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ECONOMIC GROWTH AND TOTAL CAPITAL FORMATION

A STUDY

PREPARED FOR THE USE OF THE

SUBCOMMITTEE ON ECONOMIC GROWTH

OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

FEBRUARY 18, 1976

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(II)

LETTERS OF TRANSMITTAL

FEBRUARY 16, 1976.

To the Members of the Joint Economic Committee:

Transmitted herewith is a study entitled "Economic Growth and Total Capital Formation," which was performed for the Subcommittee on Economic Growth by Professor John W. Kendrick of the George Washington University. Since the findings of this study have a direct bearing on the future economic growth of our country, I believe the members of the Joint Economic Committee and other Members of Congress will find it most useful.

The views expressed in the study are those of the author and do not necessarily represent the views of the members of the Joint Economic Committee or the committee staff.

HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee.

FEBRUARY 12, 1976.

Hon. HUBERT H. HUMPHREY,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith is a study by Professor John W. Kendrick of the George Washington University and the National Bureau of Economic Research, entitled "Economic Growth and Total Capital Formation."

Professor Kendrick's study is a pathbreaking attempt to estimate the total level of capital formation in the American economy from 1929 to 1973. Going beyond the traditional measures of capital and investment in the official national income accounts, Professor Kendrick defines total capital as "all tangible durable goods (structures and equipment) plus inventory accumulation of all sectors, households and governments as well as business, and all intangible investments designed to enhance the efficiency of the tangible factors. The intangibles comprise outlays for research and development (R. & D.), education and training, health and safety, and mobility."

In the study, Professor Kendrick has made a serious effort to construct a complete profile of how much total investment our nation has made, both in tangible and intangible forms of capital. This is the first time such an attempt has been made.

The analyses and conclusions Professor Kendrick makes on the basis of his new data have serious implications for the continued growth of the American economy. Between 1929 and 1966, our nation continuously increased the proportion of our national output going to tangible and intangible investment, but since then the proportion has declined. Furthermore, there has been a major shift from tangible investment to intangible investment, and from the business sector to government.

At the end of his study, Professor Kendrick makes a number of recommendations concerning how we can reallocate our investments to get our economy growing again and avoid recreating the bottlenecks which slowed down our growth two years ago and which helped precipitate our current economic malaise.

The views expressed in Professor Kendrick's study are those of the author and do not necessarily represent the views of the members of the Subcommittee on Economic Growth.

LLOYD M. BENTSEN, Jr.,
Chairman, Subcommittee on Economic Growth.

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ECONOMIC GROWTH AND TOTAL CAPITAL FORMATION

By John W. Kendrick*

Evaluation of the impact of the tax system, and changes in taxes, on economic growth and progress requires an understanding of the chief sources of economic growth. Broadly defined, capital formation, in all its many forms, is by far the most important source of growth.

As traditionally measured in the official national income accounts, capital formation or "investment" comprises only the tangible, non-human categories of purchases of new structures, producers' durable equipment, and business inventory accumulation, plus net foreign investments. This narrow definition was in line with Keynesian macro-economic theory, which highlighted business tangible investment as the chief independent variable involved in determining the level of national income and product. Certainly it is the most volatile form of investment over the business cycle, and is heavily influenced by conditions in the financial markets.

However, from the viewpoint of economic growth analysis, it is useful to define and measure net investment more broadly as comprising all current outlays that augment income- and output-producing capacity (capital) for future periods. Gross investment includes additionally the investment required to offset capital consumption (chiefly depreciation) reflecting the gradual wearing out and/or obsolescence of capital. Thus broadly defined, capital formation consists of outlays for all tangible durable goods (structures and equipment) plus inventory accumulation of all sectors, households and governments as well as business, and of intangible investments designed to enhance the efficiency of the tangible factors. The intangibles comprise outlays for research and development (R. & D.), education and training, health and safety, and mobility. Also, for the sake of logical consistency, one may also include tangible human investment, defined as the cost of rearing children to working age, which parallels the cost of the brick, mortar, and machines that comprise the tangible nonhuman fixed capital. The intangibles are generally embodied in the human and non-human capital, increasing the productivity of the physical constituents.

The importance for analysis of looking at all forms of investment is that they all compete for the finite savings of the community; and that to promote the optimum allocation of resources, investments in each type should be carried to the point where the expected rate of return equals the marginal cost of funds. Even though we recognize that human investments, in particular, are undertaken for noneconomic as well as for economic reasons, in varying degree, it is nevertheless useful to have estimates of all forms of investment in devising policies to influence economic growth. At least rough allowance can be made for the nonpecuniary as well as the monetary returns to human investment in attempting to formulate growth strategies.

*Professor economics, George Washington University, and senior research staff member, National Bureau of Economic Research.

Since the U.S. national income and product accounts do not identify or provide estimates for many of the categories of "total investment" as defined above, I undertook the preparation of estimates of such investments, together with the associated capital stocks, in a study soon to be published by the National Bureau of Economic Research.[1] For this paper, I have updated the gross investment estimates, by type and sector, through 1973. In the following section, I summarize briefly the chief findings of the study.

Gross Investments in Relation to GNP

In table 1 the ratio of gross saving and investment, as conventionally defined, to GNP is shown for selected business cycle peak years, 1929–73. The ratio of the current dollar magnitudes has been relatively stable at around one-sixth. In constant prices, the ratio was higher in 1929 and 1948 than in more recent years.

TABLE 1.—INVESTMENT IN RELATION TO GROSS NATIONAL PRODUCT

	Gross national product (1)	Gross private domestic investment plus net foreign investment (2)	Ratio (2)÷(1) (percent)
Billions of current dollars:			
1929	103.1	17.0	16.5
1948	257.6	47.9	18.6
1957	441.1	71.2	16.1
1966	749.9	123.9	16.5
1969	930.3	137.9	14.8
1973	1,294.9	209.4	16.2
Billions of 1958 dollars:			
1929	203.6	42.0	20.6
1948	323.7	62.8	19.4
1957	452.5	72.3	16.0
1966	658.1	111.4	16.9
1969	725.6	109.7	15.1
1973	839.2	138.2	16.5

Source: Bureau of Economic Analysis, U.S. Department of Commerce.

In comparing estimates of the saving and investment concept expanded to include nonbusiness tangible capital outlays, and intangible investments of all sectors, it is necessary to adjust the official GNP estimates for comparability. We make no attempt here, however, to enlarge the estimates generally to include all imputations for nonmarket activities and other adjustments sometimes advocated to produce a better welfare-oriented measure. Rather, we adjust the official GNP estimates only for the several items necessary to obtain consistency with the expanded investment estimates. As shown in table 2, these comprise the imputed rentals on nonbusiness capital stocks, investments charged to current expense by business, and imputed compensation of students and the frictionally unemployed which is included as part of human investment. It will be observed that the adjustments to GNP rose gradually from 24 percent in 1929,

and 27 percent in 1948, to around 34 percent in 1969 and 35½ percent in 1973. In constant prices, the upward trend was less marked, and levelled out at around 32 percent in both 1969 and 1973

TABLE 2.—ADJUSTMENTS OF COMMERCE DEPARTMENT ESTIMATES OF GNP FOR CONSISTENCY WITH TOTAL INVESTMENT AND CAPITAL ESTIMATES

[In billions of dollars]

	1969	1973
Current dollars:		
GNP, commerce concept	[1] 929. 1	1, 294. 9
Plus:		
Personal sector imputations:		
Student compensation	92. 3	148. 1
Frictional unemployment	16. 0	24. 1
Rentals on household capital	100. 1	138. 5
Rentals on institutional capital	5. 7	8. 5
Business: Investments charged to current account:		
Tangible	2. 3	3. 3
Intangible	35. 4	45. 6
General governments: Imputed rentals on public capital	67. 0	91. 2
Equals: Adjusted GNP	1, 247. 9	1, 754. 3
Ratio to Commerce GNP	1, 343	1. 355
Constant 1958 dollars:		
Commerce GNP	724. 7	, 839. 2
Adjusted GNP	957. 2	1, 104. 5
Ratio	1. 321	1. 316

[1] The Commerce Department estimate of GNP for 1969 was subsequently revised slightly upward from the number shown here which is consistent with the adjusted GNP series for the period 1929-69 presented in John W. Kendrick, "The Formation and Stocks of Total Capital." (New York: National Bureau of Economic Research, forthcoming 1976.)

Even in relation to a significantly larger GNP, as adjusted, total gross investment was a much larger proportion than conventional investment—around half by the latter 1960's, as compared with one-sixth by the conventional measures. And even though adjusted GNP rose somewhat relative to the official numbers, the ratio of total gross investment to adjusted GNP rose significantly between 1948 and the latter 1960's. The proportion in 1948 (as in 1929) was close to 43 percent; by 1966 it reached 50.5 percent. Significantly, the ratio receded thereafter to 49.5 percent in 1969 and 48.5 percent in 1973. (See table 3.)

The ratios of total *net* investment to NNP were only about half the gross ratios in 1929 and 1948, but thereafter showed an even sharper relative increase—from 21.4 in 1948 to 29.7 in 1969. (We have not extended these estimated to 1973.) In constant prices, the rise in the total investment proportion was somewhat less marked, since the implicit price deflators for gross investment rose more than those for adjusted GNP. On the real basis, the proportion increased from 44 percent in 1948 to 49½ percent in 1966, and leveled out thereafter, according to our preliminary estimates.[2] As noted below, the leveling out in the real investment ratio, and drop in the current dollar ratio, was associated with a deceleration in the rate of growth in total capital after 1966, which was one factor in the subsequent slowdown in growth of real product and productivity.

Composition of Investment by Type (Table 3)

All of the increase in the ratio of gross investment to adjusted GNP was due to the relative increase of intangible investments from about 12 percent to 21 percent in 1973. The increase was steady, with

[2] See Kendrick, ibid., Table 3-3.

exception of the last subperiod, when the intangible investment ratio dropped slightly. The tangible, nonhuman investment ratio showed no pronounced trend, accounting for a bit over 23 percent of adjusted GNP in 1929, 1948, and 1973. Tangible human investments in rearing, after dropping from 7.7 percent in 1929 to about 5½ percent in the mid 1940's, rose relatively to over 6 percent in the latter 1950's. Since then a steady relative decline, reflecting the declining birth rate brought the ratio down to 4.3 in 1973. Presumably, the decline is continuing, releasing funds for other types of investment as well as for consumption (since rearing costs not only reduce family saving, but also have an abstinence effect).

TABLE 3.—TOTAL GROSS INVESTMENT, BY TYPE U.S. DOMESTIC ECONOMY

[In billions of dollars and percentages; selected years]

	Grand total	Intangible investments					Tangibles total
		Total	Education and training	Health and safety	Mobility	R. & D.	
Billions of current dollars:							
1929	55.0	15.7	11.0	1.9	2.5	0.3	39.2
1948	139.9	45.0	31.0	5.2	6.6	2.4	94.9
1951	272.0	92.7	61.4	10.6	10.5	10.3	179.2
1966	495.8	198.1	137.4	21.4	17.0	22.3	297.7
1969	611.7	267.8	192.4	27.9	21.3	26.2	344.0
1973	851.0	369.6	262.6	45.9	31.0	30.1	481.4
Percent distribution of total gross investment:							
1929	[1] 43.1	28.5	20.0	3.5	4.6	.5	71.5
1948	[1] 42.7	32.1	22.0	3.7	4.7	1.6	67.9
1957	[1] 47.6	34.0	22.5	4.0	3.8	3.8	66.0
1966	[1] 50.5	40.0	27.7	4.3	3.4	4.5	60.0
1969	[1] 49.0	43.8	31.5	4.6	3.5	4.3	46.2
1973	[1] 48.5	43.4	30.9	5.4	3.6	3.5	56.6

[1] Percent of adjusted GNP.

Within the intangible category, the sharpest proportionate increase was in R. & D. outlays up to the mid-1960's, but then the ratio to adjusted GNP dropped from 2.3 percent in 1966 to 1.7 percent in 1973. This decline has been cited as one explanation for the productivity slowdown (and has prompted proposals for a R. & D. tax credit).

Outlays for education and training, the largest type of intangible investment, grew steadily from less than 9 percent of adjusted GNP in 1929 to more than 15 percent in 1969, but then declined a bit between 1969 and 1973. Health and safety outlays rose relatively over the entire period, from 1.5 percent in 1929 to 2.6 percent in 1973. Mobility outlays did not quite keep pace with GNP sagging from 2.0 percent in 1929 and 1948 to 1.8 percent in 1973.

Sectoral Composition

With regard to the sector composition of gross investment, all of the net increase in the ratio to adjusted GNP came in the public sector. The Government investment ratio peaked in 1953 at 11.6 percent, however, and thereafter sagged, particularly in the 1969–73 subperiod. After 1953, both business and personal investment strengthened somewhat relatively, although the business investment ratio fell from a peak of 12.8 percent in 1966 to 11.8 percent in 1969. The personal

investment ratio has held quite steady at around 26½ percent in the 1966–73 period, close to the 1929 ratio.

Changes in the ratio of gross investment to GNP for each sector can be better understood by looking first at the ratio of the sectoral disposable income to GNP, and then at the proportion of that income devoted to investment. (See table 4.) Thus, it is apparent that the increase in public investment as a proportion of GNP was due chiefly to the relative increase in public revenues. While the government take from GNP more than doubled, the proportion of public revenue channeled into investment rose modestly from 44.3 percent in 1929 to 46.5 percent in 1973. It will also be observed that the Government share of gross product (income) rounded out in the latter 1960's, and the drop in the public investment ratio 1969–73 was due to the declining government income share reinforced by a mild decline in the ratio of public investment to revenues.

TABLE 4.—TOTAL GROSS INVESTMENT, BY DOMESTIC SECTOR, IN RELATION TO GROSS PRODUCT AND SECTORAL DISPOSABLE INCOME

[Percentages, selected peak years, 1929–73]

	1929	1948	1957	1966	1969	1973
Persons:						
DI/GNP	78.8	70.4	68.5	63.0	67.0	63.8
Inv./DI	33.2	35.2	37.3	41.9	39.4	38.5
Inv./GNP	26.1	24.8	25.5	26.4	26.5	26.5
Business:						
DI/GNP	10.0	10.2	10.1	12.5	9.5	9.3
Inv./DI	124.4	123.8	109.5	102.4	123.9	128.0
Inv./GNP	12.4	12.6	11.1	12.8	11.8	11.9
Governments:						
DI/GNP	10.4	18.7	20.9	24.2	23.4	21.7
Inv./DI	44.3	28.6	52.2	46.3	48.1	46.5
Inv./GNP	4.6	5.2	10.9	11.2	11.3	10.1

Notes: DI=Disposable income of each sector equals gross income earned from current production plus transfers (including taxes, in the case of governments) received from other sectors less transfer (and tax) payments. Inv.=Total gross investment, both tangible and intangible, of each sector. GNP=Sum of disposable income of each sector (including rest-of-the-world, not shown here) plus the statistical discrepancy between income and product.

Conversely, the share of the personal sector in gross national product declined over much of the period, as a result of increases in personal tax rates. But the proportion of disposable personal income devoted to investment rose, so that the ratio of gross investment to gross product remained relatively stable. It should be noticed, however, that these tendencies were reversed after 1966, when the share of personal income in GNP rose, but the proportion of income devoted to investment fell, resulting in continuing stability of the investment/GNP ratio.

Business disposable income (cash flow) was 9.3 percent of GNP in 1973, a bit lower than the 10 percent of 1929. But the ratio of gross investment to income was 128 percent, somewhat higher than in 1929. Consequently, the investment/product ratio in 1973 was only slightly below the 1929 figure. The business share of gross product was highest in 1966. The sharp drop between 1966 and 1969 was partially offset by a significant rise in the investment/income ratio, but declining relative income was nevertheless responsible for a percentage point drop in the ratio of gross business investment to GNP.

Although business was a net borrower throughout the period, usually investing about one-quarter more than its internally generated funds, even in good years, the other two domestic sectors were net savers. Saving exceeded investment, as defined here, by more than 2 percent of disposable income, on average, in the personal sector, and by an average of over 3 percent in the public sector. It will be remembered that in our study we sharply separate current and capital accounts, so that saving represents the difference between a sector's disposable income (including imputations) and its current outlays. In this view, whereas the public sector has generally been a borrower, on net balance, the borrowing has been less than public investment in most years, indicating net saving on current account.

Before leaving the topic of investments, the importance of sectoral shifts should be pointed up. Thus, given the often-overlooked fact that governments invest a higher proportion of their disposable incomes than persons, the relative shift of gross income and product from persons to governments between 1929 and 1966 contributed to the rising national total saving-investment ratio. It also contributed to the faster increase in intangible than in tangible investment, since a much higher proportion of public than of private sector investment is devoted to intangible outlays that enhance productive efficiency. Since 1966, however, the reverse shift of income back to the personal sector played a role in the declining national saving-investment ratio, accentuated by a reduction in the investment/income ratio of persons. The relative decline in total gross investment also reflected a drop in the business income/product ratio, particularly between 1966 and 1969. Since business has the highest investment/income ratio (greater than unity), it is obvious that diversion of disposable income from business tends to reduce the national investment ratio.

Gross Capital Stocks in Relation to GNP

As a result of the high and rising (until 1966) rate of saving and investment, plus inflation, the current value of the total gross capital stock increased from about $1.2 trillion in 1929 to 15.6 trillion in 1973, an average annual rate of increase of 6.0 percent. The growth rate of adjusted GNP was 6.1 percent, so the capital coefficient showed a slight net decline from 9.4 in 1929 to 8.9 in 1973. (See table 5.) Conversely, the ratio of product (income) to total capital increased on balance from 10.6 percent in 1929 to 11.2 percent in 1973. With some adjustments to convert product to factor income, this relation can be used to calculate the rates of return on capital, which we do in a later section. Note, however, that after leveling out 1966-69, the capital coefficient rose, implying a declining rate of return in recent years.

TABLE 5.—TOTAL U.S. GROSS NATIONAL WEALTH AND PRODUCT, SELECTED YEARS, 1929–73

[Dollar amount in billions]

	Current	Price deflators (indexes, 1958=100)	Constant
	A—Absolute levels		
Adjusted GNP:			
1929	$127	50.5	$252
1948	328	77.9	421
1966	983	114.8	856
1969	1,248	130.4	957
1973	1,754	158.8	1,105
Total GNW:			
1929	1,203	45.4	2,648
1948	3,012	76.0	3,964
1966	8,518	118.5	7,187
1969	10,907	135.2	8,070
1973	15,641	166.7	9,383
	B—Average annual percentage rates of change		
Adjusted GNP:			
1929–73	6.1	2.7	3.4
1929–48	5.1	2.3	2.7
1948–66	6.4	2.3	4.0
1966–69	8.3	4.3	3.8
1969–73	8.9	5.1	3.6
Total GNW:			
1929–73	6.0	3.0	2.9
1929–48	4.9	2.7	2.1
1948–66	6.0	2.6	3.3
1966–69	8.6	4.5	4.0
1969–73	9.4	5.4	3.8
	C—Ratios, GNW/GNP		
Total GNW/GNP:			
1929	9.4	.90	10.5
1948	9.2	.98	9.4
1966	8.7	1.03	8.4
1969	8.7	1.04	8.4
1973	8.9	1.05	8.5

In constant prices the relative growth of product was more pronounced, since the implicit price deflator for GNP rose by 0.3 percentage point a year less than that for capital (which we call GNW, for "gross national wealth"). As shown in table 5 the average annual rate of growth of real GNP was 3.4 percent compared with 2.9 percent for real GNW 1929–73. This is reflected in a net decline of the real capital coefficient from 10.5 in 1929 to 8.5 in 1973. This means that "total capital productivity" (the inverse of the capital coefficient) rose an average annual rate of 0.5 percent. This is a measure of all the noninvestment related forces affecting economic growth; notably, changes in (1) values and institutions; (2) rates of utilization of capacity; (3) actual efficiency in relation to potential efficiency with a given technology; (4) economies of scale; (5) the degree of economic

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(allocative) efficiency; and (6) changes in the inherent quality of natural and human resources. In addition, possible errors in the estimates of capital and product, if not offsetting, could affect the productivity estimates.

As was true of the current dollar capital coefficient, however, the real coefficient also leveled out between 1966 and 1969 and rose somewhat to 1973—which means that total capital productivity dropped. This is consistent with other evidence on productivity. Real product per man-hour, as measured by BLS (which does not take account of nonhuman capital inputs) showed a retardation in growth after 1966; and so did Kendrick's total tangible factor productivity series, which takes account of tangible nonhuman as well as human capital inputs, but not inputs of real intangible capital.[3]

In order to quantify rates of change in productivity, it is desirable to confine the measures to the private domestic business economy, for which the real product and capital measures are independent. (In the nonbusiness sectors, we impute a rental value to the capital stocks and add it to labor compensation to estimate income and product originating.)

In table 6, line 6, it can be seen that the rate of growth of tangible capital (human and nonhuman) productivity, which was 1.7 percent a year 1948–66, slowed to 0.2 percent 1966–1973. (These numbers are lower than the usual measures of total tangible factor productivity, which adjust human capital to reflect changes in average hours worked.)

TABLE 6.—MAJOR COMPONENTS OF U.S. ECONOMIC GROWTH

[Private domestic business economy, average annual percentage rates of change]

	1948–66	1966–73
1. Real adjusted gross product	4.1	3.5
2. Real gross capital stock-total	3.1	4.1
3. Tangible capital	2.4	3.3
4. Intangible capital	4.1	5.2
5. Ratio: real total capital over real tangible capital (2–3)	.7	.8
6. Tangible capital productivity (1–3)	1.7	.2
7. Total capital productivity (1–2)	1.0	−.6

Presumably, a major element helping to explain changes in tangible capital productivity has been the growth of intangible capital per unit of tangible capital, since the intangibles are designed to increase the quality and efficiency of the human and nonhuman tangible factors in which they are embodied. Line 5 shows the relative growth of intangible capital, weighted to give effect to its smaller share of the total capital stock than that of the tangibles. In the period 1948–66 the relative weighted growth of intangibles accounted for 0.7 percentage point, or over 40 percent, of the 1.7 percent increase in tangible capital productivity. Total capital productivity (the relationship of real product to total capital, intangible as well as tangible) grew at an average rate of 1.0 percent a year. This reflects the net effect of the half dozen major noninvestment forces noted earlier.

The contrast of the 1966–73 period is startling. Even though intangible capital grew even faster relative to tangible capital than in

[3] See John W. Kendrick, *Postwar Productivity Trends in the United States, 1948–1969* (New York: National Bureau of Economic Research, 1973).

the 1948–66 period, its 0.8 percent a year weighted relative increase was associated with only a 0.2 percent a year increase in tangible capital productivity, and thus with a 0.6 percent annual decline in total capital productivity!

The marked deceleration in productivity, based on this and other measures, appears to be due to a number of factors. The slower rate of growth after 1966 meant fewer opportunities for economies of scale, of course. The bulge in labor force growth after 1965 reduced the average experience of workers, and slowed the growth of real product per worker for the time being since compensation and value added of young workers are below average.

The rate of utilization of the labor force was lower in 1973 than in 1966 (4.9 percent unemployment vs. 3.6 percent); yet there were capacity bottlenecks in many basic industries, e.g., steel, aluminum, paper, and petroleum. This suggests that there had been inadequate business tangible investment in the several earlier years, and possibly some misallocation of investment. The inadequate amount, in view of the rapid growth of the labor force, was related to a declining net rate of return on investment, especially when adjustments to profits are made for revaluation of book depreciation charges to replacement cost. The declining rate of return reflects the use of macroeconomic policies to combat the accelerating inflation which, on balance, held increases in the price level below increases in unit costs. Some misallocation of investment probably resulted from the wage and price control programs from August 1971 to April 1974.

Further, the increasing amounts of investment required for environmental protection and occupational health and safety reduced the proportion available for direct productive purposes. Since the benefits of these programs are not reflected in real product but the investments are reflected in the real capital measures, the programs tend to reduce increases in productivity *as measured*.

It also seems probable that the relative decline of R. & D. investments, and the leveling out of the relative R. & D. stock (see below) tended to slow down productivity advance, since R. & D. is the fountainhead of scientific and technological advance.

Finally, there were various negative social tendencies, particularly in the latter 1960's, which probably reduced productivity growth. Examples are increasing drug use and crime, increased anti-establishment and antibusiness sentiment, and a possible loosening of the work ethic. The development of social indicators has not yet reached the point of permitting the quantification of the economic impacts of these and other social developments.

Composition of Gross Wealth

Just as intangible investments rose as a proportion of total investments up until the latter 1960's, so have intangible capital stocks increased as a proportion of total wealth—from about 23 percent in 1929 to almost 40 percent in 1973. (See table 7.) But it is apparent that the relative growth of intangible capital has been decelerating since 1966. This importantly reflects the leveling out of the ratio of R. & D. stocks to total capital after 1966, following on the most rapid relative growth of any form of capital. But the relative growth of both educational and health capital, which had exceeded 50 percent between 1929

and 1966, also slowed down. Yet their proportions of the total con-
tined to expand slowly, as did that of mobility costs, which had
dropped somewhat prior to the mid-1960's.

TABLE 7.—COMPOSITION OF TOTAL GROSS DOMESTIC WEALTH

[By type and by sector; selected years]

Year	Tangible capital			Intangible capital		
	Total	Human	Nonhuman	Total	Human	Nonhuman (R. & D.)
A. Percentage distribution by major type:						
1929	76.8	24.5	52.3	23.2	23.0	0.2
1948	73.0	21.3	51.7	27.0	26.4	0.6
1957	68.9	18.1	50.8	31.1	29.7	1.4
1966	63.2	16.3	46.9	36.8	34.3	2.5
1969	61.5	15.2	46.2	38.5	35.9	2.6
1973	60.2	15.1	45.1	39.8	37.2	2.6

Year	Personal	Business	Governments	Addendum: net foreign claims as percent of GDW
B. Percentage distribution, by major sectors:				
1929	58.0	30.6	11.4	1.4
1948	56.2	22.4	21.4	1.3
1957	55.9	22.6	21.4	.9
1966	55.4	21.9	22.7	.8
1969	54.9	21.6	23.5	.6
1973	55.5	21.3	23.2	.4

With respect to tangible capital, human tangibles, while rising
absolutely as the adult population grew, had declined relatively until
the latter 1960's, when the proportion leveled off as a result of the
bulge in labor force growth. Nonhuman capital grew less rapidly than
the total throughout the period, due particularly to the relative
decline of land and other natural resources. Machinery, equipment,
and nonbusiness durables were the only type of tangibles whose
ratio to total capital expanded.

When the various types of capital are recombined in human and
nonhuman categories, it is seen that the human share rose steadily
from 47½ percent in 1929 to almost 52½ percent in 1973. The relative
growth of human intangibles more than offset the relative decline of
tangible human capital. The recombination of capital types into
human and nonhuman groupings is helpful in computing rates of
return, which we discuss in the next section.

With regard to the sectoral composition of capital (see panel B
of table 7), it is apparent that the share of general governments more
than doubled over the 40-year period 1929–69, before receding slightly
1969–73. The relative growth of public wealth was primarily at the
expense of the relative share of business, which declined steadily, and
to a lesser extent at the expense of the personal sector. But the personal
sector share did grow somewhat 1969–73, while the business sector
share continued to recede. Note also that net foreign claims (including
monetary metals), despite a substantial absolute growth, declined
in importance relative to domestic wealth throughout the period.

Rates of Return on Total Capital

Rates of return can be computed by dividing factor compensation, gross or net of depreciation, by the value of gross or net total capital stocks. In addition to overall rates of return, returns on human and nonhuman capital may be calculated separately by splitting national income between labor and property compensation and dividing by the corresponding wealth estimates.

As shown in table 8 gross and net rates of return on total capital exhibit similar levels and movements. On a net basis, the 10.0 percent return in 1973 was virtually the same as it was in 1929, on the eve of the Great Depression. Returns during the early postwar period were significantly higher, reflecting the capital shortages carried over from the depression and World War II, in conjunction with generally high levels of aggregate demand. Rates of return in 1957 and 1966 were below the 1948–53 levels, reflecting more ample capital supply, but still well above the 1973 rate. The 1960 rate was lower than 1957, reflecting the incomplete recovery from the 1958 contraction; and the 1969 rate was lower than the 1966 rate, reflecting the restrictive monetary and fiscal policies adopted to combat inflation. Rates of return in 1973 were still lower, due to the net effect of wage and price controls as well as continued restrictive macroeconomic policies.

TABLE 8.—RATES OF RETURN ON TOTAL CAPITAL STOCKS EMPLOYED—U.S. PRIVATE DOMESTIC BUSINESS ECONOMY

[In percentages; selected peak years]

Year	Total	Human	Nonhuman
A. Gross rates of return:			
1929	10.2	11.7	9.2
1948	12.1	12.2	12.0
1953	12.1	13.5	10.8
1957	11.4	12.7	10.1
1960	10.0	12.3	9.7
1966	11.8	12.2	11.4
1969	10.8	11.7	9.9
1973 [1]	10.4	10.8	10.1
B. Net rates of return:			
1929	10.0	10.1	10.0
1948	13.4	12.6	14.2
1953	13.1	14.8	11.4
1957	11.6	13.4	9.9
1960	11.0	12.9	9.2
1966	11.4	12.8	10.7
1969	10.6	12.2	8.9
1973 [1]	10.0	11.2	8.8

[1] Preliminary.

Some analysts prefer to look at gross rates of return, which do not require a necessarily somewhat arbitrary division of gross income between depreciation and profit. But the gross rates tell much the same story, except that they were fractionally higher in the boundary years than the net rates, and did not rise as much in the 1948–53 period.

The two sets of rates diverge somewhat with respect to human and nonhuman returns, however. On a net basis, the rates of return on the two types of capital were almost the same in 1929, but by 1953 the human return significantly exceeded the rate of return on nonhuman capital. Although both trended downwards after 1953, except for the 1960–66 improvement, human capital continued to enjoy a higher rate

of return than the nonhuman. But between 1969 and 1973, the decline in the return on human capital was much sharper than that on property.

On a gross basis, the rate of return on human capital started out in 1929 significantly higher than that on nonhuman. Thereafter, the pattern was similar to that for the net rates, except that by 1973 the differential between the two sets of rates had narrowed substantially. In fact, between 1969 and 1973 while the gross rate of return on human capital dropped markedly, that on nonhuman capital rose slightly. This buoyancy apparently reflected the shortages of business productive capacity, despite the downward pressures on overall rates of return on capital as a whole.

Concluding Comments

In order to promote the resumption of economic progress (defined as increasing real income per capita), which most Americans seem to want, the material in this paper strongly suggests that an acceleration in the rate of capital formation is not required so much as an acceleration of productivity advance. Here, we are not referring just to the cyclical recovery of productivity which is currently underway and will extend well into 1976. Rather we are referring to an acceleration of the *trend*-rate of productivity advance, at least back to the 1948–66 rate.

Of course it would be helpful at least to halt and possibly to reverse the drop in the national total saving-investment ratio which began in 1966 after two decades of advance. But the rate of growth in real total capital stocks accelerated to a record rate between 1966 and 1969, and decelerated only modestly 1969–73. The problem is that the rate of increase in real product lagged, indicating a drop in total capital productivity, compared with significant advances 1948–66. This suggests, in turn, that a major attack on the problem must come through some reallocations of investment and capital, in order to increase capital productivity.

In my view the most important policy objective which would both reverse the downward trend in the saving-investment ratio and improve the allocation and productivity of capital would be to increase the disposable (after tax) income of the business sector as a percentage of GNP, reversing the decline which began in 1966. Since the business sector consistently plows back all of its gross disposable income, and more, into investments, an increase in its relative income would obviously tend to increase the national saving-investment rate. The shortages of capacity encountered in 1973, the eventual capacity requirements of the current expansion, the continuing pressures for cost-reducing innovations, the further capital requirements of social programs (EPA and OSHA in particular) and domestic energy programs all point to the desirability of a faster relative increase in business investment.

One way to accomplish this objective would be the pursuit of monetary and fiscal policies during this economic expansion that would permit the restoration of higher rates of return than were permitted by the restrictive, anti-inflationary policies followed in the recoveries of 1967–69 and 1970–73. Possibly the adoption of a stronger incomes policy would be called for later in this expansion as an alternative to a profit squeeze leading to contraction.

An alternative or supplement to the above policy would be a reduction in business income taxes. This could take one or more of several forms: An increase in the investment tax credit; a decrease in corporation income tax rates; further reduction or elimination of the double taxation of dividends; recognition of "inflation accounting," particularly the restatement of depreciation charges from historic book costs to current replacement costs, in calculation of business income subject to tax; and possibly the institution of a R. & D. tax credit of 10 to 20 percent, or possibly a larger credit on incremental R. & D.

The last proposal, although a new one, seems particularly appropriate at this time to reverse the relative decline on R. & D. investment. Studies by Terleckyj, Griliches, Mansfield and others all indicate a high productivity effect and rate of return on R. & D. outlays, particularly those designed to improve producers' goods and processes. In my view, a most important element in raising the productivity trend is a renewed relative growth in the stock of knowledge and know-how resulting from R. & D. embodied in men and machines.

This brings us to the public sector. There, too, I believe that a stronger and steadier expansion of expenditures to support R. & D. is desirable. It will also aid in maintaining and possibly increasing the national saving-investment ratio if the public sector continues its relatively high ratio of investment to disposable income. As to allocation of investments among the alternative types discussed in this study, and among specific projects, more work is needed to refine cost-benefit and prospective rate-of-return estimates, and to regularize capital budgeting.

Generalized social and private rate-of-return studies would also help in guiding personal sector investment decisions. For example, recent studies indicate a sharp drop in rates of return to investing in higher education between 1969 and 1975.[4] As a result, the fraction of young men choosing college has declined. Our numbers also suggest that the incremental returns to human investment (predominantly education) had dropped faster than the incremental rate of return on nonhuman investment 1969-73, but we did not include rate-of-return estimates by category of investment, by sector. Support for development of more such estimates could have a big payoff in making possible more rational investment decisions, and a more efficient capital mix.

As far as the personal sector is concerned, it is significant that the ratio of investment to disposable income has dropped from the peak rate reached in 1966. In part, this may reflect a decline in expenditures for rearing children as a fraction of DPI. But it does indicate that the potential for higher saving and direct investment is there. Investment in self and in one's family could be stimulated by more generous deductions in the personal income tax for outlays for education, training, medical purposes, and mobility. Recommendations for liberalization should not be made, however, unless studies indicate a sufficiently high social rate of return on such expenditures.

In conclusion I must note that my observations on possible tax policies to promote capital formation stem from my personal interpretations of the material presented here, plus my general reading of

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[4] See Richard R. Freeman, "Overinvestment in College Training?", *The Journal of Human Resources*, X–3, 1975.

recent economic history.[5] Others may well come to different conclusions. But regardless of differences among analysts, the broader view provided by the new total investment and capital estimates should help in clarifying the issues and reaching a sounder policy consensus.

[5] After having drafted this paper I was interested to find much the same viewpoint ably expressed by Albert T. Sommers, "Social Goals and Economic Growth—The Policy Problem in Capital Formation," The Conference Board *Record*, December, 1975.

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