. We must first understand that almost everything in this complex world relates to something else. Each problem, such as energy, has tentacles wrapping around a multiplicity of economic, social, environmental, and foreign policy considerations.

Let's take an example. The energy policy alone—in the executive branch and without reference to macroeconomic regulation on the above stated considerations—we find fossil fuels, nuclear power, pipe and transmission lines, rails, tankers, employee health and safety, air and water quality, motor vehicle performance standards, taxes, import restrictions, and energy research—11 related components of the energy problem—each within the jurisdiction of a different agency which in each case states that its own statute precludes it from subordinating its control. The same proliferation of responsibility exists in a multiplicity of congressional committees and subcommittees.

What does that all add up to? Federal performance suffers from two major shortcomings: (1) A lack of integrated policymaking within both our executive and legislative branches which has caused us as a nation to tackle problems in bits and pieces, often producing results favorable in one area but seriously counterproductive in another; and (2) a lack of foresight in averting problems because we do not have mechanisms to anticipate, analyze, and understand them or to take advantage of opportunities which may arise.

In a complex, crowded world, the activities of one group increasingly affect—often adversely—the lives and well-being of others. One man's transportation is his neighbor's jet noise; one nation's nuclear tests are the contaminated milk of people half a world away. The proliferation of this kind of mutual interference highlights what are generically known among lawyers as "commons problems." A commons problem exists whenever decisions which are rational from the viewpoint of individual actors combine to produce an outcome which maximizes neither the welfare of society as a whole nor that of the actors within it.

In a free society, commons problems are notoriously intractable. Almost by definition their resolution requires outside intervention, because individuals must be induced to ignore their perceived self-interests. Of the many techniques which may be used to regulate with commons, some—user charges—are more consistent than others such as regulation, with a free market economy, but all go against the grain.

If we are to deal with these problems in an appropriate manner, the Government must have a clear view of the future as well as the past. The practice of waiting for the storms to strike and then hurriedly erecting shelters is not only wasteful and inefficient of the resources of the Nation but its cumulative effect may well be devastating.

Moreover, if it wishes to solve problems rather than aggravate them, the Government must take a comprehensive view of the issues facing it. The world of the modern commons is a world of linked and multifaceted problems, and programs which address issues in isolation often create more difficulties than they resolve. Thus, the organization of the Federal Government along narrow programmatic lines has not facilitated effective governance but impeded it. If we are to cope successfully with the complex and interrelated problems of the late 20th century, it is imperative that we both improve the capacity and capability of Government to look into the future, anticipating problems instead of merely reacting to them, and also to think comprehensively when preparing to make policy choices.

Planning does not mean simply improving economic and other models to give us a more accurate picture of events to come. Nor can it be limited to the preparation and implementation of long-range programs without adequate consideration of all the effects of such programs as they unfold. In order to sharpen and clarify that, let's look at one or two examples. The problem which we face today is not lack of data, but refusal or inability to react to the data we have in any organized fashion. For example, the U.S. birth rate rose from 18 per 1,000 to 27 per 1,000 after World War II within a matter of 2 or 3 years and did not subside until the early 1960's. Though certain



long-range implications of the resulting "baby boom" could have been projected and action could have been taken to minimize undesirable impact, this was not done. Only as maturation produced crises were ad hoc measures hastily taken.

Failure to interpret the available vital statistics and anticipate their probable implications has caused numerous difficulties. A shortage of elementary school teachers and classrooms in the 1950's was followed by shortages of secondary school and college personnel and facilities in the 1960's. Only after the fact did the Nation undertake intensive teacher education and facilities construction programs, and these programs predictably were not terminated when the boom ended. Today, declining school populations are coupled with excessive capacity, to the point where 85 percent of the 1.2 million people trained to be teachers who will graduate by 1980 will not get jobs in their chosen field. There are other examples of the baby boom nonpolicies. We have been and are unprepared for the 35 million persons who will enter the labor force during the 1970's, unprepared for the need for housing, unprepared for the increase in crime, which could have been foreseen, since most crimes are consistently committed by single men aged 14 to 24. The point is that the data on the baby boom were nearly perfect; there was virtually no controversy over the figures and their future impact. There were, however, no mechanisms requiring an integrated policy-making approach.

Now, if having knowledge and not using it is wasteful, planning based on insufficient data or failure to consider all foreseeable efforts of a proposed program is reckless and dangerous. Perhaps the most striking example—and I am using examples simply to put things in context—of such behavior is the interstate highway system now approaching completion. When it was first proposed in the early 1950's, the system's planners envisioned a 40,000-mile network of expressways linking all major portions of the United States. Their vision has become our reality. The system today is an engineering marvel which has put postwar America on wheels and, as an aid to truck and automobile transportation, has exceeded all expectations.

The problem is that the planning which preceded construction of the highway system was narrowly focused and largely ignored anything not directly connected with technical design and construction per se. It was known in the early 1950's that concentrations of automobiles can cause severe pollution problems, but this was ignored. Routes were laid through central cities, ultimately requiring the eviction of thousands of people at a time when good housing was in short supply, but this too was overlooked in 1956. Obviously, the system would have—and has had—enormous and detrimental effects on non-motor vehicles modes, but these were brushed aside. By opening up the suburbs to uncontrolled growth, the system facilitated urban sprawl and accelerated the decline of central cities, but this was not taken into account either. Tens of billions of dollars were spent on a program which promised to—and has—shaped our Nation in concrete. The structure of domestic commerce was violently altered without consideration of the spillover effects that such a system would have on important sections of the economy and the regions through which the roads were to be built. And if you have the patience, one more example.

It is useless to collect data and suggest policy alternatives from it if the statements on which they are based are subject to debate or to varying interpretations because of political or ideological bias, even though each recommendation is useful and viable individually.

During the middle 1950's, responsible forecasts estimated that total crude oil production in the continental United States would ultimately amount to between 150 and 200 billion barrels. Those forecasts implied that domestic production would peak between 1966 and 1970 and decline thereafter, and as a result that petroleum imports would grow rapidly after 1970. The first reaction of the petroleum industry to the predictions of an imminent decline in U.S. oil production was one of incredulity and dismay; the second was an attempt to prove it would not be so. In the 5 years following 1956, public estimates of ultimate U.S. oil production were rapidly escalated until, in 1961, the U.S. Geological Survey trumped the highest estimates with a resounding 590 billion barrels. That figure would have kept the United States self-sufficient in oil production until about the year 2000.

The best present figures indicate ultimate production of 170 billion barrels in the "lower 48." Annual crude oil in the continental United States peaked in 1970. In the winter of 1972-73, the United States for the first time suffered from widespread fuel oil shortages because of the inability of domestic production to meet current demands. In the winter of 1973-74, the American economy was nearly paralyzed by an Arab oil embargo. America lost its chance to plan for and achieve real energy independence in 1956.

The moral of the petroleum reserves production story is not that industry should be precluded from forecasting its own production, or that its forecasts should not be taken seriously. Rather the lesson to be learned is the need for a mechanism for the collection of data of greater integrity, and for multiple centers of data generation and analysis. The data and information bases which underlie national planning efforts should not be generated solely by those whose forecasts are likely to be colored by their devout hopes for certain future conditions. We need data that is gathered on the same basis, treated with integrity and available to all agencies of the Government and even the private sector. In that way we could at least agree on what we disagree about.

In the United States, national policy planning has too often been pictured as a closed process involving only a small group of powerful technocrats, insulated from criticism, imposing a rigid program upon a willing public. In fact, there is nothing in the nature of planning that requires such an undemocratic process or solution. We do not advocate a planned society. We urge that America become a planning society. In the long run, we believe that intelligent planning will actually reduce burdensome governmental intervention in matters affecting the private sector. Much present governmental interference in the economy consists of extreme and ad hoc reaction to situations which have become acute because they were ignored until they became intolerable. With the benefit of foresight, we expect that such Government intervention as proves necessary will be more considered, more timely, and less heavyhanded.

We have recommendations which suggest new institutions and procedures which we believe are necessary if Government policymaking

is to remedy the shortcomings—and avoid the pitfalls—discussed above.

The process that we propose will give policymakers improved ability to plan. But we are under no illusions that the goals we seek are easily attainable. Our political system rewards “firefighters” and tends to dismiss efforts at foresight as the work of intellectual Cassandras. In the American version of the tale, the white knight who slays the dragon gets the damsel and the votes. His friend in the next village may have achieved the same end with less trouble by spraying dragon repellent on the shrubbery, but for his productive pains he gets only the indifference of the mob and a reputation for eccentricity.

The American people and their elected representatives still have in their consciousness the memory or legend of a land of infinite size and riches where “every man could be a king.” And the immigrants coming to our shores magnified the American dream.

This dream is philosophically inconsistent with today’s reality that we must conserve, husband our resources, more sharply define our objectives at home, use our strength more selectively abroad and with heightened reliance on economic solutions. That means we must plan more carefully the use of our more limited resources and more fragile environment while we improve our mechanisms to avoid trouble instead of reacting to it.

Crossing the psychological divide between the dream and the reality is our Nation’s most difficult hurdle. Foresight and integrated policy-making in Government will emerge only if the need is understood and is demanded by an informed public. Thus, we renew the theme of public participation with which we close this introduction and which pervades the recommendations of our committee.

In summary our recommendations are separated, for purposes of presentation, into discrete subject areas running the gamut from collection of data and its use in the construction of economic models through formulation of policy alternatives and their consideration by the President and Congress. While these recommendations are valid singly, the committee’s suggestions are intended to lay the groundwork for one continuous process and taken together, they outline a single, self-reinforcing structure. The following topics are addressed in the report<sup>1</sup> which I rendered and which appeared in the Congressional Record (Senate) :

A National Growth and Development Commission.

Data collection and statistical analysis.

Intergovernmental and territorial dimensions of national growth policy.

Presidential participation in national growth policymaking.

The role of Congress in national growth planning.

Materials and commodity policies.

My colleagues Dick Neustadt and Ralph Widner and I will discuss several of our more important recommendations, but are available for questioning on all of them. I would like to discuss the creation of what we call a National Growth Development Commission.

You, Congressman Pike, have heard something of this back in 1973.

<sup>1</sup> See the interim report of the Advisory Committee on National Growth Policy Processes, beginning on p. 261.

The committee recommends that a National Growth and Development Commission be created, as an independent agency of the executive branch of the Federal Government with a broad mandate to examine emerging middle- to long-range growth and development issues with particular attention to the integrative implications and to recommend feasible policy alternative implications and to recommend feasible policy alternatives to the Congress, the President and the public. We recommend that the obligation to prepare the national growth and development report be transferred to the Commission from the Office of the President.

However much we as a Nation improve the capabilities of Congress and the executive to govern on a cohesive and farsighted basis—and as I said, my colleagues will talk further to that possibility—it is unrealistic to expect existing institutions preoccupied with the crisis-making headlines today to devote extensive resources to problems of the near and distant future. The demand for long-range policy analysis already has, and in the future increasingly will, outstrip institutional capabilities. In addition, there are matters that require attention, but the raising of which carry, or appear to carry, large political liabilities that both the Congress and the Presidency allow to linger in limbo until the repercussions have enveloped us. Our committee intends the National Growth and Development Commission to be an independent center devoted to identifying and examining policy issues before they surface as crises—an early warning system—and before they enter the partisan political arena, and to assess the impact of existing policies on future needs. The Commission's output must be broad and comprehensive, addressing the future needs of regions and sectors as well as the economy as a whole. It will not make a single recommendation, but rather explore feasible policy options involving crosscutting issues of national import, so that when it looks at the problem it will lay out alternative courses of action, and it will attach to those alternative courses of action in each case the costs, economic or social to each of these alternative solutions it proposes.

The Commission, as we view it, will have no executive, legislative or judicial powers, but is to be an evaluative and advisory institution. Its task is to raise the level of national debate by clearly setting forth policy options. It will also raise the national awareness of problems not yet upon us or not being tended to. Among these will be issues raised by the Advisory Committee on Intergovernmental Relations, which Ralph Widner will discuss, and the State and regional implications of those recommendations. They will have been brought to the attention of the Commission and will have been organized by the Commission seeking integrative policy alternatives.

The National Growth and Development Commission's output will take three distinct forms:

First, the organization will annually prepare and submit to Congress, the President, and the Nation a report setting forth its proposed research agenda, the status of ongoing work, and Government responses to previous studies.

Second, the National Growth and Development Commission should periodically select major policy issues for comprehensive analysis by its staff and others working under its auspices. A typical analysis

would identify and describe the problem addressed and present alternative feasible means of approaching it, including the cost of each alternative, and the sectoral and regional impacts of the options considered. There should be no substantive limitation on the scope of the National Growth and Development Commission's investigations; however, the President or either House of Congress by special resolution might require the Commission to address any major topic it selects.

Third, the job of writing the National Growth Policy Report, now imposed on the President by title VII of the 1970 Housing and Urban Development Act, should be transferred to the National Growth and Development Commission. At least once every 4 years the Commission would be charged with preparing a broad overview of major prospects and policy issues affecting our Nation's future growth and development. We believe that transferring the growth policy report to the Commission will disentangle it from the constraints imposed upon elected officials in dealing with politically sensitive issues or in raising issues which at the moment appear to be beyond their capacity to solve, and thus elevate the candor and content of the national growth policy report. To involve the public at large in the Commission's work, the growth policy report might be preceded by hearings across the country, and presented to the Nation in a televised joint session of the Congress.

As far as the structure of the Commission, we suggest that the Commission consist of nine people of diverse interests and backgrounds appointed by the President after consultation with the congressional leadership, and subject to Senate confirmation. Five of the members would be full time and four part time, serving staggered terms of 2 to 5 years. The President would select, from among the full-time members, a Chairman to serve in that capacity at the President's pleasure. No member would be removable during his term except for cause.

The committee's purposes in recommending this complex structure are four: To provide continuity of membership; to give the Commission some degree of political autonomy; to balance Presidential and congressional influence by making the Chairman responsive to the President while requiring consultation with Congress before appointment of members; to insure that high caliber individuals may serve on the Commission although not in a position to accept full-time appointments. And the reasons for suggesting this Commission structure are to balance congressional and Presidential influence and get high caliber people, et cetera.

As far as staff, we are not thinking of more than approximately 35 people. To guarantee access to necessary information, the Commission should be given authority both to contract out analytic work and to demand information from executive agencies as needed, and remain aware of useful planning efforts by governmental bodies such as OSTP. We expect it to hold hearings, receive information and seek advice from sources outside of the Government.

The committee is sensitive to the fact that much of the Commission's work may be controversial. Simply in choosing the topics to be addressed, even without regard to its findings, the Commission over time will inevitably make some enemies. While its activities would not be shielded from congressional and Presidential oversight,

we believe that in the interest of giving the Commission a reasonable opportunity to prove its worth its organic act should provide authorization sufficient to see it through an initial 8-year lifespan and, like independent regulatory agencies today, its annual budget should be submitted to Congress without OMB intervention. But the Commission's enabling legislation also might well include a "sunset" provision requiring a thorough, independent evaluation of the institution after 7 years, prior to the renewal of its legislative charter.

We have given some thought to the problem of focusing the attention of the President and Congress on the National Growth and Development Commission's output. In the final analysis, the Commission's work can only be guaranteed a hearing if the competence and stature of the body are established and it has public support. However, we do believe that the Commission's enabling legislation should include a provision requiring a President and the Congress to respond in some fashion to the Commission's output. The economic report—about which Professor Neustadt will speak—should be an ideal vehicle for this kind of response, but the voice or mode of response to be left to the President. Some provisions must be made for regular transmission of the Commission's work to designated committees in the House and Senate, or to the leadership of the Congress for assignment as it sees fit. And that is something that the Congress would have to work out with and for the Commission.

I would just like to add one last statement before the other recommendations are presented. It is often argued that there are hazards to our freedom in a planning economy. But the alternatives are not planning on the one hand and freedom on the other. The alternatives as we see them include the option of planning democratically in a way that does not diminish our freedom but expands it.

I pointed out greater limitations in our freedom which come from not anticipating. If we turn our backs on all we have learned in 200 years about the domestication of power, the uses of all our institutions, and the emergence of freedom, then planning will be very hazardous indeed. But if we proceed with care, make use of the planning of the private sector, learn as we go, and build accountability into the system, planning will be considerably less hazardous than drifting into a dangerous future.

Planning must be open and competitive to be sound. The process we envision is designed both to maximize public participation and to encourage multiple centers of data and policy analysis. Diverse centers of expertise guarantee sharp debate and vigorous advocacy. They are our insurance against the triumph of weak policy by default.

A vigorous and free press, an open planning process, a multiplicity of centers creating vigorous debate, and a healthy respect for the effectiveness of the free market can combine to permit a planning process which successfully avoids the Scylla of blindly stumbling about in a complex world on the one hand, and the Charybdis of centralized, totalitarian usurpation of our rights on the other.

And with that, Mr. Vice Chairman, I would presume that my friends and associates who have worked with me and the others of our committee for a long year would like to add their views.

Representative BOLLING. Thank you very much, Mr. Saltzman, for what I consider to be an enormously interesting proposal, which has

obviously taken a tremendous amount of effort. Looking at the composition of your group, I would suspect that you had many hundreds of hours of discussion before you could arrive at conclusions like this. And I think they are of urgent importance.

Mr. Saltzman, the interim report of the Advisory Committee on National Growth Policy Processes that you have rendered for the hearing record will be placed in the record at this point.

[The interim report follows:]

INTERIM REPORT SUBMITTED TO THE HONORABLE MIKE MANSFIELD, MAJORITY LEADER, UNITED STATES SENATE, BY ARNOLD A. SALTZMAN, CHAIRMAN, ADVISORY COMMITTEE ON NATIONAL GROWTH POLICY PROCESSES TO THE NATIONAL COMMISSION ON SUPPLIES AND SHORTAGES, OCTOBER 1976

#### INTRODUCTION

"I am not an advocate for frequent changes in laws and constitutions, but those institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths discovered, and opinions change with change of circumstances, institutions must advance to keep pace with the times."

THOMAS JEFFERSON.

The Advisory Committee on National Growth Policy Processes was established by Public Law 93-426, Section 720(i)(2) and charged with developing recommendations: ". . . as to the establishment of a policy-making process and structure within the Executive and Legislative branches of the Federal Government as a means to integrate the study of supplies and shortages of resources and commodities into the dual problem of balanced national growth and development, and as a system for coordinating these efforts with appropriate multi-state, regional and state governmental jurisdictions."

The legislation creating the Committee was jointly sponsored by Senate Majority Leader Mansfield and Senate Minority Leader Scott. In Senator Mansfield's view it had "become clear that institutions of government and the traditional processes relied upon to develop national policy do not adequately respond to new challenges . . . the finiteness of natural resources \* \* \* and the needs of state and local governments across the nation." This is a view shared by the overwhelming majority of members of both Houses of Congress which have supported our efforts to date. In the minds of those who established the Committee, the object of its work and its recommendations is to "make it possible at the highest levels of our national life to—think long-range, to analyze in a methodical way the full spectrum of problems and opportunities that lie before our Nation in the years and decades ahead."

Since its first meeting in January 1976, this Committee has sought to reach agreement on a series of measures designed to improve the Federal government's abilities to anticipate and then deal with the challenges of the future. To a gratifying degree, this has truly been a *working* committee; a small staff, small budget, and tight deadlines meant that Committee members were asked to give much of their time and themselves, and they have responded generously with both. The Committee's work has benefitted accordingly.

#### AMERICA IN A CHANGING WORLD

This Committee grew out of a Congressional sense of frustration and concern—frustration at the Government's apparent inability to anticipate and deal with the larger problems of our time, and concern that unless this drift were checked America's position in the world and progress at home would be irreversibly damaged.

Congress' concerns mirror those of the nation as a whole. Only in the last few years have Americans even begun to face the fact that we no longer have water to waste, oil to spill or forests to raze. We do not possess or dominate the vast natural resources and share of the world's productive capacity that once was ours by default. The dollar, though still a leading currency, is not the strongest or most stable in the world. As a nation we are belatedly only beginning to deal with the facts of our limitations of power abroad and the end of a "frontier society" with an abundance of riches to exploit at home.

One reaction to the end of American dominance is a sense that government has been inadequate; that it does not serve the needs of the governed. A Louis Harris poll of September, 1976 found that 45 percent of American voters feel "left out of things going on around me," up from 9 percent in 1966, and fully 64 percent agree that "the people running the country don't really care what happens to you," compared to 26 percent who shared that view a decade ago.

The initial question facing this Committee was: Why? Why doesn't "the System" work well any more? What has changed over the past dozen years that gives people the feeling that their government is no longer up to carrying out its assigned tasks?

The short answer is a simple one. It was alluded to by Thomas Jefferson two centuries ago in the quotation which opens this Report. Our nation and the world have changed since 1960 but our government has not kept pace. Governmental institutions and processes have not responded to changes in the environment that they are supposed to understand and manage. We are backing into the future, stumbling as we go.

There are two major changes which have materially altered the condition of the United States and which our nation has not fully recognized and our Government has not adequately reacted to. The first is the accelerating interdependence of the nations of the world (an interdependence in the face of increased nationalism and lack of cooperation) and the effects of this on the United States economy committed—in theory if not in practice—to free-market principles. The other is the almost unmarked but rapid shift of our already mature industrial civilization into a new phase of industrial and societal development. Together these add up to an enormous total of new problems taxing our Government's capacity to understand, let alone to deal with, and further exacerbated by the increasingly widespread belief that improving the economic well-being of individual citizens is a legitimate responsibility of Government.

The world is indeed smaller, but the benefits have been obscured by the willingness of nations—particularly of emerging or relatively underdeveloped nations—to use their sovereignty as a nationalistic economic sledgehammer. Growing world trade has spurred the prosperity of recent decades and cemented global interdependence. Between 1960 and 1974, the United States' Gross National Product tripled, but the value of its imports and exports multiplied sixfold. Whereas in 1960 exports and imports each totaled approximately \$25 billion, 14 years later both exceeded \$140 billion. Today, 10 percent of all American-produced goods and services are destined for use overseas, and 10 percent of what Americans consume originates outside our borders. It is symptomatic of the changing world that trans-national corporations have recently grown at an annual rate of 10 percent, twice that of the world's economies taken as a whole. By 1980, it is expected that sales of trans-national corporations will constitute 16 percent of the Gross World Product.

Trade expansion contributes to American prosperity, but it has also increased our vulnerability to foreign economic and political pressure. The American economy has expanded relatively slowly (our growth rate since 1960 has been below that of any other major industrial nation except Great Britain), and simultaneously there has been an increased American dependence on imported raw materials. A recent analysis by the U.S. Geological Survey identified 29 minerals required in significant amounts to produce and transport energy: the United States depends on imports for more than half of its supplies of 14 of these minerals. Foreign sources now supply about 40 percent of the petroleum consumed in this country. Since the Arab oil embargo demonstrated our dependence on foreign oil in 1973 and the nation embarked upon "Project Independence" to free us from reliance on foreign energy sources, oil imports have increased by 20 percent. The world does not face an imminent shortage of natural resources, but American dependence on imports and the willingness of producers to form cartels or to use materials to promote immediate national objectives may combine in the future, as they have in the past, to create domestic shortages of necessary raw materials or sudden artificially high prices.

Moreover, the growing importance of world trade complicates the Government's desire to achieve balanced national growth largely through the expansion of the free market economy. It implies a removal of a good portion of economic decision-making authority from private firms to the Government, both because foreign trade is more regulated than internal commerce, and because most nations expect and demand greater government participation than we do in economic affairs. The reluctance of our Government to intervene in transactions between foreign central governments and American firms occasionally puts Am-



erican industry at a severe disadvantage, as in the notorious Russian wheat deals of 1973, or the government's current refusal to halt the unregulated export of cattle hides (contributing to accelerating import of finished shoes and garments and corresponding unemployment) while other nations with cattle hides permit only finished goods to be exported. International trade is not immune to market forces, but it is certainly less responsive to the "invisible hand" and more responsive to political considerations than domestic commerce. The Government cannot expect to play the same role in foreign trade that it does internally with the same result, for there is no single authority in the international trade field to make rules and authoritatively arbitrate disputes as they arise.

Because it cannot unilaterally make and enforce rules to govern international trade as it does to govern commerce at home, the growth of international commerce inevitably lessens America's control over its economic destiny, suggesting a more aggressive role consistent with that of other industrial nations. That is understood if not fully accepted. What the American people and their leaders have not understood are the domestic changes that have diminished our ability to chart an economic course and to hold to it.

The economic and social structure of the United States has been profoundly transformed since the end of World War II, and even since the early 1960s. Many believe that after successively: (1) filling the nation and commencing development of its natural resources; (2) industrializing the Northeast and Midwest; and (3) becoming a largely urban society, America has entered on a fourth stage in its national development. Beginning in the late 1960's, this new era has been marked by an end to the exodus of rural population to the cities, the resurgence of the South and Southwest, less manufacturing employment relative to service employment, decentralization of financial and corporate enterprise as the tie between manufacturing and the cities is severed, and the decline of older metropolitan areas in the Northeast and industrial Midwest. Government programs and priorities have lagged behind these developments. The Federal Government continues to return 69-80 cents to Northeastern and Midwestern States for each dollar they contribute to Federal coffers while the booming South and West receive 120-170 percent of their tax dollars back as Federal assistance of various kinds.

The "post-industrial revolution" is viewed by many as a phenomenon with a potential impact the same order of magnitude as the agricultural revolution of 10,000 years ago and the industrial revolution, now two centuries old. The earlier revolutions witnessed successive transformation of society's economic base from hunting and gathering to agriculture and towns and then industrial manufactures, each accompanied by a ten-fold increase in median per capita income. The latest upheaval is marked by still another shift, this time from industrial production to services. In 1947, over 50 percent of all American workers were employed in the production of goods. By 1980, two-thirds of the Nation's manpower will be concentrated in service industries such as transportation, trade, finance and government.

The post-industrial revolution has profound implications for the nation's economy. For example, productivity is far more difficult to measure and much harder to increase in the provision of services than in the manufacture of goods. Yet service employees have demanded—and received—wage increased roughly equal to those received by industrial employees, raising the spectre of continuing inflationary pressures as service employment begins to predominate. Moreover, Government itself is a leading "service" industry, and it is less responsive than others to market forces or constraints. Since the close of World War II, state and local expenditures have increased 35 times faster than the increase in the American population, rising from 5 percent of the GNP in 1946 to 15 percent in 1974. State and local employment has doubled since 1960, growing faster than in any other sector of the economy. Though expenditures for Federal programs have grown no faster than the economy since World War II (the number of Federal civilian employees has increased by less than 25 percent since 1946) Federal aid to states and localities rose from \$2 billion in 1950 to \$52 billion in 1975; today about one out of every seven dollars in the Federal budget is earmarked for aid to sub-Federal governments.

Two of the most important aspects of economic transformation are the declining influence of market forces and the growing interdependence of sectors and regions. The former has been aggravated by industrial concentration—the 200 largest manufacturing corporations in America controlled 48 percent of all manufacturing assets in 1950, 56 percent of such assets in 1960, and 60 percent of those same assets in 1970. The latter is a function of the complexity of society

and specialization within it. Before the agricultural revolution a family could be self-sufficient; before the industrial revolution a single village might supply all its own needs; before the post-industrial revolution a region, consisting of a city and surrounding agricultural areas, could survive on its own. Today, however, no family, village, region, or even nation produces the variety of goods and services which it consumes, and no government can embark on a new enterprise without profound effects both on its immediate surroundings and on remote portions of the world.

The emerging post-industrial order has had profound effects not only on the American standard of living, but also on the psychology of the American people. Advancing technology has both sparked the need for the environmental movement and also made possible most of its successes to date. For the first time in its history, this nation is engaged in a debate over national growth and development, pitting those who unreservedly favor such growth, and the industrial development which fuels it, against others whose view is that sometimes "less is better." American attitudes change to reflect changes in the world. As in the cases of the transition from a world view of limitless resources and opportunities to one in which both are limited, the shift is often slow, painful and accompanied by alienation and unease.

#### THE GOVERNMENT'S RESPONSE TO A CHANGING WORLD

Government in a free society facilitates economic growth and development by providing for those left behind, arbitrating disputes which cannot be resolved in the market place, maintaining defense and hopefully preserving peace at home and abroad, and supplying goods and services which are necessary but inadequately provided by the free market. In a post-industrial nation, with all of the new pressures that brings, part of an even more economically interdependent world—but a world marked more by narrow economic antagonisms and competitions than by accommodation, it is increasingly difficult for our government to perform well. Government today has greater responsibilities to successfully influence our economic involvement with other nations and simultaneously to avoid or minimize those crises more prone to surface in complex and delicately balanced, social systems.

Present government institutions do not effectively carry out these responsibilities. It is not so much a question of individual competence, or a lack of human or material resources as it is one of structural inability of the government to confront changing needs in a timely and cohesive fashion.

It is simple to grasp the implied benefit of timely or early grasp of a potential problem and thus minimize it. But the price we pay for failure to integrate our policy-making is less clear. We must first understand that almost everything in this complex world relates to something else. Each problem, such as energy, has tentacles wrapping around a multiplicity of economic, social, environmental and foreign policy considerations.

In energy policy alone—and without reference to macro-economic regulation on the above-stated considerations—we find fossil fuels, nuclear power, pipe and transmission lines, rails, tankers, employee health and safety, air and water quality, motor vehicle performance standards, taxes, imports restrictions, and energy research—11 related components of the energy problem—each within the jurisdiction of a different agency which in each case states that its own statute precludes it from subordinating its control.

In sum, Federal performance suffers from two major shortcomings: (1) a lack of integrated policy-making within both our executive and legislative branches which has caused us as a nation to tackle problems in bits and pieces, often producing results favorable in one area but seriously counter-productive in another; and (2) a lack of foresight in averting problems because we do not have mechanisms to anticipate, analyze, and understand them or to take advantage of opportunities which may arise.

In a complex, crowded world, the activities of one group increasingly affect (often adversely) the lives and well being of others. One man's transportation is his neighbor's jet noise; one nation's nuclear tests are the contaminated milk of people half a world away. The proliferation of this kind of mutual interference highlights what are generically known as "Commons problems." A Commons problem exists whenever decisions which are rational from the viewpoint of individual actors combine to produce an outcome which maximizes neither the welfare of society as a whole nor that of the actors within it. The name

derives from the village commons of medieval England, on which each man by law and tradition was permitted to graze his cattle. Because use of the commons was "free" it was in the interest of each village resident to expand his herd indefinitely, but when all did so the Commons were overgrazed and could no longer sustain anyone's herd. Pollution is a notorious example; the least expensive way for any individual to dispose of his wastes has historically been by dumping them into the nearest stream. This has few adverse affects until everyone in town does likewise, at which point the municipal water supply is destroyed.

In a free society, Commons problems are notoriously intractable. Almost by definition their resolution requires outside intervention, because individuals must be induced to ignore their perceived self-interests. Of the many techniques which may be used to regulate with Commons, some (user charges) are more consistent than others (regulation) with a free market economy, but all go against the grain.

If we are to deal with these problems in an appropriate manner the Government must have a clear view of the future as well as the past. It is always more difficult to correct a problem after it becomes acute than before. "The practice of waiting for the storms to strike and then, hurriedly, erecting shelters," Senators Mansfield and Scott note, "is not only wasteful and inefficient of the resources of the nation but its cumulative effect may well be devastating. There is a need, it seems to us, to anticipate and, as far as possible, to act in an orderly fashion before the difficulties have descended on us." Overseeing the progress of a post-industrial society requires an accurate grasp not only of where we are but also of where we need to be and the merits of alternative ways of getting there.

Moreover, if it wishes to solve problems rather than aggravate them, the Government must take a comprehensive view of the issues facing it. The world of the modern Commons is a world of linked and multi-faceted problems, and programs which address issues in isolation often create more difficulties than they resolve. Thus, the organization of the Federal Government along narrow programmatic lines has not facilitated effective governance but impeded it. Many agencies, each serving only themselves and their constituent groups well, often add up to a totality that serves the nation inadequately. Almost thirty years ago, the Fourth Annual Report to the President by the Council of Economic Advisers addressed the problem of coherent policymaking in terms that still sound current today.

"A cardinal task, as the Council sees it, is to achieve even more harmony and consistency among those outstanding programs of government which greatly affect the whole economy. . . . The privilege of men and agencies within a free government to give differing advice should be cherished. But this does mean that the final execution of public programs touching upon the whole economy should not achieve that internal consistency and that harmonious relationship to defined common objectives which any large undertaking demands."

The Government, in sum, fails to plan in a systematic fashion. If we are to cope successfully with the complex and interrelated problems of the late 20th century, it is imperative that we both improve the capacity and capability of Government to look into the future, anticipating problems instead of merely reacting to them, and also to think comprehensively when preparing to make policy choices.

Planning does not mean simply improving economic and other models to give us a more accurate picture of events to come. Nor can it be limited to the preparation (and implementation) of long-range programs without adequate consideration of all the effects of such programs as they unfold. The problem which we face today is not lack of data, but refusal or inability to react to the data we have in any organized fashion. For example, the U.S. birth rate rose from 18 per 1,000 to 27 per 1,000 after World War II and did not subside until the early 1960's. Though certain long-range implications of the resulting "baby boom" could have been projected and action could have been taken to minimize undesirable impact, this was not done. Only as maturation produced crises were ad hoc measures hastily taken. The baby boom is now over, but those born during it are still very much with us and our society has not had an easy time thus far in its attempts to accommodate the baby-boom generation.

Failure to interpret the available vital statistics and anticipate their probable implications has caused numerous difficulties. A shortage of elementary school

teachers and classrooms in the 1950's was followed by shortages of secondary school and college personnel and facilities in the 1960's. Only after the fact did the nation undertake intensive teacher education and facilities construction programs, and these programs predictably were not terminated when the boom ended. Today, declining school populations have produced excessive capacity, to the point where 85 percent of the 1.2 million teachers who will graduate by 1980 will not get jobs in their chosen field. There are other examples of the baby boom non-policies. We have been and are unprepared for the 35 million persons who will enter the labor force during the 1970's. Although almost one-third of the increase in the crime rate during the 1960's was attributable to the new baby boom population and could have been foreseen (most crimes are consistently committed by single men aged 14 to 24), we did not react to the new crime wave until the 1970's were almost upon us. We note that there has been the same lack of attention to housing. The point is that the data on the baby boom were nearly perfect; there was virtually no controversy over the figures and their future impact. There were, however, no mechanisms requiring an integrated policymaking approach.

We have not fully learned the lesson of the baby boom even today. Only because the Social Security Administration is forward looking and captures the attention of Congress and the Executive are we aware of the pressures which will be placed on our retirement system as the over-65 population doubles in the next 40 years. There is, at the same time, little concern at the highest levels about the crisis which faces the VA hospital system in the next 15 years, as huge numbers of World War II veterans age and their needs for medical care expand.

If having knowledge and not using it is wasteful, planning based on insufficient data or failure to consider all foreseeable effects of a proposed program is reckless and dangerous. Perhaps the most striking example of such behavior is the interstate highway system now approaching completion. When it was first proposed in the early 1950's, the system's planners envisioned a forty-thousand mile network of expressways linking all major portions of the United States. Their vision has become our reality: the system today is an engineering marvel which has put post-war America on wheels and, as an aid to truck and automobile transportation, has exceeded all expectations.

The problem is that the planning which preceded construction of the highway system was narrowly focused and largely ignored anything not directly connected with technical design and construction per se. It was known in the early 1950's that concentrations of automobiles can cause severe pollution problems, but this was ignored. Routes were laid through central cities, ultimately requiring the eviction of thousands of people at a time when good housing was in short supply, but this too was overlooked in 1956. Obviously, the system would have (and has had) enormous and detrimental effects on non-motor vehicle modes, but these were brushed aside. By opening up the suburbs to uncontrolled growth, the system facilitated urban sprawl and accelerated the decline of central cities, but this was not taken into account either. Tens of billions of dollars were spent on a program which promised to—and has—shaped our nation in concrete. The structure of domestic commerce was violently altered without consideration of the "spillover" effects that such a system would have on important sections of the economy and the regions through which the roads were to be built.

An additional factor of single facet policymaking which contributed to our urban spread and sprawl was our Nation's policy commitment to the increased productivity of agriculture through the contribution of research at land grant universities and other government supported facilities. While this has contributed to the bounty of our Nation, it also facilitated one of the largest movements of people from rural to urban areas with no programs, no arrangements to cope with these population shifts.

Finally, it is useless to collect data and suggest policy alternatives from it if the statistics on which they are based are subject to debate or to political considerations rather than the other way around.

During the middle 1950's, responsible forecasts estimated that total crude oil production in the continental United States would ultimately amount to between 150 and 200 billion barrels. Those forecasts implied that domestic production would peak between 1966 and 1970 and decline thereafter, and as a result that petroleum imports would grow rapidly after 1970. The first reaction of the petroleum industry to the predictions of an imminent decline in U.S. oil production was one of incredulity and dismay; the second was an attempt to prove it would not be so. In the five years following 1956, public estimates of ultimate U.S. oil

production were rapidly escalated until, in 1961, the U.S. Geological Survey trumped the highest estimates with a resounding 590 billion barrels. That figure would have kept the U.S. self-sufficient in oil production until about the year 2000.

The best present figures indicate ultimate production of 170 billion barrels in the "lower 48." Annual crude oil production in the continental United States peaked in 1970. In the winter of 1972-73, the United States for the first time suffered from widespread fuel-oil shortages because of the inability of domestic production to meet current demands. In the winter of 1973-74, the American economy was nearly paralyzed by an Arab oil embargo. America lost its chance to plan for and achieve real energy independence in 1956.

The moral of the petroleum reserves prediction story is not that industry should be precluded from forecasting its own production, or that its forecasts should not be taken seriously. Rather the lesson to be learned is the need for a mechanism for the collection of data of greater integrity, and for multiple centers of data generation and analysis. The data and information bases which underlie national planning efforts should not be generated solely by those whose forecasts are likely to be colored by their devout hopes for certain future conditions. We need data that is gathered on the same basis, treated with integrity and available to all agencies of the Government and even the private sector. In that way we could at least agree on what we disagree about.

In the United States, national policy planning has too often been pictured as a closed process involving only a small group of powerful technocrats, insulated from criticism, imposing a rigid program upon a willing public. In fact, there is nothing in the nature of planning that requires such an undemocratic process or solution. We do not advocate a planned society. We urge that America become a planning society. In the long run, we believe that intelligent planning will actually reduce burdensome governmental intervention in matters affecting the private sector. Much present governmental interference in the economy consists of extreme and ad hoc reaction to situations which have become acute because they were ignored until they became intolerable. With the benefit of foresight, the Committee expects that such government intervention as proves necessary will be more considered, more timely, and less heavy-handed.

The Committee's preliminary recommendations suggest new institutions and procedures which we believe are necessary if government policy-making is to remedy the shortcomings—and avoid the pitfalls—discussed above. We cannot as a nation begin to adequately cope with changes, internal or external, unless and until our national leaders have improved mechanisms which will assist them in reacting to the new complications in society with more forward-looking and integrative policies.

The process that we propose will give policy-makers improved ability to plan. But we are under no illusions that the goals we seek are easily attainable. Our political system rewards "fire-fighters" and tends to dismiss efforts at foresight as the work of intellectual Cassandras. In the American version of the tale, the White Knight who slays the dragon gets the damsel and the votes. His friend in the next village may have achieved the same end with less trouble by spraying dragon repellent on the shrubbery, but for his productive pains he gets only the indifference of the mob and a reputation for eccentricity.

The American people and their elected representatives still have in their consciousness the memory or legend of a land of infinite size and riches where "every man could be a king"—or at least "paddle his own canoe" in a river filled with salmon. And the immigrants coming to our shores magnified the American Dream.

This dream is philosophically inconsistent with today's reality that we must conserve, husband our resources, more sharply define our objectives at home, use our strength more selectively abroad and with heightened reliance on economic solutions. That means we must plan more carefully the use of our more limited resources and more fragile environment while we improve our mechanisms to avoid trouble instead of reacting to it.

Crossing the psychological divide between the dream and the reality is our nation's most difficult hurdle. Foresight and integrated policymaking in government will emerge only if the need is understood and is demanded by an informed public. Thus, we renew the theme of public participation with which we close this introduction and which pervades the recommendations of the Committee.

## SUMMARY OF THE COMMITTEE'S RECOMMENDATIONS

Our recommendations are separated, for purposes of presentation, into discrete subject areas running the gamut from collection of data and its use in the construction of economic models through formulation of policy alternatives and their consideration by the President and Congress. Despite this organization, the Committee's suggestions are intended to lay the groundwork for one continuous process; taken together, they outline a single, self-reinforcing structure. The following topics are addressed below:

A National Growth and Development Commission.

Data Collection & Statistical Analysis.

Intergovernmental and Territorial Dimensions of National Growth Policy.

Presidential Participation in National Growth Policymaking.

The Role of Congress in National Growth Planning.

Materials and Commodity Policies.

This paper is not the final report of this Committee. That report will be delivered, prior to year-end, to the National Commission on Supplies and Shortages and to the public, along with a supplementary document containing individual Committee papers, contractor studies, and other related materials. The recommendations presented and summarily discussed below are those on which the Committee has reached substantial consensus to date, and matters which remain to be resolved are noted. We expect that the next two months will see refinement of the Committee's views on some of the subjects discussed herein, particularly the role of Congress. Moreover, while Committee sentiment is not completely unanimous, there has been a surprising degree of argument on the major recommendations outlined in this interim report. In the final report, any Committee member who wishes to take issue with particular recommendations, or to offer additional substantive comments, will have the opportunity to do so.

The Committee has been operating since its formation in accordance with all provisions of the Federal Advisory Committee Act of 1972 which, *inter alia*, requires that all of our meetings be open to the public and the records and meeting minutes be made available for public inspection. Public attendance and interest in the ongoing work of the Committee has been both encouraging and helpful. We hope that it will not abate with the conclusion of our work.

We have made no effort to analyze in depth any substantive policy problem, or to recommend alternative possible solutions on such matters as energy or urban blight or nuclear proliferation, or a whole host of other present or potential difficulties. That job was not assigned us. Rather, we have addressed ourselves to the more general problem of improving the structure and processes of the Federal Government so that it may deal more capably with the whole spectrum of problems and potential problems facing our nation.

## NATIONAL GROWTH AND DEVELOPMENT COMMISSION

The Committee recommends that a National Growth and Development Commission be created, as an independent agency in the Executive Branch of the Federal Government with a broad mandate to examine emerging middle to long-range growth and development issues with particular attention to the integrative implications and to recommend feasible policy alternatives to the Congress, the President and the public. We recommend that the obligation to prepare the National Growth and Development Report be transferred to the Commission from the Office of the President.

However much we improve the capabilities of Congress and the Executive to govern on a cohesive and far-sighted basis, it is unrealistic to expect existing institutions preoccupied with the crises-making headlines today to devote extensive resources to problems of the near and distant future. The demand for long-range policy analysis already has, and in the future increasingly will, outstrip institutional capabilities. In addition, there are matters that require attention, but the raising of which carry, or appear to carry, large political liabilities that both the Congress and the Presidency allow to linger in limbo until the repercussions have enveloped us. The Committee intends the National Growth and Development Commission to be an independent center devoted to identifying and examining policy issues before they surface as crises (an early warning system) and enter the partisan political arena, and to assessing the impact of existing policies on future needs. The Commission's output must be broad and comprehensive, addressing the future needs of regions and sectors as well as the economy as a whole. It will not make a single recommendation,

but rather explore feasible policy options involving cross-cutting issues of national import. It will attach the costs, economic or social, to the alternative solutions it proposes.

The Commission, as we view it, will have no executive, legislative or judicial powers, but is to be an evaluative and advisory institution. Its task is to raise the level of national debate by clearly setting forth policy options. It will also raise the national awareness of problems not yet upon us or not being tended to. Among these will be issues raised by the ACIR of sectoral or of regional consequence, which they have brought to the attention of the Commission and which will have been organized by the Commission seeking integrative policy alternatives.

The National Growth and Development Commission's output will take three distinct forms:

First, the organization will annually prepare and submit to Congress, the President, and the nation a report setting forth its proposed research agenda, the status of ongoing work, and government responses to previous studies.

Second, the National Growth and Development Commission should periodically select major policy issues for comprehensive analysis by its staff and others working under its auspices. A typical analysis would identify and describe the problem addressed and present alternative feasible means of approaching it, including the cost of each alternative, and the sectoral and regional impacts of the options considered. There should be no substantive limitation on the scope of the National Growth and Development Commission's investigations; however, the President or either house of Congress (by special resolution) might require the Commission to address any major topic it selects.

Third, the job of writing the National Growth Policy Report, now imposed on the President by Title VII of the 1970 Housing and Urban Development Act, should be transferred to the National Growth and Development Commission. At least once every four years, the Commission would be charged with preparing a broad overview of major prospects and policy issues affecting our nation's future growth and development. We believe that transferring the Growth Policy Report to the Commission will disentangle it from the constraints imposed upon elected officials in dealing with politically sensitive issues or in raising issues which at the moment appear to be beyond their capacity to solve, and thus elevate the candor and content of the National Growth Policy Report. To involve the public at large in the Commission's work, the Growth Policy Report might be preceded by hearings across the country, and presented to the nation in a televised joint session of the Congress.

#### COMMISSION STRUCTURE AND PROCEDURES

We suggest that the Commission consist of nine people of diverse interests and backgrounds appointed by the President after consultation with the Congressional leadership, and subject to Senate confirmation. Five of the members would be full-time and four part-time, serving staggered terms of two to five years. The President would select, from among the full-time members, a Chairman to serve in that capacity at the President's pleasure. No member would be removable during his term except for cause.

The Committee's purposes in recommending this complex structure are four:

- to provide continuity in membership;
- to give the Commission some degree of political autonomy;
- to balance Presidential and Congressional influence by making the Chairman responsive to the President while requiring consultation with Congress before appointment of members; and
- to insure that high caliber individuals may serve on the Commission although not in a position to accept full-time appointments.

The Commission would appoint an executive director and deputy director to head a staff of from 35 to 50 professionals, supplemented by visiting specialists and consultants as needed. To guarantee access to necessary information, the Commissions should be given authority both to contract out analytic work and to demand information from executive agencies as needed, and remain aware of useful planning efforts by governmental bodies such as OSTP. We expect it to hold hearings, receive information and seek advice from sources outside of the government.

The Committee is sensitive to the fact that much of the Commission's work may be controversial. Simply in choosing the topics to be addressed, even with-

out regard to its findings, the Commission over time will inevitably make some enemies. While its activities should not be shielded from Congressional and Presidential oversight, we believe that in the interest of giving the Commission a reasonable opportunity to prove its worth its organic act should provide authorization sufficient to see it through an initial eight-year lifespan and, like independent regulatory agencies today, its annual budget should be submitted to Congress without OMB intervention. But the Commission's enabling legislation also might well include a "sunset" provision requiring a thorough, independent evaluation of the institution after seven years, prior to the renewal of its legislative charter.

The Committee has given some thought to the problem of focusing the attention of the President and Congress on the National Growth and Development Commission's output. In the final analysis, the Commission's work can only be guaranteed a hearing if the competence and stature of the body are established and it has public support; the ultimate success of the body will largely turn on the individuals appointed to it. We cannot emphasize too strongly, therefore, the importance of appointing an initial body of the highest caliber, whose membership is widely respected for its fairness and competence.

Beyond this, we have several suggestions. It is important that the Commission conduct its affairs openly, not only making its reports available but actively stirring public participation and interest in its work. To the extent that the public at large believes the Commission's work to be valuable, it will be helpful in promoting national consensus assisting the legislative process—particularly in complicated and controversial matters. We also believe that the Commission's enabling legislation should include a provision requiring the President and Congress to respond in some fashion to the Commission's output. The Economic Report of the President, about which more is said elsewhere in this report, would be an ideal vehicle for response, but the choice of mode should be left to the President. Finally, some provision must be made for regular transmission of the Commission's work to designated committees in the House and Senate, or to the leadership of Congress for assignment as it sees fit.

Not since the National Resources Planning Board under President Roosevelt has our nation had a permanent organization to identify and raise policy issues of the type recommended above at the highest levels of government, with a broad mandate and no substantive limitations. The NRPB was an enormously valuable institution, but its failure to serve Congress as well as the President led to its early demise. The Committee has tried to address the problems encountered by the NRPB in developing our recommendations. But a new institution of the kind we envision cannot survive, whatever its structure and mandate, without the active support of the American Government and people. We trust that the National Growth and Development Commission will earn such support, and we hope that it will be forthcoming.

#### DATA COLLECTION AND STATISTICAL ANALYSIS

The Committee recommends the creation of a new statistical unit in the Executive Branch to coordinate and rationalize the Federal Government's collection and processing of basic economic data. The new unit should construct its own econometric model of the American economy, sophisticated enough to trace and project the effects of alternative policies and scenarios on individual regions or sectors as well as the economy as a whole.

Accurate and usable information is the foundation of all economic analysis and forecasting. These in turn are the principal tools of economic and policy planners. We should not take any action of potentially great impact on the economy without understanding its probable effects on the course of national economic growth and development.

During and after World War II, the United States pioneered in the development of advanced econometric models that reduce the web of interrelationship in a modern industrial economy to manageable size. In the decades since the War, however, we have fallen behind in the use of such models to guide Federal efforts to understand the economy and achieve balanced economic growth.

The United States does not lack for economic models. Within the Federal Government the Departments of Commerce, Labor, Agriculture, and Interior, the Federal Energy Administration, and the Environmental Protection Agency each have econometric models used in forecasting the national economy or narrowly defined sectors of it. We fail, however, to coordinate the construction of



models, or to standardize the collection of data which drives them. As a consequence, the value which the Government gets for its statistical dollar and the analysis available to the public and decision-makers is not maximized. The closest thing at present to a statistical coordinating agency, OMB's Statistical Policy Division, has not taken a strong lead in rationalizing the construction of models or coordinating collection of data. As a consequence, some data is collected twice while other important statistics are neglected altogether, with data being inconsistent. Federal models, written in diverse computer languages, cannot "communicate" with each other. Moreover, fractionated statistical capabilities have failed to produce a model anywhere in the U.S. sufficiently large and detailed to provide an adequate overview of the sectoral and regional implications of proposed economic policies or possible future events.

To remedy these defects, the Committee recommends that a new statistical coordinating body be created within the Executive Branch, without strong ties to any existing department or agency. The new unit's task would be two-fold :

First, it would assume responsibility for coordinating the construction of Federal econometric models and overseeing collection of the data that drives them. The new unit is not to dictate the purposes or use of Federal statistical efforts, but it should be given sufficient budgetary and administrative powers to encourage agencies to build models capable of interacting with each other, to eliminate wastefully duplicate data gathering, to foster data collection in areas where it is now weak, and to guarantee the integrity of the data collected. It is to forcefully promote the notion that all Federal models, whatever their origin and purpose, should be integrated into a single statistical system permitting the user of one to draw on the resources of all.

Second, the new unit would be responsible for developing a large, sophisticated model capable of detailed analysis and simulation of the economy by sector or region, and available as a base upon which to model smaller and more specialized sections of the economy at minimal expense. We do not propose that the Department of Commerce's Bureau of Economic Analysis and the Department of Labor's Bureau of Labor Statistics give up their modeling capability in favor of reliance on a single central model. We do anticipate, however, that in time many consumers of econometric data will discover on their own that the well-funded and highly sophisticated model which we propose can capably supplement or replace their own more modest efforts.

The Committee does not favor placing the new statistical agency under the wing of any existing department with important econometric responsibilities. Because of the substantial staff and budget which its modeling and data coordinating responsibilities will require, placement within the Executive Office of the President would not be appropriate. At the same time we are skeptical of the value of a totally new, independent agency. In the final analysis, it may be best to place the new functions in an existing office with a reputation for integrity, objectivity and technical capability; the National Bureau of Standards, the Smithsonian Institution, or the National Science Foundation are suggestive of what we have in mind.

The Committee has also not yet reached a firm position on the extent to which the new statistical entity should become involved in analysis and commentary as well as description, which we expect to do in our final report. It is clear that the proposed National Growth and Development Commission, the Congress, and the strengthened Presidential policy staffs (which we advocate in the Presidential section) will be eager consumers of the new agency's output. Moreover, we can envision a program under which scholars or others from outside of the government gain access to the new model.

#### INTERGOVERNMENTAL AND TERRITORIAL DIMENSIONS

##### Improving the State and Regional Contribution to National Growth Policy :

The Committee recommends that the responsibilities of the Advisory Commission on Intergovernmental Relations (ACIR) for analysis of intergovernmental problems and communication of regional prospectives to the federal government be expanded. The Committee further recommends that statutorily based intergovernmental commissions, similar in organization to the ACIR, be established in each of the 10 existing Federal administrative regions. These should be given immediate responsibility for communicating regional problems and prospects to the Federal government and overseeing collection and dissemination of information on subjects of regional importance.

Of the three perspectives from which we should view the consequences of national policy decision—aggregate impact on the nation as a whole, sectoral impacts on specific industries, and territorial impacts on communities or areas—we are weakest by far in attending to the third. Improvements in our ability to anticipate aggregate and sectoral problems in the economy must be accompanied by parallel improvements in our ability to foresee territorial and intergovernmental difficulties arising from aggregate or sectoral problems. We lack adequate means at present to assess, before we move, the potential consequences of Federal action in such areas as regulation, land leases, subsidies, and tax policies on states and localities. With the exception of the ACIR, no institution monitors the sub-federal effects of Federal decisions even after they are made, and there are no regular channels through which state and local governments can routinely communicate with the Federal government in areas of shared authority.

In recent decades, the powers and responsibilities of the Federal Government have increasingly intertwined with those of state and local governments. Increasing Federal intervention in national economic affairs, including energy and transportation, affects, and is impacted by, the power of the states to control land use, set up local governments, develop systems of taxation, etc. The growth of environmental concerns and the emergence of important resource imbalances across regions have heightened this interdependence. Proposals to improve intergovernmental cooperation have gone unimplemented or failed to provide the necessary degree of coordination. No institution adequately assesses the territorial and intergovernmental impact of major public and private initiatives.

The Committee's recommendations in this area reflect a desire to recommend ways of assessing the territorial implications of national policy decisions, of modeling developments in the nation's major regions, of making recommendations for adjusting national policy to avoid undesirable territorial impacts, and of providing opportunities to air concerns common to Federal and sub-Federal governments.

As currently organized, the Advisory Commission on Intergovernmental Relations (ACIR) functions primarily as a forum for the consideration of common concerns of officials at all levels of government and a source of expert studies on problems of federalism. We envision expanding the body into an intergovernmental "conscience", prodding other components of the government to give attention to the kinds of regional concerns which will form so large a portion of our national agenda in the years ahead.

To that end, we recommend that the ACIR undertake the following new responsibilities:

First, periodic reports should be made to the National Growth and Development Commission on the intergovernmental and territorial aspects of national development. These, to include documents compiled by each of the ten (10) intergovernmental commissions discussed below, would be incorporated into the Commission's National Growth and Development Report.

Second, ACIR should undertake to consult with the Commission and the policy staffs in the Executive Office of the President to insure that those groups give adequate consideration to issues of major regional significance in preparing their own reports and recommendations.

Third, the ACIR should respond, on behalf of state and local governments, to discussion of intergovernmental issues by the Commission and Presidential staffs in their products. In a similar vein, the ACIR might submit "intergovernmental impact statements" to the President and Congress assessing the probable effects of proposed policy initiatives on states and localities.

The proposed regional intergovernmental commissions would perform, on a more limited basis within regions, the functions that the ACIR is to perform on behalf of sub-national governments in general. Like the ACIR itself, they would be funded jointly by the states and the Federal government. For example, they might weigh the local impact of proposed tax reforms or railroad subsidies, reporting the results to the ACIR and the public. Moreover, they would continually monitor and evaluate the territorial effects of specific policies or programs, looking towards reports to the ACIR on regional growth and development for use in preparing the periodic National Growth and Development Report of the Commission. In these reports, critical regional problems would be identified and viewed in the context of national development trends, Federal policies and programs, and other factors of interest. On a day-to-day basis, the "mini-ACIR's" should function as clearinghouses for information and analysis of regional problems and prospects—sponsoring some studies and disseminating others.

It is the Committee's hope that these mechanisms will strengthen America's ability to weigh the effectiveness of policies and programs, particularly as they insert general elected officials into the intergovernmental arena on a continuing basis. Hitherto, intergovernmental working relationships have been almost exclusively between functional agencies, such as the Federal Highway Administration and state and local highway departments. This has contributed to the fragmentation of public policy and the misallocation of public resources.

The Committee has not decided yet on other uses of the regional intergovernmental commissions. Clearly, the efficacy of federal programs could be enhanced if a gradual but determined effort were made to rationalize the crazy-quilt system of Federal regional organization, interstate economic development activities, and other councils which take in part of more than one state but less than the entire nation; the mini-ACIR's might take the lead in such an endeavor. Some on the Committee have suggested that the proposed regional intergovernmental commissions may be appropriate vehicles through which to channel Federal regional development funds. Others resist giving program responsibilities to the regional commissions, arguing that it is precisely the lack of such functions which has permitted the ACIR to avoid involvement in bitter but pointless controversy and to develop a reputation for impartial expertise. We hope to have more to say on this subject in our final report. Whether or not they are given line functions, however, the Committee strongly believes that the proposed regional commissions would make an important contribution to the national effort to develop better policy-planning tools.

#### PRESIDENTIAL PARTICIPATION IN NATIONAL GROWTH AND DEVELOPMENT POLICY

The Advisory Committee recommends that the Economic Report of the President, broadened to include detailed analyses and a comprehensive outline of the President's economic goals and program by sector, become a principal vehicle for Presidential initiative in national economic affairs. To assist in preparing the expanded Economic Report, generating policy alternatives, and providing fresh sources of substantive expertise, the President needs staff competence across the government by program and the economy by sector. We recommend three things: strengthening some staffs that already exist (e.g. OMB's capacity to do integrated policy analysis and the technical assessment capabilities of the new OSTP), reassigning or eliminating some existing staffs which have failed (e.g. the Domestic Council), and creating a new unit to fill the Executive Office's void in the area of sectoral economic analysis.

Three distinct phenomena stand in the way of the leadership which Americans expect—and increasingly fail to get—from their Presidents in proposing and implementing policies affecting national growth and development. The first is the problem of attracting Presidential attention to long-range concerns in the face of the President's normal role as a "firefighter," confronting the problem of the moment without the leisure to reflect on its relationship to last week's crisis or tomorrow's agenda. The second is the difficulty of securing impartial counsel in the face of departmental and interest-group parochialism; to the extent that the President relies on these sources (each with its own mandate and constituency to service) the information he receives is likely to be limited and his options narrowed accordingly. The third is the parochialism and fragmented jurisdiction of the Federal departments, which works against coherent national policy development because almost all important problems (food and energy, for example) cut across departmental lines.

The key to solving the last problem lies in a thorough reorganization of the executive branch. We believe that such a move would be in the nation's interest, but do not have the time or resources to undertake the kind of analysis that the subject deserves. The other two problems noted are addressed in the Committee's major recommendations.

Sustained White House interest, a prerequisite to effective Presidential participation in national economic growth and development, can be secured by placing a reporting requirement on the President that impels him and his principal advisors to step back from day-to-day concerns and take a comprehensive look at the economy and what they propose to do about it. Because it is an action-forcing document with high visibility and statutory deadlines, the budget has become the principal planning tool of modern administrations. But the budget's short-term focus and consideration of Federal program expenditures to the exclusion of

other relevant factors makes it unsuitable for use as the major general planning document.

Rather than suggest yet another report, the Committee's contribution to curbing Presidential paper proliferation is the suggestion that the Economic Report of the President be broadened in a fashion that returns it to the spirit of the Presidential message contemplated by the Senate when it passed the Employment Act of 1946, the nation's last serious attempt at national growth policy planning. The report is visible, prestigious and ripe for expansion. Recent Reports, in fact, show some signs of evolving into the broad policy tool we envisage, a role which they have not placed since the Truman Administration. And the Report's tie to Congress, formalized in annual hearings by the Joint Committee on the Economic Report, is one which we applaud and hope to see strengthened in future years.

We recommend that the present Report be expanded in two ways. As a descriptive document it should deal with such matters as investment employment, and wages not only in aggregate terms but also with reference to major sectors of the economy and geographic regions. As a prescriptive document it ought to outline Presidential policies in areas touching significantly on national growth and development. Ideally, the Economic Report can present in one place an overview of the President's entire economic program: targets at which he has taken aim, reasons for the measures he advocates, and consequences he anticipates out in the private sector as well as across the government if and when his proposals are enacted. While the President must and will retain the freedom to choose the subjects to be addressed and the attention given them, an enlarged Economic Report also strikes us as the ideal place to raise and comment on trends not yet troublesome but potentially so, such as commodities plentiful but likely to be scarce or expensive in the foreseeable future.

Simply by way of example, we note that the pages of an expanded Economic Report would be the ideal place for Presidential commentary on decisions by independent regulatory agencies like the ICC, CAB, and FCC, highlighting the impact of agency initiatives and suggesting Congressional action where appropriate. And if, as recommended above, an independent National Growth and Development Commission is established, the Economic Report would be the logical place for the President's response to the work of this body. In short, an expanded Economic Report gives the President an opportunity to state, in a unified whole, his interpretation of the nation's economic problems and his proposals for dealing with them. Simply drafting the Report will force the White House to confront and reconcile conflicting departmental goals, proposals and priorities, a valuable exercise in its own right.

Improvement in Presidential policy staffing should complement and build upon the broadened Economic Report.

The case for staff improvement is a strong one. OMB, for example, lack a real grasp of problems which straddle or fall between Departments, and has no division to monitor non-federal institutions and their interaction with national policy-making. The CEA, for its part, rarely ventures to examine production or employment in any one sector of the economy, however vital. No part of the Executive Office effectively monitors middle-range concerns, up to five years in the future, though OMB does prepare five-year budget forecasts.

OMB has a long history of substantive service to the President. Over the last decade it has increasingly moved from the nuts and bolts of operational oversight to broad gauge policy analysis. This movement has been limited, however, by the pre-occupation of most OMB professionals with single agencies and thus with pieces of programs and problems. OMB can and should help the President and his aides think through policy problems in general terms, free of jurisdictional limits. We suggest that a substantial number of OMB staffers devote more time to broad and medium-range issue analysis on the President's behalf. We believe that this can be accomplished without net increases in personnel by folding what is left of the Domestic Council staff into OMB and re-orienting parts of the underused management staff to this mission.

More specialized but equally relevant capabilities can be created in the new Office of Science and Technology Policy (OSTP). The Office's enabling legislation gives it a mandate to do medium range planning on all matters touching science, technology, and engineering; these endeavors constitute a vital component of needed planning capability insofar as advancing technology is a prime cause of the conditions for which we feel the need to plan.

In addition, the Executive Office needs a new sectoral (micro-economic) economic staff of perhaps 50 to 150 professionals to follow and analyze sectors

of the private economy for the President. The tasks are varied, but all involve watching what goes on "out there" for the President and then helping him to formulate his economic program in a manner sensitive to individual slices of the economy. The new office, though not equipped with its own data-collection capability, will make extensive use of input-output models of the economy by sector and region, and thus should be a natural supporter of the efforts advocated elsewhere in this report to coordinate and expand the government's statistical capabilities.

We are hopeful that many of the positions needed to staff the new office can be obtained by abolishing present vestigial Executive Office units with related missions, such as CIEP and COWPS. Such action would provide an excuse for abolishing various Cabinet Committees now frozen into being by statute but of little use to the President. Statutory Cabinet committees strike us as a mistake. Such things are better left to Presidential discretion, so that they can be easily started, easily stopped, and not swollen with staff. Comparable committees established in the future should look for staff assistance to the overall resources, strengthened as we suggest, of OMB, CEA and OSTP.

Without detailed discussion, we recommend that the new unit be located either in the CEA or in the OMB. The choice between these two must be left to the President; we plan to suggest arguments for and against each agency in our final report.

In addition to their work on the Economic Report, the staffs we recommend, taken together, can do four things for the President better than these have been done before. First, they can place well-researched policy alternatives before him, drafted from his central perspective and with his needs in mind. Second, they can evaluate policy proposals put forward by others in and out of the Executive Office of the President, and, if proven competent, will almost certainly be drawn into the process of preparing the President's legislative program, researching the technical soundness of proposals and their probable effects on the private sector. Third, they can and will act as Presidential eyes and ears, monitoring events across the economy, forecasting future developments, communicating problems and potential problems to the President. Materials shortages are a case in point and one in which all of the new staffs have a role to play, whether it be developing estimates of the impact of a shortage across the economy, searching for substitutes for commodities likely to be in short supply in the future, or developing contingency plans for Presidential reaction to shortages. Fourth, the new staffs can backstop the President's own personal agents—senior White House staff, Cabinet members, or combinations of the two—in grappling with sectoral, technical and/or inter-departmental problems as they occur.

Expanding the Economic Report and improving Presidential staffing in key areas are not panaceas, but they do address the problem of achieving more cohesive presidential policy across the range of federal concerns. The proposals we make offer a President so inclined the chance to give future-oriented, integrated attention to those policy concerns which are critical to balanced national growth and development.

#### THE ROLE OF CONGRESS IN NATIONAL GROWTH AND DEVELOPMENT POLICY

To date, the Committee has not had an opportunity to finalize its views on Congress' role in national growth and development planning. The Committee, at the outset, also feels more tentative about making specific, substantive recommendations to Congress than it has felt about making such recommendations to the Executive Branch. This is because Congress is a more complex governmental department and because Congress itself has been and presently is in the midst of preparing its own suggestions for internal structural reform which we strongly applaud.

Congress functions best as a reactive body. Its two political parties, its two autonomous but interdependent Houses, and its 535 individual members (each with a different and unique constituency) make it difficult for it to take unified and cohesive initiatives. The planning process which we have outlined along with our other recommendations takes this tendency into account and works with it, not against it. The consummation of the planning process is the submission of programs to Capitol Hill and subsequent Congressional consideration of the National Growth and Development Commission's and the President's proposals.

We do have some interim and more general observations to offer Congressional involvement in the planning process.

First, we think it's important for Congress to devote greater resources to involving itself in national policy formation processes and to attracting increased public attention to these processes. To permit the televising of key Congressional debates, for example, might help inform the average citizen about the workings of government and lessen the sense of distance from the national government. It must be left to Congress' leadership to decide which proceedings ought to be televised, and in what manner, but surely debates on the President's newly expanded Economic Report or debates on the reports of the National Growth and Development Commission would be likely candidates for electronic dissemination to a wide audience.

Second, Congress ought to give careful consideration to the way in which it will receive the special planning submissions to be made by the President and by the National Growth and Development Commission. Congress could, for example, expand the role of the Joint Economic Committee, which already receives and conducts hearings on the Economic Report, to include reception and comment on the National Growth and Development Commission's reports as well. To facilitate serious Congressional attention to long-term policy problems, the JEC might even be given some limited authority to draft and report "sense of the Congress" resolutions in response to the National Growth and Development Commission's papers or the President's Report. These, brought to the floor at the beginning of a Congressional Session, could set the stage for a discussion that would hold the promise of being more farsighted and more insightful than most.

Alternatively, the National Growth and Development Commission might send its papers simultaneously to the Speaker of the House and the President Pro Tempore of the Senate, with a concurrent recommendation that they call in the leadership of both Houses of Congress and that the combined group determine how to pass on the Commission's report which has been laid before them. A policy paper on energy, for example, might be assigned to one or more committees in each House, or to a joint hybrid meeting of several sub-committees of different committees (e.g. Interior, Science and Technology, and Interstate Commerce). Again, hearings and a resolution expressing the sense of Congress could emerge from such a process. At this point, the Advisory Committee advocates neither of the aforementioned proposals; we simply think it incumbent upon Congress to provide some mechanism whereby the initiatives of other agencies of the Government can receive serious attention in an organized fashion on Capitol Hill—and especially how members of Congress reply to recommendations of the National Growth and Development Commission.

In Congress, even more than in the Executive, there is no effective mechanism which encourages it to approach issues in an integrated and comprehensive manner, or even to make discrete decisions in a broad and more explicit policy context. In fact, there are many severe constraints within Congress which militate against developing an improved policy-making process. Without an improved process, however, Congress is further limited in its ability to respond to broad policy issues or proposals originating elsewhere. In making this general interim finding, the Committee takes specific note of the following:

The relative political independence of individual Members of Congress leaves them free to define issues and select goals as they choose, being constrained only by their perception of the constituencies.

The ever-increasing burden of complicated legislation, the multiplicity of duties, the need to be available to constituents, the frequency of the two-year election race in the House, all conspire to limit the time the individual member of Congress has to think beyond the immediate.

The increasing number and complexity of issues, combined with the territorial imperatives of individual members, have led to a division of labor among the committees and subcommittees of Congress. They have become the primary decision-making site. Such fragmentation implies that contemporary policy problems are susceptible to competing definitions often resulting in different directions for future policy.

The multiplicity of subcommittees representing specialized subjects tends to be duplicated in the Executive Branch organization which further reinforces this fragmentation.

Given this fragmentation in decision-making and policy deliberation, there does not exist a central mechanism or system or process for coordinating and providing direction for more comprehensive legislative policy-making other than through the new budget process, which is a giant step forward, but which has its own limitations on long-range policy formulation. The Committee is considering the pros and cons of two-or more-year budgets.

Individual committees and subcommittees—even party leadership committees—are inadequately equipped, with staff and data analysis capability, to undertake a comprehensive impact assessment of individual legislative proposals, nor are comprehensive independent assessments made outside of Congress, i.e. The Executive.

The Committee, in continuing its examination of the Congressional role in integrative policymaking, does not mean to imply that Congress does not manage complicated, cross-cutting jobs well when traditionally it has had the leadership role and accommodated itself to such performance. Among such examples is its creation of tax bills. One thing further needs saying at this time.

There has been some discussion in Congress regarding the role of Regulatory Agencies. The Committee feels that Congress might wish to seek an overall review. The last 25 years has seen a huge increase in the activities of Federal regulatory agencies reflecting the growth of the nation generally, enormous technological development, and change in the value judgments of our citizens. This has brought with it a corresponding growth of legally binding administrative decisions with the force equal to a law passed by state legislatures, or the Congress, or by a judicial decree. The growth of administrative law has troubled many, both in the Government and the private sector, especially since in various cases, a particular regulatory agency can and does act in the capacity of lawmaker, prosecutor, and judge—all by the same agency.

There are pressure for and against actions taken by those regulatory agencies and these pressures do not all cut one way. While industry is generally opposed to almost all F.T.C. regulations, the airplane industry insists on the C.A.B. setting fixed rates. At the same time, many in Congress and the C.A.B. itself would prefer to let the marketplace take over.

There has been talk of the need for a sweeping review of our Regulatory Agencies and our Committee would favor such action. We do not refer to an "Inspector General's review" but one which, in each case, looks at the basic purposes and objectives of the agency to determine if such objectives are still valid, if generally they are being fulfilled, and if alternative or modified objectives might be more appropriate.

#### MATERIALS AND COMMODITY POLICY ISSUES

The Committee recommends that future Presidents designate one Cabinet member or senior personal aide to be responsible for materials and commodity policy matters. The Committee believes that the recommendations made above for national growth and development planning processes will enormously improve the nations' approach to materials and commodity problems.

This Committee's tasks do not include a consideration of materials policy per se. Rather, our legislative mandate requires that we make recommendations to "integrate the study of supplies and shortages of resources and commodities into the total problem of a balanced national growth and development."

Our recommendations in this area are incomplete as the result of an early decision to defer to the Commission on Supplies and Shortages (with which we are associated) on statistical and technical matters relating to materials. The Commission has not, to date, presented its conclusions and recommendations on key commodities issues to us.

Generally, however, we are convinced that the structures recommended above can and will deal adequately with policy questions involving materials and non-agricultural commodities. Our study group on materials issues has made the following observations concerning Federal efforts in the field:

First, adequate data and information are generally available to the Government, though some gaps do exist—especially timely information regarding certain imported commodities. More important than lack of information is the proliferation of statistical units and the disparate methods of making the information available to users, including policymakers and analysts in other departments. The Committee finds a definite need for and an increased emphasis on setting up normal, continuous reporting mechanisms. Materials data collection and analysis activities within the Government suffer from poor organization that fails to meet the needs of high-level decision makers. Second, our study group noted serious deficiencies in analytic and policy staffing in the materials area at the highest departmental levels and in the Executive Office of the President. As a result, available data are used inadequately, if at all, in the policy process.

Finally, we note that confusion and difficulty have been caused in recent years by the absence of a clear channel through which persons concerned with materials problems, inside or outside of the Government, might obtain the attention of the Chief Executive.

The Committee believes that materials and commodity policy issues, like other major sectoral policy issues, should be addressed as an integral part of the total national policy development process. Only in this way can we insure that such issues are treated in the context of their relationship to other international and domestic factors. We believe that the recommendations of the Committee, set out above, for improved statistical coordination and a new sectoral staff in the Executive Office of the President will effectively fill the gaps observed by the subcommittee concerning the handling of materials and commodities issues in the Executive Branch. The new statistical coordinating unit would insure that Government agencies collect and process data in a form usable to those who depend upon it. Moreover, searching out and planning for problems in the materials area will be an important part of the work of the sectoral staff which we propose to place either in OMB or CEA.

Of our subcommittee's major observations, only the fourth has not been addressed above in our various recommendations. Accordingly, the Committee recommends that the President designate a Cabinet or senior staff member as a contact point for those with an interest in materials and commodities questions. We emphasize that we are not proposing the creation of a Special Assistant to the President for Materials and Commodities. We are proposing that one of the President's aides whose work touches on materials questions (for example, a Presidential Assistant for Economic Affairs or the Secretary of Interior) should be given a special brief to watch materials and commodities. He or she must carry the burden of bringing to the President's attention looming or distant problems in the field.

The Committee has also had occasion to address the matter of "economic stockpiling". A majority of the Committee favors economic stockpiling, but opinion as to its scope and purpose differs widely. A few advocate the use of economic stockpiles to stabilize market prices within ranges. Others favoring the stockpile see it as an opportunity to "buy time" and protect the economy from unexpected and abrupt interruptions in the supply of materials and commodities. All agree that substantial import dependency, vulnerability to cartel action, and the importance of the commodity to the U.S. economy should be the criteria used in determining which materials and commodities should be stockpiled. Finally, there is sentiment for vesting the policy management functions of an economic stockpile system (e.g. what and when to acquire, when to dispose of how much) in an apolitical public organization or in a broadly based commission with government and public members. The purpose of such a group is to prevent the domination of stockpiling decisions by partisan political considerations or a particular departmental or Presidential view.

The fact that there may be no shortage of almost all minerals in the earth's crust does not insure us against dislocations in certain cases where much of the commodity is imported. However, economic stockpiling as a policy instrument should be embarked upon, if at all, only carefully and gradually. It is an area of government intervention in which costly and disruptive mistakes can be made, and it is only one of several policy instruments that might be utilized to deal with materials shortages. Each material or commodity should, at the least, be examined carefully to determine the best alternative approach to its case.

#### CONCLUSION

It is often argued that there are hazards to our freedom in a planning economy. But the alternatives are not planning on the one hand and freedom on the other. The alternatives, as we see them, include the option of planning democratically, in a way that does not diminish our freedom but expands it.

The American people are subject day in and day out to a great variety of pressures—from every level of Government, from the actions of powerful special interests in the private sector, from crises, shortages, and inflation, and from circumstances that stem *not* from deliberate action on anyone's part but from inaction, confusion and cross-purposes, and from actions of other Governments. The sum total of coercion may actually be diminished as we move toward more orderly and coherent policy making.



Historically, Federal intervention has been most severe in times of unforeseen difficulty. Then we not only get intervention, we get it hastily with little reckoning of the consequences. If we look ahead and identify problems down the road, perhaps we will be spared the need to act precipitously in ways that limit our freedom of choice.

Historically, resolute avoidance of planning has not spared us intervention in the private sector. We have had heavy doses of such intervention, but it has come in the form of multiple uncoordinated actions, not adding up to a coherent attack on our gravest problems, and frequently making solution of those problems more difficult as one such intervention modifies another.

Government programs can become gigantic smothering bureaucracies; they can distort the mechanism of the market; they can reduce our freedom; they can bring unintended consequences. If we turn our backs on all we have learned in 200 years about the domestication of power, the uses of all of our institutions, and the emergence of freedom, then planning will be very hazardous indeed. But if we proceed with care, make use of the planning of the private sector, learn as we go, and build accountability into the system, planning will be considerably less hazardous than drifting into a dangerous future.

Planning must be open and competitive to be sound. The process we envision is designed both to maximize public participation and to encourage multiple centers of data and policy analysis. Diverse centers of expertise guarantee sharp debate and vigorous advocacy. They are our insurance against the triumph of weak policy by default.

A vigorous and free press, an open planning process, a multiplicity of centers creating vigorous debate, and a healthy respect for the effectiveness of the free market can combine to permit a planning process which successfully avoids the Scylla of blindly stumbling about in a complex world on the one hand, and the Charybdis of centralized, totalitarian usurpation of our rights on the other.

It is not merely ideologies which divide our nation—although partly that is so. In large measure, it is the frustration of how to accomplish national objectives that often could be beneficial to all sectors of society. Our Federal system of 50 States with various powers vis-a-vis the national government, of divided responsibility between the Presidency and the Congress, and our pluralistic democratic society, taken all together, makes it exceedingly difficult to get the whole governmental process to work well. Thus, it is not merely a matter of talking about programs, we must also talk about mechanisms and structure by which to effectuate programs—and make them work.

There has been such enormous change in our nation and in the world over the last dozen years that approaching solutions from a recent historical perspective no longer applies. This has frustrated our politicians as well as our people. We must, therefore, create new institutions and new mechanisms in our governmental process to enable government to respond more appropriately to these new conditions. The ability to accomplish this will challenge all the managerial and psychological talent that our society possesses, as well as our courage and determination to face change—and then to act.

Representative BOLLING. Our next witness, Mr. Richard Neustadt, is an old friend. We have known each other for years and years. But he is also a political scientist of great eminence.

He did his undergraduate work at the University of California.

He worked for OPA, too, but they say he is an economist.

Mr. NEUSTADT. It was simpler in those days.

Representative BOLLING. Other governmental service includes Assistant to the Director of the U.S. Bureau of the Budget from 1946 to 1950; Special Assistant to the White House from 1950 to 1953; and teaching at Cornell and Columbia before becoming professor of government and associate dean at the John Fitzgerald Kennedy School of Government.

In 1959 to 1961 he was a consultant to the U.S. Senate Subcommittee on National Policy Machinery, which indicates that he has been at this problem for awhile. He has been a consultant to many other distinguished bodies, as well as the Rand Corp. And he won the Woodrow Wilson Foundation Award in 1960.

He is the author of "Presidential Power," which, as I understand it, is frequently used as a text in a variety of places. He has written a lead article in the American Political Science Review called "Presidency and Legislation."

I am delighted that you can be with us this morning. We will be glad to hear you.

**STATEMENT OF RICHARD E. NEUSTADT, PROFESSOR OF GOVERNMENT AND ASSOCIATE DEAN, JOHN FITZGERALD KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY; AND A MEMBER OF THE ADVISORY COMMITTEE ON NATIONAL GROWTH POLICY PROCESSES**

Mr. NEUSTADT. Thank you very much, Mr. Vice Chairman. I will try to be brief.

The three of us who are here today have each developed specialties in dealing with that vast terrain, "national growth policy processes." It is a mouthful. Mr. Widner has been shepherding our work on inter-governmental relations and Mr. Saltzman has been interested particularly in what I expect will be the most innovative of our proposals—a national commission to serve as a frankly experimental substitute for Roosevelt's old NRPB. With this experiment we seek to fill a gap in institutional resources never yet filled satisfactorily in our system, and in the process to learn by the short, rather unhappy experience in Roosevelt's time. For my part, I have focused on the terrain most familiar to me, the Executive Office of the President, which I know from studies of successive administrations and also from relevant experiences. Experience doesn't make me an expert, but it has made me sensitive to problems which now seem acute.

The Commission that Mr. Saltzman has discussed can raise the level of debate, at least we hope it will, and can pose policy alternatives for identifying upcoming problems.

But when it comes to choosing courses to advocate, and picking alternatives and advocating them and giving Congress something to respond to or react against, the White House has a job to do, or so it seems to us.

Americans expect leadership from their Presidents in proposing and implementing policies affecting national growth and development. They haven't been getting much of that lately, and more is involved in this lack than personality, or ideology—though both plainly have been at work in recent years. Among other, more institutional inhibitions our committee has focused on two:

First, a President is a firefighter; if he doesn't do much broad or long-range planning it is partly because his schedule is crowded with short-run issues that demand attention now. Second, a President is hard put to get timely advice shaped to his peculiar national, central perspective. And this has been especially the case with certain kinds of economic problems in particular sectors. For illumination of what goes on inside sectors, inside given parts of the economy, the Presidency nowadays seems to be woefully dependent upon inexpert or biased sources of advice, plagued by parochialism.

Our Advisory Committee feels that the first of these two difficulties—the firefighter syndrome—can best be dealt with by expanding

the Economic Report of the President, making it more like the document contemplated in the original full employment bill of 1945. Reporting requirements are about the only device we have to help Presidents step back and take a comprehensive look at any problem. We see no point in more Presidential paper, so rather than suggest a new report we favor broadening an old one. As a descriptive document, the report should consider production, employment, investment, etc., not only in the aggregate—as it does now—but also by sector across the economy. As a prescriptive document, the report seems to us an ideal place to comment on trends in the economy which are not yet troublesome but may become so, and to comment also on important decisions of the independent regulatory agencies. This is a new thought, but I think a good one.

We can't require Presidents to talk about every sector of the economy every year, but even a selective report can bring the White House to confront and reconcile conflicting departmental priorities, a valuable step in itself.

As it stands today, the Economic Report is visible, prestigious, and ripe for expansion. Lately, it has begun to evolve into the kind of broad policy tool which we would like to see. And its tie to Congress—through this committee—is one we applaud and hope to see strengthened. Indeed, if the National Commission to which Mr. Saltzman has referred were in being, and if the President were to use his Economic Report as a vehicle for commenting on, giving his reactions to the recommendations and advice in the report of that Commission, that would be a great advantage.

To deal with the second problem outlined above—adviser parochialism—there will have to be a strengthening of the President's institutional staff—in the Executive Office of the President, as distinct from White House, *per se*. That is an old distinction. It has almost ceased to exist today. I hope it can be revived—to complement and build upon the expanded report. Within the Executive Office today, OMB lacks a firm grasp on many problems cutting across departmental lines, and CEA focuses on aggregate economic issues to the virtual exclusion of individual sectors. We would like to see OMB help the President and his personal aides think through issues of program development in appropriate terms, across agencies, beyond budgets. At the same time, we think a new unit is needed to fill what strikes us as a void, or gap, in the Executive Office today—a new unit in the form of a sectoral or "microeconomic" staff to track pieces of the private economy for the President the way the CEA now tracks the economy as a whole.

As was demonstrated so starkly in 1973, especially on agriculture, and less publicly—we are told—in many other spheres before and since, a President needs—and has not got—reliable and handy sources of disinterested advice on what is happening in key parts of the private sector. Nowhere in the Executive Office is there staff well equipped to do this. Large groups are not needed; small numbers of sophisticated persons might do wonders. They, we think, can be provided without net increases in present Executive Office personnel; instead slots can be squeezed by abolishing vestigial units. In our discussions we have looked upon the Domestic Council as a prime candidate, and the Council on International Economic Policy as another. And there are still others.

Our committee is unsure whether the new unit would be best placed in the CEA or in the OMB—I can give you the arguments each way, if you wish—but we are sure that a new independent agency is not necessary and would be counterproductive.

In the Nixon and Ford administrations, inflation and recession, and resource constraints, have shown up simultaneously to plague both private and public decisionmakers. There has been lots of improvised activity and many new mechanisms created in the White House: The Council on International and Economic Policy, the Council on Wage and Price Stability, the Economic Policy Board, these among others. Among them EPB seems the most nearly effectual, probably because it most nearly reflects the way Ford likes to deal with problems. Our review of its work suggests to us an immense range of governmental issues—public policy issues—arising all the time, that turn upon performance and requirements in particular parts of the private sector. Yet expertise about these parts of the economy, to the degree that it is found in Government at all, is closely tied to either agencies or interest groups quite far removed from the Presidency or its perspectives. Accordingly, we think new staff of the right sort in the Executive Office could do three things for a President better than now. First, help him weigh the pros and cons of program and policy proposals flowing to the White House from Congress, departments and the private sector. Second, monitor events across the economy, forecast future developments, communicate problems to the President—generally serve as eyes and ears in areas where Presidents have often lacked for both. And third, provide ad hoc support as needed for a White House aide or Cabinet member grappling with technical economic problems that involve the private sector—as most do—while cutting across departmental lines—as virtually always is the case.

Cabinet committees like the Economic Policy Board or individual Presidential agents, like a George Shultz under Nixon, are only as good as the quality of staff work they have ready to hand and can call their own. It is our strong impression that in respect of economic sectors, staff resources at the center may be thinner, lesser both in numbers and in expertise, than at almost any time in the past 40 years. Since the start of the defense period 1940. I stress the word “impression,” but I think you will find it widely shared outside our committee’s ranks.

I don’t want to sound more authoritative than I feel, and my feelings are quite modest. A more extensive, purposeful, economic report and a stronger staff to deal with what it covers will not, in and of themselves, assure that any President plays an intelligent role in guiding national growth policy. But they do offer the President so inclined a chance to address policy concerns important for growth and development in a more cohesive, thoughtful way than has been the case to date. Whether done by statute or by the President acting on his own initiative, these things are worth a try.

In that regard, my own preference is for Executive initiative, not legislation—although some of my committee colleagues see this the other way. If you will grant me an additional 3 minutes sometime this morning, over and above these prepared remarks, I will tell you why I have that preference. It is a matter of history, starting with the history of the Employment Act of 1946.

Representative BOLLING. Thank you very much.

Our next witness is Mr. Ralph Widner. Mr. Widner is listed in "Who's Who" as a planning executive. And I think that Mr. Saltzman is to be complimented for his ability to keep Mr. Widner and Mr. Stein in the same room together.

Mr. Widner is also a public administrator of great talent, and was a member of the planning task force for the Appalachian Regional Commission from 1963 to 1965. He has also been a member of the Committee on Science, Technology and Regional Development of the National Academy of Sciences. He has worked on the Hill as the legislative assistant to Senator Clark, I understand, from 1963 to 1965, when he became executive director of the Appalachian Regional Commission. Since 1971 he has been president of the Academy for Contemporary Problems.

We are very glad to have you here with us today.

**STATEMENT OF RALPH R. WIDNER, PRESIDENT, ACADEMY FOR CONTEMPORARY PROBLEMS, COLUMBUS, OHIO; AND A MEMBER OF THE ADVISORY COMMITTEE ON NATIONAL GROWTH POLICY PROCESSES**

Mr. WIDNER. Thank you, Mr. Vice Chairman.

In the interest of saving time I will submit the prepared statement for the record and summarize as quickly as possible the salient points.

I might say that in the area for which I have been responsible in the committee we have taken off from one of the recommendations of the Joint Economic Committee in its 1976 report, in which you propose that major economic programs and policies should be preceded by a special analysis of their impact on regional and local economies, and that major executive and legislative proposals should be accompanied by an analysis of their impact on economic activity in regions and in areas within the regions. We took off on that point primarily because there is a recognition in the committee that in addition to being concerned about the aggregate performance of the national economy, and the sectoral components of the economy to which Professor Neustadt has just referred, there are also obviously territorial impacts from these policies, or intergovernmental impacts if you want to describe it in another way. And we have been fairly blind in our national policymaking about these consequences until after they have already occurred and we are feeling them either in our wallets or elsewhere.

So our committee has attempted to come up with some modest means for putting a little more awareness into the national policy process concerning the territorial or intergovernmental dimensions of these decisions.

As is the case in the recommendations that Professor Neustadt has summarized, we looked around for existing mechanisms. We don't want to create more gingerbread. And we looked across the whole apparatus that we have available to us: The Federal Regional Councils, the multiplicity of regional commissions and federally mandated bodies of one kind or another in the various regions of the

country. We came to the conclusion that at the national level we could do a lot worse than simply to strengthen some of the responsibilities of the Advisory Commission on Intergovernmental Relations by adding an additional charge or two to that Commission's mandate, so that they would be responsible periodically, perhaps every 2 years, for assessing the impact of Federal decisions upon the regions of the country, and submitting a report to the National Growth and Development Commission, or whatever other body has responsibility for producing the national growth and development report. And in this way begin to make us more aware of the inadvertent consequences that flow from Federal decisions.

We are fully cognizant—and I think this is reflected in Mr. Saltzman's statement—of the debate that is rapidly heating up right now about whether the Sunbelt is draining the Northeast and industrial Midwest dry. We are hearing all these figures lately about people in Ohio paying far more into the Federal Treasury than they get back, while the people of Alabama are getting back far more than they pay in. There are important issues here. The irony is that the debate has been stated in essentially negative terms when actually I think a little applause may be in order. We have had a national goal ever since the Roosevelt administration of bringing the South and the West up to some degree of parity with the rest of the country, and now when we seem to be at least within hailing distance of accomplishing that objective, instead of saying we have reached a goal we say we have created a problem. A little shifting of gears in Federal policy is in order, because there have been some profound structural changes in the Northeastern and Midwestern economies which have had to be recognized at the national as well as the State and regional levels. It is that kind of issue that we think we have to have more vision and perception at the national level than we had in the past. And we think the Advisory Commission provides a potential mechanism.

The difficulty is that in a continental country the variety of problems and contexts among the sections of the country are so varied that we really can't take a standardized look at the whole country and come to useful conclusions or decisions.

For that reason we have grappled—and I must say not totally satisfactorily—with the question of what kind of structure could we establish at the regional level that would enable the Federal Government and the States to come together in a useful forum for those decisions that are shared. We can give them all the bloc grants and revenue sharing in the world, but we still lease Federal lands, and we still make regulations and standards in Washington. The Federal Government is a direct actor in each of these regions, whether we want that to be true or not. And a bloc grant revenue-sharing program by itself simply doesn't mean that responsibility can be devolved downward and we get away from the problem. So we wanted to find some kind of forum for shared decisionmaking, if you will. We have an awful lot of apparatus out on the ground right now. We have economic development commissions and river basin commissions, and we can go down a long list of 30 or 40 different kinds of entities, none of them are satisfactory. The Federal Regional Council is one that frequently occurs to most of us. But we find that the Federal Regional Councils,

because they are essentially coordinating bodies for the Federal Government, don't enjoy a particularly good reputation among Governors or legislators. The GAO did an evaluation just a year or two ago of the Federal Regional Councils and found in one case that the Federal representatives sat on a dais like this and forced the Governors to sit down there in the audience, and the Governors simply wouldn't come to any more meetings—which is a perfectly plausible position for them to assume, it seems to me.

So we went back and looked at history again. And we found that much to no one's surprise, the National Resources Planning Board had grappled with this same question in 1935, and they came to the conclusion that we really can't draw lines around regions that are perfect for every purpose. If you have a river basin problem, one set of lines makes sense. If you are trying to deal with commuting patterns, another line makes sense. And so on. And so they recommended the establishment of centers in 10 cities in which the Federal Government would have a staff analogous to these Federal Regional Councils which could work directly with the States in that general region or specific problems in which the conjoint exercise of Federal and State powers was going to be necessary. We are proposing that something on that order seriously be considered, and that each of these 10 centers be responsible for submitting to the Advisory Commission on inter-governmental Relations every 2 years a report on the difficulties and problems of these regions, particularly with regard to national policy, and that this become part of the ACIR report for the National Growth and Development Commission, or whatever body produces the National Growth Report. We simply then outline the alternative approaches you might take to that problem.

There is one other area of recommendation which Mr. Saltzman asked me to briefly summarize for you this morning, which is really the work of a subcommittee chaired by Prof. Wassily Leontief, whom most of you know received the Nobel Prize some years ago for his work in economics.

Representative BOLLING. He was one of our earlier witnesses in this series.

Mr. WIDNER. At any rate, the subcommittee has made recommendations on the problem that both of the previous witnesses have mentioned: That is the data problem, the informational problem, the ability to integrate information into some kind of coherent picture of what is happening nationally and regionally.

They have in that subcommittee, and the Commission in general, anticipated recommending the creation of a new statistical unit in the executive branch to coordinate and rationalize the Federal Government's collection and processing of basic economic data. The new unit in their opinion should construct its own econometric model of the American economy sophisticated enough to trace and project the effects of alternative policies and scenarios on individual regions and sectors, as well as the economy as a whole.

One of the debates that we have been having in the Commission is over the fact that there are many such models, both in the Government and outside of the Government. John Gardner is frequently warning us about the dangers of monopolizing the flow of information, because

we are all fallible, and if that institution or model should happen to have a flaw in it we are all affected by the data generated by one source. We don't mean to stress that this would be the sole conduit for all economic data. But I think Professor Leontief is arguing that you really do have to centralize to some degree the interpretation of information so that you can get a coherent picture, but that you always have as a check, these other models that exist inside and outside of Government to validate or critique your own conclusions based on that model.

He is also arguing that we really don't have anywhere the capability that he is recommending we develop at the national level.

We looked at the European experience with respect to this problem, and we find very mixed experiences. The Germans are very wary of a monopoly of economic information, because of the difficulties that it would present. We found that the French have invested a great deal of money in developing such a model, but it is unusable with respect to budgetmaking. One asks, what is the point to the investment if they can't use it for the day to day and year to year operations of Government?

So we find a mixed bag. On the whole, though, much of the experience in other countries is fairly heartening. There is a certain case to be made for a strengthened unit in the executive branch for integrating information into a coherent picture of what is happening in the economy.

Mr. Chairman, I think that summarizes where we are.  
[The prepared statement of Mr. Widner follows:]

#### PREPARED STATEMENT OF RALPH R. WIDNER

I am Ralph R. Widner, President of the Academy for Contemporary Problems, a public policy research center established in September, 1975 by the Council of State Governments, International City Management Association, National Association of Counties, National Conference of State Legislatures, National Governors' Conference, National League of Cities, and U.S. Conference of Mayors.

However, my testimony today is in another capacity: as a member of the Advisory Committee on National Growth Policy of the National Commission on Supplies and Shortages.

Mr. Saltzman and Professor Neustadt will cover the committee's thoughts with respect to improving capacity within the Federal Government to achieve long term growth.

My remarks are addressed to the intergovernmental and informational dimensions of the problem.

#### THE NEED FOR NEW INTERGOVERNMENTAL MECHANISMS

There are three general perspectives from which we should view long-term decisions on economic growth:

- (1) The potential aggregate impacts on our national economic and social system as a whole;
- (2) The potential sectoral impacts on specific components of our economic and social system, e.g., the steel industry; and
- (3) The potential territorial impacts on specific communities or areas of the country.

We are weakest by far in attending to the territorial or intergovernmental dimensions of national policy decisions.

With the exception of the Advisory Commission on Intergovernmental Relations, there is no agency in the Federal Government concerned with the territorial or intergovernmental consequences of national policy nor with the associated conflicts that frequently arise between national, state, and local development decisions.



The question now arises as to whether some additional structural innovations will be necessary to enable the Federal Government and states to cope with issues of national growth and long-term problems of supplies and shortages which could profoundly affect regional patterns and intergovernmental systems.

In the future, energy-exporting regions will confront development issues quite different in character from energy-importing regions. Approaches to energy development and consequent community development pressures that will result in the Wyoming Basin will be quite different from the challenges confronted by New England, the Middle Atlantic, and Midwestern industrial regions.

Federal decisions on energy development, supply, and allocation questions will assume great significance for all regions.

The varying regional consequences of economic and population shifts, energy resource development, obsolescence in economic and physical plant, and regional impact of Federal policy will become a central domestic concern in the coming years as we strive for balanced growth.

It will not prove sufficient for the Federal Government to simply assume that block grants and shared revenues from Washington will enable regions to cope with their varying problems on their own. Such a complete devolution of responsibility fails to recognize the increasing interdependence of private and governmental actions and that the Federal Government itself is a major actor in each region. It is Federal regulatory decisions, land leases, procurement policies, performance and quality standards, subsidies, and tax policies which play a key role in the ability or inability of each region to cope with the special development problems it now confronts.

We lack adequate means at present to assess the potential intergovernmental and territorial consequences of such Federal actions in advance of their adoption.

For the larger part of our history the separation of powers and responsibilities between the national government on the one hand and the states on the other has stood us in good stead in populating a continent and organizing our affairs.

But in the last several decades, we have entered a new stage in our national existence in which the powers and responsibilities of the national government have grown increasingly intertwined with those of states and local government.

The ability of the Federal Government to influence the nation's aggregate levels of economic activity; to set social, economic, environmental, physical standards of various kinds; and to build large scale public improvements and facilities directly affects and is impacted by the parallel powers of the states to control land uses, set up local governments, prescribe systems of taxation, set standards, and to take their own direct actions.

In the light of its review, the committee sought to recommend policy procedures that would:

Provide means for continually assessing the territorial or intergovernmental implications of international or national developments and decisions;

Provide means for continually monitoring the performance and well-being of the nation's major regions;

Make recommendations for adjustments in national policy that avoid undesired territorial or intergovernmental impacts;

Provide a forum or forums for shared Federal-State decisions.

To this end, it has recommended broadening the responsibilities of the existing Advisory Commission on Intergovernmental Relations and the establishment of intergovernmental centers in each of the 10 Federal Administrative Regions. It has also recommended a review of existing regional bodies.

It recommends that a regional economic reporting system be established as a regular component of the Federal Government's economic monitoring procedures.

#### STRENGTHEN ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS

The responsibilities of the Advisory Commission on Intergovernmental Relations should be expanded to require the Commission to:

(a) Prepare for the proposed National Growth and Development Commission a biennial report on intergovernmental and territorial problems of national development and emerging problems related to them in multi-state regions, metropolitan regions, and non-metropolitan areas. This report shall be included by the Commission as a component in its Biennial Report on National Growth and Development.

The Commission should include, as part of its report to the Council, reports compiled by each of the ten intergovernmental centers.

(b) Consult with the National Growth and Development Commission as it prepares its annual research agenda.

(c) Consult with the staff in the Executive Office of the President as it selects sectoral issues to be addressed in the proposed expanded annual Economic Report and assess the analysis of these issues in terms of their territorial and intergovernmental implications.

(d) Forecast and assess potential impacts of major proposed national policy initiatives (legislative and administrative) upon states and localities in each region of the country.

(e) Continually monitor and evaluate the intergovernmental and territorial impacts of specific policies and programs and identify alternatives for maintaining a desirable regional balance in the consequences flowing from these national actions and submit the specific reports to the Office of the President, Congress and the National Growth and Development Commission.

The committee concurs with the Joint Economic Committee in its 1976 report in which it proposes that major economic programs and policies should be preceded by special analysis of their impact on regional and local economies and that major executive and legislative proposals should be accompanied by an analysis of this impact on economic activity in regions and in areas within regions.

#### REGIONAL INTERGOVERNMENTAL CENTERS

Ten statutorily-based intergovernmental centers similar in organization to the ACIR should be established in each of the existing Federal Administrative Regions.

Functions of these commissions would be as follows :

(a) To submit bi-annually to the ACIR a report on regional growth and development identifying critical regional development problems related to the supply or shortage of energy and materials; the impact of national development trends upon well-being in the region; the impact of Federal policies and programs; and other factors which may be contributing to regional development problems. Those regional reports should provide a major component in the ACIR Bi-Annual Report on National Growth and Development.

(b) Assess potential impacts upon the region of specific national, state, local, or private initiatives likely to significantly affect well-being in the region and report these forecasts and assessments publicly to the ACIR.

(c) Continually monitor and evaluate impacts of specific policy and programs in the region and submit them publicly to the ACIR.

(d) Provide a forum within which Federal, state, and local leaders in the region can consider regional problems requiring joint exercise of Federal and state powers for their resolution.

(e) Provide a clearinghouse for considering the impacts of major Federal as well as state and local development decisions on the region.

By establishing these linked mechanisms for intergovernmental consultation, the committee believes that greater coherence can be achieved in the use of Federal, State, and local powers;

Our ability to continuously monitor the effectiveness of policies and programs will be strengthened, particularly because these mechanisms re-insert the elected official into the intergovernmental arena. Hitherto, these relationships have been almost exclusively between functional agencies—a fact that has contributed to the fragmentation of public policy and misallocation of resources.

It would also clearly establish a much-needed new dimension in our national decisionmaking: the formal recognition of territorial and structural consequences flowing from all significant policy decisions.

#### ECONOMIC DATA, FORECASTING, AND ANALYSIS

We anticipate recommending the creation of a new statistical unit in the Executive Branch to coordinate and rationalize the Federal Government's collection and processing of basic economic data. The new unit should construct its own econometric model of the American economy, sophisticated enough to trace and project the effects of alternative policies and scenarios on individual regions or sectors as well as the economy as a whole.

Accurate and usable information is the foundation of all economic analysis and forecasting. These in turn are the principal tools of economic and policy

planners. We should not take any action of potentially great impact on the economy without understanding its probable effects on the course of national economic growth and development.

During and after World War II, the United States pioneered in the development of advanced econometric models that reduce the web of interrelationships in a modern industrial economy to manageable size. In the decades since the war, however, we have fallen behind in the use of such models to guide Federal efforts to understand the economy and achieve balanced economic growth.

The United States does not lack for economic models. Within the Federal Government the Departments of Commerce, Labor, Agriculture, and Interior, the Federal Energy Administration, and the Environmental Protection Agency each have econometric models used in forecasting the national economy or narrowly defined sectors of it. We fail, however, to coordinate the construction of models, or to standardize the collection of data which drives them. As a consequence, the value which the Government gets for its statistical dollar and the analysis available to the public and decision-makers is not maximized. The closest thing at present to a statistical coordinating agency, OMB's Statistical Policy Division, has not taken a strong lead in rationalizing the construction of models or coordinating collection of data. As a consequence, some data is collected twice while other important statistics are neglected altogether, with data being inconsistent. Federal models, written in diverse computer languages, cannot "communicate" with each other. Moreover, fractionated statistical capabilities have failed to produce a model anywhere in the United States sufficiently large and detailed to provide an adequate overview of the sectoral and regional implications of proposed economic policies or possible future events.

To remedy these defects, the committee recommends that a new statistical coordinating body be created within the Executive Branch, without strong ties to any existing departments or agency. The new unit's task would be two-fold:

First, it would assume responsibility for coordinating the construction of Federal econometric models and overseeing collection of the data that drives them. The new unit is not to dictate the purposes or use of Federal statistical efforts, but it should be given sufficient budgetary and administrative powers to encourage agencies to build models capable of interacting with each other, to eliminate wastefully duplicative data gathering, to foster data collection in areas where it is now weak, and to guarantee the integrity of the data collected. It is to forcefully promote the notion that all Federal models, whatever their origin and purpose, should be integrated into a single statistical system permitting the user of one to draw on the resources of all.

Second, the new unit would be responsible for developing a large, sophisticated model capable of detailed analysis and simulation of the economy by sector or region, and available as a base upon which to model smaller and more specialized sections of the economy at minimal expense. We do not propose that the Department of Commerce's Bureau of Economic Analysis and the Department of Labor's Bureau of Labor Statistics give up their modeling capability in favor of reliance on a single central model. We do anticipate, however, that in time many consumers of econometric data will discover on their own that the well-funded and highly sophisticated model which we proposed can capably supplement or replace their own more modest efforts.

Representative BOLLING. Thank you very much.

To comment on the progress of the Advisory Committee we have chosen the newly appointed chief economist of the Chamber of Commerce of the United States, Mr. Jack Carlson. He is very well qualified for this task, both the one that he has in the chamber and the one we are assigning to him today, because he has not only a PBA but a master's degree in public administration and a Ph. D. from Harvard. He was an associate professor of economics at the Air Force Academy. He left that job to become Assistant Secretary of the Air Force from 1964 to 1965. He later became senior staff economist for the Council of Economic Advisers from 1966 to 1968, and then Assistant Director of the Bureau of the Budget from 1968 to 1971, and Assistant to the Director for Economic Policy in OMB, when the transition took place,

from 1971 to 1974. And his last Government post before coming to the U.S. Chamber of Commerce was Assistant Secretary of Interior for Energy and Minerals.

Mr. Carlson, your whole statement will appear in the record. And I hope you will attempt to summarize it somewhat.

**STATEMENT OF JACK CARLSON, VICE PRESIDENT AND CHIEF ECONOMIST, CHAMBER OF COMMERCE OF THE UNITED STATES**

Mr. CARLSON. I am pleased to join with many of my former colleagues and distinguished people in the Congress. I want to indicate that I have met a payroll, I have carried a precinct, and I have planned and managed Federal programs, so I am about as well balanced as you can be on this particular topic.

I do think it is appropriate, at this time of change in leadership, both in the Congress as well as the Presidency, to consider longer term improvements. This is the best opportunity for considering longer term aspects before people have to worry about ancient decisions that they have to protect. They can be somewhat more flexible now.

I feel that your hearings on this particular subject, especially the ones on November 16 on physical capital shortage, and financial shortages, are vitally important, because I feel that the tools for workers are not in place for us to move, on a timely basis, to full employment. We are going to have to do something to encourage savings and encourage investment in those tools so that we can achieve a full-employment economy.

Let me move on to the role of the development that can help us in a longer term perspective. The role of the Congressional Budget Office, I think, is a useful one. They have started extrapolating alternative budgets and economic trends. They have looked at the particularly long lived programs, Government retirement programs, and social security. I think that the steps they have taken in that direction are commendable, and should be expanded.

The Joint Economic Committee plays a vital role. As you say in your opening statement, and as you have said very expressly in the two books that you have written, there are very few places in the Congress where longer term perspectives are considered, but the Joint Economic Committee is one of those places. I see the need for expansion here. I know it is not a substantive committee as such, consequently it tends to have lower priority, than some of the other committees in terms of additional staffing, and additional capability. But I think that expansion of the Joint Economic Committee is a very important area for the Congress to consider, so that it can undertake Commission studies, receiving studies from the executive branch, or demand them from the executive branch, hold hearings, and transfer information to its colleagues. The ignorance level about Government is high. Adult education on these topics is very important.

The General Accounting Office can play a role. I think the movement—since I and some other people testified in 1969—of the GAO from merely financial auditing to performance auditing has been a welcome trend. I think that the expansion of GAO's efforts in this direction would be very useful.

But, as the interim report of the Advisory Committee on National Growth Policy declares, both the executive and the legislative branches suffer from the consequences of our representative Government, and suffer from having functional or activity lines. Both branches have difficulty considering all programs that serve the same objective, such as redistribution of income to the poor. We consider food stamps, AFDC, medicaid, and other income distribution programs in separate committees and separate agencies. Both in the Congress and in the executive branch we have a difficult time looking across departmental or committee structures at the necessary complements and substitutes of those various programs.

We are making the situation worse. The Congress and the executive branch are fragmenting more. We are moving toward single objective agencies like FEA, and EPA, as opposed to multiple objective agencies, so that the tradeoffs can be made right now. Tradeoffs have to be made by someone in those departments, and often there is no one over those departments in the executive branch to make the effective tradeoffs, or they are made rather crudely. I dare say you have similar problems of providing tradeoffs across the more fragmented committees in the Congress. Single objective agencies and single objective committees are making it more difficult for all of us to look at the longer run perspective.

Let me concentrate on the role of the Office of Management and Budget, which the President-elect has wisely identified as his management arm. I have talked about what it does do and what it doesn't do, and where some of the problems are. The OMB attempts to consider longer term problems and trends through an exercise they go through at least 6 months before an annual budget is sent to the Congress. It used to be called the planning review session. While I was Assistant Director of the Bureau of the Budget and the Office of Management and Budget, long-term issues were often discussed there. Interestingly enough, every issue without exception identified in the interim report, has come up in sessions dealing with the spring planning review that I have participated in. Some of these issues include interdependence among countries brought about by the growth of trade, changes in the age distribution affecting age-related programs such as old-age health and welfare assistance, and programs such as young age education. Clearly the oversupply of teachers and school buildings was identified years ago in these particular sessions. Many of these sessions are backed up by long-term studies. One study of the liquid metal fast breeder reactor took over 18 months to complete. It was discussed during many of these spring planning reviews. So these reports are being considered, and I think that the interim report overly generalizes when it refers to the problems of "refusal or inability to react to data we have in any organized fashion."

The information from the planning review goes to the President and his key advisers. Short- and long-term targets and objectives are established.

Therefore, I think that it is misleading to say, "We do not have mechanisms to anticipate, analyze and understand problems." The real problem is why those studies aren't picked up and used in a meaningful way. The answer is that the users, the decisionmakers do not have

an incentive to do it, because most decisionmakers are at their posts for a relatively short period of time—Congressmen 2 years. Senators 6 years, and Presidents 4 years. The average life tenure of a Presidential appointee is 2 years. It is difficult to get people to concentrate on topics beyond their tour of duty. That is a fundamental problem. Analysis and data are there, plentiful terms, but it is rarely pulled out and used for decisionmaking purposes, unless the information can be shown to affect people generally or the constituency of public officials in particular. Longer term analyses are quickly set aside in favor of short-term solutions. This is true for both the legislative and executive branches, and reflects the tenure of public office I have mentioned.

When officials of both the legislative and executive branches attempt to inform citizens or their constituency, then all of a sudden you have interests in that particular problem no matter what it is. For example, nuclear proliferation was talked about nearly a decade ago. No one picked up on it until public interest started to come down on the problems of nuclear proliferation. You do have to have the ultimate driver of our system, an informed citizenry or farsighted officials, draw forth information that is being provided to give a long-term perspective.

We do have the problem, as Professor Neustadt brought out, of reviewing objectives, functions, and activities located in different agencies, as you may well have with different committees. Even with all of the great attempts to give us techniques to help whether program budgeting, PPBS, management by objectives, we still have that as the major problem. And it is primarily a conflict with the desire to manage the executive branch well, which means you have to have a set organizational structure. The problem is to evaluate where we are going with these programs. Organizations that you think ideal today, you would not think ideal tomorrow when objectives shift. The magic solution you find today may not be the magic solution tomorrow. Objectives change and emphasis changes. It is impossible to find the best organizational structure of Government that will be appropriate through all time and eternity.

I applaud the President-elect's support of techniques that I think will help: Mission-based budgeting, multiyear budgeting and zero-based budgeting. The techniques used in the past, such as program budgeting during the Eisenhower administration, PPBS during the Johnson administration, management by objectives during the Nixon administration, and inflationary impact statements requiring the longer term benefits and cost analysis established by the Ford administration, are all helpful. I can see that the President-elect's proposal would be helpful.

In addition, I think you ought to look at sunset laws that would limit the life of programs and agencies so that change can more easily be made to conform with long-run objectives. No one is talking about most of those programs or agencies going away but about opportunities to make some modifications in the programs.

I think sunset laws are important, not just for expenditures, but also for taxes and regulations. Regulations are the most undersupervised activity in government. When I was Assistant Secretary of the Interior I had the authority that you in the Congress had given me to close down every mine in this country on the basis of health and safety

of the miners. I didn't have to check with you, I didn't have to check with the President. I didn't have to check with any elected official. And clearly there ought to be a review process for such a decision to get back to somebody who is elected, such as the President of the United States. I do think it is important that the President in the executive branch review regulations, at least the major ones.

We also have a serious problem of following good administrative procedures. The Administrative Procedures Act is not followed in many cases. Even that needs to be considerably upgraded so that people feel that they can participate and have a meaningful process in the development of regulations.

From a longer term perspective, nothing would be more helpful than if the actions of the Congress and the President or their proposed actions were shown in terms not only of their impact on the next budget, but subsequent budgets. Now only a 1-year cash flow budget is relied upon. No description of longer term liabilities are made. Although a pay increase went into effect October 1, it is not the \$2 to \$3 billion cost this year that may be the most interesting information, but the billions of dollars it will cost in subsequent years, and in Government retirement expenditures for decades.

The same goes with long-life programs like social security and others. You ought to know what you are committing for the future and you ought to have some sort of budgetary way of showing it either with or without a discount rate. That can be one of the most effective techniques for contributing to a longer term perspective by decision-makers at all times. Perhaps it can be written up in the special analysis of the budget, and it can be accomplished within a year. It would be a very helpful direction to move in.

By the way, I agree with the Interim Committee that the users charges are greatly underused. This partly reflects the fact that the Congress has a unique mix of skills, primarily legal, and consequently economic mechanisms are seldom used. Police force approaches are generally relied upon, and subsequently user charges aren't adopted. We would be far further along in our environmental quality goals if we had used user charges as opposed to police powers.

#### THE ROLE OF THE STATISTICAL UNITS

I agree that improved data analysis is necessary, but I have reservations about the method recommended in the report. It recommends "a new statistical unit in the executive branch to coordinate and rationalize." I feel this recommendation falls back on an old axiom that most of us have used while in government: "When in doubt reorganize." But I think there is less doubt. I think there is a credible, though not achieving its potential, Statistical Policy Division within the Office of Management and Budget. It has the authority, it has the power of the purse to referee among agencies, reduce duplication and moderate the burden imposed upon industry for data collection, and upgrade and fill in gaps. I am afraid that an independent agency for this purpose would experience difficulty in accomplishing its goals from scratch and without the power of the purse. I recommend that you beef up that capability and go for a change in leadership if necessary rather than fragment organizations. If we find that something isn't measuring up

to par, why do we reorganize? Why don't we fire some people and hire some people that can do the job? Of course, fire is not the word to use. You shift people around to take into account their comparative skills in different areas.

Representative PIKE. Mr. Vice Chairman, I was just getting ready to applaud, until he backed up.

Mr. CARLSON. The interim report calls for a standardization of models and for the executive branch to develop a major model of its own. I disagree with this approach. Rather, the Executive Office and executive agencies and congressional offices should make use of many techniques and models, depending on the needs of policy analysis. When I helped make the official executive branch economic forecast for policy purposes, I found it useful to use a variety of models, such as those of DRI, Chase Econometrics, Wharton, University of Michigan, University of Maryland, Federal Reserve Board, the National Planning Association and the Commerce Department. Some have better price estimating equations for consideration of inflation. Some have greater detail by sectors and geographic areas, such as the National Planning Association model. And some have better information to consider the different industry components, such as the University of Maryland. Some provide measures of the impact of economies abroad on the United States for assessing the role of trade and investment. No one model or technique is best for everything, nor will it ever be. The last thing in the world you want is to have an upgrading of the input-output table in the Executive Office of the President. With all due respect to Wassily Leontief, this is best housed in an area where you can go through the technical details and long hours necessary to develop those improved coefficients for how the economy is really operating. Clearly you wouldn't want to bring that up to the Executive Office. I am very much opposed to that. So I would rather see improvement in the capabilities where they are located.

I think the greatest problem is the fact that because of their incentives or other reasons, we do not have people demanding analysis and data. It is the demanding side, not the supply side, that is our most serious problem. In fact, when I went through a review of all major models and data bases in the Government, I found without exception no data base had over 50 percent of its data ever used by decisionmakers. How did this occur? Because the suppliers came along and asked, wouldn't it be great to add on this additional bit of information, without ever having it flow through to see if it was ever useful from the demand side? That is a very serious problem, and so we can overinvest, as well as underinvest, or we can invest in the wrong kind of information. It is not helpful for a long-term or short-term decisionmaking.

I am impressed by how fast this can come forth if you happen to see you are short of data analysis, or how fast you can obtain data if a key decisionmaker requests it. For example, during 1974 we faced a coal strike. The President asked me to try to develop a system so that we could keep track of what the economic impact would be on particular States and regions, and their plants, communities, jobs, income, and particularly vital community services. We did not have a data base for that at that particular point. We didn't have the analysis for



it. But within 6 weeks we did. We went from a 2-month reporting of data coming in from the production and inventory side to a weekly reporting. And on the production side where coal was still produced we went to a daily reporting. We knew the inventories of every major source in the country. We knew where coal was being delivered, and we had estimates of what that did to unemployment in the area, and what the broad effect would be. For example, the Tennessee Valley Authority considered cutting down on the production of electricity as the inventories went down. That would impact upon the aluminum industry and jobs would tend to go down, and we had to be concerned about it. The demands for data came along. The supply reacted to that demand on a very timely basis. It was a very effective and a very good lesson to show that if the demand is there the data will be provided rapidly and the analysis will be available rapidly.

Let me take another example. The first oil embargo did not occur in 1973, but in 1967, but for only 2 weeks, because of the objections of some Arab country members of OPEC to U.S. foreign policy. At that time many of us recommended that we go ahead and collect data, because it was obvious that we were going to become more dependent on supplies of oil from the Middle East.

There wasn't one decisionmaker who felt that that was high enough on his order of priorities to recommend an investment in data. Consequently we did very little between 1967 and 1973 to prepare us specifically for the embargo in October, or the price increase on Christmas Day 1973. In that case you did not have demand for data. There was no way of making an investment in data, and no support from the suppliers of it because they weren't responding to a particular demand at that particular point.

#### DISCUSSION OF THE DATA FROM INDUSTRY

The interim report exhibits a lack of trust in data provided by industry. I found that industry provided data much more accurately and reliably than Government data on its own programs, almost without exception. When some Members of Congress accused industry of giving misleading information on reserves of oil and gas on public lands, I directed the subsequent investigation. I was impressed by the degree of accuracy and ability to compensate for biases, in spite of the obvious incentive under price controls to withhold such information. The problem is grossly overstated.

I have also gone through the problem of estimating reserves; what price/cost ratios do you use; what structures do you feel you can get oil and gas from versus others, and at what depths. These are all judgment calls. I feel that they have been reasonably made, in fact I don't see a manipulation of the basic data.

I see people taking the basic data and saying, you can only go to certain depths or to certain kinds of structures, that the price/cost ratios is going to be such-and-such, and this is my outcome, and for this reason. So I think we ought to be very careful about myth that we have a lot of bad data flowing into our data system from industry. That isn't the case, at least in the situation that I have explored on the public lands and elsewhere.

## ROLE OF THE COUNCIL OF ECONOMIC ADVISERS

It is by nature a longer term analysis organization. The predominance of its members comes from the academic community and the academic community prides itself on a long-term perspective. I agree with the interim report that some expansion of CEA's responsibility and capability would be useful. This would of course require a commitment, as Professor Neustadt points out, on the part of the President about how he wants to use the agencies that are very close to him. I would say 5 to 10 additional staff members could be useful. However, I would be very worried about getting into very large numbers of staff because then the Council members would become managers instead of advisers, and they would not have time to offer advice. And the day-to-day analysis should be relied on from the basic departments that can provide it: BLS, Commerce, Interior, FEA, and others. The President's Economic Report could be expanded to include longer run problems and solutions.

The Joint Economic Committee could help foster the longrun solution by holding more meetings on important long-term problems, as you are doing in this case.

The interim report recommends an independent long-lived National Growth and Development Commission which would study issues and recommend feasible policy alternatives to the Congress, the President, and the public. I agree that the Commission can be helpful in studying problems and recommending solutions. I feel a perpetual commission, generally independent of the President, however, is not appropriate. Problem solving should be integrated with decision-making in order to be relevant. Those who study shouldn't be highlighted by just a set of seven wise men. Rather there are many other sets of wise men around our country, and many other sources to tap. Brookings and the American Enterprise Institute have made the claim that they have wise men that can provide studies. Common Cause, Citizens Choice, and other more mass-oriented groups have made claims that they have not only seven wise men, but many thousands of wise men to provide input. So I really don't see the logic of going ahead and highlighting one set of wise men to do long-term studies. And I frankly think pluralism makes a lot more sense. The JEC itself has proven capable of commissioning useful studies without bias. Some of the people I know here couldn't be persuaded to be biased about the committee's deliberations. And that is a useful source of information. More and more study and analysis centers are cropping up around the country, so I think pluralism makes a lot more sense than one monopoly commission looking at longer term problems.

## ROLE OF ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS

I appreciate the concern with regional analysis leading to a recommendation by the Advisory Committee for some Regional Advisory Commissions on Intergovernmental Relations. An even more comprehensive proposal would be federally sponsored mini-ACIRS for States and substate regional commissions of councils of government. The Interim Report apparently contemplated further steps toward regional government. Prior to this step a longrun study should be made

of the effectiveness of the 10 Federal Regional Councils. The standardization of the Federal Government regional staffs has costs as well as benefits, as we pointed out earlier. The Interim Report refers to the "crazy quilt system of Federal regional organizations." But often it is wise to have them, and have them focus on problems as opposed to some arbitrary selection of States.

Also, as Ralph Widner pointed out with respect to his experience with the Governors, I frankly feel that the further expansion of the capability of the Federal regional councils does run smack into a major issue of States rights and direct representative government that I think must be thought through.

The interim report refers to a need for economic stockpiles to protect against embargoes or price increases. I feel that this issue is behind us now. The President in September 1976 accepted the National Security Council's recommendation to increase strategic stockpile supplies from 1 to 3 years. Inasmuch as the few threatened materials, primarily chromium, platinum, and aluminum, are on the list of strategic materials, no additional stockpiling is necessary. The stock currently consists of adequate supplies of chromium and 1 year's supply of bauxite. However, less than 1 year's supply of platinum exists which is heavily imported from the U.S.S.R. and the crisis ridden Union of South Africa. There might be a need for some expansion there.

The very existence of a strategic stockpile has economic consequences. When I was a program manager in this area people from other countries came and talked about price adjustments, and said they would not adjust, and I asked why. And they said that the fact that we have tin in our strategic stockpile makes it impossible to raise the price from their standpoint. Consequently it does have a desirable stabilizing price effect by its very existence, even though it is for national security purposes.

Beyond national security purposes, material shortages are most efficiently and quickly overcome by removing constraints on the market system. Price changes cause conservation, substitution, and additional supplies that overcome shortages quickly. This was true during the only two material shortage experiences we have had since World War II, in 1951 and 1973-74. One should not blow the material shortage problem out of perspective, other than the oil cartel problem, which is the most serious cartel we have had in the economic history of the free world.

This completes my initial comments. I would be pleased to join in the discussion.

[The prepared statement of Mr. Carlson follows:]

#### PREPARED STATEMENT OF JACK CARLSON

I am pleased to testify before the Joint Economic Committee on Long Term Economic Growth, particularly concerning possible improvement in decision-making processes that consider long-term economic growth. The National Commission on Supplies and Shortages and its Advisory Committee have given some thoughts to this problem. I am proud to have played a role in its creation and definition of its purpose while I as an official of the U.S. Office of Management and Budget and Department of Interior. I am pleased to comment on the Interim Report of the Advisory Committee on National Growth Processes to the National Commission on Supplies and Shortages.

## NEW LEADERSHIP

This is an ideal time to consider such an issue. Both the legislative and executive branches of government will have new leadership. Economic growth is a concern to all Americans. The economic pie must grow if Americans are to satisfy their needs—whether it be for food, clothing and shelter, or improvement in environment, health and safety.

Improvement in decisionmaking process affecting long-term growth is most likely early in the term of new leadership. Decisionmaking horizons are longer and new leadership doesn't have to account for ancient decisions.

## ROLE OF THE JOINT ECONOMIC COMMITTEE

The fact that the Joint Economic Committee (JEC) sponsored this hearing for the President-elect and the Congress-elect reflects progress toward longer-run thinking. An expansion of this kind of activity is useful. As Vice Chairman Congressman Richard Bolling stated earlier this month, this committee "... is the only one in the Federal Government focusing on a comprehensive and long-run view of our nation's economy."

The papers and panel discussion by national experts concerning capital shortage on November 16 should be helpful in understanding an important limitation to full-employment growth during the next few years. Incentives for savings and investment during the coming years are necessary to reduce the risk of too few tools for workers—and thus the existence of unnecessary unemployment will haunt us.

The reports from these hearings and perhaps a summary by the Chairman would be helpful to a number of policy-writing committees, such as Ways & Means and Finance. In turn, all Congressmen should feel a responsibility to inform the American people on long-run topics like this. Then appeal can be made to an informed citizenry instead of creating an incentive to appeal only to people's misunderstanding.

## ROLE OF THE CONGRESSIONAL BUDGET OFFICE

The Congressional Budget Office (CBO) can help provide a longer-run perspective through extrapolations of alternative budgets and economic trends and evaluation of particular programs such as government retirement and social security. Steps have already been taken in this direction and should be expanded.

## ROLE OF THE GENERAL ACCOUNTING OFFICE

The General Accounting Office (GAO) has moved slowly but surely into performance auditing as opposed to merely financial auditing. GAO is assessing some existing programs and estimating the longer-run implications. Having encouraged GAO to move in this direction while Assistant Director of the Bureau of the Budget (now OMB), when testifying before this Committee in 1969, I recommended further expansion.

As the Interim Report of the Advisory Committee on National Growth Policy Processes declares, both the executive and legislative branches suffer from the consequences of organizing along functional or activity lines. Both branches have difficulty considering all programs that serve the same objective or goal such as all programs that redistribute income—food stamps, AFDC, Medicaid, or making explicit trade-off among competing objectives such as environmental quality, health and safety, and improvement in material well-being of citizens—rather single-objectives agencies and committees exist instead of multiple-objective agencies and committees that can consider such trade-offs. In the Congress, final consideration by each House helps provide an overview. Final deliberations of the entire Appropriations Committee help. The emerging role of the new Budget Committee should also help.

## ROLE OF THE OFFICE OF MANAGEMENT AND BUDGET

In the executive branch, the Office of Management and Budget is the primary coordinating and trade-off proposing or making agency on behalf of the President. OMB attempts to consider longer term problems and trends through use of annual "Planning Review Session" held at least six months prior to the submission of the President's annual budget request to the Congress. While I was

Assistant Director of Bureau of the Budget and OMB, long-term issues were often discussed. Interestingly, every issue identified in the Interim Report without exception was discussed in these sessions, such as interdependence among countries brought about by growth of trade, changes in the age distribution affecting age-related programs such as old-age health and welfare assistance and young-age education, changes in productivity and changes in employment in manufacturing and services, the impact of the interstate highway program on cities and other transportation modes, Government and private sector retirement liabilities, nuclear proliferation and others. Studies backing up these discussions may have required several months or a year or two to complete, such as the study of the Liquid Metal Fast Breeder Reactor and Nuclear Proliferation. The Interim Report overly generalizes when it refers to the problems of "refusal or inability to react to the data we have in any organized fashion."

The information from "the planning review sessions" is summarized for the President and his key advisers, along with recommendations for policy changes for both the near and far term. The implications of the policy decisions are translated into target budget figures for the subsequent budget and extrapolations for 5 years, or longer in the case of selected programs such as water projects and social security. This information is given to agency and program managers to use in development of the President's legislative and budgetary program.

Although the Interim Committee overstates the situation when it states "we do not have mechanisms to anticipate, analyze, and understand" problems, there is a problem of receptivity. Unless the information can be shown to affect people generally or the constituency of public officials in particular, longer term analyses are quickly set aside in favor of short term solutions. This is true for both the legislative and executive branches and reflects the tenure of office holders: 2 years for congressmen, 6 years for senators, 4 years for presidents, and about 2 years for presidential appointee. When the constituents of the officials are informed or feel the longer term problem is so important that expedient, short term solutions are inappropriate, then the already available data and analyses are used.

When officials of both the legislative and executive branches attempt to inform citizens, they run the risk of being accused of advocating a particular solution. Then it is not clear who is representing whom. Consequently, the President and Congress have attempted to limit the growth of public information staffs.

The federal government has always had a difficult time reviewing federal programs with similar objectives, functions or activities located in different agencies. This occurs because programs have to be managed under only one organizational arrangement for proper setting of responsibility and accountability. Although some useful techniques are employed to evaluate complementary or substitute programs in different agencies, the conflict of effective management and adequate evaluation remains.

#### IMPROVEMENTS PROPOSED BY PRESIDENT-ELECT

I applaud the President-elect's support of mission-based budgeting multiple-year budgeting, and zero-based budgeting. This should help provide a longer-run perspective. This was the case when useful techniques were tried by past presidents. President Eisenhower accepted Program Budgeting, which placed budgeting in a format that related to the purpose or function of programs. President Johnson initiated the Planning, Programming and Budgeting System and brought about better analysis of problems. President Nixon inaugurated Management by Objectives to help set priorities for managing the executive branch effectively. President Ford directed preparation of "inflationary impact statements" so as to understand explicitly the benefits and costs of proposed policy actions.

#### ADDITIONAL IMPROVEMENTS

In addition to the innovations already proposed by the President-elect, the following techniques should also be considered:

(1) Sunset laws should be passed to limit the life of programs and agencies so that changes can more easily be made to conform with long-run objectives.

(2) Sunset laws should apply to all tools of government—expenditures, taxes, and regulations.

(3) Public policy changes should be described in a way that shows future as well as current year impacts. Accrued liabilities in each year should be

shown, with or without a discount rate. For example, small changes in social security this year mean larger dollar liabilities for subsequent years but are now nowhere to be found.

(4) Both Congress and the President should exercise more oversight over regulatory organizations. Major new regulations should be cleared with the President or his management arm (OMB) for agencies reporting to the President, such as FEA, OSHA, MESA, EPA, etc. The Congress should provide more effective review of major regulations and insist on legislation for the more important regulations. In addition, citizens should be assured that all changes in regulations follow procedures that allow them to participate. Prior publicity of economic and environmental impact statements and hearings are a minimum requirement. The Administrative Procedure Act should be updated for this purpose.

(5) The Congress should routinely require the Executive Branch and Independent Regulations Commission to estimate the impact regulations and proposed changes have on economic growth. Estimates are needed for some expenditures and tax programs, but little is estimated for regulations. The President could include these estimates in the special analysis section of his annual budget message along with estimates for expenditures and taxes.

#### ROLE OF STATISTICAL UNIT

The Interim Report appropriately recommends improvement in data and analysis. I agree. However, I have reservations about the method recommended. The report recommends "a new statistical unit in the executive branch to coordinate and rationalize . . ." This recommendation falls back to the standard advice given: ". . . when in doubt reorganize." In this case I have less doubt. Rather I recommend strengthening the existing mechanism for overseeing statistical programs. The Statistical Policy Division within the OMB has adequate authority and the power of the purse to referee among agencies, reduce duplication, moderate the burden imposed upon industry for data collection, and upgrade and fill in the gaps. I am afraid an independent agency for this purpose would experience difficulty accomplishing the task from scratch and without the power of the purse.

#### MODES AND TECHNIQUES

The Interim Report calls for standardization of models and for the executive branch to develop a major model of its own. I disagree. Rather the executive offices and executive agencies and congressional offices should make use of many techniques and models, depending on the needs of policy analysis. When I helped make the official executive branch economic forecasts for policy purposes, I found it useful to use a variety of models, such as DRI, Chase Econometrics, Wharton, University of Michigan, University of Maryland, Federal Reserve Board, the National Planning Association and the Commerce Department. Some have better price estimating equations for consideration of inflation, some have greater detail by sectors and geographical areas, to consider impacts on particular industries or communities. Some provide measures of the impact of the economies abroad on the United States for assessing the role of trade and investment. No one model or technique is best for everything, nor ever will be.

#### IMPORTANCE OF DEMAND FOR DATA AND ANALYSIS

The best approach for improving data and analysis is the selection of decision-makers and advisers to the President and the Congress who can recognize the need for better data and make the request to agencies that can provide it. Who the President-elect appoints will determine more about improvements in data and analysis than any other single factor.

I am impressed how quickly data and analysis can be provided once the request is made. For example, during 1974, the country faced the prospects of a coal strike, and the President felt it necessary to be aware of potential shortages and ways to minimize detrimental effects on jobs and vital public services. The data routinely collected were often two months old by the time they were published and included no detail to determine impact on particular industries, firms, communities, or hospitals. The data system was quickly upgraded to provide daily information on production of coal and weekly information on coal inventories at electric power plants, coking plants and elsewhere; and current and

anticipated job losses each week ahead. Estimates were made as the impact on other industries such as steel and aluminum, on particular regions, states and cities and on people's incomes. This was possible only because the data collectors knew the peculiarities of the industries, the people that could provide the data, and how to compensate for bias in definitions or otherwise.

The real problem with adequate data collection and analysis is the failure of the decisionmaker to request relevant data or failure of the decisionmakers' constituency to require the official to obtain better information. For example, the first oil embargo by the Organization of Petroleum Exporting Countries occurred during 1967 and lasted about two weeks. This experience failed to carry a warning of a serious problem in the future. Many people, including myself, recommended analysis of the potential threat because it was obvious that the U.S. was becoming more dependent on Middle East oil. Not even one key decisionmaker supported investment in additional data collection or analysis. Consequently, very little was done to assess the threat until the embargo in 1973 and the huge price increases that crippled the U.S. economy in 1974 and 1975.

#### DATA FROM INDUSTRY

The Interim Report exhibited a lack of trust in data provided by industry. And yet, I have found industry provided data much more accurate and reliable than government data on its own program. When some members of the Congress accused industry of giving misleading information on reserves of oil and gas on public lands, I directed the investigation. I was impressed by the degree of accuracy and ability to compensate for bias, in spite of the obvious incentives under price controls to withhold such information. This problem is grossly overstated.

#### ROLE OF THE COUNCIL OF ECONOMIC ADVISERS

The Council of Economic Advisers is a source of longer-term analysis than will be found in program agencies. This occurs because the CEA staff is primarily oriented toward a community that prides itself on a longer-term perspective.

I agree with the Interim Report that some expansion of CEA's responsibility and capability could be helpful. This would require a commitment from the President and his Council members and some additional appropriations. A recommendation from the JEC would be persuasive. Five to ten additional staff members could be useful. More than that would diminish the role of the Council from advisers to managers. Greater data and analysis capability is available from other agencies such as BLS, Commerce, Interior, FEA, HUD and others.

The President's Economic Report could be expanded to include longer run problems and solutions. JEC could help foster the longer run perspective by holding more hearings on important long term problems, as JEC is doing at this hearing.

#### NATIONAL GROWTH AND DEVELOPMENT COMMISSION

The Interim Report recommends an independent and long-lived National Growth and Development Commission which would study issues and recommend "feasible policy alternatives to the Congress, the President, and the public."

While I agree Commissions can be helpful studying tough problems and recommending solutions, I feel a perpetual Commission, independent of the President, is not appropriate. Problem solving should be integrated with decision making in order to be relevant. Those who study shouldn't be high lighted by just a set of seven wise men. Rather many sources of analysis and study are preferable. A new Commission is not necessary to commission long-term studies. The JEC has been proven to be capable of commissioning useful studies, as has the Executive Branch through program agencies, OMB and CEA. More and more study and analysis centers are being established at universities or elsewhere. The Brookings Institution and the American Enterprise Institute, for example, are well known sources of long-run studies.

#### ROLE OF ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS

I appreciate the concern with regional analysis leading to a recommendation by the Advisory Committee for 10 regional advisory commissions on Intergovernmental Relations (ACIR). An even more comprehensive proposal would be federally sponsored mini-ACIRs for states and sub-state regional commissions

or councils of government. The Interim Report apparently contemplated further steps toward regional government. Prior to this step, a long-run study should be made as to the effectiveness of the ten Federal Regional Councils and whether they should continue in their present form. Standardization of Federal Government regional staffs has cost as well as benefits. The interim Report refers to the "crazy-quilt system of Federal regional organization" but often it is wise to organize to solve a problem such as river basin manager that does fit standardized council boundaries. Also this proposal involves a major conflict with states' rights and representative government.

#### STOCKPILE OF MATERIAL

The Interim Report refers to a need for economic stockpiles to protect against embargoes or price increases. The President has already met this need. He announced in September 1976 that he had accepted the National Security Council's recommendation to increase the strategic stockpile objective from one to three years. Inasmuch as the few threatened materials, primarily chromium, platinum, and aluminum are on the list of strategic materials, no additional stockpiling is necessary. The stockpile currently consists of adequate supplies of chromium and one year supply of bauxite. However, less than one year's supply exists for platinum, which is heavily imported from the USSR and crisis-ridden Union of South Africa. Strategic stocks should be increased in this area.

By reason of its existence, the strategic stockpile serves economic objectives. Foreign suppliers fear retaliation if they act abruptly and hurtfully.

Beyond national security purposes, the material shortages are most efficiently and quickly overcome by removing constraint on the market system. Price-changes cause conservation, substitution, and additional supplies that overcome shortages quickly. This was true during the only two material shortage experiences since World War II, 1951 and 1973-74.

This completes my initial comments on the topic and the Interim Report of the Advisory Committee, and I am pleased to join into your discussion.

Representative BOLLING. Thank you very much.

Congressman Pike, you can start the discussion where you please.

Representative PIKE. Mr. Vice Chairman, I have been very impressed by the articulate and diverse views that we have had here this morning. I would just like to throw out the thought, and see if anybody wants to jump up and down on it, that perhaps we envision a goal which is not attainable.

And I guess I throw this at you, Mr. Saltzman, as much as anybody.

When we think that through planning we are going to accomplish things, we are going to be able to anticipate the future, and accomplish things which I think are not going to happen, they don't follow through. We had this tremendous energy crunch briefly when there just wasn't enough fuel. It didn't take a hell of a lot of genius to understand that one of the things that we could do about this would be to lower the speed limit. And we not only planned it, we passed a law. I just wonder what would happen tomorrow in this country if we enforced that law. I don't think anybody in this room obeys that law today. I think that if you try to say that you can look down the road and through planning accomplish these things, it isn't going to happen.

I like one phrase you used, Mr. Carlson, that the ultimate driver has to be an informed citizenry. And we have got a situation in America today where we will not conserve energies. We have passed laws requiring the conservation of energy. Our citizenry will not obey those laws. We do not enforce those laws. When the economic factor comes into the picture, we find that General Motors and AMC, which



tried to do something in this regard, find they are having to give cash rebates to sell their small cars. Ford, which went in the opposite direction and advertised, you don't have to buy a little car, we will sell you a big car, in doing much better. I just don't think that planning is going to get us where we are going to go, or where we hope to be. ;

Go ahead, jump up and down.

Mr. SALTZMAN. I would rather surround you than jump up and down.

First of all, I agree as to the importance of an informed citizenry. And that is the major purpose of this National Growth and Development Commission, because what it will do, since it has no legislative or Executive authority, is to lay out the incipient problems and it is going to inform the public at the same time as it does the Congress and the Executive. The Commission is not just going to say, this is the problem, but it is going to set fourth alternatives, and cost each one so that everybody is going to know whose ox may be gored and how much.

At that point a national debate will start on a major issue that requires a solution. The citizenry will be informed and can press the Congress and the Executive in certain directions based on logical alternatives which have been suggested. It doesn't make anybody do anything, but it does cause, in a pluralistic society, the Congress and the Executive to take positions in areas in which they have not moved. And energy is a very good example. Let's talk about planning and about energy. Cutting down the speed limits—and I agree that it isn't being enforced—but cutting down the speed limit is a tiny, tiny visible way to get people excited about something. It is a very small drop in the bucket as to the gas we could save. We waste much more gas trying to get out of the urban sprawl, which isn't being attended to, than we ever could by cutting the speed limit.

But in 1970 we know then, if anybody wanted to know, including Mr. Carlson, that we were using up energy faster than we are replacing it in our country. So what did we do? We passed a Clean Air Act in 1970 which caused utilities and other large industries to convert from coal burning ovens to oil. We have enough coal in this country to last 200 years—you know the number better than I do. They did it because it was cheaper to buy oil than it was to convert the ovens. The reason we had to convert is because environmentalists didn't want the air fouled—and that was a legitimate concern. What we could have done if there had been an integrated policymaking capability—an institution that would take a look at the whole thing—was decide (a) do we want to send \$20 billion out of the country for foreign oil purchases, (b) cause our dollar to weaken and have an unbalanced trade situation vis-a-vis the rest of the world, (c) be at the mercy of people we don't want to be at the mercy of?

Maybe what we should have done is propose an investment credit of 10 percent, 20 percent, 25 percent, or whatever was necessary to make it more desirable to put scrubbers on those existing coal ovens in the utilities and elsewhere. We would not convert to oil, we would save our money at home, create jobs at home, have a more flourishing economy, and and not mess up the atmosphere, use the coal, and not

be at the mercy of foreign interests. That is what planning might have done if we had done it appropriately, if we had looked at the whole picture and did it in an overall fashion.

**Representative PIKE.** You have gone beyond planning into an enforcement technique through taxes. That is not planning. You haven't got a planned economy.

**Mr. SALTZMAN.** No, sir, what I have said is that we would have looked at the whole picture, instead of just looking at one area at the time and taking one piece of the problem, which traditionally is done. We would have looked at the whole picture, and in an integrative fashion we would have posed alternatives that were more desirable for our country. It cost money for the people to convert from coal to oil. If you talk about persuasion, let's realize Congress passed that law, they made industry do that. With planning, at least we would have a feasible alternative that could have been chosen more intelligently. Government intervention was not less because planning was eliminated—it was probably greater.

**Mr. WIDNER.** Could I just take 1 minute, because I think you have raised a fundamental issue. There is a big debate which has been going on for 12 years in the planning field about whether planning is even possible given the rapidity of changing events and so on. An objective in 10 years will be obsolete. We could cite some classic examples in the past decade. Back when I was in the Navy as a young fellow just out of college, the captain could tell me what—I was the navigator of the ship—and he could tell me what port he wanted to go to, and I could sit there in the chart room and plot the theoretical course to that port.

But I knew darned well that the minute I left the harbor I would get winds and currents that would jockey the position of the ship. And the captain could very well get an order in midocean to go to a different place.

Now, a couple of things were happening as you traced that course. First of all, if it was clear I could usually ascertain where we were by shooting the stars or the Sun. If it got cloudy I couldn't see the stars or the Sun but we had machinery that could tell me approximately where we were, and then I could check it when the sky cleared up again. Of course if we were near the coast we had electronic aids, and so on. But I always knew roughly where I was. And even though somebody's mind would change about where we were going, we had a reference point to change from.

One way to think about planning is as more of a kind of—and this is what the planning alternative is now—an enlightened incrementalism. You have a rough idea of where you want to go and you may change your mind. But unless you know where you are and roughly where you would like to go, you deal with crisis after crisis, and ever time you clean up a crisis you create another one, because you haven't taken account of where you really generally want to end. That is a different concept of planning than the old notion of a master plan which says that 25 years from now our gross national product is going to be X, and here is what our institutions are going to be, et cetera. I don't know of a country in the world that has been able to make that work. But there is a much more fluid, flexible, creative

kind of approach—contingency planning I guess is the term—we do it in defense and foreign policy, and I guess we can do it domestically. The point is, could we get enough consensus about where we want to tend?

Representative BOLLING. I don't know whether this is the process of planning, whether you were a small boat man or not.

Mr. CARLSON. May I add a comment?

Everybody would like to have certainty. It is very hard for people to deal with uncertainty. People throw out the fact that a little more data, a little more analysis will remove uncertainty, but it doesn't. For instance, we were trying to figure out what the impact was of the last oil crisis. We had a good scholarly study by Otto Eckstein, I believe, on estimating what the sensitivity of price on supplies, and also of reduction in demand from increases in price. However, were the conditions at the time the price was imposed on the United States by the OPEC countries the same as the study? It turned out they weren't. So you must take estimates, and you modify them for the unique conditions of the time. Eckstein's study is probably one of the better scholarly pieces that we had or expected to have for that kind of decisionmaking. Yet we still have a lot of uncertainty, and there is a very wide margin of estimation involved.

We came out pretty well in estimating what the impact was in the first half of 1974 but the estimates for the latter half of 1974 and 1975 weren't so good. Any estimates, involve a great deal of uncertainty.

People were talking about central planning—spending policies, taxes and regulations. Planning can become a mandatory process. It is a process that started in the Soviet Union with long-range planning in the 1920's. Today, planning is a word that has so many different meanings that it has lost its usefulness.

The work force in the future—due in part to young people practicing birth control—is going to be much smaller than today's. Retirement programs are becoming so generous, that the workers in the future will rebel against the burden of supporting these programs. The real purchase power of retirement programs at the end of this century will not be maintained, I would forecast, by the work force at that time. They will rebel. Increasing retirement programs even more and misleading people about their real purchasing power is something that we may have to face soon.

If a commission has a bright idea, do they go out and sell it? If so, why did the Congress cut down public information activities in every agency of this Government? Because by selling their ideas, the commissions become advocates. That is a reversal of roles of Government. The citizenry is supposed to come forward instead of our going out and brainwashing them about what they should have. This is a very fundamental problem. Maybe we have to rely more on this information getting to Common Cause, Citizens Choice and other mechanisms.

On the other hand, everytime you run for office, you have to face to facts, do you run on the people's ignorance, or do you run on what would be their enlightened self-interest? You could lose on the latter.

Representative BOLLING. That is where I flatly disagree.

Mr. CARLSON. There are some people who contend that they lose by being ahead of the thinking of the citizenry.

Representative BOLLING. This business about losing and winning—let's take it out of the particular business of running for office. Everybody has a different style in the way they run for office. But I will draw from two attempts within the Congress to deal with changing the institution. I happen to have been involved in both. I was the floor manager for the Budget Act in 1973-74, which was a repair job. I guess an objective observer would say that in terms of modernizing the Congress that was perhaps more important than dealing with the jurisdictions. But I also happen to have been the chairman of the select committee that dealt with the question of rationalizing jurisdictions. Both of them were just organizational matters trying to take the same situation and improve the way in which the same number of people could function. One of them went through in a breeze, passed by 400 to something, not much. And the other one went down the drain. And there was one difference. The public was heavily involved in one and not the other. But it doesn't seem to me that there is anything wrong with the attempts in either case, if the exact reversal had been made. And I think that all that Mr. Saltzman and company are trying to say is that we ought to figure out if there is a better way to try to do what we are going to do anyway.

Mr. NEUSTADT. Marginal improvement.

Representative BOLLING. I think that is what we are really talking about, is a marginal improvement. And I can't see any monopoly on information. I think the thing that is ingenious about this proposal is that that Commission has a life of its own, but it doesn't have any power. I happen to believe more and more that it is very important for us to try to find sources of information that can't be self-implementing—that can't come to conclusions and then implement them automatically. That is totalitarian. But what we are talking about here is an attempt to have stock of information that might conceivably be relatively objective. Because the sum of the self-interests of the country aren't always or often the general interests of the country.

Mr. CARLSON. You know, I have never seen a commission that did not have a bias of its own.

Representative BOLLING. Of course they all have biases, but you may have to have a more generalized bias.

Mr. NEUSTADT. Mr. Carlson, back off just a second. All things have biases. The Commission will at least have a bias that comes out of the combination among its members as it goes on. But what is being proposed here is rather ingenious and I want to be sure that the full ingenuity—which isn't mine, it is mostly Mr. Saltzman's—is laid out.

We note that while the NRPB was an ineffectual vehicle, it didn't last long, it ran afoul of Congress and got shut up.

Representative BOLLING. It ran afoul of a faction in Congress.

Mr. NEUSTADT. The Corps of Engineers mobilized support for that.

But there was a period—if you go back and look at the level of reporting, there was for a period of years a really remarkable—you can go back and look it it—a remarkably interesting address of longer term medium range problems. In retrospect, specifics were often wrong, but so they always are. The general thought and emphasis was often emphatically right.

Now, you can argue that stuff just as interesting is being produced today, or more so, by a multiplicity of private and public research

sources. Well, a lot of interesting stuff is being produced today. A part of the difficulty is the noise level. There's so much and some is so bad.

So what is being proposed is that you add another institution to the multiplicity of institutions, and you try to give it a little notoriety, if you will, a little platform to see if it can get above the noise level. How do you propose to do that? We propose to try to do that by something very difficult, by naming a nine-member commission, five full time and four half time, recognizing that you wouldn't get somebody you might want full time—with a small staff to do selective work—but not vast amounts of their own data generation. Those people are to be selected by the President on advice and consent of the Senate, with the President acting after consultation with the Senate and House leadership. The whole thing is ingenious, but may very well not work. But what we are doing is saying quite explicitly, let's have an experiment, a sunset commission, it only lasts 7 years then it has to be reviewed. If a President were seriously interested in seeing whether he, together with the leadership of both Houses, could visualize a way to get a thing like this a little above the noise level, he might be able if he sat down and seriously addressed that problem, in common with the leadership of both sides, be able to work out a better than average bargain on people. If you worked out a better than average bargain on people—if you have got nine people who had this experiment to perform, and they wanted to get a little above the noise level, which is the critical thing, nine people selected on a better than average bargain might do a better than average job, and if they don't, 7 years is a guillotine on them. I can think of few proposals shyer or more modest or more experimental than that—or further away from cursive planning.

Here it is just one additional voice among all the voices. But the hope is that you might raise the level of discourse a little bit, and we could sure as hell stand that in this country, on these problems. And that is really all that I believe Mr. Saltzman is saying.

Mr. SALTZMAN. With one amendment. This Commission does not create the problem that exists today. They are not going to create an energy problem, they are not going to create a health problem. Those problems exist. Part of the trouble we have, me, you, all of us, is that the world has changed so rapidly, and we are viewing things from our historical past, and it just doesn't dovetail any more with reality.

Now, they are not going to create a problem, they are going to look down the road and identify the problem which exists or which is bound to exist, and not every little thing, but major things. And they are not going to take the position, that is not their job, and therefore they are not advocates of a position. What they are going to do is say, look, here is the problem, and let's better focus on it, because it has begun to exist, and 8 years from now it is going to be a heck of a lot worse. Now, we can do this, and that is going to cost so much in money and total impact. We can do this and we can do this. There are going to be alternative choices. And they have no right to come in with one recommendation. That is not their job. And they are going to lay those alternatives and the problem on the Congress and the Executive—they are not creating the problem, it is there, with alternatives and costs—and on the public.

Now, the difference between all the organizations you talk about is that those organizations have no important status. And nobody is required to respond to them. And mostly they don't. Here is going to be an organization that is going to require that some response occur, without having chosen a particular solution. You have a choice.

Now, Congress can elect to do nothing. It can elect to take one of those choices and try to explore within its own committees or improvise. They can take a combination of two. The President likewise. I fail to see where the duress exists, and where the fears exist. We don't want a socialized country anymore than you do. But I cannot see how it can help but do good, because the bells ring all day, and everybody runs for office every 2 years, and the bells ring, and the multiplicity of things that you have to look at is enormous. Where do you get the time, even if you have the inclination to think that way and look that way?

The OMB is to me not the ideal solution and not the ideal choice. First of all, if they were, this process would have been taken place better. And second, conceivably that may not be the thrust of their assignment.

We spoke to CEA. And what they have told us is that they do what the particular President in office wants them to do. And they don't go into a bunch of stuff for him just because it is their idea that they are going to go chase something and bring it to him. And also they are not going to tell him what he doesn't want to hear. So that is not a reliable way to get what you are talking about.

Representative BOLLING. Even when they do the President doesn't listen.

Mr. SALTZMAN. We are trying in an impartial way to focus on the problem a little down the road, which nobody else is doing, and then laying out alternatives and getting the public involved. And that doesn't seem to me as a heck of a lot of duress.

Mr. CARLSON. May I comment?

I am sorry Mr. Neustadt had to go.

Representative BOLLING. He had to go talk to a luncheon. We will all have to leave pretty soon.

Mr. CARLSON. We have started with the Employment Act which created CEA and JEC and the Budget Act of the 1920's which created OMB. These institutions in and of themselves are still evolving. They have a broader perspective now than they had in the past. A further evolutionary step makes sense to me more than jumping to completely new organizational lines.

Second, why do you want nine members to be lifted above the noise level when you probably have nine wise people out there involved in other sources of information about what your problems are? They are looking at a longer term perspective, and they don't see the short-term argument. Why do you want to place it on a pedestal instead of letting it be among equals? I don't see the argument.

Third, there is a foot in the door argument. There is an inclination when you look at these problems—and these are not just Government program problems you are talking about, they are national economic and social problems—to use nonmarket solutions. For example, the user charge, which is being used very little, is an inclination of Government entities to go toward nonmarket type solutions, and to get

into nongovernment activities. Slipping down the road to more planning in the private sector is a fear that many people have.

Fourth, you don't start an organization and cut it off in 7 years. It develops a constituency. In fact, there are many programs in which I have tried to make a change where the benefits to the new set of beneficiaries was six times greater than the benefits to the old set of beneficiaries, and the old beneficiaries prevented the change. We minimize losses, we don't maximize gains in this Government. Once you start on this you start in an inevitable path of greater involvement by such a commission. I don't believe that the sunset provision has a role only in modifying programs and not cutting back on activities.

Mr. WIDNER. There is a good bit in what Mr. Carlson says. We had a heated debate in two sections over some of those points, Mr. Carlson. But there is a peculiarly dynamic situation I think we have in mind in making this proposal. If the President or the Congress chooses, they can ignore Brookings, they don't have to pay any attention to it. They can ignore Rand, or anybody they want. Indeed they can ignore this Commission. But what we are trying to do here is set up a little more tension in the system by having a vehicle that can say things that it would be very difficult for an elected official to say in the short run, that could begin to alter and prepare public opinion in a way that would enable the elected officials ultimately to act—and I think the two examples that Congressman Bolling gave us a few moments ago are prime examples. If we had had a device by means of which the public was made far more aware than they are right now of the implications of present jurisdictional structures of the Congress for what happened out there on the ground, and if they understood that, you would have had a ground swell of support for those reform proposals. But the point is that the vast majority of people in this country are oblivious to that problem.

Representative BOLLING. For an accidental reason. It was caught behind Watergate.

Mr. WIDNER. I don't know whether even the Commission could have surmounted that.

Representative BOLLING. The question of raising it above the noise level is difficult. Normally you would get it above the noise level of the Commission that you propose. Sometimes you wouldn't.

Mr. WIDNER. That is right. But it seems to me that by saying to the Congress and the President, this thing will occasionally call attention to a problem, and you may choose to ignore the alternatives they have outlined, and indeed you may dismiss the problem as insignificant, but you are going to have to tell the public, because the newspapers are going to have to play it up to the Commission, you are going to have to tell the public why.

Representative PIKE. Mr. Vice Chairman, I don't want to leave any kind of impression that I am (a) opposed to planning, (b) opposed to this Commission. I have just gotten old enough, I guess, so that I still think that it would be healthy for it not to promise too much, because the frustration of faded expectations is one of the sadder things in our society. And this bothers me greatly.

Finally as a comment on anything trying to lift itself above the noise level, I think all of these extraneous or exterior groups will

simply increase their own noise levels, and what you will wind up with is a generally higher noise level.

Mr. CARLSON. If I can just comment, if you promise too little, then it is more difficult to raise it above the noise level.

Representative PIKE. That is right.

Mr. CARLSON. So undoubtedly you are going to have to promise more, and it will be a self-fulfilling promise.

Representative BOLLING. I would like to comment on that. My impression is that the public—the public that I see, which is a multi-faceted public, not just my district or the Congress—is fed up with the conflicting information, with no set of choices being presented other than those that they perceive as stemming from one or another self-interest. One of the reasons that the public is disaffected at the moment with Government is that they don't think Government is telling them the truth about the problems that they face. There is a little story, and it may not be accurate, about the speed limit. I was told by somebody that should know about Maryland law enforcement that within a day after the President in a public statement indicated that the whole energy problem was over, their ability to enforce the speed limit became 1 in 100 compared to the day before. The public when it thought that it was working together in a very minor way was responding well to the speed limit. When they decided that its highest official had told them that this wasn't any problem, they quit. So that you have all kinds of intangibles working, as you know better than I.

Representative PIKE. Nobody knows.

Representative BOLLING. You have got to know about intangibles better than I because of the district you are from.

Thank you all very much. We will have to quit.

The committee stands adjourned. We appreciate your testimony very much.

[Whereupon, at 12:20 p.m., the committee adjourned, subject to the call of the Chair.]

