210

87th Congress
2d Session

COMMITTEE PRINT

# INVENTORY FLUCTUATIONS, PRICE LEVEL CHANGES, AND ECONOMIC GROWTH

MATERIALS PREPARED FOR THE

## JOINT ECONOMIC COMMITTEE
## CONGRESS OF THE UNITED STATES

Printed for the use of the Joint Economic Committee

U.S. GOVERNMENT PRINTING OFFICE
86096 WASHINGTON : 1962

## JOINT ECONOMIC COMMITTEE

(Created pursuant to sec. 5(a) of Public Law 304, 79th Cong.)

WRIGHT PATMAN, Texas, *Chairman*
PAUL H. DOUGLAS, Illinois, *Vice Chairman*

| HOUSE OF REPRESENTATIVES | SENATE |
|---|---|
| RICHARD BOLLING, Missouri | JOHN SPARKMAN, Alabama |
| HALE BOGGS, Louisiana | J. W. FULBRIGHT, Arkansas |
| HENRY S. REUSS, Wisconsin | WILLIAM PROXMIRE, Wisconsin |
| MARTHA W. GRIFFITHS, Michigan | CLAIBORNE PELL, Rhode Island |
| THOMAS B. CURTIS, Missouri | PRESCOTT BUSH, Connecticut |
| CLARENCE E. KILBURN, New York | JOHN MARSHALL BUTLER, Maryland |
| WILLIAM B. WIDNALL, New Jersey | JACOB K. JAVITS, New York |

WM. SUMMERS JOHNSON, *Executive Director*
JOHN W. LEHMAN, *Deputy Executive Director*
JOHN R. STARK, *Clerk*

---

### SUBCOMMITTEE ON ECONOMIC STABILIZATION, AUTOMATION, AND ENERGY RESOURCES

HENRY S. REUSS, Wisconsin, *Acting Chairman*
WRIGHT PATMAN, Texas, *Chairman*

| | |
|---|---|
| MARTHA W. GRIFFITHS, Michigan | WILLIAM PROXMIRE, Wisconsin |
| CLARENCE E. KILBURN, New York | CLAIBORNE PELL, Rhode Island |
| WILLIAM B. WIDNALL, New Jersey | JOHN MARSHALL BUTLER, Maryland |

# LETTERS OF TRANSMITTAL

JULY 6, 1962.

*To Members of the Joint Economic Committee:*

Transmitted herewith for use by the Joint Economic Committee, and other Members of Congress, is a report titled "Inventory Fluctuations, Price Level Changes, and Economic Growth" which has been prepared by a task force of economists and business executives appointed by Hon. Henry S. Reuss, acting chairman of our Subcommittee on Economic Stabilization, Automation, and Energy Resources.

Sincerely yours,

WRIGHT PATMAN, *Chairman.*

JULY 5, 1962.

Hon. WRIGHT PATMAN,
*Chairman, Joint Economic Committee,*
*House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: Transmitted herewith is a report entitled "Inventory Fluctuations, Price Level Changes, and Economic Growth," which has been submitted by the task force appointed by me for this purpose.

The purpose of the participants in this report has been to summarize existing knowledge of (1) the part played by inventory accumulation in generating price increases during business expansions and (2) its relation to the rate of utilization of productive capacity and economic growth.

The present report is one of a series of task force reports prepared for the Subcommittee on Economic Stabilization, Automation, and Energy Resources. Members of the task force who have participated in the present report are as follows:

Mr. Robert J. Eggert, director of marketing research, Ford Division of Ford Motor Co.
Prof. Charles C. Holt, University of Wisconsin.
Mr. Robert E. Johnson, economist, Western Electric Co.
Prof. Franco Modigliani, Massachusetts Institute of Technology.
Mr. Sanford S. Parker, chief economist, Fortune magazine.
Mr. Murray Weidenbaum, economist, the Boeing Co.
Mr. Nat Weinberg, director, special projects and economic analysis, United Auto Workers Union, AFL–CIO.

All of these individuals have given of their time and knowledge voluntarily, without compensation. Prof. Paul G. Darling, on loan from Bowdoin College as consultant to the subcommittee, prepared the first draft of the report and, thereafter, revised the draft to incorporate the suggestions and recommendations of other members of the task force. Because of the shortness of the time available for the

preparation of the report, it was not possible to try to obtain the agreement of all members of the task force participating in the report on each and every suggestion, recommendation, or reservation, in which case such suggestions or reservations are noted in footnotes at appropriate places in the text.

While a principal purpose of the task force reports has been to obtain an authoritative statement of what can be said with confidence concerning the influence of inventory fluctuations on economic activity, another objective has been to obtain such statements in nontechnical language, to the extent possible, so that the available information on the subject will be readily accessible to the general public.

To a very large extent this report draws on the 13 technical papers prepared for the subcommittee under the general title, "Inventory Fluctuations and Economic Stabilization," and published during December of last year and June of this year; but the report also reflects the published findings of other research as well as the rich experience of individual members of the task force.

Prof. James S. Duesenberry, Harvard University, has served as general chairman of the task force.

Sincerely yours,

HENRY S. REUSS,
*Acting Chairman, Subcommittee on Economic Stabilization, Automation, and Energy Resources.*

# INVENTORY FLUCTUATIONS, PRICE LEVEL CHANGES, AND ECONOMIC GROWTH [1]

## A. INTRODUCTION

The growth of the U.S. economy during the postwar years has not been along a "smooth" rising path. Rather, total gross national product (GNP) has expanded for a period of time, then contracted, to be followed by another expansion, and so on. The duration of business expansions has been from 2¼ to 3½ years, while phases of contraction have been shorter, averaging about three quarters of a year. As a result, the movement of GNP when plotted on a graph exhibits a very distinct "wavelike" pattern, evidence that some sort of cyclical mechanism may be at work. This is illustrated in the upper panel of chart 1 which shows the wavelike movement in total production for final use ("GNP Final Sales").[2]

During the postwar period, peaks in GNP appear in 1948, 1953, 1957, and 1960, recession troughs in 1949, 1954, 1958, and 1961. What factors caused the early postwar expansion to reverse itself (a peak) in 1948, producing a business recession which, in turn, reversed itself (a trough) in 1949? And similarly for the succeeding peaks and troughs? Economists are not unanimous in their analyses of the "triggering" factor or factors in each postwar turning point. The economy's approach toward a peak appears to be characterized by a slowing down of the expansion of sales and unfilled orders. The difficulty is in pointing a finger at the reason, or reasons, why this slowing down of demand increments occur. In one case, one economist may point to a fall-off in defense procurement, another to a leveling out of consumer spending for durables, another to a slowing down of new plant and equipment commitments, and so on.[3] Whatever the "ultimate cause" of the retardation in growth of sales and backlogs of orders, however, the inventory factor plays an important role in events leading into the business reversal. The empirical record shows that the amount of goods businessmen are adding to stocks begins to decline prior to the downturn in general business activity. This is shown in chart 1. Inventory accumulation passed its peak (and began to decline) three quarters before the 1948 peak in final sales; two quarters before the 1953 peak; four quarters before the 1957 peak; and three quarters before the 1960 peak.[4] In every

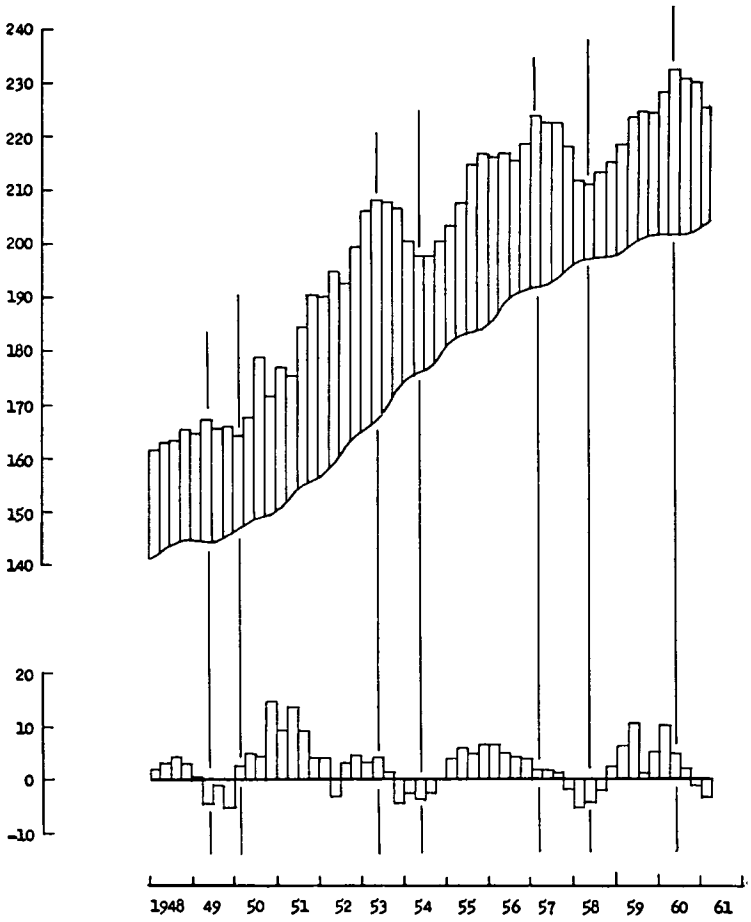
[1] References in brackets, [ ], are to numbered items in bibliography at end of report.

[2] The "final sales" part of GNP is the aggregate of all production which is not accumulated in inventories but sold to ultimate users. The adjusted GNP final sales data shown in the upper panel of chart 1 excludes "services" and "construction" both of which some exhibited very smooth growth trends during the postwar period.

[3] It is perfectly possible, and some economists feel it to be very probable, that it is simply the dynamic properties of an economic system containing mutual interaction between inventory investment determinants and total income determinants which suffice to explain the "ultimate" causes of postwar cycles. See [3] and [11].

[4] The three-quarter lead of the inventory investment peak, in relation the peak of general business activity in 1960, is not obvious from inspection of the data shown in chart 1, due to the disturbance of the 1959 steel strike. The three-quarter lead of inventory investment is claimed to hold by Darling, on the basis of an analysis which attempts to abstract from the "disturbances" of the 1959 strike [3, p. 58].

CHART 1




GNP final sales (excluding services and construction) in upper panel; net change in nonfarm inventories in lower panel; seasonally adjusted quarterly data at annual rate in billions of constant 1954 dollars, 1948–I through 1961–I.

postwar reversal, in other words, production for inventory was declining during the period immediately prior to the reversal in aggregate activity, and consequently, this fall in inventory investment was a factor contributing to the reversal.[5]

The role of shifts in inventory investments during the period of upturn from a business slump tends to be symmetrically the opposite, with a decline in the rate of liquidation of stocks helping to spark a rise in aggregate demand.

Whatever may be the role of changes in inventories in precipitating turning points, the part they play in accentuating the downswings and upswings in postwar business cycles is clear. Business firms tend to maintain inventories at levels which are determined by the rate of

[5] It should be recognized that this conclusion falls short of a claim that the prior decline in inventory investment is the "cause" of these business reversals. It simply asserts that that part of total production which is being demanded for the purpose of inventory accumulation is declining during the period immediately leading up to the general downturn, and to this extent contributes a subtractive element to aggregate demand.

receipt of new orders from customers and by the conditions of market supply for purchased materials and components. Thus, during periods of expansion when sales and backlogs of unfilled orders are rising, production increases both to meet higher levels of sales and to provide for accumulation of stocks. This double-barreled stimulus to production yields a cumulative rise in activity, with increases in production-for-inventory both a cause and an effect of the expansion. Other elements, of course, may enter into this picture of rising GNP; for example, increasing production implies higher levels of profits and disposable personal income, hence an expansion of demand for, and production of, consumer and capital goods. Contrariwise, during periods of business contraction and falling sales and unfilled orders, production falls below levels of sales as business firms try to disgorge unwanted stocks. In other words, the liquidation of inventories forces production to a lower level than it otherwise would be set, thereby contributing to a cumulative decline in GNP.

### B. PURPOSE OF THE REPORT

The purpose of the present task force report, the third in the series, is to summarize the state of knowledge regarding these inventory fluctuations as they relate to price level change and to the rate of economic growth. The following series of questions will help define the scope of the report.

To what extent do supply conditions, especially those in markets for durables produced to order, tend to deteriorate during the course of business expansions, this deterioration being marked by a rise in the rate of increase in order backlogs which mean increased leadtimes and increased uncertainty concerning leadtimes?

What evidence exists that price increases tend to occur more frequently during periods of deteriorating supply conditions than at other times?

What is the relation of market supply conditions to the rate of utilization of productive capacity? For example, comparing a case where the economy is operating along a "trend line" which is close to the capacity ceiling with a case where there is a large gap of excess capacity separating the trend line and the capacity ceiling, will the former case lead during cyclical expansions to more severe supply deterioration, a higher rate of inventory investment, and greater pressures for price increases, than the latter case?

Does it follow from answers to the foregoing questions, that some degree of success in implementing policies designed to reduce inventory fluctuations, especially to reduce very high rates of accumulation during business expansions, would permit a higher average rate of utilization of productive capacity with a diminished inflationary consequence? This question may have relevance to the present state of the U.S. economy. Underutilization of production capacity may be an important factor in today's situation, explaining in part our low rate of economic growth.

The empirical record which is to be inspected on the following pages yields tentative answers to most of the foregoing questions. The fact that these answers are tentative, however, needs emphasis at the start. It will become clear to the reader, if it is not already,

that the questions asked involve difficult problems. Additional research is needed in this area.

But clearly the questions asked are important ones for the U.S. economy and for this reason it seems well worth while to describe the answers which are suggested by our present state of knowledge.

### C. CHANGES IN CONDITIONS OF SUPPLY

The empirical record of the postwar period clearly shows a cyclical pattern of changing supply conditions which, as will be discussed in a following section, is closely associated with the pattern of inventory accumulation and liquidation. By "conditions of supply" is meant the availability of input materials and components needed by a manufacturing firm, at the going market price. Thus, supply conditions will be said to be "orderly," when the firm is relatively certain that a purchase order for materials and components will be filled by a specified future date and "deteriorating" when suppliers are quoting increasingly longer delivery periods and the firm is faced with growing uncertainty regarding the length of "leadtime" it should give to purchase orders to be sure of having materials and components on hand when they are needed on the factory floor.

The problem at hand, cyclical changes in these conditions of supply, can be sharpened by noting that suppliers of many kinds of input materials, generally those of standardized form and size, of a staple character, and of widespread use, fill their customers' orders immediately out of a "finished goods" inventory. Such a supplier produces in advance of sales, accumulating output in inventory. Its activity may be called "production for stock." In this case, purchase orders from customers are transformed almost immediately into suppliers' sales. The supplier has little or no backlog of unfilled orders.

A considerable part of manufacturing activity, on the other hand, is of another sort. The commodity to be produced must be tailored to the customer's specifications; it may be of a sort for which customer usage is infrequent and not very predictable; it may be a bulky item expensive to store or one which takes a long time, and is very expensive, to produce. These characteristics of output militate against production in advance of order and sale and the holding of output awaiting sale in the form of finished goods inventory. In this case, output takes the form of "production to order," instead of to stock, and characteristically it is the receipt of the order which sets production wheels in motion. In this category of manufacturing, rapidly increasing demand results in the accumulation of a backlog of unfilled orders.

While any specific firm or industry may, of course, produce both some products to order and some to stock, investigation has shown that durables industries produce predominantly to order, and nondurables industries predominantly to stock [14]. The same study shows that the largest backlogs of unfilled orders (relative to shipments) tend to exist in the nonautomotive transportation equipment industry, with primary metals, fabricated metal products, electrical and nonelectrical machinery, and motor vehicles and parts, being also characterized

by a relatively long "lead" of new orders ahead of corresponding shipments, and normally a relatively large backlog.[6]

As might be expected from the foregoing distinction, cyclical changes in business activity often tend to cause rapid and sometimes very substantial changes in conditions of supply in the production-to-order part of manufacturing. The reasons for this are simply, first, that of all demands for final output, those for durable goods exhibit the widest cyclical swings, and second, because of the time-consuming nature of production to order, shipments to customers cannot easily be varied in amount over short periods of time. During business expansions, accordingly, as the derived demand of durables manufacturers rises for materials and components to be supplied largely by production-to-order firms, suppliers' backlogs of orders increase, and they, in turn, are forced to quote longer delivery periods. In terms of order backlogs, this process is likely for a while to "feed on itself." The lengthening of quoted delivery periods implies for the purchasing firm a necessarily longer "leadtime" in ordering, so additional purchase orders must be placed. Suppliers' backlogs rise further, delivery periods are extended, provoking still more orders, and so on [5, p. 46].

That the foregoing generalizations tend to correspond with reality is shown by the evidence in chart 2. Panel (1) shows "Vendor Performance," a measure of changes in quoted delivery periods (specifically the percentage of total reports by members of the Purchasing Agents Association of Chicago showing slower delivery periods minus the percentage reporting faster deliveries). The delivery periods (for goods ordered from firms scattered throughout the country by purchasing agents based in Chicago) lengthened during the early and middle stages of the expansion phases following the recession troughs in 1949, 1954, and 1958, reaching their maximum length (slowest deliveries) in the first two of the three cases slightly before the peak period of inventory accumulation.[7] In concordance with these phases of lengthening delivery periods, backlogs of unfilled orders, shown on panel (2) of chart 2, mount higher and higher, reaching peaks [8] roughly at the same time as maximums in delivery periods.

It should be observed also in chart 2, that delivery periods are reduced, and order backlogs fall, well before business cycle peaks in July of 1953, July of 1957, and May of 1960, as these are dated by the National Bureau of Economic Research. Apparently, then, supply conditions tend to improve well before general expansions have run their course [11, p. 51]. This phenomenon has an important implication for the ensuing business reversal [11, pp. 124ff.].

The two panels of chart 2 also indicate that delivery periods and backlogs rapidly decline during recessions, and reach their minimums approximately at the time of troughs in general activity, in October of 1949, August of 1954, and April of 1958.

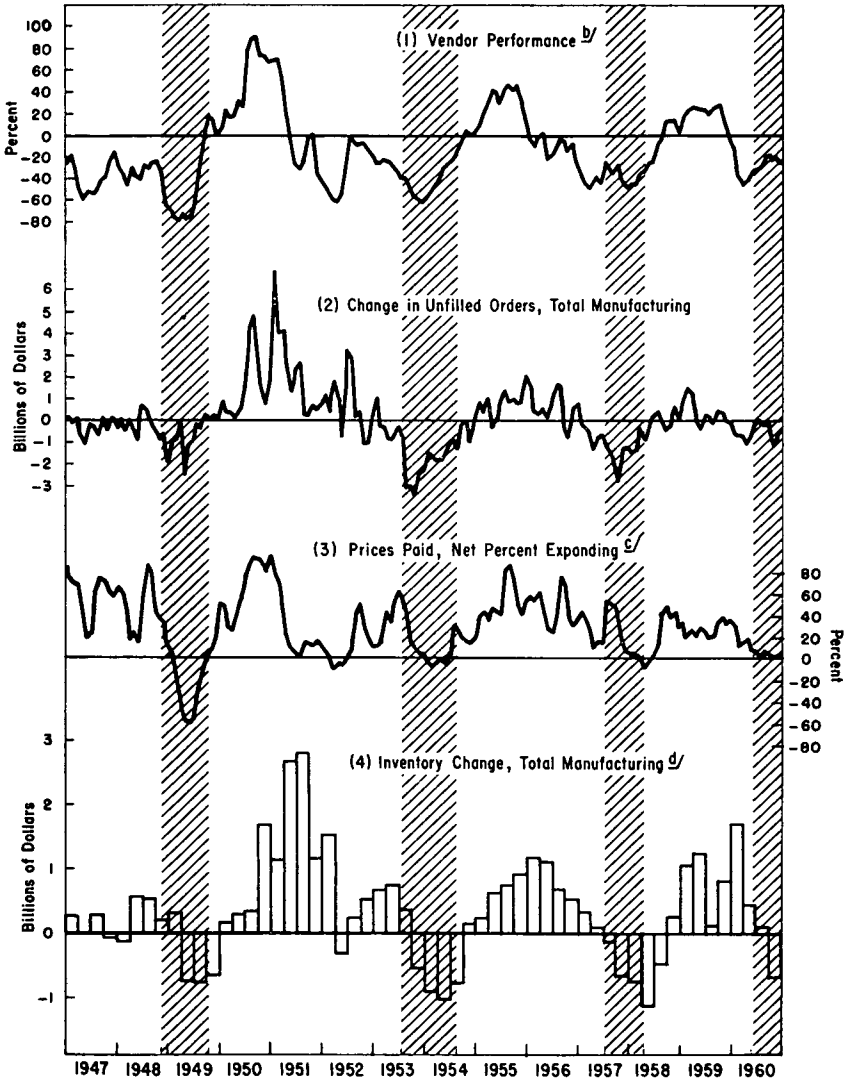
[6] Some rather important industry differences tend to be glossed over by this generalization. Thus, new orders for passenger cars tend to be quickly translated into sales by the manufacturer. The same tends to be the case for manufacturers of consumer appliances. It should also be noted that backlogs in the nonautomotive transportation equipment industry represent substantial amounts of orders for defense materiel.

[7] The 1959 steel strike was probably responsible for delivery periods remaining very slow right up to the end of 1959.

[8] The peaks (maximums) for delivery period and total backlog of orders occur in chart 2 when the graph lines decline to the zero from positive values.

CHART 2

COMPARISON OF VENDOR PERFORMANCE, CHANGE IN UNFILLED ORDERS OF MANUFACTURERS, PRICES PAID BY PURCHASING AGENTS, AND MANUFACTURERS' INVENTORY CHANGE a/, 1947-1960




a. Shaded areas represent business contractions; unshaded areas, expansions.

b. From monthly reports of member agents of Purchasing Agents Association of Chicago: Percentage reporting slower deliveries minus percentage reporting faster deliveries.

c. Percentage of member agents of PAA of Chicago reporting paying higher prices minus percentage reporting lower prices.

d. Quarterly Change in Manufacturers' Inventories after inventory valuation adjustment, seasonally adjusted in 1954 dollars. Source: Department of Commerce.

### D. SHIFTS IN INVENTORY OBJECTIVES AND "SNOWBALLING" EFFECTS

There exists an association between deteriorating supply conditions for materials and components for manufacturing, and investment in inventory of purchased materials, which is not readily apparent from chart 2. One can accept the proposition that a cyclical increase in ordering for the purpose of accumulating inventory will itself cause suppliers' backlogs to rise, and delivery periods to lengthen. What is not so obvious is that causation tends to run in the opposite direction, too. The fact that supply conditions are deteriorating during the early phases of expansion is itself a reason for prompting efforts by purchasing firms to invest still more in stocks of purchased materials and components [11, p. 124; 3, p. 33]. These stocks are held quite largely as a precautionary reserve against the hazard and cost of running out of materials. At times of deteriorating supply conditions, when quoted delivery periods are rapidly lengthening, the purchasing firm faces growing uncertainty regarding "lead time" in ordering. As a precaution, it will raise its desired inventory objective, and increase its ordering for the purpose of stock accumulation. Clearly, a "snowballing" effect may occur, with rising inventory demand leading to increases in suppliers' backlogs, and increases in suppliers' backlogs and deteriorating delivery performance leading to still higher demands for precautionary inventory accumulation. Stanback puts this well [11, pp. 121–122]:

> Fluctuations in order backlogs are indicative of changing supply conditions which alter buyers' desired inventory target levels. Such changes in supply conditions have a well-defined cyclical pattern. Thus we find that forces operating through supply conditions (which influence inventory demand) * * * are superimposed upon cyclical changes in final demand * * * (producing) a sort of accelerator.

Empirical evidence that changing supply conditions do affect businessmen's inventory objectives cannot be sought in the mere fact of association between time series of changes in unfilled orders and inventory investment, such as are shown in panels (1) and (4) of chart 2. But a number of investigators have shown, on the basis of econometric analysis that change in unfilled orders, used as a proxy variable for supply conditions,[9] substantially increases the ability to explain and predict desired levels of stocks and inventory investment itself [3, pp. 36–37; 4, p. 71; 7, p. 129; 13, p. 189].

### E. THE ASSOCIATION OF PRICE CHANGES AND CHANGES IN SUPPLY CONDITIONS

The fact that supply conditions undergo substantial changes over the course of phases of the business cycle suggests the next line of inquiry. Is it not reasonable to expect that prices, especially those for durables, will show the greatest tendency to rise during periods of deteriorating conditions of supply? And the least tendency to rise, when supply conditions are improving? This expectation is supported by the following argument [14].

[9] The unfilled orders data which is relevant for supply conditions are those which measure backlogs of supplying firms which sell intermediate materials and components to customers who, in turn, carry these sorts of goods in a "purchased materials" inventory. Unfortunately, the orders backlog data published by the Department of Commerce do not distinguish between these sorts of intermediate commodities and those for goods (e.g., machine tools) which are sold for fixed investment purposes.

During the early part of the phase of expansion, the demand for intermediate materials and components moves upward with vigor from its recession low. Purchase orders accumulate in the hands of suppliers who produce to order rather than selling from stock. Delivery periods are extended and backlogs rise. The demand pressures for intermediate products are stimulated additionally by purchasers' uncertainties regarding leadtime, and by a consequent upward revision in their inventory objectives. A substantial degree of excess demand at going prices comes into existence.

Zarnowitz [14] has analyzed the relationships in such markets among changes in backlogs, delivery periods, Wnd prices. The mere existence of backlogs is, of course, insufficient grounds on which to base a prediction of rising prices, since the willingness of the buyer to accept a delayed delivery (in relation to the price) must be taken into account. Also relevant is the degree of competition among the sellers.

Nevertheless, during a period of cyclical expansion, rising backlogs and lengthening delivery periods, if the process goes far enough, will generate an unstable situation where either or both of these consequences follow: buyers can no longer meet their own inventory and production requirements and become more willing to pay a premium for swifter delivery; or sellers decide they have more to gain from a price increase than they might suffer from lost business either now or in the future. Both forces operate in the direction of an upward shift in prices.

Several aspects of the empirical record support the foregoing analysis and its conclusion.

In chart 2, an inspection of panel (3) with panels (1) and (2) demonstrates an association of price change with supply conditions. It will be seen that the percentage of PAA members reporting price increases minus those reporting price decreases rises during the early phases of the expansions following the business troughs in 1949, 1954, and 1958. As soon, however, as the rate of deterioration of supply conditions begin to stabilize (rates of increase in backlogs of orders falling and a falling net percentage of reports of lengthening delivery periods), the net percentage of reported price increases itself declines.

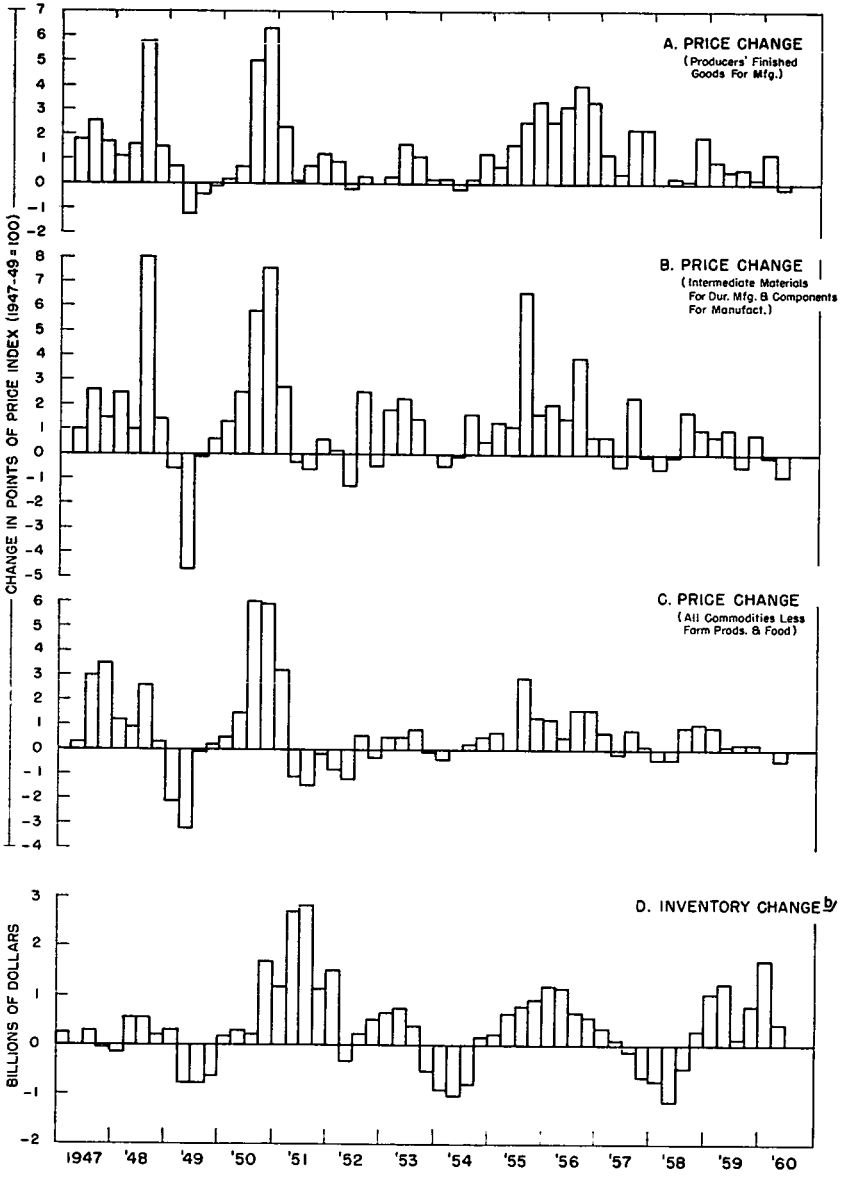
Econometric analysis also gives support to the proposition that price increases are generated by deteriorating supply conditions. Zarnowitz has related price change to the lagged change in backlog of unfilled orders (relative to shipments) for seven industry groups and finds a rather high degree of correlation [14].

In chart 3, several components of the wholesale price index are compared with manufacturers' inventory investment. The association of price change for all three components with inventory change may be observed. This is consistent, of course, with the correlation between inventory change and change in supply conditions discussed above.

A significant aspect of the data shown in chart 3 is the fact that prices for durables, both producers' finished goods for manufacturing (e.g., machine tools, presses, material-handling equipment, etc.) and intermediate materials and components (e.g., steel products, lumber, pumps, motors, valves, etc.) have tended to rise much more during cyclical expansions that the prices of nondurables. This is seen from a comparison of panels A and B of chart 3 showing durables price

CHART 3

CHANGES IN SELECTED COMPONENTS OF WHOLESALE PRICE INDEX AND CHANGE IN MANUFACTURERS' INVENTORIES 1947 to Second Quarter of 1960 a/




a. Quarterly price changes in points of Wholesale Price Index of Bureau of Labor Statistics (1947–49=100) measured from last month of one quarter to last month of succeeding quarter. Data for 1st quarter of 1947 not available.

b. Quarterly change in manufacturers' inventories after inventory valuation adjustment, seasonally adjusted in 1954 dollars.

Source: Department of Commerce.

change, with panel C, which shows wholesale price change for all commodities (except farm products and food). These results suggest that the so-called creeping inflation of the postwar period found an important wellspring in recurrent cyclical deterioration of supply conditions in markets for durable intermediate and final goods.

The preceding proposition does not, of course, exclude the probability that other forces also contributed to rising prices during the postwar period. But the evidence that the largest price increases have occurred in the durables sector of the economy, and are closely associated with cyclical deterioration of supply conditions, suggests as a conclusion that a moderation of periodic inventory buildups and accelerating ordering in the durable sector would put a significant damper on the kind of inflation which has characterized the postwar economy.

### F. SUPPLY DETERIORATION, INVENTORY INVESTMENT FLUCTUATIONS, AND CAPACITY UTILIZATION

The picture so far drawn is one of cyclical fluctuation in demand for intermediate durable goods, shifting conditions of supply, and associated changes in prices. Only passing mention has been made of the level of capacity of industrial plant and equipment. Yet it must be clear that the degree of supply deterioration during periods of expansion must depend in part on the level of industrial capacity and the rate of its utilization. A vigorous expansion in demand when the economy is operating close to its capacity ceiling, is likely to generate a more vigorous rise in order backlogs and more rapidly lengthening periods of delivery, than would be the case with much excess capacity present.

There is evidence from experience during the postwar period that this conclusion holds true. Panel C of chart 4 shows estimates of the extent to which capacity was utilized during the period from 1947 through 1960.[10] It will be seen from the chart that from 1947 through the Korean war, the percent of capacity utilized at cyclical peaks varied between about 94 and 97 percent. Since that time, it may also be observed, succeeding expansions in economic activity have resulted in utilization rates which have been successively lower at business peaks. The highest utilization rate during the expansion following the 1954 recession trough was 94 percent; during the next expansion it reached only 89 percent of capacity (in 1959). It appears then that since the Korean war period there has been a trend toward increasing underutilization of productive capacity.

In these circumstances of increasing underutilization of plant capacity, one would expect business cycle expansions to generate successively smaller order backlogs. Also to be expected, would be swings in inventory investment of lower amplitude. These consequences would seem to follow from the fact that "bottlenecks" and capacity limits would be less potent restraints on suppliers' abilities to fill customer orders. Backlogs would rise less during expansions

[10] The plotting of percentages of capacity utilized by quarter shown in chart 4 represent the mean of (a) the index of "percentage utilization of capacity" published by the econometric research unit of the Wharton School of Finance and Commerce; (b) the index of "Manufacturing Output as a Percent of Capacity," prepared by Frank de Leeuw of the Division of Research and Statistics of the Federal Reserve System, and (c) an index of capacity utilization, based on McGraw-Hill survey data, prepared by Paul G. Darling.

under these circumstances, and delivery periods would tend to be shorter. This, in turn, would lead purchasers to feel more certain of their ability to meet production requirements and diminish their need for precautionary holdings of materials and components.

That these expectations are generally confirmed by empirical evidence can be seen from panels (a) and (b) of chart 4. In panel (a), are shown quarterly changes in manufacturers' backlogs of unfilled orders, put in relative form by showing them as percentages of total inventories on hand. In panel (b) quarterly changes in manufacturers' inventories are plotted as percentages of total inventories.

Inspection of the graph of change in unfilled orders shows successive cycles of diminishing amplitude, consistent with the trend during the period toward increasing underutilization of capacity.

Also consistent with expectation is the pattern of successively smaller swings in manufacturers' inventory investment since the Korean period (one will do well to make a mental adjustment for the unusually large accumulation of inventories during the two quarters preceding the 1959 steel strike and the "catching up" in first quarter 1960.[11]

### G. CONSEQUENCES FOR ECONOMIC GROWTH

If the propositions of the preceding paragraphs are true, an important implication for economic growth and inflation should be recognized. The rate of growth of the economy is determined in the immediate sense by two main factors, first, the availability of physical capacity to produce (which in the broad sense includes not only plant and equipment but labor and materials inputs and technology as well) and second, the extent to which this capacity at any moment is being utilized. We have seen that the second of these factors has been partly responsible for a relatively slow rate of economic growth since the middle 1950's. Irrespective of the proportion of total outputs we are devoting to investment in plant and equipment, the low rate of economic growth of recent years is clearly attributable in some degree to our failure to utilize capacity at higher rates.[12]

That part of the growth rate retardation of recent years which is attributable to underutilization of capacity has, it is true, yielded a benefit. Demand pressures especially in markets for durable intermediate and final goods have been relatively weak, and have not caused very severe deterioration of supply conditions during cyclical expansions. Pressures for price increases stemming from this sector of the economy have been relatively weak, and except insofar as the price level of services has continued to climb, the Consumer Price Index has been fairly steady.

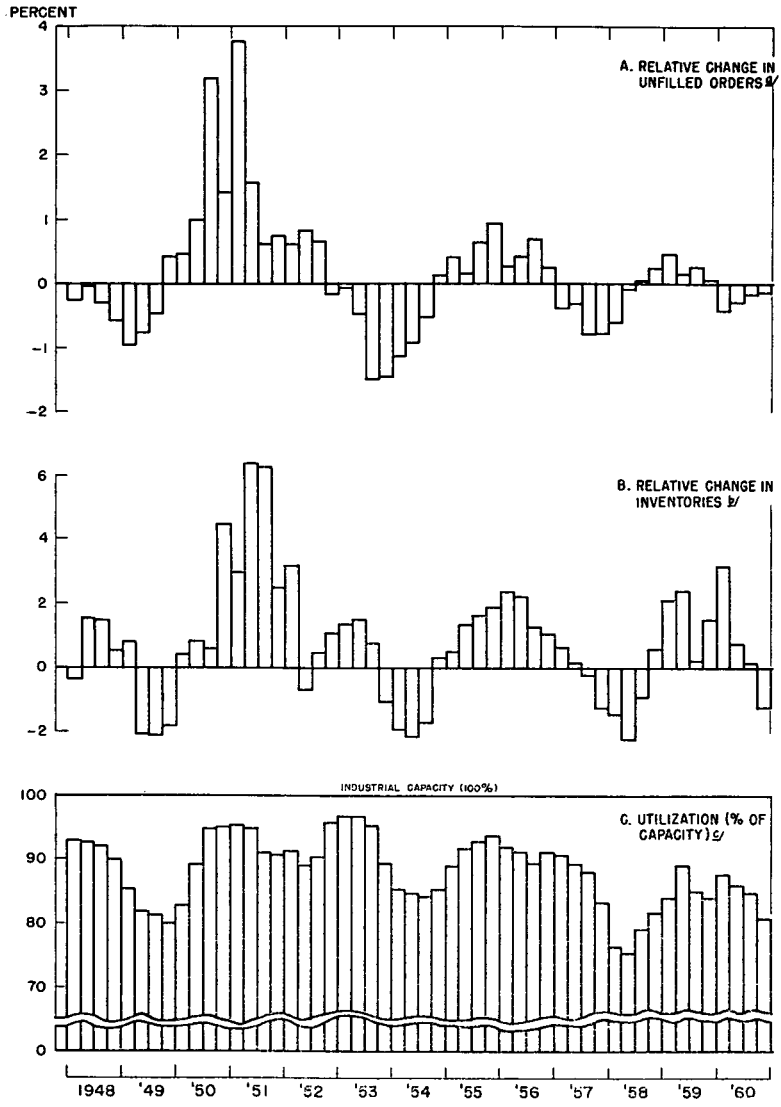
On the other hand, if, through fiscal and monetary policy means, an attempt is made to increase aggregate demand in order to achieve a faster rate of growth, the economic propositions summarized in this

[11] The pattern of cycles of diminishing amplitude shown for change in unfilled orders, and in change in inventories shown in chart 4, might be attributable to dynamic properties of the economic system which yield a succession of diminishing cycles following a "disturbance" to the system. In the case at hand, the "disturbance" would be the extraordinary military demands during the Korean war period, which set the system into oscillation with a strong dampening factor at work. Needless to say, on the other hand, the dampening factor might be underutilization of capacity.

[12] An interaction must be recognized. Fuller use of capacity would probably induce a larger proportion of resources to be devoted to fixed investment and hence to a more rapid growth in capacity itself.

CHART 4

COMPARISON OF QUARTERLY CHANGES IN MANUFACTURERS' UNFILLED ORDERS AND INVENTORIES, AS PERCENTAGES OF TOTAL INVENTORIES, AND RATE OF UTILIZATION OF INDUSTRIAL CAPACITY, 1948-1960




a. Change in unfilled orders in 1954 dollars as percentage of total inventories, all manufacturing. Source: Department of Commerce. (Price deflation by author).

b. Change in inventories after inventory valuation adjustment, seasonally adjusted in 1954 dollars, as percentage of total inventories, all manufacturing. Source: Department of Commerce.

c. See footnote in text for source of capacity utilization data.

report imply renewed inflation.[13] Moving the economy up closer to its capacity ceiling will open the door to more rapid deterioration of supply conditions during expansion phases of the business cycle, and to renewed pressures for price increases in the durables sector of the economy. Undoubtedly, faster growth will insure, but at the expense of a recommencement of inflation.

A partial escape from this dilemma may be feasible. By moderating the cyclical swings in inventory investment, if this could be achieved, more "elbow room" would be opened up between peaks in GNP and the capacity ceiling, and some of the pressures on markets for durables would be relieved. If this could be achieved, in other words, the average rate of capacity utilization could be pushed up closer to the capacity ceiling with a diminished inflationary consequence. This, in turn, would yield two benefits: first, a larger flow of output for any given level of capacity: second, a more powerful incentive to increase capacity. The result would be a faster rate of economic growth.

### H. THE NEED FOR ADDITIONAL RESEARCH

It was emphasized in the introduction that the conclusions reached in this report are tentative in character. The reader will have noted the repeated use of the phraseology that a particular conclusion is "suggested by," or "appears to be supported by" a given piece of empirical evidence. Confirmation of the truth of such propositions is, of course, a matter of degree. A single confrontation of a hypothesized statement with empirical data, however objective the researcher, is really only a beginning. Several such tests by several different individuals lend stronger support to the proposition. Many tests by many researchers are still better. It should be clear that the stated conclusions of this report, resting as they do on only one, or at most very few, tests against empirical data, stand primarily as challenges to the economist and to the policymaker.

[13] Professor Holt enters the following qualification: "The above statement assumes that the monetary and fiscal policy measures increase the long run demand pressure on the economy but are not used to counter the tendencies toward short term fluctuations. This assumption can be defended in view of our present limited knowledge concerning the dynamics of the economy and our limited ability to take timely stabilization actions. "However, there is considerable reason for anticipating that governmental policies potentially can offset inventory fluctuations at least partially and thereby improve the stability of the economy. This would to some extent reduce increases in the price level. Further research in this area is badly needed especially because of its great practical importance for governmental policy."

"However, there is considerable reason for anticipating that governmental policies potentially can offset inventory fluctuations at least partially and thereby improve the stability of the economy. Further research in this area is badly needed especially because of its great practical importance for governmental policy."

The principal conclusions of the report deal with matters of high importance. It is, therefore, of equal importance that additional research be promptly undertaken.

Submitted by task force of the following persons:

Mr. Robert J. Eggert, director of marketing research, Ford Division of Ford Motor Co.
Prof. Charles C. Holt, University of Wisconsin.[14]
Mr. Robert E. Johnson, economist, Western Electric Co.[14]
Prof. Franco Modigliani, Massachusetts Institute of Technology.[14]
Mr. Sanford S. Parker, chief economist, Fortune magazine.
Mr. Murray Weidenbaum, economist, the Boeing Co.
Mr. Nat Weinberg, director, special projects and economic analysis, United Auto Workers Union, AFL–CIO.

[14] Mr. Johnson and Professors Modigliani and Holt ask that the following qualification be made with respect to their participation in the preparation of this report: that they are in basic agreement with the spirit of this summary report, and in particular with its stress on the strategic role of inventories in economic instability and on the need for further research in the area; however, pressure of time has prevented reaching complete agreement on every aspect of the analysis and conclusions set forth.

## Bibliography *


1. Allen, Julius W., and Gentry, Richard H., "Inventories, Inventory Investment, and Inventory Control—A Selected Bibliography," part III.
2. Bratt, Elmer C., "Availability and Reliability of Inventory Data Needed to Study Economic Change," part III.
3. Darling, Paul G., "Inventory Fluctuations and Economic Instability: An Analysis Based on the Postwar Economy," part III.
4. Fromm, Gary, "Inventories, Business Cycles, and Economic Stabilization," part IV.
5. Holt, Charles C., and Modigliani, Franco, "Firm Cost Structures and the Dynamic Responses of Inventories, Production, Work Force, and Orders to Sales Fluctuations," part II.
6. Klein, Lawrence R., and Popkin, Joel, "An Econometric Analysis of the Postwar Relationship Between Inventory Fluctuations and Changes in Aggregate Economic Activity," part III.
7. Lovell, Michael C., "Factors Determining Manufacturing Inventory Investment," part II.
8. Mack, Ruth P., "Changes in Ownership of Purchased Materials," part II.
9. McGouldrick, Paul F., "The Impact of Credit Cost and Availability on Inventory Investment," part II.
10. Paradiso, Louis; Smith, Mabel A.; Bridge, Lawrence; and Winston, Clement, "Analysis of Business Inventory Movements in the Postwar Period," part I.
11. Stanback, Thomas M., Jr., "Postwar Cycles in Manufacturers' Inventories," part I.
12. Stevenson, Frederick, "Experience in Inventory Management—A Survey of Large Manufacturing Firms," part IV.
13. Terleckyj, Nestor E. (assisted by Alfred Tella), "Measures of Inventory Conditions," part II.
14. Zarnowitz, Victor, "Unfilled Orders, Price Changes, and Business Fluctuations," a monograph prepared under research sponsorship of the National Bureau of Economic Research, as yet unpublished but available on a "preliminary" basis in mimeographed form.


*All items of bibliography, except No. 14, have been published in four parts by the Joint Economic Committee, Washington, D.C., 1961 and 1662, under the general title "Inventory Fluctuations and Economic Stabilization."