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CHAPTER 14

The Timing of Manufacturers' Orders During Business Cycles

Victor Zarnowitz

I. General Considerations

THE manufacturing sector has been particularly active in the cyclical movements of the United States economy, according to the historical records of several decades. Factory employment and output have moved in close rhythm with the business cycle. Comprehensive series representing essentially these two variables were selected by Geoffrey H. Moore as "roughly coincident" indicators of cyclical revivals and recessions.[1] In this area, conformity to general economic fluctuations is, on the whole, high even for series of narrower scope, representing employment, production, or shipments of individual industries. The specific cycle turns in the manufacturing series definitely tend to cluster about the dates selected by the National Bureau as peaks and troughs in aggregate economic activity.[2]

We shall not consider at any length now the reasons for this relatively

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[1] These are: (1) nonagricultural employment, Bureau of Labor Statistics (and its historical equivalent, the index of factory employment compiled by the BLS and, for earlier years, by Harry Jerome for the National Bureau); (2) industrial production index, Federal Reserve Board (in which the weight of manufacturing is about 90 per cent and that of mining output 10 per cent). See Chapter 7, Table 7.11.

[2] It will perhaps be said that this is not surprising, since these so-called reference dates were themselves identified from time-series records, among which those for factory production are quite numerous. But the statement, if not further qualified, would be a gross oversimplification. Obviously no serious objection of circularity can be raised to comparisons between specific cycle turns in any individual series or relatively small group of series and the business cycle turns; the selected processes are but a fraction of those that supplied the turning dates underlying the chronology of the nation-wide fluctuations. Different processes vary greatly in their cyclical timing and in the regularity and sensitivity of their cyclical reactions. The common reference chronology facilitates measurement and appraisal of such differences among activities, and it performs this function for both the individual series and the comprehensive aggregate. But it should be noted that, for any type of economic process, a comprehensive series is likely to conform better to business cycles than a series of narrow scope, since it will be less influenced by movements peculiar to specific industries or localities, and more by the economy-wide tides of expansion and contraction.

close correspondence, but some points bearing on the explanation are easily listed. Many companies experience large cyclical fluctuations in demand and react to them strongly, primarily by output adjustments. Industries in which there are many such companies constitute an important part of manufacturing, which in turn is a sector that carries much weight within the economy as a whole.

The above has a clear implication for the cyclical analysis of new orders for industrial commodities. If peaks and troughs in aggregate output of manufacturers on the average roughly coincide with like turns in business cycles (without any significant leading or lagging), peaks and troughs in the corresponding total of new orders should be expected typically to lead these business cycle turns. This should be so, at least, when both new orders and production are measured in the same units (current or constant dollars or physical units). In production to order—where manufacturing is undertaken in direct response to specific advance commitments—new orders must of course lead output. There is evidence to show that production to order accounts for a very large proportion of total manufacturing. Moreover, even in production to stock—where goods are made in anticipation of the demand for them and sold from finished inventory—incoming business is likely to precede output.

The relations, expected and observed, among orders, production, and shipments in manufacturing industries are examined at length in the author's forthcoming monograph on the cyclical behavior of manufacturers' orders. A condensed account of this subject is given in the next section of this paper in order to introduce the distinctions that proved useful in studying these relations and to see whether these same categories can also be useful in interpreting observations at business cycle turns.

Meanwhile let us resume the argument that new orders would be expected to lead the business cycle because they lead the output of products to which they give rise and stimulate ordering of other goods needed for that production. This is a broad and simple notion which is certainly not without merit as far as it goes. But it is also, in a sense, formal and limited to the surface of the matter. Clearly, the timing of new orders can never be *explained* by reference to the timing of production of the order-receiving industries: the causal connection runs from commitments or sales to output, not the other way round.

A thoroughgoing explanation of why the major categories of new orders turn when they do is indeed one of the principal tasks of business cycle theory. This will hardly be disputed in view of the undoubtedly dynamic and critical role of the demands represented by the new order series. But the task is very complex: commercial and industrial buying depends on many economic processes just as it influences many. More-

over, the available data on new orders are ill designed for use in such analyses as are here required.[3]

Fortunately there is much to be learned from measures of cyclical behavior of the data that we are able to gather and put in usable form; and concern with explanations of a wider range should not delay the presentation of these measures, but rather provide a stimulus to assimilate them in a more comprehensive inquiry. Our plan calls for a discussion of cyclical conformity and, in particular, of the timing of new orders at major turns in aggregate economic activity (section III). One of the questions to be dealt with is which industries saw their receipts of orders turn early at general revivals and recessions, and which saw them turn late. Any persistent traits in such sequences deserve careful attention. They would bear upon the problem of interrelation of the demand flows, and imply some systematic tendencies in sequences of production turns for the same industries. Following the major section on timing of new orders at business cycle turns is an account of the cyclical changes in industry's backlog of unfilled commitments (section IV). Section V contains a cyclical analysis of diffusion indexes based on new orders and related data. In section VI we give a brief preliminary account of the relation of new orders for investment goods to plant and equipment expenditures, a matter of substantial interest to the analyst and forecaster of general business conditions. The last section (VII) summarizes the findings of the study.

II. Relations Among Orders, Output, and Shipments in Manufacturing Industries

SYSTEMATIC DIFFERENCES IN AMPLITUDE OF FLUCTUATION

Except at times when ordering is limited by sellers who temporarily close their order books or by governmental action, data on new orders represent a measure of current demand. The flow of demand is very unstable for many types of manufactured product, due to a number of factors, some of which are familiar from analyses of broad categories of expenditures, in particular investment outlays. Cost and efficiency considerations make it imperative for manufacturers to strive after greater

[3] For example, to analyze what determines the fluctuations in buying of materials for industrial production, data on new orders *placed* by manufacturers with their suppliers are needed, but this information is largely unavailable. The situation is better but still far from satisfactory in some other areas. Purchasing for trade depends considerably on sales to consumers; here data on new orders placed by department stores and on sales of the same firms are helpful, although better and additional statistics are still required. For an analysis of what these data tell about the role of retailers' orders in transforming fluctuations of consumer demand and transmitting them to earlier production sectors, see Ruth P. Mack and Victor Zarnowitz, "Cause and Consequence of Retailers' Buying," *The American Economic Review*, March 1958, pp. 18–49.

stability of their outputs relative to fluctuating demand. Factors independent of any deliberate actions of the producers also supplement at times their stabilization policies. The joint effect of both sets of influences is that a considerable measure of stabilization is achieved in various industries most of the time. The relative amplitudes of both cyclical fluctuations and shorter movements are systematically larger for new orders than for the corresponding series on current manufacturing operations.[4]

In discussing these regularities an important distinction must be drawn between production to order and production to stock. When finished inventories change in an "inverted" fashion, i.e. increase during contractions and decrease during expansions in demand, it is always an indication that some output stabilization has been achieved, although it is not always a result of planning for stabilization.[5] But this, of course, presupposes the existence of substantial unsold stocks, that is production "for the market" rather than to specific orders. Other ways to stabilize production must be sought by manufacturers of goods made exclusively or predominantly to order (products made to individual specification, or unstorable, or subject to sporadic, style-sensitive, or unpredictable demand). These manufacturers cannot or will not accumulate finished goods inventories, but they may at times be in a position to accumulate a backlog of orders. If they carry it over, as surplus of work to be done, from a period of expanding into a period of contracting business, they will then be able to draw upon it and thereby maintain for some time satisfactory levels of activity.

In times of demand pressures when the position of suppliers is strong ("seller's markets"), many manufacturers will obtain advance orders in sufficient volume and have a sufficient degree of discretion over the delivery dates to be able to initiate a stabilization policy of this type. Indeed, at such times order backlogs may well accumulate even without any planned action by producers to achieve this result; some accumulation will occur as long as demand is not deterred (by substantial price increases) from rising above the levels of full capacity production.[6]

[4] The evidence on this and other points made in this section is given in the author's monograph referred to above.

[5] Accumulation of unsold stock may, of course, be due to incorrect sales forecasts rather than to an intention to work for surplus inventory to keep current activity from falling off too drastically when sales decline.

[6] During a single month, a firm cannot *fill from current output* more orders than its capacity permits, but it can *receive* orders far in excess of that amount. The capacity constraint, then, works in the same direction as a deliberate policy of using order backlogs for output stabilization. To note a formal analogy: the nonvolitional factor in the accumulation of unfilled orders during a boom expresses the inability of output to *follow* the course of sales, while the nonvolitional factor in the accumulation of unsold stock during a slump reflects the inability of output to *anticipate* the course of sales.

Ultimately, the effectiveness of such a policy or process depends also upon the firmness of the received orders. But there is ample evidence that changes in unfilled orders are an important instrument in stabilizing output in certain major industries. Thus we find that unfilled orders have a general positive conformity to business cycles and to major fluctuations in the output of the corresponding industries. Moreover, the predominant tendency of production to move cyclically in the same direction as new orders (with a lag) becomes temporarily inoperative in certain periods following accumulations of considerable backlogs. A major (but not very long) contraction in new orders would then be accompanied by stable or even moderately increasing output and shipments.

PRODUCTION TO ORDER AND PRODUCTION TO STOCK

The distinction between goods made typically to order and goods made typically to stock is particularly important in the analysis and interpretation of *timing* relations among new orders, production, and shipments. In the case of a pre-ordered commodity, the time sequence is, of course, invariably new orders-output-shipments. The lag of output behind orders may well be long, due to a long production period, or a long delay before new orders are started in production, or both.[7] The lag of shipments behind output is likely to be short. In manufacture to stock, on the other hand, output need not necessarily follow upon new orders, which are here coincident with shipments. It could well lead them, and in fact occasionally does, although the prevailing tendency seems to be for output of various finished staples to lag behind orders or shipments by short intervals, presumably because of the difficulties and hazards that are usually associated with making sales forecasts and acting upon them.[8]

In practice, a manufacturing concern produces as a rule not one but several or many products, of which some may be made to order and others to stock. In some lines of business, both types of production policy may be pursued by different firms, or by the same firms at different times. If only for these reasons, empirical estimates of the order-output-shipments lags for various industries or products must not be expected to show such sharp and systematic differences as the contrast between the two simple models—pure production to order and pure production to stock—might

[7] The lag must be at least as long as the technically necessary production period; on new models and applications it will often be considerably lengthened by the time needed for planning, designing, procuring skills and materials, testing, etc. It will be longer than the production period in the broadest sense of this term if there is a backlog of unfilled commitments, the work on which is being scheduled and carried out according to the priority ratings of the various orders.

[8] Cf. Moses Abramovitz, *Inventories and Business Cycles*, New York, NBER, 1950, pp. 256–262. The reference in the text is to finished nonperishable staples made from storable materials—the class of goods best qualified to be produced "for the market," i.e. not for specific orders.

suggest.[9] What can be expected is that they will reflect these differences in a more or less muted form, roughly in accordance with the degree to which one or the other type of production prevails in the industries analyzed. But how strong is that prevalence, especially in the more broadly defined industries? In a classification of industries according to the relative importance of production to order, would the timing relations among orders, shipments, and output differ significantly as envisaged?

To establish the distinctions needed to answer these questions requires an examination of a variety of data, but our main method is to compare for each industry or product for which information was available the levels of finished goods inventory (F) and of unfilled orders (U). Where F is typically higher than U, production to stock is said to prevail; where F is typically lower, production to order. The rationale of this is that when all output is made to stock, F (consisting of product not yet sold) is always positive, while U is nil. In pure production to order, on the other hand, F is probably small absolutely and certainly small relative to U (unsold stocks are nil and sold stock would accumulate in larger volumes only if deliveries lagged behind output by long intervals, which is unlikely). The industries for which we have data on both variables must, of course, be situated somewhere between these two extremes. The greater the importance of goods made to order in its total output, the closer will an industry approach the first limiting case and the lower will be its representative F/U ratio. Conversely, the larger the share of production to stock, the higher will be the ratio.[10]

[9] Still other complications arise in measuring timing relations. It is often difficult to identify and match the turning points in activities that are subject to seasonal and irregular variations as well as cyclical and longer-term movements. Among individual comparisons of this type, some may very well be of problematic significance, reflecting mainly erratic or episodic influences. Thus occasionally disagreement with the expected patterns of timing may be due to technical errors of observation or measurement. However, lapses will most likely be rectified, and sensible and essentially correct results obtained, when the comparisons at individual turns are averaged to estimate the timing relation typical of the given industry and period (assuming, of course, that the method is applied to a significant sample of proper data).

[10] The ratios were computed from monthly averages of F and U for each complete calendar year covered by the data, and expressed as percentages. As would be expected, these annual series of the average stock-backlog ratios move inversely to cycles in the given industry's activity and indeed usually to the business cycle at large. To take account of the cyclical factor, separate averages were computed of the ratios for the expansion (including peak) years and for the contraction (including trough) years, using the National Bureau's annual reference chronology. The averages—we used medians to avoid distortion by the extreme items which are here as a rule very unrepresentative—are in all but a few cases higher for the contraction than for the expansion years. But we find that the ratio series, while all fluctuating cyclically, group themselves easily into two major categories: those which in most years, expansion and contraction alike, move substantially below the level of 100 (i.e. $F < U$) and those which move in a parallel fashion above that level ($F > U$). We infer that the former represent mainly goods made typically to order and the latter goods made typically to stock.

On the whole, the evidence of the stock-backlog ratios conforms to what would be expected. For example, the ratios are low in both good and bad business years for steel sheets, which are known to be made largely to specification, and extremely low throughout for steel barrels and drums, a heavy item of industrial equipment. The ratios run below the level of 100 for those textile products which are style-sensitive or must meet individual buyer requirements, e.g. men's wear wool fabrics and yarns, cotton and worsted. They are, on the other hand, higher than 100 for various finished staples: textile products such as hosiery or sheets, construction materials such as southern pine lumber or face brick, residential building equipment such as oil burners or bathroom fixtures. In section IV those individual industries and products for which we have measured the timing of new orders at business cycle turns are classified according to whether they represent manufacture to order or manufacture to stock (see Tables 14.2 and 14.3).

The output of a major industry can be very heterogeneous in its composition by goods made to order and goods made to stock (a telling example is provided by textile products). This does not impair the significance of the stock-backlog ratios for such industry groups as primary metals, machinery, and transportation equipment, where they indicate very much what would be expected, namely a heavy preponderance of production to order. According to the ratios of still more comprehensive aggregates, industries which sell mainly from future output are decidedly dominant in the composite of all durable manufactures. In contrast, production to stock apparently prevails within the aggregate of nondurable goods industries. For manufacturing as a whole, the evidence suggests that sectors working to order outweigh those working for stock, and this despite the inclusion here of seven major nondurable goods industries whose backlogs of unfilled orders (not reported) are assumed negligible and treated as zero.[11]

TIMING RELATIONS

We were able to match series on new orders and shipments for two groups of individual industries and products: eleven items representing manufacture to order (I) and seven items representing manufacture to

[11] The period covered by the major industry data, beginning in 1939, includes mostly years of good or excellent business conditions. However, even in 1939, which was still quite a poor year, finished stocks amounted to no more than 88 per cent of unfilled orders for all manufactures (48 and 229 per cent for total durables and total nondurables, respectively). In the weakest of the postwar years, 1949, the corresponding ratios were 52, 25, and 279; and at the peak in the total order backlogs, 1952, they fell to 20, 10, and 256 per cent. The over-all median ratio for the entire period is 23 per cent, which on the logic of the test is a strong indication that the greater part of manufacturing production is organized on the order basis.

stock (II).[12] A close inspection of these series and a count of turns covered and matched show that order and shipment series have largely parallel cyclical movements. In a few cases new orders have a somewhat larger number of specific cycle turns than shipments, that is some additional cyclical movements. But practically all of the peaks and troughs in shipments are matched by like turns of new orders, in either group of data.

The timing patterns differ distinctly between the two groups, however. The leads of new orders over shipments tend to be both shorter and less regular for the sample of goods made to stock than for the sample of goods made to order. When items in each sample are ranked by the average lead of orders, we find that the *shortest* mean lead in group I (1.6 months) differs little from the *longest* comparable lead in group II (1.9 months). In other words, there is little overlap between the two arrays; rather the one for the order-made commodities stops descending toward ever shorter leads approximately where the other begins. The timing averages for the items representing manufacture to stock are all contained within the range of "rough coincidences" (leads or lags not longer than three months and instances of synchronous timing), although a tendency toward short leads of orders is distinguishable. The comparable measures for the items representing manufacture to order vary over a long range, but eight out of the eleven are leads of from four to eleven months. Distributions of the individual timing comparisons within each set provide further demonstration of the contrast between the two groups. In short, the facts support the expectation that new orders anticipate shipments by longer intervals and more regularly for goods sold largely in advance of production than for goods sold largely from finished stocks.

Another block of evidence showing the tendency of new orders to lead shipments is provided by aggregate value series for major industries (the current estimates of the Office of Business Economics are the principal data here). These industries cannot be divided between goods made to order and goods made to stock, but can be grouped according to the durability of their products. As mentioned before, the stock-backlog ratios indicate that manufacture to order prevails heavily among the durables and manufacture to stock among nondurables. The evidence of the timing measures accords with the expected relations: the leads of new orders over sales, i.e. the value of shipments, are on the whole longer for the durable goods than for the nondurable goods sector of manufacturing.[13]

[12] For the composition of the two groups, see Table 14.3. It will be noted that group I consists mainly of highly complex or specialized or large-unit and expensive goods used by producers: iron and steel products, industrial machinery and transportation equipment. In contrast, the products in group II are much more standardized and closer to the needs of consumers, associated most of all with residential construction.

[13] The average lead of orders at six turning points in durables sales during 1948–58

According to the a priori argument, the timing relative to new orders of *output* need not show a systematic difference between production to order and production to stock, such as is largely predictable for the comparisons of incoming business with *shipments*. Factual evidence is much needed here; data on new orders and output (all in physical terms) can be matched only for a few individual industries.[14] Timing comparisons for this regrettably small sample show a tendency for the turns in new orders to anticipate the turns in production, but most of these leads are short, averaging about three months or less. There is no evidence here that the over-all timing patterns differ significantly for the two groups. This is consistent with the notion that new orders guide and hence anticipate production even in those industries in which they are customarily shipped from stock shortly upon receipt. However, it should be noted that these timing records, besides being scanty, refer to products which, in terms of the order-shipment comparisons, are not very sharply differentiated.[15] It is not unlikely that order-output comparisons for a more representative sample would show more of a contrast between the two types of manufacture (as the comparisons with shipments for such data certainly would).

PRODUCTION PERIOD, CAPACITY UTILIZATION, AND ORDER-BACKLOG POSITION

Technological factors are as a rule significant in determining the relation between new orders and manufacturing production. Interindustry differences in the average length of the order-output leads apparently reflect the variation in production periods. Thus railway equipment, heavy and specialized machinery, and structural steel, which includes some of the most elaborate steel products, all have long order leads, averaging six months and more. Industries or groups of commodities that are presumably less heavily weighted with complex or specialized types of product—pig iron, steel sheets, paper products, furniture, and woodworking machinery—have shorter average leads, of four months and less.

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was 4.8 months. For total nondurables, the mean of the four timing comparisons that can be made over the same period is −0.2 months, suggesting a closely synchronous relation. But most of this difference is because, for the most part, orders received by nondurable goods manufacturers are *assumed* to equal sales (in the absence of reported order backlogs). For the rest of the nondurables division—four major industries reporting unfilled orders—the average lead of the value of incoming business at the eight turns in the value of shipments, 1948–58, was respectably long (4.1 months).

[14] We have used series for merchant pig iron, steel sheets, paper (excluding building paper and newsprint) and paperboard to represent manufacture to order, and oak flooring and southern pine lumber to represent manufacture to stock. Comparisons were made at production turns falling in the years 1917–56.

[15] That is, merchant pig iron, steel sheets, and paper are among those order-made items that have relatively short shipment lags, while oak flooring and southern pine lumber rank high in length of lags among the components of the "made-to-stock" group. The averages in Table 14.4, col. 2, summarize the evidence.

So much for the evidence of individual products representing goods made typically to order. Measures for major industries based on aggregate value data show similar differences which, however, may reflect the variation in the typical production period somewhat less and the variation in the proportion of output manufactured to order somewhat more. Thus the longest average lead of new orders relative to sales is that for the transportation equipment industry, which produces items of great size and complexity such as ships, airplanes, and locomotives. Fabricated metal products and machinery rank second and third with leads of similar intermediate length, and primary metals fourth. "Other durable goods" have short leads and coincidences.[16]

Of a different sort is the variation between the order leads observed at successive turns in the productive activity of any given industry. Some of these differences have systematic features. They can hardly be attributable to changes in the production period in the narrow sense of the term (time required for fabrication) since this is presumably fairly stable over time. Instead they are apparently related to changes in the capacity and backlog position of the firms that fill the orders.

On the whole, firms utilize a higher proportion of their capacities near the peaks than near the troughs in the activity of a given industry.[17] At some point in the advanced stages of a vigorous output expansion, many companies are likely to experience a strain on their productive facilities. The actual or anticipated costs of an additional order that is to be filled with the usual promptness will then rise, so that many firms will be unable or unwilling to assume new commitments unless they can extend the delivery periods. It is true that by raising the prices of their products sufficiently high the firms may conceivably succeed in keeping the orders they currently receive down to the levels that they can handle without more than the usual lags. But such pricing is likely to be regarded by some manufacturers as too risky in view of the degree and character of competition in the markets in which they operate. Also, in the minds of many, the longer-lasting advantages of accumulating larger order backlogs outweighs the more transient, and ultimately far less certain, gains to be obtained from higher pricing. Hence, few are likely to jeopardize,

[16] This category is composed largely of furniture, lumber, and stone, clay, and glass products. Furniture is made to order but apparently at rather short notice. Lumber products are mostly staples produced for the market which typically have short delivery periods. Clay and glass products, too, are made largely to stock. Here, as elsewhere, timing differences revealed by comparisons of aggregate data have analogies in some of the measures for individual industries and products and are consistent with the indications of the stock-backlog ratios.

[17] The relative movements of physical output and of output as a percentage of capacity will correspond very closely for industries which are subject to large fluctuations of demand and which require specialized and expensive large-unit equipment of considerable short-run rigidity. In our data such industries are well represented (e.g. metal products, machinery).

by immoderate pricing, an opportunity to secure in good times a broad and reasonably firm order basis for future work.[18]

The argument has several implications which can be tested by statistical facts. For one, leads of new orders would be expected, on the whole, to be shorter at troughs than at peaks in activity. On most occasions, our timing comparisons do confirm this expectation. Some exceptions are important, however. During a boom, advance commitments are accepted by many companies which at other times do not maintain order backlogs, so that production to order usually gains relative to production to stock. When demand eases off, orders can again be filled more promptly. But in the advanced stages of a contraction which has lasted long enough to permit manufacturers to reduce their inventories, delivery lags on some items normally shipped from stock may ultimately lengthen too.

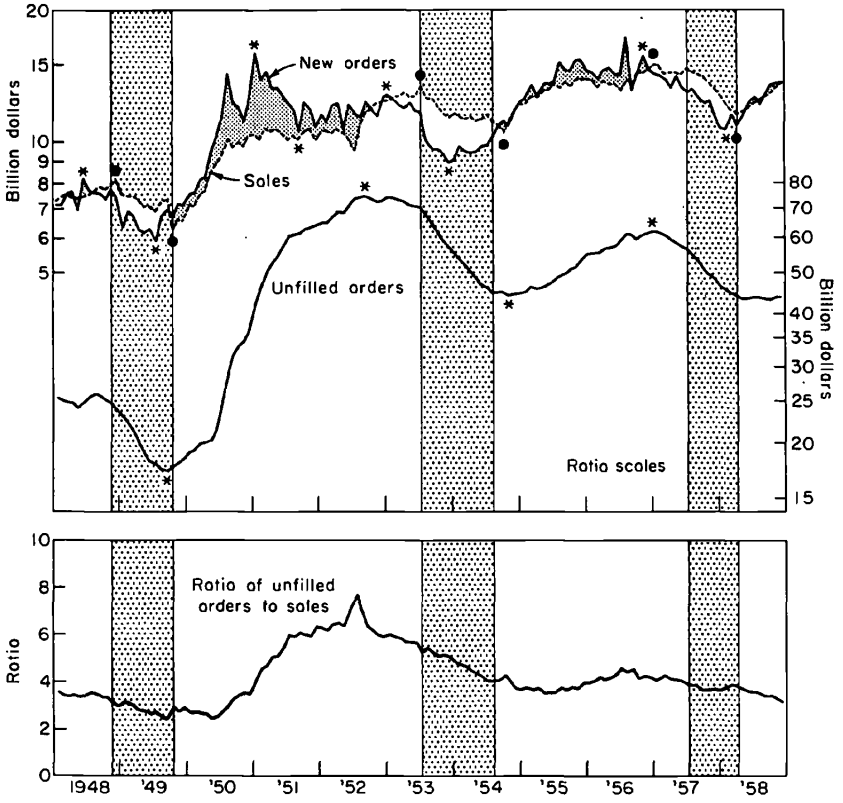
Again, a substantial amount of directional agreement (positive conformity) should obtain between the major movements in unfilled orders reported by an industry and its current activity, as represented by output or shipments. Indeed all but very few cyclical turns in order backlogs can be matched with like turns in activity. True, the proportion of unmatched turns in activity (when the specific cycle chronologies in unfilled orders are used as a reference frame) is not quite as low. But this still fits well into the picture. Weak or short expansions in activity, which fail to reach up into the range of full-capacity utilization, need not be paralleled by expansions in unfilled orders. Sometimes a mild cyclical movement in activity will correspond to a mere retardation in the course of the order backlogs. The latter, it will be noted, represent a "stock" magnitude whose movements are typically much smoother than those of such "flow" variables as output or shipments.

Of course, even when unfilled orders do increase, this in itself does not necessarily indicate a tendency for the average delivery periods to lengthen. It is the increase in backlogs *relative to current shipments* that indicates such tendency. The ratio of unfilled orders to shipments (U/S) represents the number of months that would be needed to dispose of the existing backlogs at the present rate of operations, or roughly the *average* time interval elapsing between an order's receipt and delivery. Hence if order backlogs expand but shipments do too, at about the same rate, the presumption is that the average delivery period remains stable. Actually, however, the ratio U/S is far from stable, but shows cyclical movements which most of the time correspond in direction to those in

[18] Of course, a strong expansion of demand to levels exceeding the capacities of the suppliers will typically cause both price increases and lengthening of the average delivery periods (backlog accumulation). But it is important to realize that the second effect tends to dampen the first one: if a larger part of the increase in demand is absorbed by additions to order backlogs, less of it will go into price rises (cf. R. F. Harrod, "The British Boom, 1954–55," *The Economic Journal*, March 1956, esp. pp. 1–5).

CHART 14.1

Manufacturers' New and Unfilled Orders, Sales, and Ratio of Unfilled Orders to Sales, Durable Goods Industries, 1948–58



Shaded areas represent business contractions; unshaded areas, expansions.
When new orders exceed sales, the areas between the two curves are shaded.
Asterisks identify peaks and troughs of specific cycles in manufacturers' new and unfilled orders; dots, in manufacturers' sales.
SOURCE: U.S. Department of Commerce, Office of Business Economics.

total unfilled orders (see Chart 14.1 for an illustration for the aggregate of the durable goods industries). During a buying boom when output falls heavily behind new orders, backlogs are likely to increase not only absolutely but also in relation to shipments; during a buying slump the reverse development is typical.

If only because of their great sensitivity to irregular and episodic influences, individual timing comparisons between new orders and output or shipments must not be expected to show a very close association with

such different measures as rates of capacity utilization and backlog-shipment ratios. It is certainly significant that positive coefficients are obtained throughout when order leads are correlated with either measure.[19]

The more important factors among those that are likely to complicate the picture may now be briefly considered. 1. In slack times producers may wish to keep their crews and plants busy at a slower pace but over longer periods, thus counteracting the tendency for the delivery lags to become shorter. 2. When demand is high and rising, many buyers, themselves under pressure, seek early delivery dates, but once a slump has set in their interest in prompt supplying is likely to abate. 3. As long as there are substantial reserve capacities in an industry enjoying an expansion in demand, the firms that have such reserves will attract much of the new business owing to their ability and willingness to fill orders quickly. Firms working near or at capacity are then deterred from making long delays in delivery by the risk that this will impair their good will or even that some of their orders will actually be canceled and lost to competitors. Unless all the companies are equally busy or are working with the same lags, there is always some ground for such apprehensions. Consequently, for the given industry as a whole, there is probably less retardation in filling orders when the amounts of orders received by individual companies differ substantially in the advanced stages of expansion than when such is not the case. 4. Lastly, the intensity of the fluctuations in demand is particularly important. Some expansions merely raise outputs from low to more satisfactory but still not very high levels; here the production volumes of many establishments will have been falling short of their capacities all along, including the output peaks. On the other hand, a vigorous and widespread expansion in new orders for goods with long production periods may leave the industry with heavy backlogs of work waiting to be started or completed. If the ensuing contraction in new orders is short,

[19] A positive coefficient signifies that long leads are associated with high utilization or backlog-shipment ratios. The accompanying figures summarize a few relations of this type:

Industry and Period (1)	*Timing Measures (no. in brackets) New Orders Relative to* (2)	*Coefficient of Rank Correlation*[a] *Between the Indicated Timing Measures and* *Prod. as Per Cent of Capacity*[b] (3)	*Ratio of Unfilled Orders to Shipments or Production (identified in col. 2)*[b] (4)
Steel sheets, 1919–32	Shipments (9)	+0.63	+0.50
Furniture, 1923–45	Shipments (8)	+0.33	
Paperboard, 1926–56	Production (17)	+0.52	+0.31

[a] Spearman's coefficient adjusted for the presence of "ties" or duplicated rank standings.

[b] Three-month averages centered on month of turn in shipments or production.

it may not bring about any decline in activity at all, but merely reduce the rates of increase in backlogs and in output. A new expansion in demand will then put an end to these retardations and induce an accelerated increase in production and deliveries.

Interesting examples of divergent cyclical movements in new orders, on the one hand, and unfilled orders and production and shipments, on the other, are found in the history of several major industries in recent years. Thus Chart 14.1 shows that sales of durable goods failed to turn down in 1951 despite the sharp contraction in new orders during the first three quarters of the year. Then in 1952–53 sales moved up again at high rates after a prolonged lull, even though the recovery in ordering which had begun several months earlier was only moderate and quite hesitant throughout. We submit that the behavior of sales in both periods (which was very similar to that of durables' output) must be attributed largely to the backlog factor. In 1951 unfilled orders were already high and rising, in 1952–53 partly rising and partly declining but very high throughout.

The mild business contraction in 1953–54 was dominated by the business objective of getting inventories under better control, i.e. into better balance with current sales and incoming orders. Most manufacturers apparently did not regard their backlogs as high enough to justify stepping up activity in prompt response to the upturn in new orders which came in the first third of the contraction. As long as new orders were still much lower in value than output or shipments, their steady but slow recovery could be met by retardation, rather than by a reversal, of the contraction processes, such as that of inventory liquidation. Thus output and shipments continued to decline through most of the year 1954, and turned up only after incoming orders finally caught up with sales (orders shipped) and backlogs stopped declining.

III. Timing at Business Revivals and Recessions

INDIVIDUAL INDUSTRIES OR PRODUCTS[20]

Table 14.1 shows a strong tendency of new orders for a variety of products to turn down before the peaks and to turn up before the troughs in aggregate economic activity. For each of the thirty items, new orders show an average lead at business cycle turns (col. 5). These mean leads

[20] The series used in this section are with few exceptions trade association statistics. Five series on orders for various types of machinery and supplies and one for furniture are in current dollars (see lines 18, 19, 21, 23, 24, and 27 in Table 14.1). All others are in physical units. Only four of the thirty series are nondurables—paper and textile products. As might be expected, there is much more information on new orders (as distinguished from shipments) for industries which do business largely against advance contracts than for industries which customarily sell most of their products from stock. Hence the data give better representation to the largely order-made producer goods, most of which are durable, than to the largely stock-made consumer goods, many of which are nondurable.

TABLE 14.1

Timing of New Orders at Business Cycle Turns, Thirty Individual Industries or Products

Industry or Product[a]	Period Covered[b]	Total Number of Order Turns Covered[c]	*Total Number of Business Cycle Turns*		Average Lead (−) or Lag (+), All Turns	Average Deviation from Average Lead or Lag, All Turns
			Covered[c]	Matched[c]		
					(months)	
	(1)	(2)	(3)	(4)	(5)	(6)
1. Southern pine lumber	1918–54	23	18	16	−9.1	4.0
2. Oak flooring	1913–54	27	20	18	−8.2	3.2
3. Water-tube boilers[d]	1927–54	14	11	9	−8.2	10.1
4. Clay and glass products (2)[e]	1921–33	7	7	7	−7.4	3.1
5. Rails	1873–1949	49	38	29	−6.9	6.6
6. Bath tubs	1918–29	6	9	6	−6.7	4.0
7. Steel sheets	1919–33	9	9	9	−6.2	2.5
8. Iron and steel products (6)[e]	1921–33	7	7	7	−6.1	3.6
9. Railroad locomotives	1873–1954	46	40	38	−5.8	5.4
10. Paperboard	1924–54	19	13	10	−5.7	2.7
11. Paper and printing (3)[e]	1923–33	6	6	6	−5.7	4.0
12. Railroad freight cars	1873–1954	48	40	36	−5.6	4.8
13. Fabricated structural steel	1910–54	32	22	20	−5.4	4.3
14. Lumber (3)[e]	1921–33	5	7	5	−5.4	3.3
15. Paper, excl. bldg. paper, newsprint, and paperboard	1937–54	12	8	6	−4.7	2.1
16. Architectural terra cotta	1919–38	12	11	11	−4.7	6.2
17. Railroad passenger cars	1873–1954	53	40	38	−3.9	6.8

18. Furniture	1924–45	10	9	8	−3.8	2.8
19. Woodworking machinery	1923–38	10	8	8	−3.5	2.9
20. Textile products (3)[e]	1921–33	11	7	6	−3.5	4.2
21. Mill and industrial supplies[f]	1949–54	5	3	3	−3.0	0
22. Merchant pig iron	1919–26	5	6	5	−2.8	1.8
23. Foundry equipment	1921–54	17	15	12	−2.6	2.7
24. Machine tools	1919–54	17	17	14	−2.1	1.8
25. Lavatories	1918–29	8	9	8	−2.1	4.4
26. Kitchen sinks	1918–29	8	9	8	−2.0	4.2
27. Electric overhead cranes	1926–45	8	8	6	−1.7	4.3
28. Fabricated steel plate	1924–38	7	7	7	−1.6	2.5
29. Oil burners	1933–49	9	7	3	−1.0	1.3
30. Misc. enameled sanitary ware	1918–29	4	9	4	−0.8	4.9
Total		494	420	363		

[a] Ranked by the length of the average lead, all turns (col. 5), from largest to smallest.

[b] Identifies the complete business cycle phases covered by the given series.

[c] Entries refer to periods listed in col. 1.

[d] Index of new orders for stationary water-tube boilers received by a company accounting for a large proportion of the boiler industry.

[e] Figures in brackets indicate the numbers of items included in the component series of the Department of Commerce index of new orders in physical terms, 1920–33. The commodities in question are as follows: line 4—terra cotta, illuminating glassware; line 8—steel sheets, malleable castings, steel castings, fabricated structural steel, fabricated steel plate, enameled sanitary ware; line 11—boxboard, labels, book paper; line 14—furniture, lumber (5 kinds), flooring (2 kinds); line 20—cotton finishing, hosiery, knit underwear.

[f] Index of new orders received by a cross section of members of the American Supply & Machinery Manufacturers' Association (producers of a variety of supplies such as abrasives, beltings, hoists, saws, tools, etc.).

differ greatly in length, descending from nine months at the top of the table to slightly less than one month at the bottom, but they exceed three months for two-thirds of the list. Timing varies considerably in the successive revivals and recessions, too, as witness the average deviations in column 6. But leads of orders prevail heavily throughout, and long and intermediate leads are more frequent than others for most of the industries and products included.

Timing regularities should be appraised against the background of conformity measures. A consistent leader is a series that leads at a large proportion of the reference turns *covered*, i.e. of the dates of the general business reversals within the period encompassed by the data. A series would not deserve a high consistency rating even if it led at each turn *matched*, if it matched but a few of the revivals and recessions through which it passed. Reading columns 3 and 4 in Table 14.1 line by line makes it clear that new order series match, that is turn in sympathy with, the large majority of peaks and troughs in the business cycles they cover. In fact, the percentage matched is equal to or higher than 80 for twenty-two of the thirty series included in the table, and higher than 60 for all but two. If observations for all series are combined, the percentage matched is as high as 86 (363 out of 420).

Most of the timing observations included in Table 14.1 refer to the business cycle turns of the interwar years, 1919–38; the period after World War II is less well represented. Table 14.2 presents the distribution of the leads and lags of new orders at each of the eight revivals and seven recessions during 1919–38 and 1948–54 (most of the series included failed to match the short business contraction in 1945). It shows that upturns in newly received business preceded each of the major troughs in aggregate economic activity by average intervals of about three to six months. Downturns in the incoming orders anticipated the business peaks by more variable intervals; their timing was characterized by very long leads on some occasions (1926, 1948) and by short leads and rough coincidences on others (1920). All in all, these measures suggest that a prior turn in most categories of new orders is a highly regular characteristic of a business revival or recession.

Table 14.3 presents a summary of the timing at business peaks and troughs of two groups of new order series representing production to order and production to stock. The timing of new orders in either category is shown to be on the average somewhat earlier at peaks than at troughs. The measures offer no evidence of a systematic difference in cyclical timing between the two groups of series. This contrasts with the finding that leads of new orders *relative to shipments* are (as would be expected) longer for order-made than for stock-made products. According to the averages in column 6, series representing manufacture to stock turned, if

TABLE 14.2

Timing of New Orders for Individual Industries or Products at Fifteen Business Cycle Turns, 1919–38, 1948–54

Lead (−) or Lag (+) (months)	Trough April 1919	Peak Jan. 1920	Trough July 1921	Peak May 1923	Trough July 1924	Peak Oct. 1926	Trough Nov. 1927	Peak June 1929	Trough Mar. 1933	Peak May 1937	Trough June 1938	Peak Nov. 1948	Trough Oct. 1949	Peak July 1953	Trough Aug. 1954
NUMBER OF TIMING COMPARISONS															
−13 to −24				1	2	5	1	2	1			3		1	1
−7 to −12		2	12	4	3	12	6	6	5		6	4	3	3	4
−4 to −6	6	1	3	8	1	4	3	5	4	8	4	2			2
−1 to −3	8	5	1	6	10		5	4	7	8	3	1	8	3	5
0		2			1		2		3	1	1			1	
+1 to +3		2	4		1	1	1	5	1		3		1	1	
+4 to +6	1	2					1	1	1	1					
+7 to +12		1		2			3		1						
MONTHS															
Average lead (−) or lag (+)	−2.6	−0.4	−5.2	−4.1	−4.2	−10.4	−2.8	−4.5	−3.2	−3.1	−3.5	−10.7	−3.7	−7.3	−5.7
Average deviation	1.5	3.3	3.1	3.4	4.1	3.2	6.2	4.5	3.8	1.9	3.2	5.4	1.5	7.1	3.2
SUMMARY: NUMBER OF SERIES															
Leading	14	8	16	19	16	21	15	17	17	16	13	10	11	7	12
Coincident		2			1		2		3	1	1			1	
Lagging	1	5	4	2	1	1	5	6	3	1	3		1	1	
Roughly coincident[a]	8	9	5	6	12	5	8	9	11	9	7	1	9	5	5
Matching the turn, total	15	15	20	21	18	22	22	23	23	18	17	10	12	9	12
Included, total	15	15	20	22	25	26	26	26	23	18	17	11	12	12	12

NOTE: The table includes observations for the 30 series identified in Table 14.1. Only the measures relating to the period 1919–38, 1948–54 are included.

[a] Includes exact coincidences and leads and lags of one, two, or three months.

TABLE 14.3

Timing of Thirty Series on New Orders at Business Cycle Turns, Distribution of Leads and Lags by Type of Turn and Type of Manufacture

Type of Manufacture Represented (number of series in brackets)	*Number of Timing Observations*					Av. Lead (−) or Lag (+)[b] (months)
	Leads (1)	Exact Coinci-dences (2)	Lags (3)	Rough Coinci-dences[a] (4)	Total (5)	(6)
A. AT REFERENCE PEAKS						
1. Manufacture to order (19)[c]	107	5	22	49	134	−5.6
2. Manufacture to stock (11)[d]	38	0	4	12	42	−6.6
3. Total (30)	145	5	26	61	176	−5.8
B. AT REFERENCE TROUGHS						
4. Manufacture to order (19)[c]	113	9	15	65	137	−4.2
5. Manufacture to stock (11)[d]	44	0	6	14	50	−4.9
6. Total (30)	157	9	21	79	187	−4.4
C. AT ALL REFERENCE TURNS						
7. Manufacture to order (19)[c]	220	14	37	114	271	−4.9
8. Manufacture to stock (11)[d]	82	0	10	26	92	−5.7
9. Total (30)	302	14	47	140	363	−5.1

[a] Includes exact coincidences and leads or lags of one, two, or three months.

[b] Weighted by the numbers of observations for each component item.

[c] This group includes all series in Table 14.1 other than those listed below in note d.

[d] This group includes the following series (numbers in brackets refer to lines in Table 14.1): Southern pine lumber (1), oak flooring (2), clay and glass products (4), bath tubs (6), lumber (14), architectural terra cotta (16), textile products (20), lavatories (25), kitchen sinks (26), oil burners (29), misc. enameled sanitary ware (30).

anything, somewhat *earlier* than the other series at business revivals and recessions. Hence the measures imply that some industries that customarily fill their orders on receipt or on short notice experience cyclical turns in their activity relatively far ahead of peaks and troughs in general business; their new orders *and shipments* are both early leaders.

Direct evidence on this is given in Table 14.4, which shows the average timing of new orders as well as shipments for those industries in our sample for which corresponding series on the two variables are available. The list includes seven items representing manufacture to stock. In this group turns of new orders preceded business reversals by greatly varying but predominantly long intervals, as indicated by the measures in column 4. Since these goods have short order periods (column 2), their shipments, too, turned substantially ahead of business revivals and recessions (column 3).

The made-to-order capital goods that head the list of industries in Table 14.4 according to their long order-shipment intervals present a different picture. On the average, turns in new orders for these products anticipated the reversals in aggregate economic activity by from two to six months. The delivery periods were apparently by and large longer, so that for most items in this group shipments lagged behind the peaks

TABLE 14.4

Timing of New Orders and Shipments at Business Cycle Turns, Eighteen Individual Industries or Products

Industry or Product[a]	Period and No. of Reference Turns Covered[b] (1)	*Average Lead (−) or Lag (+) in Months*			Representing Mfg. to Order (ord) or Mfg. to Stock (st) (5)
		New Orders at Turns in Shipments[c] (2)	Shipments at Turns in Bus. Cycles[d] (3)	New Orders at Turns in Bus. Cycles[e] (4)	
1. RR passenger cars	1919–54(17)	−9.1	+6.1	−3.9	ord
2. Fabricated structural steel	1926–54(12)	−7.6	+1.7	−5.9	ord
3. RR locomotives	1919–38(11)	−7.3	+6.1	−2.5	ord
4. RR freight cars	1919–54(17)	−6.0	+1.1	−4.4	ord
5. Electric overhead cranes	1926–45(8)	−5.3	+3.7	−1.7	ord
6. Merchant pig iron	1919–24(5)	−4.0	+1.2	−2.8	ord
7. Steel sheets	1919–33(9)	−3.9	−2.3	−6.2	ord
8. Machine tools	1927–54(11)	−3.1	+0.5	−1.8	ord
9. Woodworking machinery	1923–38(8)	−2.2	−1.4	−3.5	ord
10. Oak flooring	1913–54(20)	−1.9	−6.2	−8.2	st
11. Furniture	1926–45(8)	−1.9	−0.9	−3.8	ord
12. Southern pine lumber	1918–54(18)	−1.6	−7.4	−9.1	st
13. Paper, excl. bldg. paper, newsprint, and paperboard	1937–49(6)	−1.2	−4.0	−5.2	ord
14. Kitchen sinks	1919–26(6)	−1.2	−3.3	−4.5	st
15. Bath tubs	1919–26(6)	−0.5	−5.8	−6.2	st
16. Lavatories	1919–26(6)	−0.2	−4.7	−4.8	st
17. Oil burners	1933–49(7)	0	−1.0	−1.0	st
18. Misc. enameled sanitary ware	1919–23(4)	+2.8	−3.5	−0.8	st

[a] This list includes the items also covered in the order-shipment comparisons of Table 14.3, but for different periods (see note b). The items are ranked by the length of the average lead of new orders relative to shipments, beginning with the longest (col. 2).

[b] The years identify the first and the last reference turn matched by both the new order and the shipment series. Figures in brackets identify the numbers of reference turns in the periods thus defined.

[c] These averages do not include comparisons at "extra" turns, only those between specific turns related to the same reference dates. They are therefore not necessarily identical with the corresponding figures in Table 14.3, col. 5.

[d] Include all observations at the reference turns covered by periods identified in note b.

[e] Include all observations at the reference turns covered by periods identified in note b. These measures are identical with the entries for the corresponding items in Table 14.10, col. 5, except when the periods covered are different. They tend to equal the algebraic sums of the corresponding figures in cols. 2 and 3; more specifically, they are equal to these sums, except in those cases in which any of the reference turns during the period covered were matched by new orders but not by shipments, or vice versa.

[f] Goods made primarily to order are designated "ord," goods made primarily to stock are designated "st." This classification is identical with the division given in Table 14.3 between the groups I (11 items representing manufacture to order) and II (7 items representing manufacture to stock).

and troughs in general business and for the rest they led such turns by short intervals.

Obviously, at least as far as comparatively small segments of total manufacturing are concerned, long leads of new orders relative to production or shipments in a given industry need not necessarily be associated with long leads of new orders at business cycle turns. The shipment turns for all types of goods are, as one would expect, widely scattered on both sides of the turning points in business at large. Peaks in new orders have a strong tendency to occur before the end of expansions, and troughs before the end of contractions, in economic activity; but the dispersion of the cyclical reversals in ordering is also considerable, though it may be less than that of the turns in current manufacturing operations. The variety of timing patterns in buying from industry poses interesting problems. The earliness of new orders for certain standardized materials and finished staples may be due to the cyclical responsiveness of prices and the price sensitivity of buying in these areas. The timing of orders for capital goods that require considerable time to be started in production, completed, and delivered is likely to depend less on prices and short-term market prospects and more on business expectations covering relatively long spans of time. The information that we were able to examine is not inconsistent with these notions but convincing evidence about them can only be yielded by a careful study, larger in scope than the present one.

MAJOR INDUSTRY AGGREGATES

The lack of a comprehensive historical series on manufacturers' new orders is a serious gap in the stock of available statistical records, which unfortunately we cannot close in any really satisfactory manner. In the current Department of Commerce compilation on the value of new orders placed with manufacturers, broad aggregates for all durable goods industries and a group of nondurable goods industries reporting order backlogs begin in 1939. For earlier years, there is the monthly index of the value of manufacturers' new orders, 1935–39 = 100, computed by the National Industrial Conference Board. This begins in 1929 and extends through July 1944. From January 1934 on, it covers six nondurable goods industries and ten durable goods industries; an index for the latter group has also been published.[21]

[21] The total index comprises 17 series, as it includes a "miscellaneous" category not covered in either the durable or nondurable goods indexes. The weight for each industry was based on the total value of its product as reported in the Census of Manufactures of 1937. The seasonal adjustment of the chain indexes computed for each industrial group was made by the NICB. For a more detailed description of this index, see the *Supplement to the Conference Board Economic Record*, Vol. II, December 26, 1940. Figures for the component industries have not been published and only two are available, metal products and paper, from 1935 on (see the Conference Board's *Economic Almanac* for the years 1940–1944/45, five issues).

For a still earlier period, from January 1920 through August 1933, an index of physical volume of new orders (1923–25 = 100) was compiled by the Department of Commerce. Its components fall into six groups: textiles, iron and steel, lumber, paper and printing, stone and clay, and transportation equipment.[22] But the basis of all these indexes is narrow, although their names suggest broad industrial coverage. They are built from commodity data of the same type as other individual industry or product series in our collection, and actually include several of these series. The total index reflects mainly new orders for steel, lumber, and textile products, yet the makers of it believed that it is "quite representative of orders given in advance of production" because many of the industries for which no data were available do not in general have advance orders. The claim can well be doubted, but the index has at any rate no competitor for the period prior to 1929.[23]

Chart 14.2 presents the three most comprehensive new order series in the compilations described above. These series cover durable as well as nondurable goods, but do not include industries in which new orders are practically identical with shipments, or are assumed to be. Thus of the major nondurable goods industries only the four reporting order backlogs are included in the 1939–58 series of the Commerce Department (Office of Business Economics). Again in the NICB series (1929–44), nondurables are represented only by textiles, clothing, leather, shoes, paper, and chemicals and drugs. Hence the weight of durable goods in these data is heavy. The course of the corresponding series on new orders for durables only was, most of the time, closely parallel to the course of the series plotted on Chart 14.2, but some differences will be noted later in reference to the timing at individual business revivals and recessions.[24]

A few features of the chart deserve to be mentioned. The first Commerce index has no specific cycle turns corresponding to the 1927 trough and the 1929 peak; in fact, the trend in this series was practically horizontal for more than two years before the onset of the Great Depression. This is due mainly to the large weight in this index of the lumber component: buying and output of lumber have been dominated by relatively

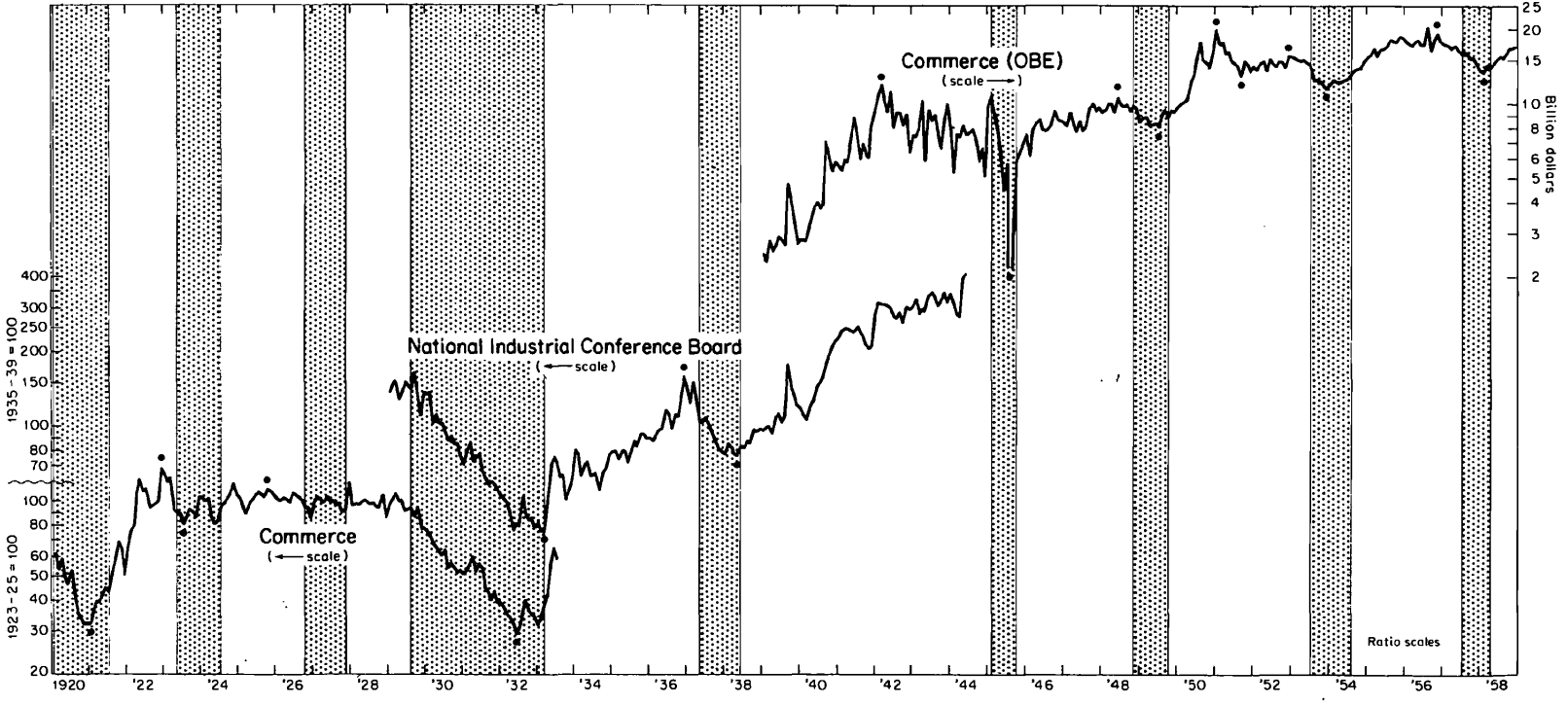
[22] The group indexes are identified in Table 14.1, note e, except that the one for transportation equipment is not included: it is simply a weighted composite of our three series on new orders for railroad cars and locomotives.

[23] The September 1928 issue of the *Survey of Current Business* (pp. 19–20) gives a description of this index, including the weights (based on the value added for 1923 and 1925) of its six major components. Nearly one half of the weight total is accounted for by lumber, almost 22 per cent by iron and steel products, and 15 per cent by textiles. Using the durable goods components of this index and the appropriate weighting factors, the National Bureau has compiled a monthly index of new orders for durable goods, 1920–33.

[24] The index series for durables—Commerce, 1920–33, and NICB, 1929–30—are shown below on Chart 14.7. Chart 14.1 presented the OBE estimates of the aggregate value of new orders received by durable goods manufacturers in 1948–58.

CHART 14.2

Manufacturers' New Orders, Three Estimates, 1920–58



Shaded areas represent business contractions; unshaded areas, expansions.

Dots identify peaks and troughs of specific cycles.

gentle but persistent downtrends since the end of 1925.[25] The timing of the NICB index at the 1929 peak is uncertain, since its behavior during 1929 is rather different from that of the Commerce index. Both series show the familiar double-trough configuration in 1932–33, but the Commerce composite points to the earlier, mid-1932 low as the specific upturn date, while the NICB series suggests the second low, as it turns up sharply in March 1933. In the first three years (1939–41) covered by both the NICB index and the new OBE series, the two behaved in similar fashion, but after March 1942 the OBE series declined while the NICB index continued to increase. Only a local high, not a specific cycle peak, can be distinguished in the value of manufacturers' new orders early in 1945, at the time aggregate economic activity turned down for a short contraction at the end of the war. (Here is the single major difference between this series and its principal component, new orders for durable goods, which experienced a specific expansion during the year ending in February 1945.) The business cycle trough in October 1945, however, was heralded two months earlier by the nadir in total advance orders of manufacturers, which principally reflected drastic reductions in new, and cancellations of old, military contracts.

Table 14.5 shows the timing of the series plotted on Chart 14.2 and of the corresponding indexes or aggregates for the durable goods industries at each business cycle turn, 1921–58. It suggests that the conformity to business cycles may be a little higher for durable goods than for nondurable goods orders. The timing of total advance orders, however, is in most instances identical or closely similar to the timing of new orders placed with manufacturers of durables. The average leads range from four to seven months. At both peaks and troughs they are somewhat shorter for the durable goods than for the combined aggregate. The leads at peaks are on the average longer than the leads at troughs of the business cycle but the differences are not very pronounced.[26]

[25] Short and mild interruptions of the downward trend in the index occurred in the winter 1926–27 and again between October 1927 and the decisive collapse of March 1929 (see Chart 14.2). These movements seem too weak to qualify as specific cycle phases, but the corresponding index for durable goods orders shows somewhat more of a cyclical rise in the two years before the 1929 recesssion. There the movement has been identified as a "specific expansion," although it too is certainly marginal (see Chart 14.7 and Table 14.5).

[26] On a state basis, a composite index of new orders has been compiled by the Associated Industries of Massachusetts (AIM) since 1924. This index is based on reports from a sample of 160–260 concerns classified by textiles, leather and shoes, metal trades, paper, and "all other" industries (mostly consumer goods such as optical, confectionery, jewelry, rubber, plastics, and some electrical appliances). The samples for metal products, paper, and the heterogeneous "all other" group are considered more representative than the rest. The total index (1926 = 100) has a good record of cyclical conformity during the interwar period. It led at six of the seven reference turns in the years 1924–38 (coincided at the June 1929 peak). Its average lead is shorter than the comparable measures in Table 14.5, about three months at business peaks as well as troughs.

TABLE 14.5

Timing of Comprehensive Series on New Orders at Business Cycle Turns, 1921–58

Date of Reference Peak	*Lead (−) or Lag (+) at Reference Peaks (months)*		Date of Reference Trough	*Lead (−) or Lag (+) at Reference Troughs (months)*	
	Durable Goods (1)	Durable and Nondurable Goods (2)		Durable Goods (3)	Durable and Nondurable Goods (4)
1.			July 1921	−6	−6
2. May 1923	−4	−5	July 1924	−12	−12
3. Oct. 1926	−12	−12	Nov. 1927	−4	
4. June 1929	−3		Mar. 1933	−4	−9
5.			Mar. 1933	0[a]	0[a]
6. May 1937	−5	−5	June 1938	−2	−1
7. Feb. 1945	[b]	[b]	Oct. 1945	−2	−2
8. Nov. 1948	−5	−5	Oct. 1949	−3	−6
9. July 1953	−6	−7	Aug. 1954	−8	−8
10. July 1957	−8	−8	Apr. 1958	−2	−2
11. Average lead (−) or lag (+)	−6.1	−7.0	Average lead (−) or lag (+)	−4.8	−5.8

SOURCE: Measures in lines 1–4 are based on indexes compiled by the Department of Commerce from various individual new order series (see text and n. 23). Measures in lines 5–6 are based on the National Industrial Conference Board indexes, and those in lines 7–10 on the current Commerce (Office of Business Economics) estimates of the dollar values of manufacturers' new orders (see text). The series used in lines 7–10, cols. 2 and 4, was computed by adding the OBE estimates for new orders of all durable goods industries and four major nondurable goods industries reporting unfilled orders: textiles, leather, paper, and printing and publishing.

[a] Excluded from the average.

[b] The specific cycle peak of March 1942 preceded the February 1945 business cycle peak by 35 months.

The most comprehensive data on new orders published on a current basis are the series compiled by the Department of Commerce (Office of Business Economics). As current value aggregates, they reflect changes in prices as well as in quantities ordered. They are derived by adding monthly sales figures to changes in unfilled orders, and are net of cancellations.

Table 14.6 shows the timing at each of the six business cycle turns, 1948–58, of eighteen new order series from this compilation. Estimates for the over-all aggregates as well as for the major component industries are included. Among the ninety-two recorded observations there are only seven lags, most of them short, and three coincidences. Two of the lags occurred in series representing shipments rather than new orders proper—relating to those nondurable goods industries in which advance orders

are of little, if any, importance. Also, the few lags were all concentrated at business revivals—in 1949 and 1958. Leads exceeding six months accounted for 40 per cent, intermediate leads (four to six months) for 23 per cent, and short leads for 26 per cent of all the observations. Intermediate leads were particularly frequent at the business peaks in 1948 and 1953, short leads at the troughs in 1949 and 1958. The relatively sluggish timing of new orders on this last occasion deserves special mention, as part of the remarkable "V-pattern" of the 1958 recovery in which so many activities turned sharply upward within an unusually short span of time. Long leads, on the other hand, were prevalent at the two preceding business reversals, the 1954 trough and the 1957 peak (see the accompanying tabulation giving the number of timing comparisons).

	Peak Nov. 1948	*Trough Oct. 1949*	*Peak July 1953*	*Trough Aug. 1954*	*Peak July 1957*	*Trough April 1958*	*Total*
Leads							
Long (over 6 months)	5	2	6	11	13		37
Intermediate (4–6 months)	6	2	5	3	3	2	21
Short (1–3 months)	1	6	3	1	2	11	24
Coincidences	1		1			1	3
Lags		4				3	7
Total	13	14	15	15	18	17	92

That the timing of new orders was on the whole so much earlier in 1954 and 1957 than on the previous occasions calls for explanation, especially since the capacities of most manufacturing industries increased considerably in the last decade, causing the average delivery periods to shorten (some evidence on this is adduced in section IV). Yet the statistical observations can be rationalized. The upturns in new orders came very early in the 1953–54 business contraction for most of the durable goods industries, but the increases in buying were quite sluggish. There was a gradual downward adjustment of the rates of current manufacturing operations, which were still considerably higher than those of incoming orders. Thus the declines in shipments slackened but continued, while backlogs of unfilled commitments were gradually reduced. In nondurables the leads of new orders relative to shipments were much shorter than in durables, but here the upturns in shipments, too, occurred before the general business revival. At the 1957 business recession, production and shipments in the durable goods sector turned down as early as six or

TABLE 14.6

Value of Manufacturers' New Orders by Major Industries, Timing at Each Business Turn, 1948–58

Industry	*Lead (−) or Lag (+) of New Orders at Business Cycle (in months)*						Average Lead (−) or Lag (+) 1948–58 (7)	Average Deviation from Avg. Lead or Lag (8)
	Peak Nov. 1948 (1)	Trough Oct. 1949 (2)	Peak July 1953 (3)	Trough Aug. 1954 (4)	Peak July 1957 (5)	Trough Apr. 1958 (6)		
Durable Goods Industries								
1. Primary metals	0	−3	0	−7	−17	−2	−4.8	4.8
2. Fabricated metal products	[a]	−5	−6	−10	−2	−1	−4.8	2.6
3. Machinery, total	−5	+1	−3	−5	−8	−3	−3.8	2.2
4. Electrical machinery	−4	−6	−3	−5	−2	−3	−3.8	1.2
5. Machinery, except electrical	−5	+1	−6	−3	−9	−2	−4.0	2.7
6. Transportation equipment, total	[b]	[b]	−7	−8	−20	+5	−7.5	6.5
7. Motor vehicles and parts[c,d]	n.a.	n.i.	−13	−8	−8	+4	−6.2	5.2
8. Other transportation equipment[c]	n.a.	n.i.	−5	−11	−11	−6	−8.2	2.8
9. Other durable goods[e]	−7	−3	−6	−9	−14	−1	−6.7	3.3
10. Durable goods industries, total	−5	−3	−6	−8	−8	−2	−5.3	2.0
Nondurable Goods Industries								
11. Textile mill products[f]	−8	−8	−12	−9	−24	−5	−11.0	4.3
12. Leather and leather products[f]	−13	−3	−7	−6	−6	n.i.	−7.0	2.4
13. Paper and allied products[f]	−9	−3	−3	−7	−14	0	−6.0	4.0
14. Printing and publishing[f]	n.m.	n.m.	n.m.	n.m.	−11	+2	−4.5	6.5
15. Nondurable goods industries reporting unfilled orders[g]	−14	−8	−7	−8	−9	−2	−8.0	2.3
16. Nondurable goods industries not reporting unfilled orders[h]	−3	+3	n.m.	n.m.	−6	−1	−1.8	2.8
17. Nondurable goods industries, total	−5	+2	n.m.	n.m.	−6	−1	−2.5	3.0
18. All manufacturing industries	−5	−3	−7	−8	−8	−2	−5.5	2.2

	AVERAGE LEAD (−) OR LAG (+)							
19. Seven durable goods industries[i]	−4.0	−3.2	−5.6	−7.6	−9.0	−1.6	−5.4[k]	3.4[k]
20. Four nondurable goods industries[j]	−10.0	−4.7	−7.3	−7.3	−13.8	−1.0	−7.7[k]	4.1[k]
21. Eleven major manufacturing industries	−6.6	−3.8	−6.1	−7.5	−10.7	−1.4	−6.1[k]	3.7[k]

[a] Timing at this reference turn uncertain. The high in 1948 for this series is in April; taking that date as a tentative peak would yield a lead of 7 months (with this additional observation, the average timing of orders for fabricated metal products would be −6.0).

[b] The series shows a distinct retardation in 1948–49, that is a practically horizontal trend contrasting with the sharp increase in the years 1946–47 and 1950. The retardation cannot be precisely dated, but it began undoubtedly a few months before the 1948 reference peak and ended before the 1949 reference trough.

[c] Based on unpublished data received from the Department of Commerce, Office of Business Economics. The two series begin in 1949 and their timing at the 1949 trough is uncertain.

[d] For producers of automobiles, new orders are to a large extent taken as equal to sales (value of shipments); military orders of motor vehicle manufacturers, however, are new orders proper and distinct from sales.

[e] Includes professional and scientific instruments, lumber, furniture, stone, clay, glass, and miscellaneous industries.

[f] Based on unpublished data received from the Department of Commerce, Office of Business Economics, which have been seasonally adjusted for NBER by Census Method II.

[g] Includes textiles, leather, paper, and printing and publishing.

[h] Includes the industries of food, beverages, tobacco, apparel, petroleum, chemicals, and rubber, for which new orders are assumed to equal sales.

[i] Summary of the timing measures for the industries identified in lines 1, 2, 4, 5, 7, 8, and 9 (nonduplicating set of the component durable goods industries).

[j] Summary of the timing measures for the industries identified in the lines 11, 12, 13, and 14 (nonduplicating set of the component nondurable goods industries).

[k] Weighted by the numbers of observations for each component item.

n.a. = not available
n.i. = not identified (timing uncertain)
n.m. = not matched

seven months before the peak in aggregate economic activity, so that new orders of this group of industries led by particularly long intervals. In nondurables, shipments also turned down early, together with new orders, although physical output held steady until several months later.[27] Thus here the lead of new orders was partly due to the fact that activity in most nonmanufacturing industries (whose share in the national economy has for some time been increasing) continued to advance for several months after the downturn in current manufacturing operations.

Additional evidence on the behavior of manufacturers' orders since 1949 is provided by series compiled by Standard and Poor's Corporation. These are monthly indexes (1949 = 100) based on dollar values. They are based on a much smaller sample than the Commerce series; hence they are considerably more erratic. Yet in those cases where Standard and Poor's and the Commerce data can be roughly matched in industrial coverage, there is a substantial correspondence between their relative movements. As the industries in question are, on the whole, quite highly concentrated, the correspondence can be explained by the fact that the indexes are based on reports from a cross section of leading manufacturers, including most of the largest firms.

Table 14.7 presents the timing record for Standard and Poor's series and for an index of nonelectrical machinery orders compiled by the McGraw-Hill Company. Some broad similarities between Tables 14.7 and 14.6 will be noted. The ranking of the revivals and recessions by average length of order leads is the same in both sets of measures. In both, the shortest leads are found at the 1958 revival and the longest at the 1957 recession, while the 1949, 1953, and 1954 episodes have intermediate ranks in the succession from shorter to longer leads (cf. Table 14.6, line 21, and Table 14.7, line 17). There is, of course, no reason to expect any *close* similarities between the two tables.[28]

One major difference between them deserves to be mentioned, however. The OBE series show cyclical downturns in 1952 and 1953 which

[27] The leads (−) or lags (+) (in months) underlying the statements in the text are as follows:

	Peak Nov. 1948	*Trough Oct. 1949*	*Peak July 1953*	*Trough Aug. 1954*	*Peak July 1957*	*Trough Apr. 1958*
Shipments (value, OBE)						
Durable goods industries	+1	0	0	+2	−6	0
Nondurable goods industries	−5	+3	not matched		−6	−1
Production (FRB)						
Durable goods industries	−1	+1	+1	−1	−7	0
Nondurable goods industries	−5	−3	−2	−8	+1	−1

[28] Only in a few cases can the series in the two tables be matched in industrial coverage, however roughly. There are also a number of other substantial differences between the two samples, and individual timing observations are as a rule very sensitive to differences in the data at the critical turning periods.

TABLE 14.7

Standard and Poor's and McGraw-Hill Indexes of Value of Manufacturers' New Orders, Timing at Each Business Cycle Turn, 1949–58

Industry	*Lead (−) or Lag (+) at Business Cycle (in months)*				
	Trough Oct. 1949	Peak July 1953	Trough Aug. 1954	Peak July 1957	Trough April 1958
1. Steel	0	−9	−6	−28[a]	−2
2. Metal fabricating (nonferrous)	−5	n.m.[b]	−5	−22	−1
3. Machinery, industrial	−3	n.m.	−8	−9	−1
4. Machine tools	−3	n.m.	−1	−19	+4
5. Nonelectrical machinery[c]	−1	n.m.	−3	−12	−2
6. Electrical equipment	−2	n.m.[d]	−1	−15	−1
7. Aircraft	−3[e]	n.m.	−11	−11	−6
8. Auto parts	n.i.	n.m.[f]	−4	−5	−1
9. Lumber	n.i.	−3	0	−23	−1
10. Building materials	−2	−3	−9	−6	−3
11. Cement	0	n.m.[g]	n.m.[g]	−14	−1
12. Textiles	n.i.	−3	−11	n.m.	n.m.
13. Floor coverings	n.i.	−9	−7	−6	−3
14. Shoes	+2[e]	n.m.	−13	0	+1
15. Paper	−3	n.m.	n.m.	−14	−3
16. Composite index[h]	−3	n.m.[i]	−6	−14	−1
17. Average, 14 component series, Standard & Poor's	−1.9	−5.4	−6.3	−13.2	−1.5

[a] A secondary peak led the July 1957 business downturn by 8 months.

[b] A minor peak leading the July 1953 business downturn by 4 months can be distinguished.

[c] Index (1949 = 100) compiled by McGraw-Hill Co. Timing measures for this series are excluded from the averages.

[d] A minor peak leading the July 1953 business downturn by 2 months can be distinguished.

[e] Based on a tentative trough date.

[f] A minor peak leading the July 1953 business downturn by 15 months can be distinguished.

[g] A minor contraction in this series began 4 months, and ended 5 months, earlier than the business contraction July 1953–August 1954.

[h] Standard and Poor's total index of the value of manufacturers' orders. Covers companies classified into 14 industries (lines 1–4, 6–15) and a few companies in industries for which no separate indexes are published because of inadequate coverage.

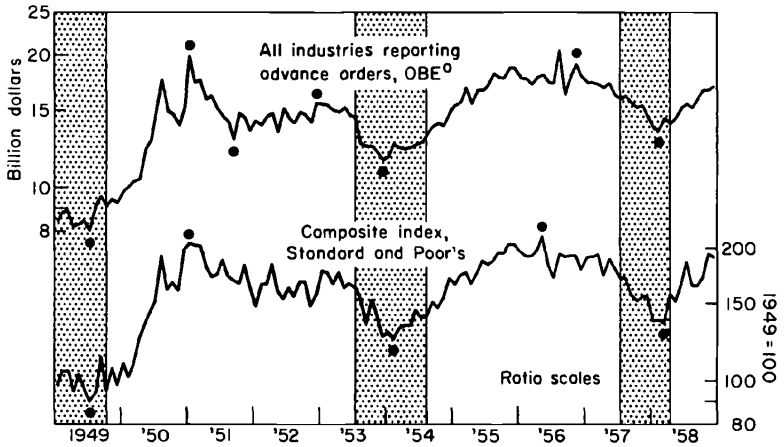
[i] A minor peak leading the July 1953 business downturn by 6 months can be distinguished.

n.i. = not identified (timing uncertain)

n.m. = not matched

CHART 14.3

Comparison of Department of Commerce and Standard and Poor's Estimates of Total Advance Orders for Durable and Nondurable Goods, 1949–58



[a] Includes all durable goods industries and four major nondurable goods industries reporting unfilled orders.

Shaded areas represent business contractions; unshaded areas, expansions.
Dots identify peaks and troughs of specific cycles.

anticipate the business peak of July 1953; most of Standard and Poor's indexes do not. What this means is that in the OBE series those contractions that followed the Korean buying surge are clearly separated from the contractions associated with the 1953 business recession by upward movements which, while mostly mild, are still sufficiently long and distinct to qualify as specific expansions. In a number of Standard and Poor's indexes, on the other hand, the corresponding movements are considerably shorter and/or weaker, so that they are merely rises or retardations superimposed upon the contractions that began early in 1951, not cyclical expansions. These series, then, do not match the 1953 peak in business, since they show no cyclical turns between the "Korean" recession in buying and the 1953 recession in aggregate economic activity. A comparison of Standard and Poor's composite index with the Commerce estimates of manufacturers' total advance orders (Chart 14.3) documents this point.

Why this should be is not easily determined, the two samples being as different as they are in size and composition, but one likely reason is that the OBE series represent new orders net, and Standard and Poor's indexes gross, of cancellations. In some durable goods industries, especially

those with heavy military contracts, net orders dropped much more rapidly than gross orders from their Korean peak levels once the hostilities had receded and the prospects for truce in the near future had visibly improved. This was due to increases in cancellations, which did not continue for long, however. With cancellations back at their more usual, substantially lower levels, net orders moved upward approaching again quite closely the values of the gross orders. But the latter may have been declining all along, or perhaps only leveling off, in certain lines of business; only the net and not the gross orders, of course, will reflect a wave in cancellations directly in the above described way. The series on machine tool orders illustrate developments of this type in the years 1952–53 (see Chart 14.4).[29]

IV. Backlog Cycles and Business Cycles

Cyclical movements in order backlogs conform positively to cycles in aggregate economic activity as well as to those in activity of the corresponding industries (cf. section II). Downturns in backlogs anticipated the recent business recessions by long time periods. Upturns in backlogs, on the other hand, were usually roughly coincident with the business cycle troughs, often lagging behind the latter by short, and at times by intermediate, intervals. The summary measures in Table 14.8, lines 25 and 27, provide succinct evidence on total unfilled orders of manufacturers and their major component, the backlogs of durable goods.

The timing of unfilled orders at peaks and troughs in the corresponding series on production or shipments shows the same asymmetrical pattern. Evidence on these relations will be presented in a more comprehensive treatment of the subject. They can be simply explained, however. 1. Production can continue to increase for some time after unfilled orders stop expanding, precisely because it can feed on the abundant reserves of work inherited from the period of backlog accumulation. 2. Even a mere stabilization of unfilled orders following a period of decline may put an end to the contraction in output; an upturn in unfilled orders signalizing an influx of new business above the current rates of manufacturing operations will be likely to have an immediate stimulating effect.

However, for the comparisons at business cycle turns (as for those involving production), the evidence of a strongly asymmetrical peak-trough timing rests chiefly on the backlog cycles since 1945. At business recessions of earlier years unfilled orders led by shorter intervals and at times even lagged. This is suggested in Table 14.8 by the fact that the

[29] Rapid decreases in demand for some industrial commodities tend to be accompanied by cancellation (and rapid increases, on the other hand, by duplication) of orders placed with manufacturers. Due to cancellations, cyclical declines are as a rule larger in net than in gross new orders. It appears, however, that the cyclical effects of cancellations are usually small.

TABLE 14.8

Timing of Selected Series on Unfilled Orders at Peaks and Troughs of Business Cycles

Industry, Firm, or Product[a]	Period Covered[b] (1)	*No. of Turns Covered*	*No. of Reference Turns*		*Average Lead (−) or Lag (+), in Months*	
		Unfilled Orders (2)	Covered[c] (3)	Matched (4)	Peaks (5)	Troughs (6)
1. United States Steel[d]	1904–33	17	17	17	−3.9	−1.7
2. Steel sheets	1919–33	9	9	9	+0.2	+0.6
3. Electric overhead cranes	1927–38	7	5	5	+4.5	+3.3
4. Foundry equipment	1926–38	6	6	6	+4.7	+1.7
5. Woodworking machinery	1921–38	11	9	9	−4.0	+0.4
6. Furniture	1924–38	9	7	7	−2.7	+1.2
7. Freight cars	1927–57	14	12	10	−8.6	+4.4
8. Machine tools	1948–57	5	5	5	−21.0	+1.0
9. Paperboard[e]	1926–57	15	13	11	−13.2	−4.0
10. Oil burners	1933–49	13	7	5	−12.5	−3.3
11. Oak flooring	1920–57	21	17	17	−4.0	0
Major Industry Aggregates (OBE)						
12. Primary metals	1949–58	5	5	5	−11.0	+0.7
13. Fabricated metal products	1949–58	5	5	5	−10.0	+2.0
14. Machinery, total	1948–58	6	6	6	−12.7	+4.3
15. Electrical machinery	1948–58	6	6	6	−7.3	−1.0
16. Nonelectrical machinery	1948–58	6	6	6	−14.7	+2.7
17. Transp. equipment, total	1948–58[f]	6	6	6	−8.0	+6.7
18. Motor vehicles and parts[g,h]	1949–57	4	4	4	−9.0	+5.0[i]
19. Other transportation equipment[g]	1949–57	4	4	4	−6.0	+9.5
20. Other durable goods industries[j]	1948–58	6	6	6	−10.5	−1.0
21. Textile mill products[k]	1948–57	5	5	4	−15.5	−6.0

22. Leather and leather products[k]	1948–57	5	5	5	−18.3	−1.5
23. Paper and allied products[k]	1948–57	5	5	3	−18.0	−7.0[l]
24. Printing and publishing[k]	1948–57	9	5	5	−7.0	−2.5
25. Durable goods industries	1948–58	6	6	6	−13.7	+2.7
26. Nondurable goods industries[m]	1948–58	6	6	5	−17.0	−4.7
27. All manufacturing industries	1948–58	6	6	6	−13.0	+2.3

[a] Data on unfilled orders are in current dollars except for the series United States Steel, steel sheets, freight cars, paperboard, oil burners, and oak flooring, which are in physical units (lines 1, 2, and 9—tons; lines 7 and 10—numbers; line 11—board feet).

[b] Identifies the first and the last reference turn matched by the unfilled order series (not the complete reference cycle phases covered, since this would be likely to make the figures in cols. 3–4 understate conformity; some of the series begin or end so close to a business turn that it is impossible to determine whether or not they matched it).

[c] Refer to the periods identified in col. 1.

[d] Timing measures are based on end-of-quarter data for the period 1904–10 (on centered monthly data afterwards).

[e] Boxboard through 1932.

[f] Observation at the 1958 trough tentative.

[g] Based on unpublished data received from the Department of Commerce, Office of Business Economics. The two series begin in 1949.

[h] For producers of automobiles, unfilled orders represent to a large extent military orders (see Table 14.6, note d).

[i] Timing at the 1954 revival uncertain. The observation included in the average is based on a minor, rather than a major, trough in the unfilled orders series.

[j] Includes professional and scientific instruments, lumber, furniture, stone, clay, glass, and miscellaneous industries. Seasonally adjusted for NBER by Census Method II.

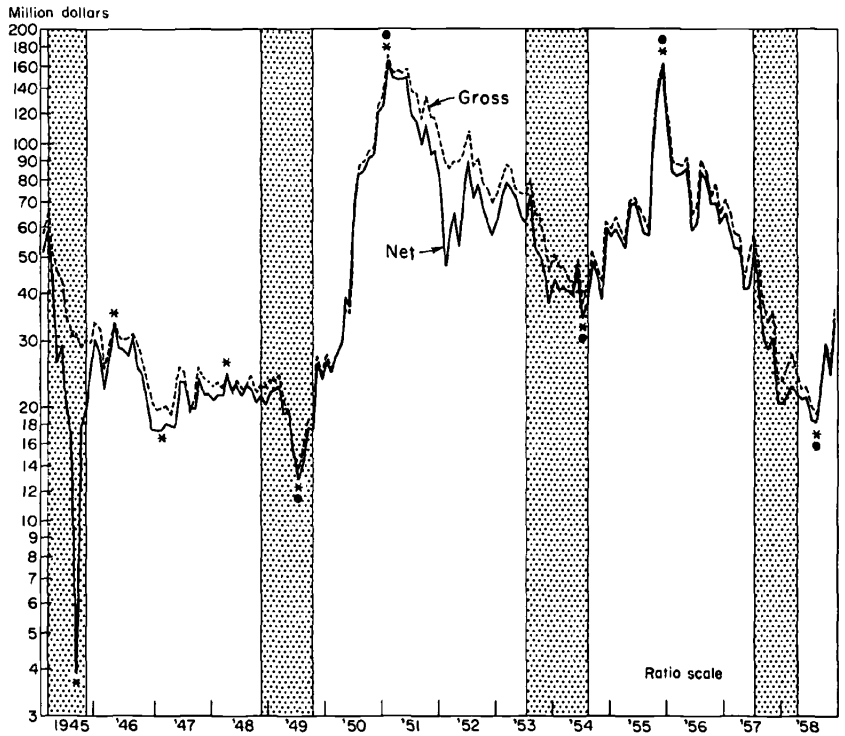
[k] Based on unpublished data received from the Department of Commerce, office of Business Economics, which have been seasonally adjusted for NBER by Census Method II.

[l] Only one observation available.

[m] Includes textiles, leather, paper, and printing and publishing. Order backlogs of other nondurable goods industries are considered zero or negligible. Seasonally adjusted for NBER by Census Method II.

CHART 14.4

Gross and Net New Orders for Machine Tools, 1945–58



Shaded areas represent business contractions; unshaded areas, expansions.

Asterisks identify peaks and troughs of specific cycles in net orders; dots, in gross orders.

SOURCE: National Machine Tool Builders' Association.

averages in column 5 are on the whole much smaller for the pre-World War II series than for the series covering the business recessions of the more recent period, and a closer inspection of the data substantiates the finding.[30]

A major point in the explanation of these differences is that backlog contractions are often much slower and longer when they start from very high levels than when they start at peaks that are relatively low. Of course, this is not inevitably so. How long it takes to reduce a volume

[30] When all the individual observations at business cycle peaks underlying the measures in Table 14.8, col. 5, are divided into two groups, those relating to the recessions before and those relating to the recessions after 1945, it is found that the former average −0.8 and the latter −13.2 months. Taking only the four series that extend over both the prewar and the recent postwar years (lines 7, 9–11), the corresponding averages are −2.2 and −13.4 months.

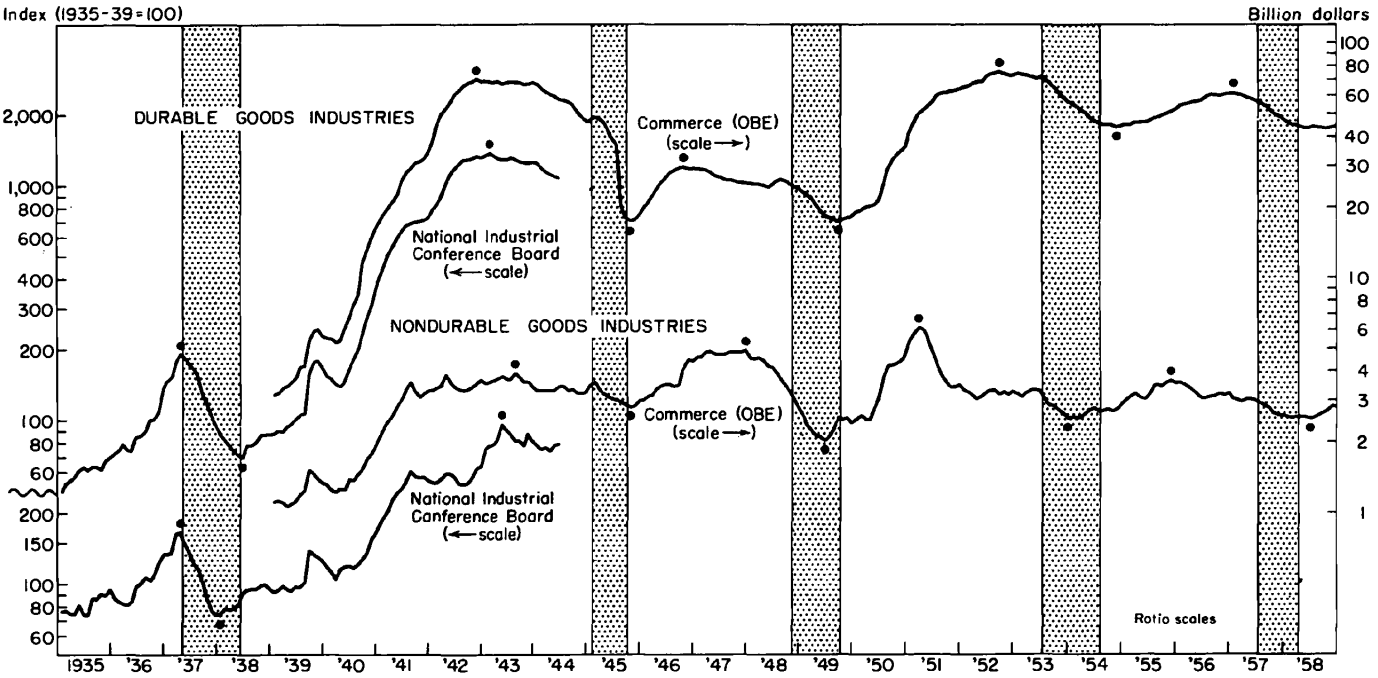
of unfilled orders to a given level depends on the average rate of *net* backlog liquidation. If this rate were sufficiently higher in the large than in the small backlog cycle, the former would have the shorter contraction (which would then necessarily be much steeper, too). But this situation, though conceivable, is not very likely and not observable in the time series at hand. It is in the advanced stages of vigorous business expansions that unfilled orders become exceedingly high. Buyers then still attempt to place new orders in large amounts. If the net rates of backlog decumulation are to be increased, producers must limit acceptance of new commitments and/or speed up deliveries. Drastic measures of either kind may be necessary to obtain the envisaged effect, and many manufacturers will probably be partly unwilling and partly unable to take them. Order limitation is known to be practiced in some industries but it is difficult to detect its effects in the aggregate data. Certain relevant factors are essentially beyond the manufacturers' control, at least in the short run: the capacity limits on the firms' current operations (output, deliveries) and the rates at which customers try to place new orders, as well as the urgency of their efforts to buy. When all this is considered, it does not seem astonishing that the net outcome should be *gradual* reductions of backlogs from their top levels. But as long as unfilled orders, while slowly receding, are still voluminous, current manufacturing operations have a firm basis—indeed here is a factor that can (and at times demonstrably does) contribute substantially toward maintenance and prolongation of industrial prosperity. Hence we have the long backlog leads at peaks of those business cycles to which the large backlog cycles correspond.

Chart 14.5 illustrates the point. At the time of the 1937 downturn, industry on the whole was still operating considerably below capacity. In that case, the peaks in unfilled orders preceded the central month of business recession (May 1937) by just one month, as shown by the NICB indexes for both durable and nondurable goods. At these peaks, backlogs were still rather small, absolutely and relative to shipments, despite the fact that they had increased substantially during the slow recovery of the thirties—for the levels from which they had risen were painfully low.[31] The 1937 dowoturns in unfilled orders were abrupt.

[31] In January 1935 (the first month covered by the unfilled order series), the ratio of backlogs to shipments was 0.7 for all durable goods. In April 1937 (peak month for both unfilled orders and shipments), the ratio was 1.3. This is still a low figure compared, say, to the ratio of more than 3 in March 1941, when backlogs were said to average from three to eight times monthly shipments of the various durable goods industries (cf. National Industrial Conference Board, *The Conference Board Economic Record*, May 1941, p. 223). The backlog index for durables increased almost four times between January 1935 and April 1937, from 50 to 190, in terms of indexes with 1935–39 = 100, yet the latter figure is dwarfed when contrasted with the standing of March 1941 (578), not to speak of the wartime peak of 1,461 points in December 1942.

CHART 14.5

Value of Manufacturers' Unfilled Orders for Durable and Nondurable Goods, 1935–58



Shaded areas represent business contractions; unshaded expansions. Dots identify peaks and troughs of specific cycles.

In contrast, the huge wartime wave in durable backlogs was gently rounded off at its peak late in 1942. The level of these backlogs was almost stable in 1943, with only a very slight downward tilt. Later the decline accelerated, but it did not become steep until after the business peak in February 1945, that is twenty-seven months after the specific peak in durable backlogs (OBE series).

The next wave in durable goods backlogs started promptly in October 1945, the month of the general upturn. The expansion part of it was moderated and shortened by difficulties connected with industry's conversion from wartime to peacetime production, a vast process complicated by strong and increasing demand pressures.[32] But there, too, the downturn came by gradual transition and the contraction was slow and long, just as would be expected of fluctuations of the "heavy-backlog" type. This contraction ended with the approach of the 1949 business revival, to be followed by the second backlog cycle of the postwar period, which in 1952 reached the peak levels of the huge wartime cycle. This wave started a quarter of a year earlier and ended a quarter later than the business cycle 1949–54, but its crest came ten months before the 1953 business peak. As was emphasized before, the exceedingly high level of durable backlogs at the "rounded top" of this specific cycle was certainly instrumental in keeping a large part of manufacturing output, and thereby aggregate economic activity, high (which was especially necessary to offset the weakness that developed early in the nondurables). The last cycle in durable unfilled orders had a lower peak, which was reached six months before the mid-1957 business downturn. The backlog contraction that followed lasted until October 1958, half a year after the trough in economic activity at large.

The picture for the unfilled orders in nondurable goods industries differs greatly from that for durables (Chart 14.5).[33] Nondurable backlogs increased fast in 1940–41, much slower thereafter up to their peak in August 1943; their wartime expansion was, of course, substantially smaller percentagewise than that of durable backlogs. In contrast, the first postwar wave (1945–49) was relatively larger in nondurable backlogs,

[32] Until late in 1946 manufacturers of durable goods continued to accept new orders at rates far in excess of those that they could handle with any regularity and timeliness. Order taking could not be maintained at these rates to the satisfaction of buyers and sellers; toward the end of the year, however, as reconversion advanced, the process of filling orders accelerated and caught up with incoming business. Thus shipments outpaced new orders, even though the latter were still increasing (cf. *Survey of Current Business*, July 1947, p. 4).

[33] Nondurables account for a minor proportion (about 5 to 7 per cent) of total order backlogs of manufacturers. Indeed, had we plotted the over-all totals in Chart 14.5 on the same scale as the durable backlogs, we would have added an almost precise replica of the latter series, a curve running parallel to it only somewhat higher. But the relative movements of unfilled orders for nondurable goods are nevertheless worth attention.

reflecting the shifts in demand and the difficulties of reconverting industries in the period of transition to a peacetime economy. But major divergences in movement between the two series occurred during the two last backlog cycles in 1951–52 and again in 1955–56 when unfilled orders declined moderately for nondurable goods but kept increasing steadily for durables. The upturns in nondurable backlogs were also much earlier than those in durables in both 1953–54 and 1958.

Table 14.9 summarizes the timing of the most comprehensive backlog series at consecutive business cycle turns in the period 1948–58. For the OBE aggregates, these measures amplify Table 14.8 by showing the systematic character of most of its averages. The table shows also a broad agreement in timing between Standard and Poor's indexes of manufacturers' unfilled orders and the OBE series.

The lead of unfilled orders for durable goods, while long at each of the business peaks during 1945–57, has progressively diminished. The number of months during which backlogs in this sector were declining before the general downturn was twenty-seven, twenty-five, ten, and six at the business peaks of 1945, 1948, 1953, and 1957, respectively. These figures also measure almost exactly the length of the intervals by which unfilled orders preceded the corresponding peaks in durables shipments. They indicate, therefore, that working off the backlogs was more effective in helping maintain the expansion of current activity in 1942–45 than in 1952–53, and again more in the latter period than in 1957. Indeed, even though the current dollar value of durable goods backlogs was about the same at its 1952 peak as at its wartime peak ten years earlier, in months of current shipments the backlogs were far lower. In 1942 unfilled orders came to exceed twelve months' shipments; in 1952 they just fell short of eight months. At its most recent peak in 1956, the ratio of unfilled orders to shipments was only 4.5 (see Chart 14.1). Apparently, the growth in the capacity of durable goods industries since 1942 has markedly reduced the average delivery period, thereby shortening the phase during which manufacturing production can be maintained by drawing upon an order backlog of any given absolute size.[34]

Unless the amplitude of the rises in buying increases sufficiently in successive business expansions, the growing productive efficiency of the suppliers will make for shorter expansions in the manufacturing sector. Similarly, unless the same factor is outweighed by a greater severity of cyclical declines in current buying, it will bring about some reduction in the length of manufacturing contractions.[35] In the recent period no such

[34] For a similar finding on one of the major components of the durable goods industry (nonelectrical machinery), see Machinery and Allied Products Institute, *Capital Goods Review*, No. 35, August 1958.

[35] If it takes less time to work off a backlog of a given size, less time will elapse before a given volume of buyers' requirements can be satisfied and before the buyers can renew

trends in the intensity of either expansions or contractions seemed to have occurred, although the percentage changes in manufacturers' new orders has varied greatly from one cyclical movement to another. There were no systematic changes in the duration of movements in months either, but the expansion and contraction intervals in durable goods shipments did show some tendency to become shorter relative to the corresponding phases in new orders.[36]

V. Cyclical Diffusion of Manufacturers' Orders

Timing analysis reveals that various series of new orders tend to expand and contract at about the same time and in conformity to the movements of the economy at large. Yet it is also evident that there is a considerable dispersion among the corresponding turning points in these series. In other words, each cluster of peaks or troughs is spread over a substantial period of time, although as a rule with an identifiable month or group of months in which the "density" of the turns is greatest. Thus cyclical movements in new orders become widely diffused throughout the manufacturing sector of the economy, but it takes time for them to spread from one commodity, firm, industry, or region to another.

How they spread among individual products and industries, as well as among the larger divisions of manufacturing, can be summarized by

ordering on an increased scale. It is obvious, however, that the mere fact that customers were given prompter service on their recent orders need not induce them to re-order faster too. Purchases of most durables are deferable. Along with other quality improvements, greater productive efficiency of the suppliers may well have a very substantial positive effect, but this may be offset or outweighed by other factors, e.g. increased diffidence of buyers during a deepening recession.

[36] The following chronology of cyclical movements in new orders of durable goods industries illustrates the statements made in the last two sentences of the text:

	Expansions				*Contractions*				
	8/45–6/48	7/49–1/51	9/51–1/53	12/53–11/56	2/45–8/45	6/48–7/49	1/51–9/51	1/53–12/53	11/56–2/58
Percentage change in new orders	+134	+123	+9	+63	−60	−17	−18	−27	−26
Duration of phase in months: New orders	34	18	16	35	6	13	8	11	15
Duration of phase in months: Shipments[a]	34		45[b]	27	11	10		15	15
Ratio of phase durations, shipments to new orders	1.0		1.3[b]	0.8	1.8	0.8		1.4	1.0

[a] Figures for shipments relate to specific expansions and contractions corresponding to those in new orders, the dates of which are given in the caption.

[b] Unlike new orders, shipments did not undergo a specific contraction in 1951. For the purpose of the comparison with 10/49–7/53 expansion in shipments, new orders were treated as expanding from 7/49 to 1/53.

TABLE 14.9

Timing of Manufacturers' Unfilled Orders at Successive Business Cycle Turns, Selected Measures, 1948–58

Series	*Lead (−) or Lag (+) of Unfilled Orders at Business Cycle (in months)*					
	Peak Nov. 1948 (1)	Trough Oct. 1949 (2)	Peak July 1953 (3)	Trough Aug. 1954 (4)	Peak July 1957 (5)	Trough April 1958 (6)
OBE Compilation:						
1. All manufacturing industries	−22	−2	−10	+3	−7	+6
2. Durable goods industries	−25	−1	−10	+3	−6	+6
3. Nondurable goods industries[a]	−11	−4	[b]	−8	−20	+2
4. Six durable goods industries[c]	−15.5	−1.0	−8.6	+3.7	−8.0	+2.3
5. Four nondurable goods industries	−16.8	−2.0	−2.0[d]	−6.3	−18.0	n.a.
Standard and Poor's Compilation:						
6. Composite index[e]		−2	−12	+2	−4	0
7. Ten durable goods industries[f]		+1.6	−10.8	+1.1	−7.9	+3.5
8. Three nondurable goods industries[g]		+1.0	−2.7	−4.0	−7.5	−1.0

[a] The group reporting unfilled orders includes textiles, leather, paper, and printing and publishing. Order backlogs of other nondurable goods industries are considered zero or negligible.

[b] This series reached a high peak in March 1951 during the Korean War period. The ensuing contraction which lasted through 1953 was interrupted by a retardation in the form of a practically horizontal movement from April 1952 to May 1953, but there is no cyclical downturn in this series that can be matched with the 1953 business peak.

[c] Includes primary metals, fabricated metal products, electrical machinery, nonelectrical machinery, total transportation equipment, and other durables.

[d] Only two of the backlog series in this group show cyclical downturns that match the 1953 business peak, with following timing measures: leather (−7) and printing and publishing (+3). The textile industry saw its unfilled orders contracting from March 1951 until December 1953, although there was a marked retardation in this decline for a year ending shortly before the recession (from April 1952 until April 1953). The order backlogs of the paper industry expanded after May 1952, but this movement was interrupted in the vicinity of the business peak by a short cyclical decline (June–October 1953).

[e] Covers companies classified into 13 industries (see notes f and g) and a few companies in industries for which no separate indexes are published due to inadequate coverage. All series in this compilation begin in 1949.

[f] Includes backlog series for steel, metal fabricating (nonferrous), industrial machinery, machine tools, electrical equipment, aircraft, auto parts, lumber, building materials, and cement.

[g] Includes backlog series for textiles, paper, and shoes.

constructing diffusion indexes from the new order series in our collection. Various techniques of making such indexes are available.[37] Chart 14.6 employs two. It includes an index showing the percentage of series undergoing specific cycle expansions in each month (A), and an index recording for a group of series the average duration of their runs, or the average number of months they have been moving in one direction (B). Index A is based on specific cycles in fourteen selected series on new orders for individual industries or products, index B on five-month moving averages of twelve series of the same kind.

Of the two curves in Chart 14.6, A is much smoother than B. The reason, of course, is that, in the approach based on specific cycles, all movements contrary in direction to the cyclical phases of the series are simply ignored. The moving averages used in the other approach will not, however, smooth out all such movements, but will merely eliminate the smaller and shorter among them and reduce the others. Hence the short swings in series B are not only more numerous but also much larger than the comparable movements in series A, and dating the specific cycles is a good deal more difficult for the former than for the latter index. Nevertheless, inspection of the chart shows that the two curves are broadly similar in their major cyclical movements.

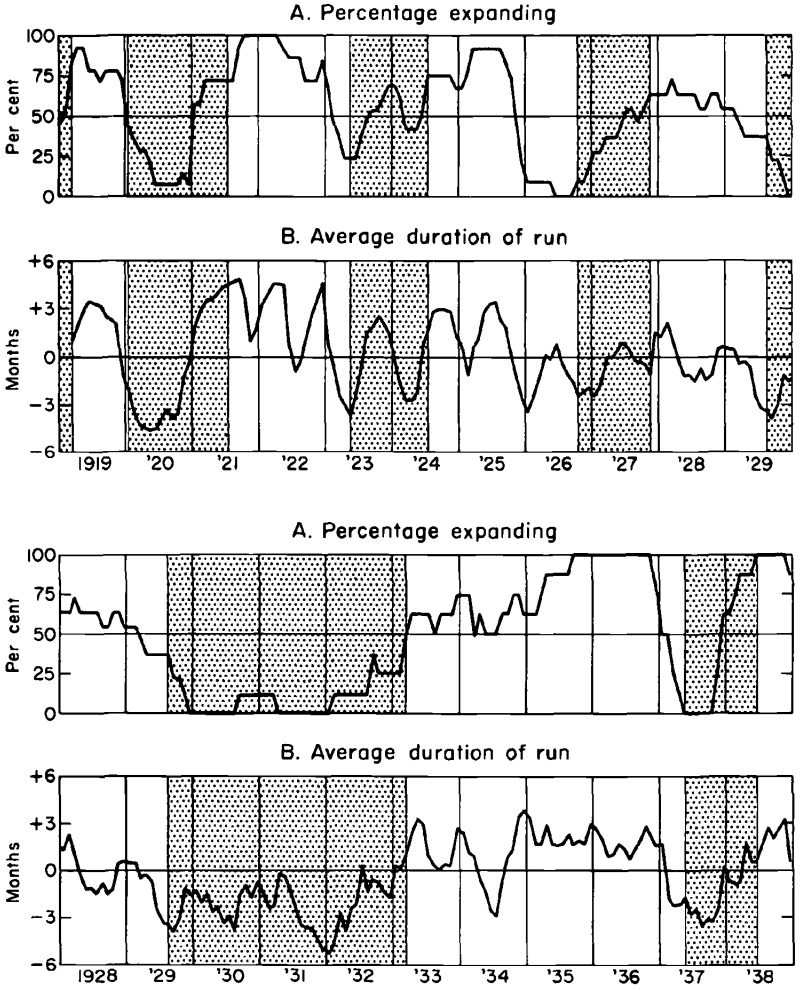
Diffusion indexes based on specific cycles of series that reach their peaks and troughs in the vicinity of downturns and upturns in aggregate

[37] A simple measure of diffusion records only the direction, not the magnitude, of changes in the component series. It shows in percentage form how many of these series (each counted as one) expand at any given time. In an historical index (1), the principle of determining when a series is expanding is simple: a positively conforming series is said to expand in each month that falls between a specific trough and a specific peak in the data; it is said to contract in each month situated between a peak and a trough. But dating the specific cycles often involves considerable uncertainty even when the job is done retrospectively; to do it on a current basis is more difficult still. The alternative (2) is to smooth the component series after seasonal adjustment with appropriate moving averages, so as to reduce their irregular, and bring out their cyclical, components. Month-to-month increases or decreases in the smoothed series would then be taken to indicate cyclical expansion or contraction, respectively. But moving averages with very long periods must not be applied because when centered they are much out of date and because they may distort the timing of the series at cyclical turns. Short-period moving averages, on the other hand, may not be adequate to smooth efficiently the more erratic series included in the index. Moore's device of the average duration of run (3) is designed to yield more smoothness in a diffusion measure and yet avoid long-period moving averages. Suppose the short-period moving average of a series turns up and rises continually for one, two, . . . months; these movements are then counted as runs of $+1$, $+2$, . . . months. Declines are treated analogously except that they are given negative signs. Rises of six months or more are all registered as runs of $+6$, corresponding declines as runs of -6. Averages of each month's runs are then struck for all series in the given group. The rationale of the weighting system lies in the strong presumption that the longer the runs, the more likely they are to reflect the cyclical phase of the series.

Curves A and B in Chart 14.6 represent measures described in this footnote under (1) and (3); indexes of type (2) will be introduced somewhat later in the text. For more information on the techniques of measuring cyclical diffusion, see Chapters 8, 9, and 20.

CHART 14.6

Percentage Expanding and Average Duration of Run, Selected Series on New Orders of Individual Industries, 1919–38



Percentage expanding is based on specific cycles of 14 series.
Average duration of run is based on 5-month moving averages of 12 series.
Shaded areas represent business contractions; unshaded areas, expansions.

economic activity (and not much later) lead at these business revivals and recessions persistently, although by variable intervals. This fact, for which there is ample empirical evidence, is due to the turning point distribution of the kind just mentioned (typical); the "historical" diffusion indexes bear a definite relation to the distributions of peaks and troughs in the series covered.[38] It is easy to see that a diffusion index built from series which lead the reference dates by relatively long intervals (e.g. new orders) should itself show longer leads than an index representing tardier activities (e.g. production or shipments). The timing at business revivals and recessions of diffusion indexes for different economic processes is a subject of great interest for both the relations among these series and their possible qualities as leading cyclical indicators.

Table 14.10 lists the leads of the percentage expanding index A at each successive business cycle turn of the period 1920–38 (col. 1). These leads are long; they range from six to fifteen months and average eleven months, which is almost twice the mean lead of either the component series of this index or the corresponding aggregate (cf. cols. 1 and 4). To the extent that it can be determined, the timing of the average duration of run appears similar to that of the percentage expanding index, as can be seen by comparing series A and B in Chart 14.6.[39]

As leading cyclical indicators, many diffusion indexes based on short-period moving averages suffer from being very choppy. This clearly applies to indexes computed from data with large short fluctuations, such as the individual new order series. Cumulation provides an effective way of suppressing the smaller irregular movements and bringing out the larger cyclical movements in these diffusion indexes. However, the method also substantially reduces the leads of the indexes at business cycle turns.[40]

The diffusion indexes of new orders nevertheless retain a comfortable lead even after cumulation. Table 14.10 lists in columns 2 and 3 the leads at successive business turns of a cumulated percentage expanding index of new orders and of the cumulated average-duration-of-run series based

[38] Some time before the culmination of business expansion the percentage of series reaching peaks begins to exceed the percentage of series reaching troughs, and when this develops, the proportion of series expanding starts declining. It does not turn up again until the percentage reaching troughs exceeds that reaching peaks, which happens some time before the central month of business contraction. This serves to explain the diffusion lead in general terms. Depending on the duration of the "zones" of peaks and troughs and the graduation of the transitions between them, indexes of diffusion will show more or less continuous cyclical fluctuations. See Chapter 2, especially the appendix.

[39] Leads of the index B are not listed in Table 14.10 because some of the turning dates in this series are rendered uncertain by large short-term fluctuations.

[40] The cumulated figures are derived by taking the deviations of percentage expanding from 50, or the deviations of the average duration of run from 0, and adding each month's deviation to the sum of the deviations for all preceding months. Hence the peaks in the cumulated figures occur when the deviations shift from + to −, and the troughs when they shift from − to +.

TABLE 14.10

Four Series on Diffusion and Volume of New Orders of Durable Goods Manufacturers, Timing at Each Business Cycle Turn, 1920–38

Reference Turn	*Lead (−) or Lag (+) at Reference Turn, in Months*			
	Percentage Expanding[a] (1)	Cumulated Percentage Expanding[b] (2)	Cumulated Average Duration of Run[c] (3)	Aggregative Index[d] (4)
1. Peak, Jan. 1920	−8	−2	−2	
2. Trough, July 1921	−7	−8	−7	−8
3. Peak, May 1923	−13	−5	−4	−4
4. Trough, July 1924	−13	−13	−2	−12
5. Peak, Oct. 1926	−14	−12	−13	−12
6. Trough, Nov. 1927	−14	−9		−4
7. Peak, June 1929	−15	−14		−3
8. Trough, Mar. 1933	−14	−3	−3	−4
9. Peak, May 1937	−6	−5	−4	−5
10. Trough, June 1938	−8	−6	−3	−2
11. Average, 10 ref. turns	−11.2	−7.7	−4.8	−5.8

[a] Based on specific cycles in 14 series on new orders (machine tools, steel sheets, structural steel, oak flooring, southern pine lumber, architectural terra cotta, 4 items of railroad equipment, and 4 items of enameled sanitary ware). All series included are monthly, except rails, RR passenger cars, and locomotives, which are quarterly.

[b] Includes 13 series on new orders (all listed in note *a*, except rails, RR passenger cars, and locomotives, plus two items not covered there, viz. fabricated steel plate and merchant pig iron). All series included are monthly. This index is based on moving averages of the following periods: architectural terra cotta, steel plate, structural steel, and RR freight cars—7 months; bath tubs—4 months; all others (8 items)—5 months. The moving-average periods were selected according to the scale given in Chapter 20.

[c] Based on 5-month centered moving averages of 12 monthly series on new orders (all those referred to in note *b* except RR freight cars).

[d] Measures in lines 2–8 are based on the index compiled by the Department of Commerce and the National Bureau of Economic Research from various individual new order series. Measures in lines 9 and 10 are based on the index of the National Industrial Conference Board. See Table 14.5 and the accompanying text.

on the index B from Chart 14.6.[41] The averages of these leads are still as long as 7.7 and 4.8 months. But the timing of the cumulated indexes is quite variable; at some of the turns the reduction of the leads due to cumulation (as indicated by comparing cols. 2 and 3 with col. 1) is small, at others large.[42]

[41] The percentage expanding index includes 13 series, all of which except one (freight car orders) are also covered by the average duration series. The percentage expanding is based on 4-, 5-, and 7-month moving averages, according to the scale given in Chapter 20, so that those component series that change their direction of movement more frequently are here smoothed with moving averages of longer periods.

[42] Most of the leads of the cumulated average duration are somewhat shorter than the leads of the cumulated percentage expanding at the same reference turns. This difference is to be expected (see Chapter 9).

The two cumulative series appear as the first two curves in Chart 14.7. Plotted beneath them is the monthly index of new orders for durable goods, 1920–33, compiled by the Commerce Department and the National Bureau. This index covers most of the series used in our diffusion measures and a few other items. Both its larger and smaller movements are very similar to the swings in the cumulated diffusion indexes, as can be seen clearly from the six-month moving average of the Commerce-NBER series. The same is true for the movements in the NICB index of new orders for durable goods, which is shown in the chart for 1929–38. The similarity is, of course, not unexpected, since studies of diffusion indexes proper have, in many cases, established their close correlation with the rates of change in the corresponding aggregates.[43]

The bottom curves in Chart 14.7 represent the Federal Reserve Board production index for durable manufactures; above it is plotted the cumulated percentage expanding of sixteen component series of this index, based on month-to-month changes. The chart and the tabulation below show that the indexes for new orders consistently lead those for production. The timing relation between the diffusion measures resembles the timing relation between the aggregates. The figures in the tabulation

Turn in Cumulated Percentage Expanding Prod. of Durable Goods	*Lead (−) or Lag (+) of Cumulated Percentage Expanding, New Orders for Selected Durable Goods*	*Turn in Cumulated Percentage Expanding Prod. of Durable Goods*	*Lead (−) or Lag (+) of Cumulated Percentage Expanding, New Orders for Selected Durable Goods*
Trough, Aug. 1924	−14	Trough, Mar. 1933	−3
Peak, Sept. 1926	−11	Peak, May 1937	−5
Trough, Nov. 1927	−9	Trough, June 1938	−6
Peak, Aug. 1929	−16	Average, 1924–38	−9.1

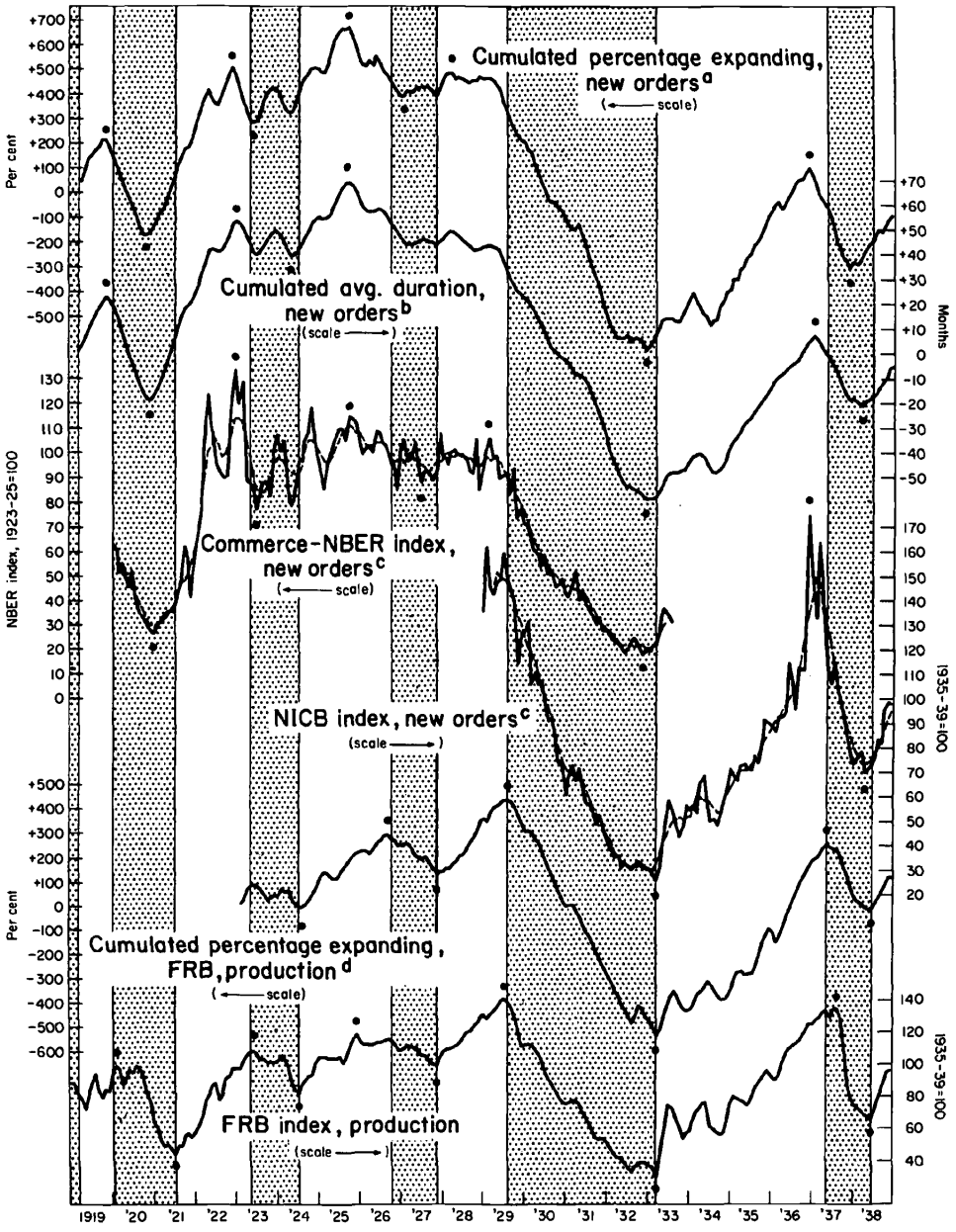
are also quite similar to the leads of the cumulated percentage expanding index of new orders at the corresponding reference turns (Table 14.10, col. 2). This is so because the production series turn at roughly the same time as aggregate economic activity. Other comparisons between the cyclical timing of diffusion indexes for new orders and production corroborate the above findings.[44]

[43] See Chapters 8, 9, and 18.

[44] A. F. Burns (Chapter 2) and G. H. Moore (Chapter 8) note that turns in a diffusion index for new orders precede the corresponding turns in a diffusion index for production. These indexes differ in several respects from those shown in Chart 14.7. They are based on specific cycles of the interwar period. The sample of production series is not constructed to avoid duplication, but covers broad indexes as well as individual commodities, altogether 187 series on durables and nondurables including foodstuffs. The new orders sample includes 56 series on construction contracts and building permits as well as the 14 series on new orders proper that are covered by our index A. Moore finds that employment and payrolls also lag behind new orders, while the diffusion indexes for profits and new orders are roughly coincident.

CHART 14.7

Cumulated Diffusion Indexes and Aggregative Series, New Orders and Production of Durable Manufactures, 1919–38



[a] Based on 4-, 5-, and 7-month moving averages of 13 selected series; see text.

[b] Based on 5-month moving averages of 12 selected series; see text.

[c] Solid lines are seasonally adjusted data, broken lines 6-month moving averages of these data, centered on fourth month.

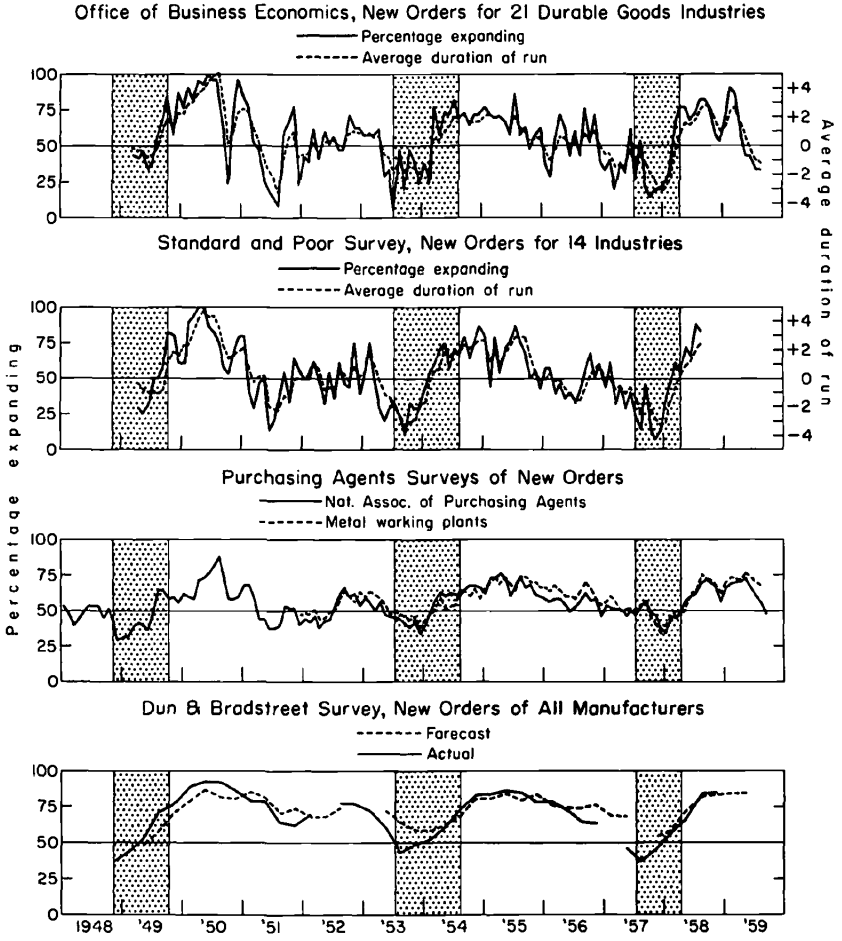
[d] Based on month-to-month changes of 16 series.

Shaded areas represent business contractions; unshaded areas, expansions.

Dots identify peaks and troughs of specific cycles.

CHART 14.8

Diffusion Indexes of New Orders, Four Groups of Series, 1948–59



Shaded areas represent business contractions; unshaded areas, expansions.

The main characteristics of the cyclical diffusion of new orders as revealed by the commodity data for the interwar period reappear in the behavior of indexes for the post-World War II period, which are constructed from aggregate value series. They are also broadly confirmed by diffusion measures based on business surveys for recent years.

Chart 14.8 presents eight indexes grouped by pairs representing four different sorts of data. The series plotted in the upper panel of the chart measure the diffusion of cyclical movements in new orders for twenty-one

durable goods manufacturing industries covered by the Department of Commerce compilation. The industrial breakdown used in the construction of these indexes is considerably more detailed than that employed in the published OBE data; unfortunately, not all of the series included were available for inspection, so that the behavior of the indexes could not be examined in the light of the behavior of their components. One of the two series shows the percentage expanding, the other the average duration of run for this group of data; the latter is considerably smoother than the former, as it should be, but both have specific cycles that are clear and as early as would be expected from the timing of the component industry series.

The indexes shown in the second panel measure the percentage expanding and the average duration of run for the group of fourteen industry series on new orders from Standard and Poor's compilation. Again, we find that the average duration of run index is smoother than its companion series, but that fairly clear cyclical movements can be distinguished in both.

Of the two indexes plotted in the third panel of the chart, the longer one records the results of the monthly business survey of the National Association of Purchasing Agents insofar as they refer to new orders. These figures are based on 200–225 member reports which reflect in general the conditions in the firms with which the respondents are associated. They show the percentage of survey participants reporting an increase plus half the percentage reporting no change in new orders from a month before.[45]

The shorter series in the third section of Chart 14.8 is an index computed from a monthly survey of purchasing agents conducted since November 1951 by *Purchasing News* magazine. This index shows the diffusion of new orders of metal working plants only. The computation method is the same as that used for the NAPA index and has the same implications. The two indexes are remarkably alike, not only in their timing which is practically synchronous at turns and base-line crossings,

[45] The main effect of this treatment is to raise the level of the index without altering appreciably its cyclical pattern, because the "no change" answers, while usually more numerous than either the "better" or the "worse" replies, constitute a relatively stable series. Two other features of this index may be noted. First, the findings of the survey are available very early, even before the end of the report month. Second, the replies of the members are not adjusted for seasonal variation, yet for reasons that are not clear there seems to be very little seasonal in the resulting diffusion index. Cf. *An Appraisal of Data and Research on Businessmen's Expectations About Outlook and Operating Variables, Report of the Consultant Committee on General Business Expectations*, Federal Reserve Board, September 1955, p. 62; also, see Heinz E. Luedicke, "The Effectiveness of Opinion Surveys," *Bulletin of the National Association of Purchasing Agents*, Vol. XXIV, No. 43 (Section Two), December 2, 1953. After the work on this chapter was completed, the NAPA new orders diffusion index was seasonally adjusted (see Volume II, series D4.3). The unadjusted data are used here.

but also in their range of fluctuation. Even their shorter and smaller movements have a general likeness.[46]

The two curves at the bottom of Chart 14.8 represent the actual and the expected diffusion of manufacturers' new orders as reported in the Dun and Bradstreet Survey of Business Men's Expectations. Here the sample consists of individual business concerns ranging in number from less than 300 early in 1949 to about 700 in 1958. Each quarter, responsible management officers of the firms surveyed are asked about their expectations for the quarter roughly six months ahead compared with the same quarter of the preceding year. They also provide information on the actual change in new orders between the current report quarter and the same quarter a year ago.[47] The resulting diffusion figures are plotted at midpoints of the intervals to which the underlying comparisons refer. This method of presentation, which should assure that the forecast as well as the actual index figure in any given quarter relate to the same interval, is comparable with the procedure used in the case of diffusion indexes based on short-period directions of change.

The indexes represented in Chart 14.8 differ markedly in amplitude and smoothness, as would be expected in view of the diversity of the underlying samples and methods. Thus it is obviously far more likely that fourteen or twenty-one series would all expand or contract simultaneously than that some 200 or 1,000 respondents would all report or anticipate changes in the same direction. Accordingly, the OBE and the Standard and Poor's indexes should and do reach farther toward the extremes of the diffusion scale than the other indexes presented. Also, despite the fact that they are constructed from smoothed data, their short noncyclical movements are larger and more frequent than those in the NAPA and *Purchasing News* indexes which are based on month-to-month directions of change. The Dun and Bradstreet series are, of course, the smoothest of all, as they are not only derived from relatively large numbers of reports but also equivalent to indexes computed from quarterly data graduated with four-quarter moving averages.

[46] We have no basis for judging how much of this parallelism is due to overlapping information and how much to convergence of opinions. The membership of NAPA's Business Survey Committee is said to reflect both regional and industrial diversification (see Luedicke, "Opinion Surveys," p. 2). Some 42 industries are represented, but information about the industrial stratification of the sample is not available. The *Purchasing News* survey is described in the source as a "representative sampling of 1,000 metal working plants across the nation."

[47] Five other variables—sales, profits, prices, inventories, and employment—are also covered by these surveys. Here the samples are larger than for new orders, ranging from 500-odd to about 1,500 firms over the years, as they include wholesale and retail trade as well as the manufacturing sector. See the *Report of Consultant Committee on General Business Expectations*, pp. 25ff. A more comprehensive analysis of these data is given in Millard Hastay, "The Dun and Bradstreet Surveys of Businessmen's Expectations," *Proceedings of the Business and Economic Statistics Section, American Statistical Association*, September 10–13, 1954.

In the direction and timing of their major cyclical movements, however, the diffusion data of Chart 14.8 display a degree of agreement which under the circumstances can be judged quite substantial. The intervals between their matching turns are short and their average timing relative to each other "roughly coincident," with only one marked exception. Interestingly, in the Dun and Bradstreet survey the expected diffusion index lags behind the actual one, and it accordingly turns later than the other series in Chart 14.8, too.[48]

Of the few timing comparisons at business cycle turns that are available for these series, all are intermediate or long leads. At the 1953 recession, the leads were nine and eight months for the two OBE indexes, five months for the two Standard and Poor's indexes, and ten months for the NAPA, *Purchasing News*, and the Dun and Bradstreet actual index. At the 1954 revival, the leads were thirteen and seven months for the OBE indexes, eleven months for Standard and Poor's, eight months for NAPA and *Purchasing News*, and twelve and nine months for Dun and Bradstreet actual and expected indexes, respectively.

We have also constructed various diffusion indexes from the seven or eight published component series of the Commerce compilation of manufacturers' new orders. Although only a few broadly defined industry figures are published, and these are characterized by frequent directional changes, the constructs based on the OBE data (smoothed with moving averages of periods not exceeding six months) have surprisingly clear cyclical movements. The comparison of our working charts shows that there is a general but well expressed agreement between the cyclical movements in the diffusion of the OBE series and the fluctuations of the indexes included in Chart 14.8. But in view of their choppiness, it is helpful to present the OBE index figures in cumulative form, and they are plotted in this fashion at the top of Chart 14.9.

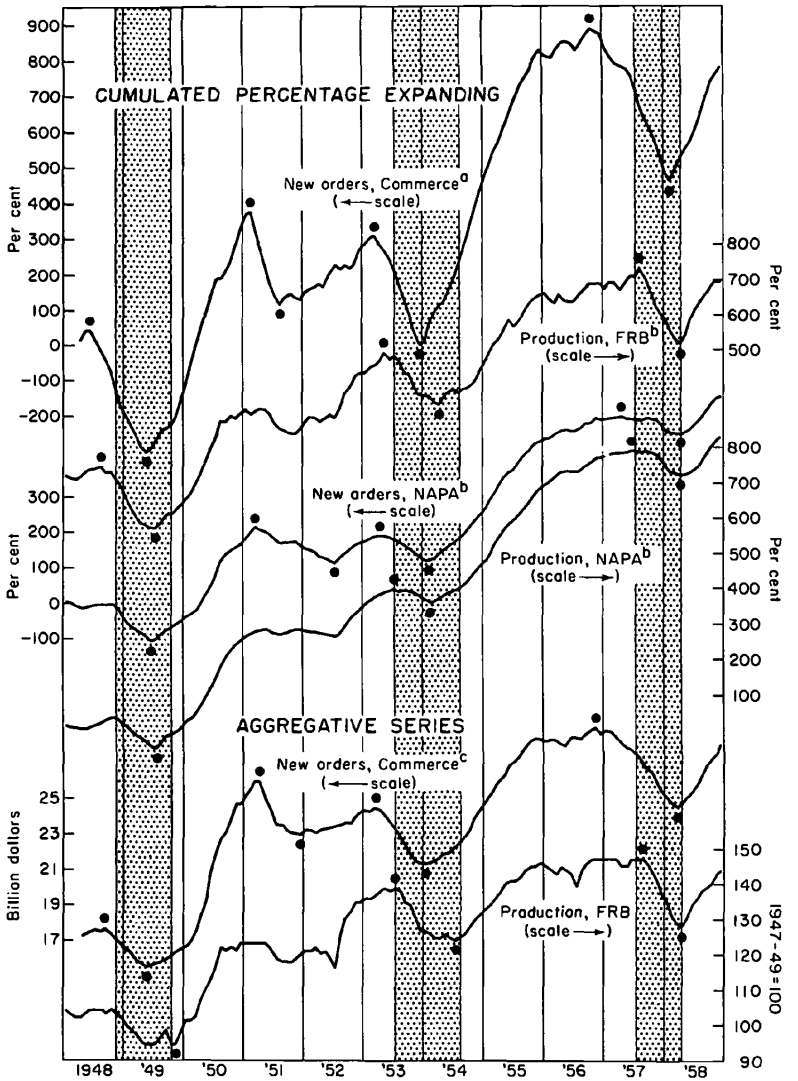
The peaks and troughs in this series led the general recessions and revivals of the recent period regularly, and so did the turning points of the other cumulated diffusion index of new orders shown in Chart 14.9, which is based on the NAPA survey data. The leads of these indexes at business cycle turns are shown in Table 14.11, columns 3 and 4. They are shorter on the average and less variable than those of the cumulated diffusion indexes of the interwar years (cf. Table 14.10, cols. 2 and 3).

Two further points can be demonstrated. First, the postwar diffusion cycles in new orders tended to precede those in production by short intervals. Table 14.11, columns 1 and 2, presents the evidence based on

[48] The tendency for expectations to lag behind actual experience is noted in the discussion of Dun and Bradstreet surveys in the previously quoted report of the FRB committee on business expectations (p. 51).

CHART 14.9

Cumulated Percentage Expanding and Aggregative Series, New Orders and Production, All Manufacturing Industries, 1948–58



[a] Based on 5-month weighted moving averages and on 6-month simple moving averages.

[b] Based on month-to-month change.

[c] 6-month moving average centered.

Shaded areas represent business contractions; unshaded areas, expansions.

Dots identify peaks and troughs of specific cycles.

TABLE 14.11

Timing of Cumulated Diffusion Indexes and Aggregates, New Orders and Production, All Manufacturing Industries, 1948–58

Date of Turn — Cumulated Percentage Expanding, Production (FRB)[a]			*Cumulated Percentage Expanding, New Orders (OBE)*[b] — Lead (−) or Lag (+) (months) (1)	*Date of Turn* — Cumulated Percentage Expanding, Production (NAPA)[c]			*Cumulated Percentage Expanding, New Orders (NAPA)*[c] — Lead (−) or Lag (+) (months) (2)
Peak	Aug.	1948[d]	−2[d]				
Trough	July	1949	−2	Trough	July	1949	−1
Peak	April	1951	−2	Peak	Dec.	1951	−9
Trough	Nov.	1951	−3	Trough	July	1952	0
Peak	May	1953	−2	Peak	July	1953	−3
Trough	April	1954	−4	Trough	Feb.	1954	0
Peak	Aug.	1957	−10	Peak	June	1957	−2
Trough	April	1958	−2	Trough	April	1958	0
Average, 1948–58			−3.4	Average, 1949–58			−2.1

Date of Business Cycle Turn			CUMULATED PERCENTAGE EXPANDING — *New Orders*: Commerce (OBE)[b] (3)	*New Orders*: Nat. Assoc. of Purch. Agents (NAPA)[c] (4)	*Production*: Fed. Reserve Board (FRB)[a] (5)	*Production*: Nat. Assoc. of Purch. Agents (NAPA)[c] (6)	*Aggregative Series*: Value of Mfrs. New Orders (OBE)[e] (7)	*Aggregative Series*: Index of Mfg. Production (FRB) (8)
Peak	Nov.	1948	−5[d]		−3[d]	0	−2	−1
Trough	Oct.	1949	−5	−4	−3	−3	−5	+1
Peak	July	1953	−4	−3	−2	0	−4	0
Trough	Aug.	1954	−8	−6	−4	−6	−7	−1
Peak	July	1957	−9	−3	+1	−1	−8	+1
Trough	April	1958	−2	0	0	0	−1	0
Average, 1948–58			−5.5	−3.2	−1.8	−1.7	−4.5	0

[a] Based on month-to-month changes in major industry components of the FRB index of manufacturing output.

[b] Based on weighted 5-month moving averages and 6-month moving averages of the OBE data on manufacturers' new orders (major industry components). The weight formula +1, +2, +3, +2, +1 was used; its rationale is explained in an unpublished paper by the present author on "An Experiment in Smoothing Time Series for Diffusion Measurement." This series retains the leading characteristics of the new order series in a somewhat larger measure than does its counterpart based on simple moving averages of the same periods.

[c] Computed from diffusion data yielded by the Monthly Business Survey of the National Association of Purchasing Agents (see text). Seasonally unadjusted data for both new orders and production are used here, although adjusted data for new orders are available (cf. Volume II, series D 4.3). Only two turns in the cumulated percentage expanding for new orders are affected by the adjustment: the February 1954 trough in the unadjusted series is shifted to January, and the April 1957 peak is shifted to June.

[d] Tentative or based on tentative dates.

[e] 6-month moving averages centered on the fourth month. The average lead of unsmoothed data is 4.8 months (for individual timing comparisons based on such data, see Table 14.5, cols. 2 and 4, lines 8 and 9).

two pairs of cumulative curves, the OBE-FRB combination and the two NAPA series (curves 1–2 and 3–4 in Chart 14.9, respectively).[49]

Second, Chart 14.9 testifies to the close parallel between cumulated diffusion indexes for new orders and production and the corresponding aggregates, just as Chart 14.7 did for comparable series in the interwar period. The burden of proof here is on the OBE and BRF data (the curves to be compared are 1–5 and 2–6), since surveys such as that of NAPA, which are concerned with directions of change, provide no basis for any meaningful aggregation.

Comparisons analogous to those involving production have also been made between new orders and the value of shipments or sales. They add little to what is indicated by our previous findings and may be summed up very briefly. Timing measures for cumulated diffusion indexes based on the OBE data (1948–54) show sales lagging behind new orders with a high degree of consistency by intervals averaging about three months. In the Dun and Bradstreet survey data, too, actual diffusion of new orders leads that of sales.[50]

VI. Investment Orders and Business Expenditures on Plant and Equipment

Among the earliest insights gained by business cycle students is the recognition of the exceedingly high cyclical sensitivity of producers' investment in fixed capital.[51] As measured by business plant and equipment expenditures on capital account, this major part of gross private domestic investment continues to receive considerable attention from both analysts of economic fluctuations and forecasters of business conditions. This attention is certainly justified and indeed much more of it will be needed before the interaction of business investment and other strategic processes during business cycles is properly understood.

Interestingly, as far as the *results* of the process are concerned, the cyclical sensitivity of private fixed-capital formation can be seen in large amplitudes but not in earliness of timing. What little evidence there is on this point indicates that peaks and troughs in aggregate business expenditures on plant and equipment are roughly coincident with or lag behind the corresponding turns in general economic activity. In the period since 1947, for which fairly representative quarterly estimates are available owing to the joint efforts of the Department of Commerce and

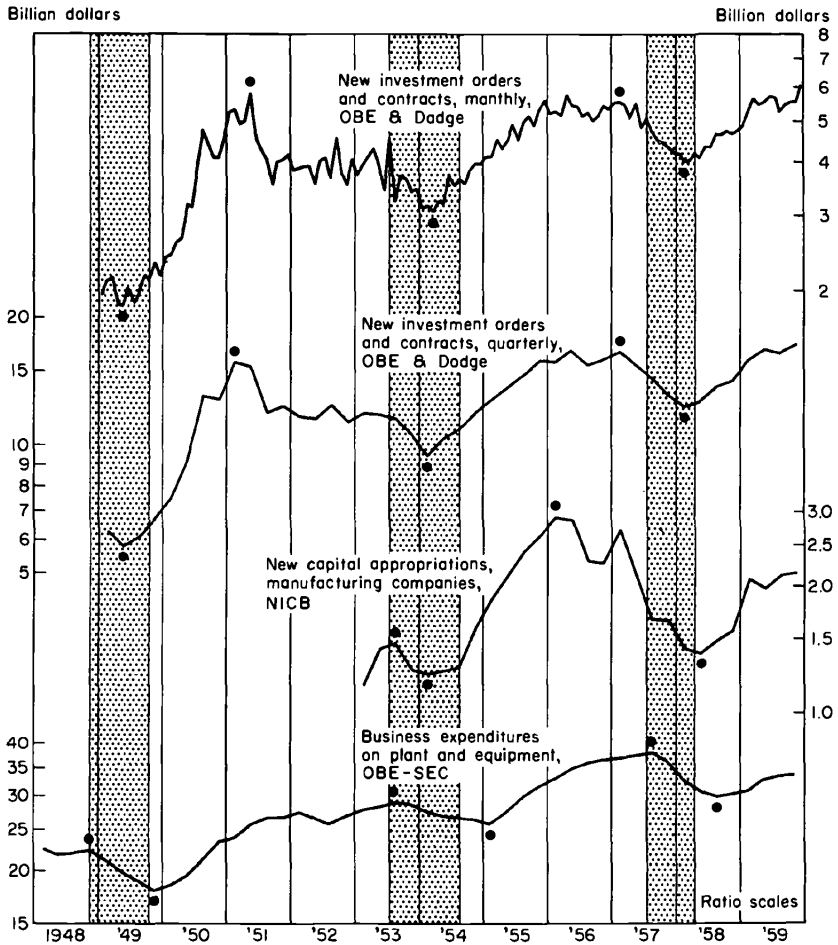
[49] See Chart 14.7 for a demonstration of a similar relationship in 1924–38. The leads of new orders over production, in terms of indexes of cumulated percentage expanding, were on the whole considerably longer in those years than in the recent period (compare Table 14.11 with the tabulation on p. 465 above).

[50] However, the *expected* diffusion indexes of Dun and Bradstreet fail to exhibit a similar timing relationship between the two variables. This poses another question about data derived from these surveys (see reference in footnote 48).

[51] For a broad review of the evidence, see Millard Hastay, "The Cyclical Behavior of Investment" in *Regularization of Business Investment*, Special Conference 4, Princeton for NBER, 1954.

CHART 14.10

New Investment Orders and Contracts, New Capital Appropriations, and Plant and Equipment Expenditures, 1948–59



Shaded areas represent business contractions; unshaded areas, expansions.
Dots identify peaks and troughs of specific cycles.

the Securities and Exchange Commission, business outlays on plant and equipment were coincident once and lagged at five recessions and revivals in aggregate economic activity (see Chart 14.10 and Appendix B). For the interwar period, quarterly data on plant and equipment expenditures for manufacturing industries alone, constructed by Lowell Chawner, led at two business cycle turns, were coincident three times, and lagged on seven occasions (see Appendix B). The lags, however, are short, as in the postwar period.

Spending by business for fixed-capital formation, then, appears to fluctuate more or less in unison with, or to lag slightly behind, the nation's over-all economic performance. Production and shipments of various investment goods also have roughly coincident timing in most cases, often with a tendency to lag.[52] But, as we know, *new orders* for these goods reach their peaks and troughs considerably earlier than production or shipments and typically before the central months in the general business recessions and revivals. This situation suggests another possible application for new orders data. Can series on new orders be selected which would, probably in some weighted combination, portray the course over time of total fixed-investment *commitments* of the business community? An index of this sort should predict well at least the major changes in actual business expenditures on gross investment in productive capacities.[53]

Clearly, the aggregate of new orders received by durable goods manufacturers contains orders that correspond to the "equipment" component of business fixed-investment outlays, but it also includes a large variety of other orders. These are the orders placed by intermediate (nonfinal) users for resale purposes, those placed by government, and those for consumer durable goods. For the purpose in view, therefore, new orders received by the following eleven durable goods manufacturing industries are taken to represent, in large part, commitments for the purchase of equipment by business enterprise:

Electrical generating and transmission equipment
Other electrical machinery and equipment (excl. radio, TV mfg.)
Transportation equipment other than motor vehicles, parts, and aircraft
Metal working machinery
Special industrial machinery
General industrial machinery
Engines and turbines

[52] Cf. Table 14.4, lines 1–9, col. 3. Note also the heavy preponderance of coincident cyclical timing (characteristic expansion stages I–V) in Wesley C. Mitchell, *What Happens during Business Cycles: A Progress Report*, New York, NBER, 1951, Table 16, section C, p. 162.

[53] The value of an index of this sort was suggested by Wesley C. Mitchell and Arthur F. Burns in 1938. See Chapter 6, footnote 13.

Construction machinery
Office and store machines
Other nonelectrical machinery
Other fabricated metal products

Excluded are the following ten durable goods manufacturing industries: iron and steel, primary nonferrous metals, other primary metals, radio and TV equipment, motor vehicles, motor vehicle parts, aircraft, stone, clay and glass, agricultural implements, household appliances. Orders received by these industries do not, for the most part, represent business purchases of equipment.

The "plant" component of business capital formation is not directly represented in the new orders aggregate. The best counterpart to it among the commitments data is the series of contracts awarded to building contractors for industrial and commercial construction, plus contracts for privately owned public works and public utilities, as compiled by the F. W. Dodge Corporation.

Thus the aggregate of current fixed-investment commitments entails combining the above construction contracts series with the estimates of new orders for industrial and other productive equipment, made available by the Department of Commerce. Since the construction contract and the new orders figures are both in current dollar values, the two can be combined by simple addition.[54] In the resulting totals, then, the component categories are weighted by the transaction volumes they represent.

The estimates of the aggregate value of fixed-investment commitments, derived according to the above procedure are shown in Chart 14.10 together with the NICB data on new capital appropriations and the OBE-SEC data on total business expenditures on plant and equipment. All series are presented in quarterly, seasonally adjusted form (the commitment data are, however, available monthly—see series 6.2 in Volume II). The chart accords with general expectation of what the relation between commitments and appropriations, on the one hand, and expenditures, on the other, should be like: the time path of expenditures on investment goods resembles on the whole the course of the estimated orders and appropriations for such goods, but the cycles in expenditures lag behind those in orders and appropriations by long intervals and have smaller relative amplitudes. The only conspicuous difference between the orders and expenditures curves is that the short but pronounced "Korean" cycle in investment orders with a high peak

[54] It would be of interest, also, to obtain a physical volume index, perhaps by combining floor space of industrial and commercial building contracts with deflated new orders for producers' durable equipment. Among the advantages of such an index would be the substantially less erratic behavior of the floor space than the value data, and the earlier timing of deflated orders at peaks.

in the first quarter of 1951 is largely smoothed out in the expenditures for plant and equipment (as it is in the corresponding production or shipment series).

The regularity of the orders-expenditures lag for investment goods is brought out in the accompanying tabulation. With the exception of the long lag following the 1951 peak in orders, which is associated with the heavy accumulation of order backlogs described above, the lags run between six and twelve months at every turn.

Peak in Orders-Contracts (quarter)	*Lag of Expenditure (months)*	*Trough in Orders-Contracts (quarter)*	*Lag of Expenditure (months)*
		II 1949	6
I 1951	30	I 1954	12
I 1957	6	I 1958	6

As an aid to forecasting plant and equipment expenditures, the orders-contracts estimates can be shown to possess certain advantages over the OBE-SEC estimates of the *anticipated* plant and equipment expenditures. To this end, Chart 14.11 presents the quarterly percentage changes in orders-contracts, anticipated percentage changes in expenditures, and actual percentage changes in expenditures.[55] By comparing changes rather than levels, we avoid a basic difficulty due to systematic revisions of the expenditures estimates.[56]

Chart 14.11 shows a systematic lead of the change in investment orders and contracts over the change in actual plant and equipment expenditures. Except for one instance of coincident timing, the former series led the latter at each turning point, by intervals varying from one to four quarters. This corresponds, of course, to the results in Chart 14.10. The series of anticipated changes, on the other hand, led both change in actual expenditures and investment orders at only one turn and lagged at two.[57]

Compared with the investment orders estimates, the OBE-SEC

[55] In each case the percentage change between two successive quarters is based on the value of the series in the earlier quarter and is plotted in the later quarter. The quarters are those *for* which, not those *in* which, the estimates are made. The series are plotted separately to the same scale.

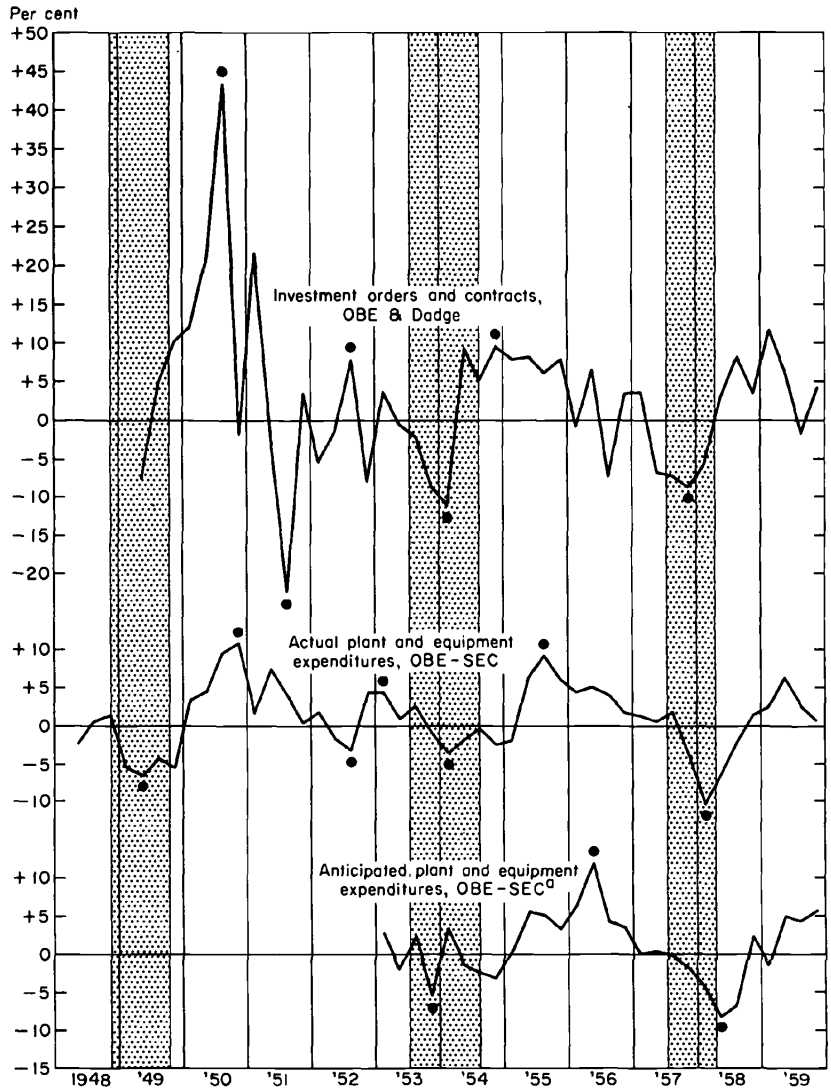
[56] A series made up of the anticipated expenditures levels alone cannot be taken to show at what points of time the actual expenditures were expected to experience upturns or downturns. Such a series would show changes from a *previously anticipated* level to the next anticipated level, whereas, in fact, at any given time the anticipated change is from the latest available estimate of the *actual* level to the next anticipated level.

[57] The first anticipation estimates of business plant and equipment outlays, to which the bottom curve in Chart 14.11 refers, are not available in seasonally adjusted form before 1953. The earlier unadjusted figures did not seem to warrant presentation; their record as anticipatory statistics has apparently been poor.

CHART 14.11

Quarter-to-Quarter Percentage Change in Investment Orders and Contracts, Actual and Anticipated Plant and Equipment Expenditures, 1948–59

(plotted in the second of the two quarters to which the figures refer)



[a] Anticipated changes are available (published) approximately 3 months ahead of the quarter to which they refer.

Shaded areas represent business contractions; unshaded areas, expansions.

Dots identify peaks and troughs of specific cycles.

investment expenditure anticipations have the advantage of earlier reporting dates.[58] But the lead of the investment orders relative to the actual expenditures is so long that it definitely outweighs this advantage. To illustrate, consider the developments during the latest business revival. By May 1958, data on new orders and contracts were available for the first quarter of the year, i.e. through March. Their rates of change showed a slight improvement (decelerated decline) from the trough in the third quarter of 1957. This would have provided an indication that the contraction in plant and equipment expenditures was leveling off. The anticipations figures available by that time (through the second quarter of 1958) gave no such signal: the anticipated decline was larger than in any preceding quarter. Although a reduction in the rate of decline could first be detected only a little later, in June, when third quarter anticipations became available, it was then so embryonic that at best it was a very uncertain sign of a possible improvement in the fixed investment situation (note the small rise in the curve at bottom of Chart 14.11 between the second and the third quarters of 1958). A firmer indication from the anticipations data could not be had until September 1958, the publication month of the first estimate for the last quarter of the year. This gave notice of an upturn in investment in plant and equipment (since the anticipated change became positive). But an indication to the same effect from the monthly orders-contracts data was apparent two to three months earlier.

To recognize fully the strength of this evidence, it should be noted that of the three turning zones covered by these data the 1958 upturn was decidedly the one to show the performance of the first anticipations in the most favorable light. At the 1954 upturn the usefulness of the anticipations was marred by the erratic nature of their early movement and at the subsequent downturn the record of the anticipations was poor because they lagged relative to actual expenditures (Chart 14.11).

An attempt to match new orders for and expenditures on plant and equipment serves the straightforward purpose of tracing the process of fixed investment through two of its stages that one would expect to be markedly spaced in time. A very different and much less obvious relationship that can also be explored with the aid of the same two sets of data is the association between the fixed-investment outlays made and the orders received by a given group of companies such as any of the major manufacturing industries. We have made comparisons of this sort for all

[58] The estimate of the *actual* investment expenditures is published with a four-month lag (from the last month of the quarter to which the estimate refers). Thus the figure for the last quarter of 1958 became available in March 1959. But OBE-SEC released a first estimate of the *anticipated* plant and equipment outlays for the same quarter (IV 1958) six months earlier, in September 1958 (that is, with a three-month lead, to the last month of the quarter). On the other hand, the investment orders series can be constructed with a two-month lag, e.g. late in February 1959 an estimate could be made of the December 1958 figure.

TABLE 14.12

Value of New Orders Received and Expenditures on Plant and Equipment Made by Seven Major Manufacturing Industries: Summary of Comparisons at Turning Points, 1948–58

Industry	No. of Turns Covered, New Orders (1)	*No. of Turns in Plant and Equipment Expenditures*		No. of Leads of New Orders (4)	Average Lead of New Orders[a] (months) (5)	Average Deviation[a] (months) (6)
		Covered (2)	Matched (3)			
1. Primary metals	8	6	6	5	−11.0	6.0
2. Electrical machinery	8	5	5	4	−7.2	7.0
3. Machinery except electrical	8	8	8	7	−6.4	4.1
4. Motor vehicles and parts	5	7	5	4	−3.0	3.6
5. Other transportation equipment	7	5	5	5	−8.4	3.1
6. Paper and allied products	5	5	5	5	−7.2	2.2
7. Textile mill products	7	6	5	5	−9.0	3.6
8. Total or average[b]	48	42	39	35	−7.5	4.7

SOURCE: New orders: Department of Commerce, Office of Business Economics. Expenditures: Securities and Exchange Commission and Office of Business Economics.

[a] Expressed in months but based on timing comparisons between quarterly turning points.

[b] Totals in cols. 1–4; averages, weighted by the numbers of observations for each component item, in cols. 5 and 6.

industries for which the proper data can be matched. In brief, we find that as a rule (that is, for a majority of the industries and most of the time) industry expenditures on plant and equipment followed a course similar to that of new orders for products of the given industry. Indicative of this correspondence is the fact that the number of instances in which turns in new orders can be matched with those in plant and equipment expenditures represents over 80 and 95 per cent of all turning points covered in the orders and the expenditures series, respectively (this is based on comparisons for seven industries 1948–58, see Table 14.12, cols. 1–3). Substantial correlations between these series involve fairly long leads, however. Typically, cyclical movements in the incoming business begin and end several months ahead of the corresponding movements in the fixed-investment outlays of the industries concerned (col. 5).

Moreover, there is some indication that these leads are more often than not longer than the intervals that elapse between the time the pertinent investment decisions are made and the time they result in expenditures. The evidence, admittedly slender, comes from comparisons of the quarterly capital appropriations data compiled by the National

Industrial Conference Board with the OBE figures on manufacturers' new orders; such comparisons can be made only for the period 1955–58, i.e. at peaks and troughs associated with the latest business contraction, for six major industries. The record for the observations at peaks is four lags and two leads of new capital appropriations relative to orders received by the same industry; the record at troughs is three lags of new appropriations, two coincidences, and one lead. The prevailing sequence of turning points then is: (1) new orders for the industry's products; (2) newly approved appropriations for the industry's capital spending; and (3) actual expenditures on the industry's plant and equipment.[59] Thus expansions and contractions in new orders for manufacturers' output seem to have stimulated and discouraged, respectively, both the new approvals and the actual implementation of capital expenditure projects of the affected companies.

This suggests that it may be possible to expand the argument, given earlier in this paper, that new orders tend to lead the business cycle "because they lead the output of products to which they give rise and stimulate ordering of other goods needed for that production." It would now seem that a substantial cyclical rise in new orders for an industry's output is also likely to stimulate ordering by the companies concerned of things that serve their estimated *future* (as distinct from current) production requirements. This at least is the tentative conclusion to be drawn from the record of the generally prosperous decade since 1948. In this period production pressures on capacity were considerable most of the time and the sellers' market positions were on the whole strong. Manufacturers' profits in general reflected these favorable conditions while moving in sympathy with the changes in current output. Correspondingly, the short-term expectations of profits were much influenced by changes in new orders, which anticipate the movements of production in at least the near future. The business climate in this period was probably not conducive to the development of any sharp differences between the short-run and the longer-term economic outlook. It is thus for good reasons that the recent trends in new orders could be expected, *via* their effects upon actual and anticipated profits, to influence in a major way the industrial producers' decisions regarding investment in plant and equipment.[60]

VII. Summary of Findings

Let us reconstruct what seems to be the typical sequence of events in the response of an industry to cycles in ordering, and then, against this

[59] The lags of (2) relative to (1) appear to be by and large considerably shorter than the lags of (3) relative to (2).

[60] On the relations between output and investment in plant equipment, see Bert G. Hickman, "Diffusion, Acceleration, and Business Cycles," *The American Economic Review*, September 1959, pp. 535–565.

background, review our principal findings on the behavior of manufacturers' orders during business cycles.

One of the earliest signs of a business revival, at a time when general economic activity is still depressed, is an upturn in the proportion of companies with increases in new orders. This is followed by an upturn in the proportion of companies that start expanding their output volumes. As the expansion in demand widens, aggregate new orders turn up too, again preceding the revival in aggregate industrial production. At business recessions, an analogous sequence of downturns in these activities is typical.

As a rule, the expansion in demand will soon carry new orders above the levels of production and shipments. Hence unfilled orders accumulate; they come to increase faster than shipments, and average delivery periods lengthen. When at a later date new orders turn down, current production continues expanding. Order backlogs continue increasing, too, although at a slower pace; they turn down only when new business declines below the level of shipments. Even after that, output may still move up for quite a while, but now its ultimate curtailment is foreshadowed. The ensuing contraction in the industry's activity is, however, slower than the contraction in new orders; production and deliveries tend to exceed the concurrent volumes of new business, as manufacturers work off the backlogs of their past commitments. Unfilled orders begin to decrease faster than shipments, and average delivery periods shorten. When current demand (new orders) turns up again, its level is often much lower than that of output—too low in the view of most firms to justify a reversal of their contractive production policies. The initial effects of the increase in new orders will then be limited to a slowdown in backlog decumulation and, perhaps, in the rate of output decline. But as soon as the expansion of new orders carries them above the levels of current manufacturing operations, the latter will most likely turn up; backlogs by then will be increasing, too, and we are back at the point in the cycle at which our description started.[61]

Cyclical analysis of series on new orders and related activities gives results that fit well into the above typical picture. New orders generally conform closely to business cycles. Few of these series fail to show a matching peak or trough in the vicinity of a business downturn or upturn. However, in addition to these reversals, new orders series exhibit a fair number of "extra" turns. These are typically associated with those expansions or contractions in new orders that expire before reaching up or down to the concurrent levels of industrial operations.

Relative amplitudes of cyclical fluctuations are systematically larger

[61] About the principal factors introducing deviations from, or complications in, this sequence, see above pp. 432f.

for new orders than for the corresponding series on current manufacturing, partly because output is limited by capacity and partly because of manufacturers' efforts to stabilize production.

New orders generally tend to lead production; for goods made to order, of course, they also lead shipments. Among such goods, those serving investment in producers' durable equipment and plant are particularly important and relatively well represented in our data. New orders and contracts for such capital goods lead investment activity, whether the latter is measured by output or expenditure. Moreover, industries experiencing increases in new orders for their own products will in time also increase their ordering of, and spending on, investment goods.

The tendency of new orders to turn before the reversals in aggregate economic activity is general and pronounced, hardly less so than their characteristic of leading production in the industry receiving the orders. Business revivals as well as recessions are anticipated. Individual leads vary considerably, but most are long.

Series for durable goods industries have particularly consistent leading records. Among these, not only goods made to order but also some staples sold chiefly from stock belong to the early leaders. In the nondurable goods sector, on the other hand, new orders show a strong leading tendency only in those industries that report backlogs of unfilled orders; it is at least doubtful whether there is any similar tendency on the part of those nondurables for which new orders and shipments are equivalent.

Comprehensive series beginning in 1939 show order backlogs turning down long before the peaks in business cycles, but turning up at approximately the time of the troughs. Expansions in backlogs, especially those of durable goods orders, reached unprecedented heights during World War II and in the following prosperity periods. From these top levels backlogs receded only gradually, and this helped to make business expansions longer. Counteracting this factor, however, is the growth of manufacturing capacity, which is reflected in lower backlog-shipment ratios (shorter delivery periods) at successive peaks in aggregate unfilled orders.

Measures of cyclical timing reviewed in this study show that manufacturers' new orders, especially those for durable goods which are produced largely against advance contracts and often in time-consuming processes, have considerable merit as indicators of revivals and recessions in general business. Their records of leading business cycle turns in the past stand out for consistency in any collection of the available early indicators. Moreover, the economic significance of the process they represent is relatively stable; there is no reason why their future behavior in regard to business cycles should not be essentially similar to their past behavior.

The shortcomings of new orders as cyclical indicators are also substantial, however. Their leads are far from uniform in length and often rather short. The "extra" cycles in ordering are interesting and on the whole explicable phenomena, but as a general rule the closer the specific cycles of an indicator series come to having a one-to-one correspondence with business cycles, the more useful is the series. More than anything else, the presence in the new order data of relatively large and frequent "irregular" movements constitutes a major limitation on the use of these series for forecasting or identifying business cycle turns.

It is not difficult to conceive of various ways of reducing these deficiencies. A forecasting index of new orders might be planned to include series selected for good records of conformity, timing, and smoothness. It is preferable, however, to base selection not merely on the empirical records but also on the considerations that explain them. In this study much attention has been given to such considerations. Once series have been rated, on the strength of their actual or expected records, those that are judged better may be given larger weights. Improved performance of the composite index should then result from the strengthening of the part played by the more consistent and early leaders among the new order data.

Beyond other more conventional techniques of index construction, diffusion measurements are promising. The established empirical rule that diffusion indexes lead the corresponding aggregates was shown to apply to new orders. Being based on series that themselves have a strong tendency to move ahead of the ebb and flow of general business, diffusion indexes of new orders are therefore especially early indicators of cyclical revivals and recessions. Various devices, such as cumulation, weighted graduation, and averaging the duration of movements in the series used for diffusion measurements, are available to reduce irregularities with a minimum loss in timeliness.

But any such improvements should be supplemented by efforts to make the workable data available more promptly. What is needed primarily is reliable aggregative estimates of new orders divided into a larger number of industry series than that provided in the present breakdown of government statistics.