Chapter Title: Setting and Scope

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CHAPTER I

Setting and Scope

The recurring alternations of prosperity and depression we now call business cycles have been a prominent feature of capitalist economies for at least a hundred and fifty years. Systematic thought about the causes and control of economic crises goes back over a century. For perhaps fifty years business cycle research has been pursued on a large scale, as such things go. Yet even today we know relatively little about what happens during business cycles. In whatever direction speculation about the causes of cycles turns, one comes up against hard questions of fact. Do prices fluctuate more violently than wages? Do costs rise during the last stages of business expansions? Does construction activity turn down before or after business activity at large? Do consumers save a larger or smaller portion of their incomes in prosperity than in depression? The unsettled questions are innumerable, and many must be answered before a firmly founded theory of business cycles will be possible.

To find answers to some of the many questions is the aim of the National Bureau's systematic investigation of business fluctuations. By adding to the materials from which an explanation may be constructed, we hope to provide students of cycles with more comprehensive and tested information about the phenomena they are attempting to explain.

This book, a report on a portion of the larger study, examines an almost virgin territory, manufacturers' inventories.

1 Importance of Inventory Fluctuations

Students of business cycles will not demand documentation for the assertion that fluctuations in inventories, though not utterly neglected, have, until recent years, occupied only a minor place in both

descriptions of business cycles and speculation about their causes. In the minds of businessmen the accumulation and liquidation of stocks have played a larger role. With some notable exceptions, however, even professional economists who stress the instability of business investment have neglected inventories. They emphasize rather fluctuations in the production of durable capital equipment and construction. Investment in inventories, though often recognized as subject to many of the influences that determine other types of investment, is usually relegated to a secondary position.

The root cause has undoubtedly been lack of knowledge about the size of inventories and of the rate at which they are built up and liquidated. Fortunately this situation is changing. The speculative inventory boom of 1920 and the events connected with the recession of 1937-38 drew the attention of economists to inventory movements and stimulated government and business to more active collection of information. At the same time the publication of Simon Kuznets' estimates of capital formation provided the first comprehensive estimates of inventories and of inventory investment.[1] With these data it is possible to establish the role of stocks in the fluctuations of capital investment and of business at large.

Table 1 presents a composite picture of the changes in total national production during the five business cycles between the two world wars and of the portion of those changes that took the form of changes in inventory investment, that is, in the rate of production of goods that were added to or removed from stock. For business expansions the underlying figures are the differences between the standings of each element of gross national product in trough years and those in succeeding peak years; the figures for contractions are the differences between peak and succeeding trough years. The changes for each full cycle are the differences between the changes during the expansions and contractions that make up each cycle measured from trough to trough. The figures in Table 1 are averages for the five expansions, contractions, and full cycles.

[1] These terms follow current usage in economics. 'Inventories' are the stock held by business at a given time. 'Inventory investment', the net volume of goods added to, or removed from, stock during a given period, is synonymous with net inventory accumulation.

TABLE I

Gross National Product and Its Main Components
Average Changes, 5 Business Cycles, 1919-1938

	AV. AN. VALUE, $ BILLION, 1929 PRICES	CHANGE, $ BILLION. 1929 PRICES			CHANGE AS % OF CHANGE IN GNP		
		Exp.	Contr.	Cycle	Exp.	Contr.	Cycle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 Gross national product	79.8	12.1	—7.2	19.3	100.0	100.0	100.0
2 Flow of goods to consumers	66.5	7.3	—1.4	8.7	60.5	19.6	45.2
a Durables	6.3	1.6	—1.4	2.9	12.9	19.1	15.2
b Nondurables	36.2	3.3	0.1	3.2	26.9	—1.4	16.3
c Services	24.0	2.5	—0.1	2.6	20.7	1.9	13.7
3 Capital formation	13.3	4.8	—5.8	10.6	39.5	80.4	54.8
a Construction	7.1	0.7	—0.8	1.5	6.1	11.0	8.0
1) Public	2.0	—0.2	0.2	—0.4	—1.5	—3.0	—2.1
2) Business	2.5	0.5	—0.6	1.1	4.1	8.8	5.9
3) Residential	2.6	0.4	—0.3	0.7	3.3	4.7	3.8
b Prod. durable equip.	5.1	1.7	—1.9	3.6	14.4	26.0	18.7
c Net change in claims against foreign countries					—4.1	—3.6	—3.9
d Net change in inventories (inventory investment)	0.50	—0.5	0.3	—0.8			
1) Total	0.56	2.8	—3.4	6.3	23.3	47.5	32.4
2) Total. excl. farmers	0.58	2.4	—3.1	5.5	20.0	42.8	28.5
3) Mfr. inventories	0.36	1.4	—1.8	3.2	11.7	24.9	16.6

Sources: All dollar figures. except line 3d(3) are derived from estimates by Simon Kuznets. *National Product since 1869* (NBER, 1946). The table numbers refer to his book. Percentage figures are derived from estimates in dollars.

LINE
1   Table I-15
2 and 2a-c   Table I-5
3a(1)·(3)   Table I-8
3b   Table I-6
3c and d   Table I-11

Net changes in manufacturers' inventories, line 3d(3), are from Kuznets' *Commodity Flow and Capital Formation* (NBER, 1938). revised and extended by me. Differences between these figures and those included by Kuznets in the total. line 3d(1) are not substantial. For a description of the estimates underlying line 3d(3). see App. A of this volume.

Method of Computation: (see also text, note 4).

COLUMN
1 Simple average of annual values in all years 1919-38
2 Difference between standings in trough years and in succeeding peak years averaged for five expansions
3 Difference between standings in peak years and in succeeding trough years averaged for five contractions
4 Difference between standings in col. 3 and in col. 2.

Col. 1, lines 3c, 3d(1)·(3) is computed to two decimal places because original data involve values below $0.5 billion which are carried to two decimal places in the source.
Because totals and subtotals are computed from rounded values for individual cycles. they do not always equal sum of components.

The trough and peak years that bound the expansions and contractions are those selected by the National Bureau as the years in which business at large reached its highest and lowest levels in successive business cycles.[2]

Inspection quickly reveals what a large part of the cyclical changes in gross national product, that is, the total output of the country, took the form of changes in the rate of accumulation and

[2] See Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (NBER, 1946), Ch. 4.

liquidation of inventories.[3] The average change in gross national product during the five expansions was about $12 billion. The corresponding average change in inventory investment was some $2.8 billion, about 23 percent as much. Excluding investment by farmers, the change was somewhat smaller. The average increase of manufacturers' inventories alone was some $1.4 billion, nearly 12 percent of the average increase in gross national product.

[3] It may be useful to note at this point the way in which inventory changes enter into national production and its changes. National product for any year equals the value of the goods that pass into the hands of consumers plus the value of the goods added to the national stock of capital, plus or minus the net change in our claims against foreign countries. Net national product, as conventionally measured, excludes the value of the output of durable goods and construction that merely replaces goods in these classes that wear out during the year. Gross national product, the measure used here, includes it. Consequently, the value of the additional goods placed in business inventories during a year (that is, the value of *inventory investment*) must be added to goods flowing to consumers in order to get total output for the year. Or if the volume of goods in inventories declines, the value of the goods removed (that is, the value of *inventory disinvestment*) must be subtracted. The change in the rate of inventory investment between any two years is simply the difference between the rate of investment in the second year and that in the first. The change in gross national product between two years is the sum of the changes in its components.

The accompanying hypothetical figures, which assume that national product has only two components, illustrate the computations.

Gross National Product and Its Components

A Value

	1900	1901	1902
1 Flow of goods to consumers	1000	1100	900
2 Net change in inventories (inventory investment)	100	200	−100
3 Gross national product	1100	1300	800

B Changes

	1900-01 (1)	1901-02 (2)	Difference (1) − (2)
1 Flow of goods to consumers	+100	−200	300
2 Net change in inventories (inventory investment)	+100	−300	400
3 Gross national product	+200	−500	700

Part B is derived by obvious means from Part A. The figures in col. 2-7 of Table 1 correspond to those in Part B of this hypothetical table. The figures for expansion in Table 1 correspond to those in the first column, those for contraction to the figures in the second column, and those for full cycles to those in the third column. The figures for net changes in inventories in Table 1 correspond to those in line 2.

During contractions changes in inventory investment constituted an even bigger part of the average change in total output. The average decline appears to have been nearly half, 47 percent, the average decline in gross national product. The average cyclical decline in investment in manufacturers' inventories alone was about one-fourth the average decline in total output.

The results of taking expansions and contractions together are, of course, intermediate between those obtained by taking each phase separately. The average fluctuation in total output from trough to peak and back again was over $19 billion. About 32 percent apparently took the form of changes in the rate of investment in inventories generally; excluding farmers, the share was over 28 percent; inventory investment by manufacturers was over 16 percent.

Cyclical changes in inventory investment are not only a large part of changes in total output; they are comparable in size with changes in construction and in the output of producer durable equipment, elements that have received far more attention in business cycle research. Indeed, on the face of Kuznets' estimates, fluctuations in inventory investment appear to be much larger than in either of the other principal components of total capital formation. The average change in total inventory investment during expansions was 23 percent of the average change in total output, in construction, 6 percent, and in producer durable goods, 14 percent. In contractions the figures were 47 percent for inventory investment, 11 percent for construction, and 26 percent for producer durables. Manufacturers' inventory investment alone apparently accounted for just about as large a portion of the average cyclical change in total output as did changes in the output of producer durables, and for a larger portion than construction. Similar statements might be made about the relative size of the fluctuations in inventory investment and in the production of consumer durable goods, another component of output whose instability has attracted attention in analyses of cycles.

These comparisons of the size of cyclical fluctuations in the various categories of output take on even more importance when considered in connection with the average flow of goods within each category. The absolute amount by which output in a certain cate-

gory increases between depression and prosperity depends partly on its sensitivity to changes in business activity and partly on its size. The changes in the flow of nondurable goods and of services to consumers are large: the average full cycle changes were some $3.2 and $2.6 billion, respectively. But these are the largest components; their average annual value for the entire period 1919-38 were some $36 and $24 billion, respectively. In view of their average size, the fluctuations are small; these are stable categories. Producer and consumer durable goods and construction are far less stable. Their average cyclical fluctuations, $3.6, $2.9, and $1.5 billion, are to be set against average annual rates of production of only $5.1, $6.3, and $7.1 billion. By the same criteria, the cycles in inventory investment are the most violent of all. The average full cycle change was $6.3 billion for total inventory investment and $3.2 billion for manufacturers' investment. The average annual investment in all inventories, however, was no more than $560 million, and that in manufacturers' stocks only $360 million.

These estimates are, of course, crude, but they are sufficiently accurate to establish several important propositions. One is that, on the average, a very considerable portion of the cyclical changes in total output has been in the form of a change in the volume of goods added to stocks. A second is that, during ordinary business cycles,[4] fluctuations in the rate of inventory investment as a whole have been larger, in terms of the value of goods involved, than those in construction or in the flow of durable goods to either producers or consumers. And a third proposition is that inventory investment, in terms of violence of fluctuation, is the most volatile of the main components of output. In Chapter 21 we shall see whether these statements, suggested by the average behavior of inventories, apply regularly to business cycles in case after case, and whether they are equally applicable to cycles of all types.

2 Inventories in Business Cycle Literature

These broad findings clearly establish the prime importance of inventory fluctuations in business cycles. They emphasize the need for further work to uncover the character and causes of inventory

[4] In Chapter 21 we shall find reason to distinguish between longer and shorter cycles.

cycles and to gauge their influence upon business in general. As a
first step, it will be useful to review the work of earlier writers.
Though necessarily tentative and based on a fragmentary view of
the actual behavior of stocks, their theories are still a useful intro-
duction to this book. Their conclusions illustrate well the range of
issues to which our investigation is relevant. Implicitly or explicitly,
their theories impute a certain pattern of behavior to inventories
during business cycles; they suggest the factors that govern the
movements of inventories; and they indicate a number of the ways
in which inventory fluctuations may influence business in general.
A comprehensive review of the literature of business cycles is not
possible, but I shall attempt to summarize the leading ideas of rep-
resentative students. Aside from incidental comment, such criticism
and confirmation as emerge from this study are presented at later
points.

MITCHELL ON THE ROLE OF STOCKS

Characteristically, Mitchell develops his ideas about inventories as
part of his description of how the events that occur during a con-
traction of business lead to revival; how revival leads to expansion,
and so through the cycle. During cyclical contractions, he writes,

"Merchants require smaller stocks and cut their orders more than
sales fall off. A similar policy is followed by other enterprises. Thus
the reduction in volume of trade is amplified stage by stage as it
travels back through wholesale dealers to manufacturers and pro-
ducers of raw materials."[5]

The reduction of stocks helps to intensify contraction, but it has
its limits. When stocks have been reduced as far as they safely can
be, goods must be replaced as rapidly as they are sold. This bolsters
the demand for goods, and may actually cause merchants' orders
and manufacturers' purchases and production to increase.

"First, the accumulated stocks of goods carried over from the pre-
ceding period of prosperity are gradually disposed of. Even when
current consumption is small, manufacturers and merchants can re-
duce their stocks of raw materials and finished wares by filling orders
chiefly from what is on hand and confining purchases to the small
quantities needed to keep full assortments. But when the stocks have

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[5] *Encyclopedia of the Social Sciences* (Macmillan, 1937), III, 104.

once been reduced to the smallest dimensions allowed by the regular filling of orders, then current purchases and current production are perforce increased, even though current consumption does not grow larger."[6]

The necessity of halting, or at least retarding, the liquidation of stocks is thus one of the factors that, in Mitchell's opinion, help to bring the depression to an end. And once output and sales begin to increase, businessmen feel the need for larger stocks to support their larger activity. Their purchases and output, therefore, tend to increase more than their sales, adding momentum to the expansion. The incentive to build up stocks, moreover, comes not only from increasing activity but also from rising prices when these are thought to be an omen of further increases.

[Businessmen] "become eager to lay in large stocks or to make long contracts while quotations are still moderate and terms are still easy. Thus the anticipation of future advances in prices not only prevents present advances from reducing demand, but actually makes demand grow in the face of a rising level of prices."[7]

As activity increases and prosperity becomes more general, the balanced growth of stocks and production is upset. For many reasons prices tend to weaken after the upward phase has proceeded for some time. Businessmen attempt to maintain prices by keeping goods off the market and permitting current output to pile up. This policy, however, meets its own special obstacles and can, in any case, be a source of merely temporary relief. When prosperity is on the wane the attempt to stave off declines in prices by stockpiling current output must eventually fail. The liquidation of the unduly large inventories during the ensuing depression intensifies the subsequent contraction.

"High discount rates also impede the efforts, often made toward the end of a prosperous period, to maintain selling prices by keeping goods off the market and allowing current output to pile up in huge stocks, which are held for sale at a more opportune moment. . . . A temporary relief from a threatened fall of prices may be obtained in this way, but the potential danger becomes more grave. The heavy interest cost of 'carrying' the unsold stocks saps the financial strength

[6] *Business Cycles and Their Causes* (University of California Press, 1941), p. 143.
[7] Ibid., p. 11.

of even the largest enterprises and makes long persistence in this course hazardous. If buyers get wind of the situation, they hold off for the drop in prices they expect will come when the stocks are finally 'sacrificed'. In short, there can be but one end to such a policy when initiated under the business conditions of waning prosperity, and that disastrous end is hastened by high discount rates."[8]

'OVERPRODUCTION' THEORIES

In Mitchell's analysis of the forces involved in business cycles, stocks are an auxiliary factor, one of many causes accounting for the cumulation of prosperity and depression and for the transition from expansion to contraction. Other explanations assign a more crucial role to inventories. One, put forward by the so-called 'over-production' theorists, is summarized by R. G. Hawtrey:

"The classical economists argued that general overproduction was impossible, because no one produced except with a view to consuming, and therefore demand was necessarily equal to supply. Moreover, production was at its greatest during the active phase of the trade cycle, and fell off during the phase of depression, at the very time when the symptoms of overproduction appeared. These difficulties could be met if the overproduction were supposed to take the form of accumulation of excessive stocks of commodities. If production outstrips demand, it was said, a part of the products remains unsold, and traders, encumbered with unsold goods, become reluctant to produce more. Restricted production means a restricted employment. These conditions will continue so long as unsold stocks remain above normal. The redundant goods have to be sold off at a sacrifice of price. When that process is completed, traders' stocks will have been brought into relation with a reduced scale of production and consumption. The pressure on markets being then relieved, there is found to be a margin of unemployed capital and labour, anxious to start producing. When production revives, the existing stocks of commodities are found to be insufficient for the needs of markets, and the process of replenishing stocks makes for active production. Production in fact, exceeds consumption, and will continue to do so till excessive stocks have again been accumulated, and the cycle is then started afresh."[9]

To account for excessive stocks two explanations are offered.

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[8] Ibid., p. 59.
[9] *Trade and Credit* (Longmans, Green, 1928), pp. 84-5. The term 'traders', as used by Mr. Hawtrey, includes manufacturers as well as merchants.

First, the attempt to replenish stocks as well as to meet current demand is said to lead to the construction of new capacity. During this time-consuming process stocks remain inadequate; construction is, therefore, likely to be overdone. Secondly, a period of activity gives rise to optimistic expectations which induce businessmen to make larger commitments in plant and inventories than actual markets will warrant. As Hawtrey puts it (p. 85):

"At the end, therefore, of a time of depression, the period of recovery would be prolonged during the process of extending the equipment of industry. The climax would come when the fresh capital came into use, and the swollen output of consumable commodities would increase stocks up to normal and thereafter would exceed demand."

It seems consistent with these views to expect that inventories will rise and fall together with business activity but that accumulations as measured, say, by the ratio of stocks to output or sales, will be excessive only toward the end of expansions. Similarly, deficient inventories would be expected toward the end of contractions.

HAWTREY'S THEORY

Although this convenient summary of the overproduction theory was taken from one of Hawtrey's books he, of course, holds quite different views. His name is, indeed, associated primarily with the idea that the trade cycle is a 'purely monetary phenomenon'. But while he contends that the essential feature of business cycles is an expansion and contraction of the money supply, the vehicle on which the additional money is brought to the public and later taken away is the inventory policy of businessmen.[10]

Hawtrey believes that easy credit conditions and low interest rates are an incentive to merchants to borrow in order to hold bigger stocks. Their increased orders, financed by new credit, stimulate production and employment and lead to larger incomes and consumer expenditures. These in turn cause businessmen to seek still larger stocks to support their growing business. Thus the forces making for business expansion cumulate. And while the initial impulses to augment stocks come first from easy credit terms, then from bigger sales, they gain strength, later in the expansion, from

[10] See especially his *Currency and Credit* (Longmans, Green, 1930), Ch. I-IV and IX-XI; also his *Trade and Credit*, Ch. V, VII, and VIII.

rising prices. The period of increasing activity is brought to an end because, as incomes rise, the banking system tends to lose cash both to foreign countries and to the domestic circulation. The depletion of reserve cash causes a rise in interest rates and a restriction in bank loans. Merchants then try to liquidate stocks, and smaller orders set in motion the mutually reinforcing processes of contraction.

This version of Hawtrey's theory is well known. Perhaps less appreciated than it ought to be is that Hawtrey's explanation of business cycles rests on a virtual, not on an actual, cycle of inventories. That is, under the impulse given by low interest rates, merchants attempt to build up stocks by placing larger orders. But since the employment and income thereby created stimulate consumer expenditures, the first effect is bigger sales of finished goods. Thus larger stocks of goods in process are offset by depleted stocks of finished goods. Hawtrey sometimes writes as if the net result were to cause total stocks to rise but by less than the desired amount, leading to a still further increase of orders and output.[11] At other times he seems to contend that the depletion of inventories of finished goods entirely offsets the growth of goods in process so that business stocks as a whole actually remain constant (pp. 156, 157):

"Increased working capital, in the form of goods in course of production, is provided [during expansion] not by a 'windfall' conferred on producers through a rise in prices, but by supplies of money, which enable consumers to draw on the finished products in stock. . . . Goods previously idle pass into consumption, and are replaced for the time being as an item of working capital by goods in the course of manufactures. The total of working capital in the entire community remains unchanged, and therefore becomes *less* in proportion to production, but the shortage of working capital is felt only in the stocks of finished products, which can be varied within fairly wide limits without inconvenience. The shortage of finished products is a direct stimulus to increased activity. If it goes too far and threatens exhaustion of supplies in the face of a continued demand, dealers defend themselves by raising prices to the consumer above replacement value."

The significance of these passages is clear on one point. The actual change in stocks is not, in Hawtrey's view, the effective pro-

[11] *Trade and Credit*, p. 91.

pellant and may, indeed, not be very large. The operative force is the *desire* to increase or decrease inventories and the consequent larger or smaller orders.

How Hawtrey thinks stocks behave is less easily said. Dealers' stocks may rise or fall during expansions. Manufacturers' stocks of goods in process must of course rise, but their supplies of purchased raw materials or finished goods may fall. One feature implicit in Hawtrey's theory, however, seems to require total inventories, as distinct from individual categories, to rise during expansions and fall during contractions. Since Hawtrey contends that attempts to increase stocks will result in greater employment and income only if there is a net expansion of bank credit, the larger liabilities of borrowers must be balanced somewhere in their accounts by additional capital assets. These new assets may take the form of plant or equipment, but in the context of Hawtrey's argument, it is more reasonable to think of them as commodity stocks.

KEYNES' THEORY OF WORKING AND LIQUID CAPITAL

Of the inventory theories proposed by leading writers on business cycles, J. M. Keynes' are perhaps the best developed and possibly the most penetrating.[12] It may be worth while to review at least the broad features of Keynes' treatment. More details will be noted in later chapters. For purposes of analysis and exposition, Keynes divides all inventories into two categories, "working" and "liquid" capital. He defines working capital as "the aggregate of goods . . . in course of production, manufacture, transport and retailing, including such minimum stocks, whether of raw materials or of finished products, as are required to avoid risks of interruption of process or to tide over seasonal irregularities (e.g., intervals between harvests or fluctuations of individual harvests about the mean) . . . [Working capital] includes without distinction goods in process, such as food or textiles . . . the consumption of which will be spread over a short time, and goods in process . . . which will emerge as fixed capital, the consumption of which must be spread over a period, and are not immediately available."[13]

[12] *Treatise on Money*, I, Ch. 18 and II, Ch. 27-9; *General Theory of Employment, Interest and Money*, Ch. 22 (Harcourt, Brace, 1930 and 1936).
[13] *Treatise on Money*, II, 116. Keynes defines goods in process more broadly than I do; see Ch. 7 below.

Liquid capital, in contrast, is defined as surplus stocks, that is, stocks over and above the goods necessary to carry on a given volume of production and distribution.

In practice, however, working and liquid capital cannot be clearly differentiated. Goods actually passing through a specific process of fabrication (hides in the tanning vat, for example) are objectively related to the rate of production. But how large a supply of purchased raw materials does a manufacturer require to support a given output? Though Keynes was, of course, not unaware of the difficulty, he merely says (I, 129): "normal stocks required for efficient business are part of working capital and therefore in process, whilst surplus stocks are to be regarded as liquid".

With these definitions in hand, Keynes is able to draw his picture of the cyclical behavior of inventories and to show its significance. Working capital, since it represents goods in process and other inventories 'required' to support production and distribution, must, as a matter of definition, fluctuate together with output and roughly in the same proportion. More important, as Keynes later argues, it comprises the bulk of inventories, so that its movements dominate the behavior of inventories as a whole.

Keynes develops his views on liquid capital in rebutting Hawtrey's argument about the behavior of stocks. Keynes takes the position, contrary to Hawtrey, that fluctuations in liquid capital can no more than partly offset fluctuations in working capital. In support of this view, he advances three arguments.

1) During slumps production falls off much more sharply than consumption. And since the evidence does not suggest that the excess consumption is fully balanced by diminished investment in fixed capital, stocks must become somewhat depleted. Hence the liquidation of working capital must exceed any accumulation of liquid capital.

2) An investigation into the volume of stocks at different dates leads Keynes to think that the true surplus stocks of liquid capital in existence at any time are too small to offset the cyclical movements of working capital.

In addition, Keynes writes (II, 134, 135):

" . . . the figures corroborate the expectation that [in the case of a slump which has been brought about by other causes than an exces-

sive investment in fixed capital] stocks tend to attain their maximum in an early phase of the slump and are at a low point when the improvement of trade is definitely beginning. . . . This confirms expectation because, when the slump begins, the falling off of production does not show itself immediately at the finishing end of the machine of process, whilst it does show itself immediately in the amount which is being fed back into the mouth of the machine: so liquid stocks increase. Later on, however, the diminished production results in diminished available output, whilst current consumption does not fall off so much as does production—with the result that there can be no increase of liquid stocks, but rather the contrary."

3) The costs of carrying surplus stocks, including the risk of loss due to price drops, are very high. Hence if such stocks come into existence, they force their own reabsorption by causing prices to fall and production to be restricted. "Recovery—broadly speaking—cannot begin until [surplus] stocks have been absorbed . . ." (II, 145). Consequently, the liquidation of working capital characterizing a slump must eventually be reinforced, not offset, by a liquidation of surplus stocks. Keynes therefore concludes, contrary to Hawtrey, that surplus stocks, having been worked off during the slump, cannot counteract the accumulation of working capital in the ensuing recovery, except perhaps in its very earliest stages.

These various considerations lead Keynes to a general view about the behavior of stocks as a whole, working capital and liquid capital together (*General Theory*, p. 319):

"In the earliest phase of a typical slump there will probably be an investment in increasing [surplus] stocks which helps to offset disinvestment in working capital; in the next phase there may be a short period of disinvestment both in [surplus] stocks and in working capital; after the lowest point has been passed there is likely to be a further disinvestment in [surplus] stocks which partially offsets reinvestment in working capital; and finally, after the recovery is well on its way, both factors will be simultaneously favorable to investment."

A review of the statistics on manufacturers' stocks will demonstrate how discerning this passage is. Meanwhile, taking Keynes' argument at face value, we may ask some questions. Working capital increases with output, but when does the rate of investment, that is, the rate of growth in working capital reach its peak? At the same time as output or earlier? Surplus stocks are supposed to

increase both before and after the peak of the cycle. When do they grow most rapidly? Before or after the peak? Similar questions remain to puzzle us about the course and mechanism of the slump.

Keynes supplements his theory about the behavior of stocks with arguments about the size and significance of inventories and their fluctuations and their relation to the length of cyclical expansions and contractions. On the basis of some rough estimates he concludes that the impairment of working capital in a severe decline such as 1920-22 was probably about 15 percent or £250 million sterling.[14] Since he takes this sum to be equal to approximately half of a year's savings in Great Britain in a normal year, and since he considers that fluctuations in liquid capital can offset those in working capital to only a small extent, Keynes is able to satisfy himself about a number of interesting points.

First, the fluctuations in working capital that inevitably accompany fluctuations in demand and output are an important intensifying if not initiating factor, tending to reinforce movements of demand in either direction. In the language of the *Treatise on Money* (II, 116): "It is evident that fluctuations in the amount of Working Capital are so large that they can, on occasion, be an *important* factor in bringing about a disequilibrium between the rates of Saving and Investment." Thus if for any reason manufacturers receive larger orders, their attempt to fill them entails additional working capital which in turn increases incomes and presumably the demand for goods even before the original orders can be filled. The effect of this process, Keynes thinks, must be a rise in prices relative to costs, thereby giving businessmen a further incentive to invest (I, Ch. 18).

So strong, indeed, does Keynes consider the impact of investment in working capital on prices that he suggests it may determine the pace and average length of cyclical expansions and contractions. For if there is an attempt to raise the rate of employment too rapidly, the necessary investment in working capital will be so large as to cause a severe inflation in the prices of consumer goods, and presumably of the materials that enter into them.

[14] The basis of Keynes' calculations is admittedly unsatisfactory, but there is better evidence now to demonstrate that cyclical changes in inventory investment are relatively large (see Table 1 above).

"When, therefore, the time comes for the replenishment of working capital, it may be *impossible* to effect this rapidly without rupturing the equilibrium of prices and incomes. Even if appropriate steps are taken in good time, two years or more may elapse before working capital can be restored; and if such steps are not taken, a longer interval may be required."[15]

Finally, just as his theory about working capital explains for Keynes the relatively moderate pace of expansion, his theory about liquid capital accounts for the relatively swift pace of contraction. The essence of his view is that the speculative risks of holding surplus inventories, added to the burdens of deterioration, warehousing, insurance, and interest, make the cost of carrying redundant stocks very high. As a consequence, when surplus stocks accumulate at the beginning of a slump, their holders will themselves curtail production, if they can, in order to liquidate the stocks promptly; if they cannot, their attempts to sell will force prices down drastically, thereby bringing a sharp reduction in output.[16] Of course, the curtailment of output will itself reduce demand and retard the rate of inventory absorption, necessitating still further restriction of output and so on cumulatively, at least for a time. Hence the violence of contraction.

Keynes is less clear concerning the length of the process. In the *Treatise on Money* he confines himself to examples covering single commodities. In the *General Theory*, however, he suggests two factors that control the length of depressions (p. 318). The first is "the average durability of capital in a given epoch".

"The second stable time-factor is due to the carrying-costs of surplus stocks which force their absorption within a certain period, neither very short nor very long. The sudden cessation of new investment after the crisis will probably lead to an accumulation of surplus stocks of unfinished goods. The carrying-costs of these stocks will seldom be less than 10 percent per annum. Thus the fall in their price

[15] *Treatise on Money*, II, 112-3. In this connection Keynes cites Mitchell's 1913 calculations that the mean length of an expansion is just under two years and the maximum about three years.

[16] Ibid., II, 146. "Just as the improvement in the volume of production can take place only gradually, owing to the time which it takes to build up Working Capital again; so must the falling off in the volume of production take place suddenly, when there is surplus Liquid Capital, owing to the short time within which Liquid Capital must be absorbed."

needs to be sufficient to bring about a restriction which provides for their absorption within a period of, say, three to five years at the outside. Now the process of absorbing the stocks represents negative investment, which is a further deterrent to employment; and, when it is over, a manifest relief will be experienced."

Keynes' suggestion of a three to five year period is significant. As we shall see, the record lends some support to his picture of the behavior of surplus stocks during contractions of this length. On the other hand, contractions that persist for as long as three years are rather exceptional.[17] In shorter depressions, stocks have not behaved in accordance with Keynes' hypothesis. For these shorter episodes the mechanism of contraction and recovery must be different from the one Keynes sketches.

THE ACCELERATION PRINCIPLE AND THE PATTERN OF INVENTORY INVESTMENT

The theories reviewed above have at least one thing in common. Either implicitly or explicitly all rely upon changes in the rate of inventory investment to explain at least part of the impact of inventories on business cycles. But the descriptions of the behavior of stocks run exclusively in terms of level, not of rate of growth. It is clear, however, that the peaks and troughs of inventory investment may, and in general will, precede the peaks and troughs of stocks themselves.[18] The number employed in producing goods destined for stock may, therefore, be declining while inventories themselves are still rising. If we treat inventory investment in a fashion strictly parallel with investment in durable goods, we would say that inventories are exercising a depressing influence on employment when the rate of inventory investment declines, not when inventories begin to be liquidated. It is, therefore, of first

[17] The National Bureau chronology of monthly business cycles records 16 contractions in Great Britain and 21 in the United States between 1857 and 1938. Of these, only 4 British and 3 United States contractions lasted as long as 3 years. Even contractions of 2 years are in the minority: there have been only 6 in Great Britain and 5 in the United States since 1857. See *Measuring Business Cycles*, Table 16, pp. 78-9.

[18] This, of course, is not necessary. If the rate of growth of stocks increased until the peak of an inventory cycle was reached, inventories and inventory investment would turn down simultaneously.

importance to have a well founded idea about the cyclical be-
havior of inventory investment as distinct from the level of stocks
themselves.

One suggestion consists in applying the well known principle
of the magnification and acceleration of derived demand to the
accumulation and liquidation of stocks. Although this principle,
derived from the hypothesis that the rate of net new investment is
controlled by the rate of change in, not the level of, demand for
consumer goods, has been studied largely in connection with in-
vestment in producer durable equipment, its application to inven-
tories was recognized by J. M. Clark in his initial treatment in
1917.[19] Kuznets stressed this application in his study of cycles in
the merchandising trades and in a later general critique of the
acceleration principle.[20]

In its simplest form the principle assumes that manufacturers
and merchants are both desirous and able to maintain inventories
in constant ratio to their output or sales. Inventories would vary
directly and proportionately with sales or output, but the rate of
inventory investment would vary directly with the rate of change
in sales, and its magnitude would bear the same relation to the
magnitude of the change in sales as stocks themselves bear to sales.
Hence if a manufacturer kept inventories four times his monthly
sales, a $1,000 increase in his monthly sales would call for an in-
ventory investment of $4,000.

An arithmetical example will make these relations clearer. It as-
sumes that the desired inventory-sales ratio is 4 to 1 and that if the
rate of sales changes, the firm will be able, by purchases or output,
to restore inventories to the desired ratio by the end of the month
in which the change occurs. Table 2 illustrates several leading
propositions that together may be said to constitute the principle
of the magnification and acceleration of derived demand as ap-
plied to inventory investment:

[19] Business Acceleration and the Law of Demand: A Technical Factor in
Economic Cycles, *Journal of Political Economy*, March 1917, pp. 217-35.
[20] *Cyclical Fluctuations; Retail and Wholesale Trade, United States, 1919-
1925* (Adelphi, 1926), and the Relation Between Capital Goods and Fin-
ished Products in the Business Cycle, *Economic Essays in Honor of Wesley
Clair Mitchell* (Columbia University Press, 1935). See also Gottfried Haber-
ler, *Prosperity and Depression* (Geneva, 3d ed., 1941), pp. 85 ff.

TABLE 2

Sales, Inventories, and Business Expenditures
Hypothetical Example

						MONTHS						
	1	2	3	4	5	6	7	8	9	10	11	12
1 Stocks at beginning of month	400	400	408	432	452	460	460	452	432	408	400	400
2 Sales at cost	100	102	108	113	115	115	113	108	102	100	100	102
3 Increase in sales	0	+2	+6	+5	+2	0	−2	−5	−6	−2	0	+2
4 Stocks required at end of month (line 2 x 4)	400	408	432	452	460	460	452	432	408	400	400	408
5 Expenditures required for												
a) Replacement (line 2)	100	102	108	113	115	115	113	108	102	100	100	102
b) Inventory investment (line 4 − line 1)	0	8	24	20	8	0	−8	−20	−24	−8	0	8
6 Total expenditures (line 5a + b)	100	110	132	133	123	115	105	88	78	92	100	110

1) Inventory investment varies directly and proportionately with the rate of change in sales, not with sales proper. Although in the example sales continue to rise through the fifth month, their rate of increase and inventory investment fall after the third. After the peak, sales decline until the tenth month, but their rate of decline and inventory investment reach troughs in the ninth.

2) Inventory investment equals the absolute change in sales multiplied by the inventory-sales ratio.

3) Total business expenditures follow a pattern that is a compound of the patterns of expenditures to replace sales and those required for inventory investment. Usually they will reach their peaks and troughs later than expenditures for inventory investment but before expenditures for replacements. Thus inventory investment reaches its peak in the third month, total expenditures in the fourth, and replacement expenditures in the fifth.

4) The absolute amplitude of the fluctuation in total business expenditures is a compound also of the amplitudes of the fluctuation in sales and of the much wider fluctuation in inventory investment. As a result, its relative amplitude is wider than that in sales.

These propositions express the principle of acceleration and magnification in its simplest form. Clark, Kuznets, and other writers stress certain qualifications and extensions of the theory. In particular, they recognize that inventory-sales ratios are not rigid. On the one hand, expenditures for both replacement and inventory investment are likely to lag, creating a tendency to reduce both the lead and magnitude of investment cycles relative to sales. On the other hand, the lags create initial shortages relative to demand which cause prices to rise, with the result that inventory investments motivated by price speculation are likely to overlie those motivated by changes in sales. In addition, Clark emphasizes that the causal sequence does not run simply from final demand to demand for investment goods, but also from investment, via the consumer incomes created, to consumer expenditures. Each type of demand reinforces the others and modifies its pattern in a process of adaptation that at first magnifies the initial impulse, but is, in the end, self-limiting and self-reversing.[21]

[21] Cf. Clark's Additional Note on Business Acceleration and the Law of Demand, *Preface to Social Economics* (Farrar & Rinehart, 1936), pp. 349-54.

HANSEN'S THEORY OF THE ROLE OF INVENTORIES IN LONG AND SHORT CYCLES

An important problem with respect to the role of inventories in business cycles had been raised by Alvin H. Hansen. In his *Fiscal Policy and Business Cycles*[22] he substantially accepts Schumpeter's theory that several business cycle types may be distinguished: among them, long waves of approximately 50 years, "major" cycles of about 8 years, and "minor" fluctuations most of which last 3 or 4 years. Hansen, like Schumpeter, attributes the long waves and the major cycles to fluctuations in investment activity in durable equipment and construction work, connected with important economic innovations. He attributes the minor cycles, however, primarily to fluctuations in inventory investment.

In Hansen's view the ebb and flow of inventories not merely "dominates the so-called minor cycle"; he contends also that inventory investment is an important stimulus to revival after major depressions. In the period covered by the national product data to which he refers, there were two such depressions, 1920-21 and 1929-32. The improvement in business from 1921 to 1922 was accompanied by an increase in inventory accumulation; that from 1932 to 1933 was accompanied by a sharp decline in inventory liquidation. Both, of course, helped to raise the level of business. Hansen concludes (p. 60) that "inventory investment plays consistently an important role in the initiation of revival".

Professor Hansen's theories may prove important leads toward an understanding of business cycles. The influence of inventory investment in long and short cycles and its role in initiating revivals and recessions are studied below in the introduction to Part Three, and in Chapters 14 and 21.

METZLER'S THEORY OF SELF-GENERATING INVENTORY CYCLES

The idea that the short business cycle is to be attributed mainly to fluctuations in inventory investment has been developed further by Lloyd A. Metzler.[23] He has formulated a theory of short cycles

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[22] (Norton, 1941). Professor Hansen emphasized also the importance of a cycle in building construction with an average period of 17 to 18 years.

[23] Nature and Stability of Inventory Cycles, *Review of Economic Statistics*, Aug. 1941, and Business Cycles and the Modern Theory of Employment, *American Economic Review*, June 1946.

on the simplifying assumption that the sole effects of a change in income are certain adaptive responses in inventory investment together with the secondary changes in incomes and consumer expenditures caused by business outlays to increase stocks.

Metzler bases his theory on two hypotheses:

1) The economic system is essentially stable, though subject to more or less regular oscillations. The oscillations are marked by cycles of investment, income, and expenditure induced by impulses that may originate in preceding phases or may be of independent origin (such as the commercial application of a new invention). The cycles are, however, self-limiting and self-reversing fluctuations about an equilibrium level.[24]

2) Oscillations of income about its equilibrium level may consist of several cycles reflecting the response of various activities to the same impulse or impulses. Individual cycles are attributed to induced demands for consumer or producer durable goods, to the demand for housing and for inventories. Other cyclical responses are, of course, possible. Each presumably has special features of its own that in isolation would give rise to business cycles with characteristic amplitudes and durations. In practice, of course, the several cycles impinge upon and modify one another, producing the complex business cycles of experience.[25]

Metzler's articles are directed to the theory of inventory cycles, that is, to the character of the general business cycles that would be generated by the response of inventory investment to a change in income. His general picture of events during an inventory cycle runs as follows:

1) The first effect of an increase in income and expenditures is a

[24] The equilibrium level is defined as equality between intended saving and intended 'non-induced' investment (i.e., investment not itself motivated by a cyclical change in the rate of expenditure). The tendency for oscillations to reach a peak and reverse their direction is implicit in the hypothesis that the relation of increases in income to consumers' expenditures, on the one hand, and to induced investment, on the other, eventually retards the rate of increase in income. This causes the rate of induced investment to fall, which in turn causes an absolute decline in income.

[25] This concept of the general character of business cycles is now fairly common, as Metzler points out. In particular, it has been described at length by J. M. Clark in his *Strategic Factors in Business Cycles*, and has been developed also by later writers who have based their work on Keynes' theory of employment equilibrium.

decline in inventories because producers are unable to expand output rapidly enough.

2) Thereafter production is increased both to meet the bigger demand and to replenish inventories and build them up in consonance with the larger output.

3) As output is stepped up, demand also rises and stocks remain abnormally low, despite efforts to increase them. Nevertheless, since consumers do not spend all their augmented incomes, stocks do increase to some extent.

4) Eventually incomes rise to a level consistent with the rate of non-induced investment (investment, that is, not sustained by the cyclical increase of incomes). They do not stop at this level, however, since inventories are still low relative to the rate of activity. Inventory investment, therefore, pushes incomes still higher.

5) Metzler describes the reversal of business activity as follows (*American Economic Review*, June 1946, p. 288):

"Once the level of income has risen above its new equilibrium, a subsequent decline is inevitable. The inflated level of income is sustained and increased only by investment in inventories, and such investment cannot be continued indefinitely. As income rises, inventories also rise, and this process continues until a normal relation between inventories and expected sales is established. Thereafter, business men plan no further increases in stocks; they attempt, instead, to produce only what they expect to sell. Since production plans in earlier periods included production for stocks as well as for sale, the decision to produce only for sale means an absolute decline in total output. As a result, income in the hands of consumers declines, sales are reduced, and a period of general contraction develops. The contraction is accelerated by the fact that sales fall below expectations, since this causes inventories to become abnormally large and business men therefore reduce output still further in an attempt to restore their stocks to a normal level."

From this point forward, Metzler's description of contraction and revival is symmetrical with the description of expansion and recession set forth above. In the absence of further disturbances from outside the system of business responses or adaptations, Metzler expects that developments in contraction will lead to another revival, and so on around. But he thinks subsequent cycles will be highly damped.

Metzler's model is interesting because it presents not only a modern theory of business cycles in which inventories play a leading role but also a fairly definite hypothesis about the cyclical behavior of inventories that may be tested. Metzler assumes that stocks act in the following fashion:

1) Inventories rise after the peak of business and begin to fall only some time after contraction has started; they continue to fall after business has reached its trough and begin to rise only some time after expansion is under way.

2) The rate of inventory accumulation reaches a peak near the peak of business and a trough near the trough of business. It is not clear, however, whether the intended investment just preceding the peak is larger or smaller than the unintended investment immediately following it. Nor is it clear whether a period of low investment intervenes between the intended investments of late expansion and the unintended accumulations of early contraction. Similar remarks might be made about the cyclical trough.

3) The inventory-output (or inventory-sales) ratio must fall immediately after business begins to revive. Thereafter it may continue to fall or reverse its course. Toward the end of expansion, however, it must be rising, for Metzler holds that planned inventory investment reaches a peak when a 'normal' relation between inventories and sales is established. Since the first effect of expansion is to establish an abnormally low ratio (sales increase while inventories fall), the ratio must start to rise later and continue to rise until the end of expansion. In contraction the expected development is symmetrical but opposite.

BLODGETT'S ANALYSIS OF THE EVIDENCE

To my knowledge, the only systematic empirical study of cycles in the stocks of American manufacturers is Ralph H. Blodgett's *Cyclical Fluctuations in Commodity Stocks* (University of Pennsylvania Press, 1935). In his valuable pioneer work, Blodgett examined a considerable part of the material used in this report and, indeed, analyzed his data by means of the National Bureau measures of cyclical behavior. My material, however, differs from Blodgett's in several respects. I discarded a few of the series Blodgett studied because they included inventories held by nonmanu-

facturers in too great a degree, because they were deemed insufficiently reliable, or because they covered too short a time span. Many of Blodgett's other series, which I too studied, are now available for a longer period than when he wrote. Finally, I had the advantage of a considerably larger body of data, in particular the estimates based on corporation balance sheets, the only comprehensive data on manufacturers' inventories as a whole.

Despite these differences in data, Blodgett anticipated the results of this study in certain notable instances. For example, he concluded that, while stocks of finished staple goods held by manufacturers normally increase during business contractions and decline during expansions, this inverted movement is reversed in the course of long and severe contractions, and stocks tend to decline together with business activity.[26] This and certain other detailed instances of agreement and disagreement between Blodgett's findings and my own are noted at various points below. Here the important thing to record is Blodgett's general conclusion about the cyclical behavior of manufacturers' stocks (p. 104):

"Some of the stocks of finished commodities and materials held at the producers' . . . are positive in their cyclical movements, while others are inverted. These two groups of stocks appear to be quite equal in so far as numbers are concerned. When it is remembered, however, that the stocks of the inverted type are very much larger than the stocks of the positive type, on the average, and are much more active cyclically, the necessary conclusion is that stocks of finished commodities and materials at the producers' of the finished products show a net tendency toward inverted cyclical behavior in relation to the reference cycles of general business."

Now this statement, by itself, is rather seriously at variance with my conclusions, which, as we shall see, are that cycles in manufacturers' stocks as a whole tend to conform positively to cycles in business activity at large, though with a lag perhaps as long as 9 months. It is well, however, not to overstress the difference between our conclusions. At least a substantial minority of business cycle phases are no longer than 18 months, so that if stocks lag

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[26] Op. cit., pp. 53, 54. Blodgett does not present empirical support for the conclusion that this class of stocks acts differently in long and short phases. It is, however, essentially correct, as will be seen below; and is true for expansions as well as contractions.

as much as 9 months, they move counter to business activity for a major portion of these short phases, though not for their entire length, as Blodgett implies. Among American business cycles since 1855, 4 of 21 expansions and 13 of 21 contractions did not exceed 18 months.[27] Add to this Blodgett's belief that positive conformity may be expected in long severe contractions, and it will be seen that our findings, though different, are not wholly dissimilar.

GENERAL CHARACTERISTICS OF THE LITERATURE

This review of earlier work suffices to suggest the major ideas advanced and to illustrate the startling differences among economists' notions about inventory behavior. From Mitchell's suggestion that stocks move in rough positive conformity with business activity to Hawtrey's theory that cycles in stocks of finished goods and of goods in process are approximately offsetting, to Blodgett's finding that manufacturers' stocks as a whole normally vary inversely to business activity, one traverses almost the entire range of possible hypotheses about inventory behavior. Meanwhile, with the notable exceptions of Clark and Metzler, singularly little attempt has been made to state precisely how inventory investment acts. Yet from the standpoint of the impact of inventories on business cycles, investment counts more than the level of inventories.

There is another prominent characteristic of the literature: all the ideas about inventory behavior reviewed above except Blodgett's are exceedingly simple and general. Distinctions are few; in some cases the same behavior is implicitly attributed to the stocks of both merchants and manufacturers. In others the divisions are broad indeed: between working and liquid capital or between finished goods and goods in process. A review of the evidence on manufacturers' holdings, however, indicates that such simple theories will not do. The behavior of manufacturers' stocks is a compound of the diverse behavior of many classes of stocks.

The literature exhibits a striking variety of views in other ways. With respect to the forces controlling stocks, Hawtrey stresses the influence of interest costs. Clark and other writers who depend upon the acceleration principle hold that the level of stocks is determined by sales or output. Mitchell and many other students

[27] *Measuring Business Cycles,* p. 78.

assign some regular, significant influence to price expectations, among other causes. The 'overproduction' theorists in earlier times and Keynes more recently held that stocks are redundant at some stages in cycles, deficient at others because changes in production do not keep pace with changes in sales to ultimate consumers.

Finally, turning to the impact of inventories on business, we find a number of intriguing suggestions. There is general agreement that stocks influence business cycles chiefly through changes in the expenditures businessmen make with the purpose of increasing their inventories, that is, through changes in the amount of investment planned per time period. So if the magnitude and timing of such planned expenditures relative to other actions by businessmen and consumers can be determined, we should be in a position to state how inventories make their influence felt and how strong that influence is. On these questions, however, earlier writers are in disagreement. Clark suggests that planned inventory investment rises, generating an expansion in business, as long as sales and output grow at an increasing rate; thereafter it begins to drop, tending to depress business. In contraction the rate of planned investment falls (or liquidation increases) as long as sales drop at an increasing rate. In this stage inventory investment has a depressing influence, but when the decline in sales is retarded, the rate of liquidation also is reduced, which spurs business activity.[28]

Keynes holds that inventory policy influences the severity and duration of contractions in a special way. He begins with the idea that contractions open with an undesired accumulation of stocks because business is unable to reduce output as fast as sales fall off. The attempt to liquidate these redundant stocks causes a precipitate drop in orders and output. And since this in turn causes incomes and, therefore, sales to fall, the period of liquidation is necessarily protracted, requiring, in Keynes' opinion, from 3 to 5 years.

Hansen advances the idea that business cycles differ in the importance of fluctuations in inventory investment as causal factors. He distinguishes a relatively long cycle, of about 10 years, which he attributes to a wave of investment in durable goods and construc-

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[28] This is an unduly simplified version of Clark's position since he allows for business forecasts of changes in sales and in prices and for the time it takes to execute decisions and translate them into actual outlays.

tion. In the course of the upswing of such equipment cycles, how-
ever, he believes that inventories from time to time become seri-
ously out of balance with sales and output. Business contractions
then develop owing to sharp reductions in inventory investment.
In Hansen's view, therefore, the upswings of relatively long cycles
are broken into shorter cycles during which contractions of invest-
ment in plant and equipment are small. Consequently, changes
in output during short cycles largely take the form of changes in
the rate of inventory investment. In the longer swings the relative
importance of changes in inventory investment is smaller.

This wide variety of theories about the cyclical fluctuations of
stocks, their causes, and their impact on business cycles is a good
starting point for this study. Those that raise questions the data
can be organized to answer are reexamined below. Others are
helpful because they aid in defining the significance of the results
yielded by this investigation. And still others will serve to remind
us of issues raised by earlier work that this study was unable to re-
solve.

3   Materials for the Study of Manufacturers' Stocks

The views held in the past about the behavior of inventories dur-
ing business cycles, in both their diversity and simplicity, reflect the
paucity of the information available for study. Even now when
records of inventories are much better, and even in the United
States, for which records are more plentiful than in other countries,
they are seriously inadequate.

Data on American manufacturers' stocks fall into two blocks.
First, there are estimates of the value of inventories based on com-
pany balance sheets or other books of account. The most com-
prehensive estimates that utilize such materials are those prepared
by Simon Kuznets for the period since 1918. From 1926 forward
Kuznets built upon virtually complete reports for all corporations
filed for tax purposes. Before 1926 he depended in part upon tax
reports and in part upon smaller samples of corporations. Supple-
menting Kuznets' data are estimates by other investigators who
rely upon somewhat different sources and methods, cover differ-
ent but overlapping periods, and include both yearly and monthly

reports. These series are in current values; Kuznets' data have been corrected for changes in prices and so constitute indexes of the physical volume of manufacturers' stocks.

Because of the breadth of their coverage the estimates based on corporate accounts offer the best, indeed the only fairly reliable, picture of the behavior of manufacturers' stocks as a whole. For this purpose they are invaluable. But they have serious deficiencies for an analytical study of inventory cycles. The estimates that cover a considerable number of business cycles are based on annual reports, an obvious defect in studies of business movements whose duration from peak to trough is sometimes no longer than 12 or 18 months. Of the two available sets of monthly data, one starts in 1929 and covers only two contractions and one expansion in general business before the beginning of World War II. The other begins in 1939, after the close of the last prewar cycle.

Another difficulty with the estimates based on corporate accounts is their inadequate classification. Total holdings by manufacturers are divided into a relatively few broad industrial groups each of which comprises several large industries. Our analysis, however, suggests that the classification of inventories that best illuminates the factors governing inventory behavior runs by stage of fabrication—raw materials, goods in process, finished goods—and by subdivisions of these stages, rather than by industry.

A final difficulty with this block of materials is that it necessarily reports inventories in dollar values. Changes in the reported level of stocks are, therefore, affected by changes not merely in physical quantity but also in unit value.[29] To get an index of the physical volume of inventories it is necessary to correct the reported value figures for the influence of changes in prices, an inherently treacherous and inaccurate process.

Despite all these limitations, the materials derived from corporate accounts are of prime importance. They are based either on large samples of corporations or on full reports for all corporations. And despite their defects with respect to form, subdivision, and frequency, they outline at least roughly the movements

[29] The revaluation of inventories that accompanies changes in prices is in itself a matter of great interest, for it accounts for a large proportion of the changes in the book profits of enterprises. A forthcoming National Bureau study of cyclical changes in profits will discuss this subject.

of manufacturers' stocks as a whole. A theory about the cyclical behavior of manufacturers' total holdings can be constructed also from the movements of series representing stocks of particular commodities. As we shall see, however, it is an hypothesis full of gaps that must be filled by speculation, and it gains credibility only because it can be checked against the broad pattern of manufacturers' inventory cycles traced by the nearly complete data from corporate accounts.

Supplementing the data from corporate accounts are a considerable number of series representing the holdings of specific commodities in physical units. The 38 such series used constitute all the data that seemed sufficiently trustworthy and covered a long enough period to contribute to a study of business cycles. The sources and composition of the individual series are described in Appendix G and, as far as necessary, at appropriate points in the text. Their faults and virtues are the antitheses of those of the corporate reports. The commodity materials are in no sense a large or representative collection. Aggregated in any simple fashion, they would present a misleading picture of the behavior of manufacturers' stocks as a whole. On the other hand, they are reported in physical units and at monthly or quarterly intervals and, best of all, they cover the holdings of a considerable variety of important types of stock. By classifying these series in significant ways and by close study of their similarities and differences, we can derive valuable information about the factors that account for the cyclical behavior of stocks in the aggregate.

4 Plan of the Study

Although this report is concerned primarily with manufacturers' stocks, brief notice is taken in Chapters 4, 5, 14, 15, 20, and 21 of the cyclical behavior of stocks held in the other principal divisions of the economy. The body of the report is presented in Parts Two and Three. Part Two deals with cycles in the level of inventory holdings, Part Three with cycles in inventory investment. The organization of the two parts is similar. Part Two begins with an investigation of manufacturers' total holdings. It attempts to answer two questions: first, do manufacturers' stocks typically rise during expansions of general business and fall during contractions;

secondly, do inventories typically reach their peaks and troughs before or after business activity? By studying cycles in the ratio of inventories to sales and output we attempt to discover also whether inventories 'pile up' or become unduly large during business expansions. An explanation of the typical behavior of total inventory holdings is then sought in succeeding chapters through studies of several categories of stocks: raw materials, goods in process, and finished goods, as well as various subcategories. As these classes typically behave in widely different fashion, there can be no simple theory about the cyclical behavior of manufacturers' stocks. An explanation is offered for the behavior of each category. The action of the total can be roughly accounted for in terms of the diverse behavior of the several components.

Part Three is concerned with cyclical changes in inventory investment, that is, with changes in the pace at which stocks are built up or liquidated. Dealing first with the timing of inventory investment cycles, it asks whether the peaks and troughs of such investment regularly precede, follow, or coincide with the peaks and troughs of business cycles. It takes up next the relative timing of turning points in inventory investment and those in the rate of change in output. Ensuing chapters are devoted to a study of the behavior of investment in different types of stock. These studies are the basis for an explanation of the timing of cycles in aggregate investment. A final chapter examines the magnitude of the changes in inventory investment between prosperity and depression, compares them with changes in other components of total output, and presents a theory to account for the relative importance of inventory investment fluctuations in cycles of different lengths.

Since this investigation tries to build a theory of inventory cycles from a systematic examination of the data, the exposition is necessarily long and tedious. Specialists who wish to satisfy themselves about the validity of the results will, of course, want to study the entire report. Readers with more general interests may grasp the essentials by following a more selective reading plan. For them, the following notes may be useful.

The gist of the argument may be found in Chapters 4-5, 13-14, and 20-1. Chapters 7-12 are concerned with detailed studies of cyclical fluctuations in stocks of different types: goods in process,

raw materials, finished goods, and several subdivisions of these
classes. Chapters 16-19 contain similarly detailed studies of fluctua-
tions in investment in different kinds of inventory. These chapters
are the foundation for the more general accounts of inventory and
inventory investment cycles in Chapters 13 and 20, but the non-
professional reader may wish to accept the details on trust. Other
chapters are outside the main stream of the argument or serve an
ancillary purpose. Chapter 6 is a digression on cycles in inventory-
sales and inventory-output ratios. Chapter 2 compares manufac-
turers' stocks with holdings in other branches of the economy.
Chapter 3 describes the measures and discusses their reliability.
Briefer descriptions of the measures appear where they are first
employed. But Chapter 3 will serve readers who want a fuller ex-
planation or who do not read the book as a whole and so miss the
explanations of measures where they appear in the body of the
argument.