known, market demand. But in the present context, production to order is clearly of major importance.

Plan of Study. Section II of this study examines aspects of industry structure that bear in an essential way upon the dynamic processes to be explored subsequently. One result is the demonstrably large weight of production to order within the manufacturing sector. This would be expected to enhance the importance of backlog adjustments relative to stock adjustments — (C) versus (B).

Section III deals principally with the relationship between changes in price and changes in delivery period and backlog — (A) versus (C). This is treated first in general analytical terms (formulated mathematically in the Appendix), then statistically. It shows that changes in unfilled orders and delivery periods do indeed function as a major instrument for stabilizing the flows of output and shipments relative to those of new orders. The role of uncertainty and competition receives attention in this context. Section IV, finally, provides a summary.

II. Orders, Production, and Industry Structure

Manufacture to Stock and to Order. It will be helpful to consider two models: one, pure production to stock, and the other, pure production to order. In the first, new orders are shipped immediately upon receipt and hence are virtually synchronous with and equal to shipments. Orders that could not be so filled but would have to be taken for future production and delivery are either not placed or not accepted; in the absence of such *advance* orders in the real sense, there are no backlogs. Here the firm has to maintain at all times a sufficiently large unsold inventory of finished products to meet current sales. In contrast, the second case, by assuming production to order only, implies that there are no *unsold* stocks of the finished product.[9] Lacking such stocks, the firm cannot, of course, handle any orders for immediate delivery of the product in question, but is limited to advance orders to be filled from its future output.[10]

Pure production to stock admits adjustments of current output and price (A) and of stock (B); those of order backlogs (C) are obviously precluded. In pure production to order, price adjustments are available to a firm that can influence price. The rates of output reflect those of new orders with lags; the greater the input flexibility, the closer the relationship. It is only with these qualifications, then, that one can refer here to the type (A) adjustments. However, while the volume of output under contract is determined by past orders, the short-period rate of output is not rigidly prescribed, since it also depends on the delivery dates which are often subject, to a considerable extent, to the discretion of the producer. The planned and the unplanned changes in the delivery periods are closely associated with fluctuations in unfilled orders, and these are the "backlog adjustments" (C) that one would presume to be particularly important in this case. The stock adjustments (B) are here, of course, not feasible.

A manufacturing concern is generally a multiproduct firm, often with a highly diversified output. Some of its products may be made to stock and others to order. Some may also shift from one category to the other at certain times. In particular, a product normally sold from stock may temporarily be made to order when orders for it run at peak levels and customers allow lags on their deliveries. But there are good reasons to believe that to a large extent some goods are produced to order and others

[9] This ignores cancellations of orders, which may give rise to some unsold finished stocks, but the relevant data indicate that the importance of cancellations is on the whole relatively small (except at times for military contracts); and surely those cancellations that occur after the ordered items have been produced must be the least frequent of all because of the large risk of loss, an effective protection against which will be sought by the seller. (Cf. *Ibid.*) More evidence will be presented in my NBER monograph "Orders and Production in Manufacturing Industries: A Cyclical Analysis" (in preparation).

[10] To formulate these two models algebraically, let o_t and s_t be the flows of orders received and shipped, respectively, during the t^{th} unit period, say, month, and let z_t be the corresponding flow of output or production. Then

$$o_t - s_t = u_t - u_{t-1} = \Delta u_t, \quad (1)$$

$$\text{and} \quad z_t - s_t = q_t - q_{t-1} = \Delta q_t, \quad (2)$$

where u_t is the backlog, that is, stock of unfilled orders, and q_t is the finished-product inventory on hand, both measured at the end of the month t. In pure production to stock, $o_t = s_t$ and $\Delta u_t = 0$ in each period, so that u_t is always zero. In pure production to order, $z_t = s_t$ and $\Delta q_t = 0$ in each period, so that q_t is always zero.

to stock mostly because of certain "structural" considerations.

Production will not be to stock if the costs of stocking the product in finished form exceed the costs of having to meet demand exclusively from future outputs. Under this condition, production will be to order if it promises to be sufficiently profitable to be undertaken at all. The costs that must be taken into account include intangibles that are not easily assessed in dollars (or any other comparable units) and the expected values of the net costs involved. The principal factor is the cost of not selling the stocked product or selling it only at a low price with what might be called a "liquidation loss." If there is a long delay before the sale can be effected, substantial carrying charges may arise, but these are often not nearly as important as the liquidation loss. On the other hand, the main cost of not having an item in stock is the loss of potential sales and/or customer good will when there is excess demand. This, however, implies that the customer is not willing to wait for delivery. Clearly, if buyers generally expect immediate deliveries, the product will have to be held in stock.

The goods for which manufacturers will demand, and their customers will have to allow, "lead times" in filling orders are those that can be held in inventory only at very large costs and considerable risk for one or more of the following reasons:

1. The product must meet precisely individual customer specifications that are virtually unpredictable (for example, types of machine tools). Orders may be so differentiated as to require individual handling in production, but much more commonly they can be aggregated into batches that can be processed and filled together (for example, structural steel ordered and produced in several hundred different shapes and sizes).

2. In its finished, fabricated form, the product is physically or economically perishable, although it is made from materials that are durable [11] (for example, unstorable chemical explosives, highly style-sensitive goods such as some high-priced lines of women's apparel).

3. The product faces extremely unstable or sporadic demand which is very difficult to forecast (for example, items such as rails that are sold infrequently in widely varying quantities to a rather small number of companies).[12]

Goods in the above categories are particularly apt to be made only to order if the total cost of filling the smallest possible order is high, as it is, for example, for heavy transportation equipment such as ships or locomotives.

It may be well to note that the role of total inventories in products manufactured to order need not be less important than in goods made to stock, although there are functional differences here that are important. The main difference is between the levels in the vertical structure of production at which the inventories are held. Manufacturers of goods made to order will normally hold inventories of purchased materials, often including not only "raw" commodities but also various fabricated items: standardized parts, components, supplies, etc. These stocks help to keep the delivery periods as short as competitive considerations require (given the existing technological constraints). The higher the average degree of fabrication of these stocks, the better they can perform this function. But, presumably, with increased fabrication, the inventories will also be increasingly sensitive to the liquidation losses which, by assumption, are prohibitively large at the finished-product stage, as viewed by the manufacturer.

Furthermore, the finished product itself will often be held in stock by the distributor who ordered it from the manufacturer. The former, by assuming the stock-holding function, will then have enabled the latter to produce to order.

[11] If the materials as well as the finished product are perishable, the timing of production will be dominated by changes in the raw material supply rather than by changes in demand (new orders). Prices may then have to be adjusted so as to make output salable without undue delay, given the current state of demand.

[12] Even a staple product may be made to order if the demand for it is so unstable that the costs and risks of carrying unsold stocks are deemed higher than the costs of large output fluctuations resulting from production to order. Thus, a number of cotton textile products which are only slightly differentiated are apparently woven largely on previous sales contracts. These are products for which the demand is very uneven, with short but sharp speculative ordering movements reflecting chiefly the changing price anticipations of converters and distributors as well as other component variations due to seasonal and cyclical influences, shifts in popularity, etc.

TABLE 2. — AVERAGE RATIOS OF FINISHED STOCKS TO UNFILLED ORDERS FOR SELECTED INDUSTRIES, 1913–55

Industry	Period Covered [a]	Number of Years in Which		Median of the Q/u Ratio [b]		Evidence Indicates Prevalence of Production to [d]
		$Q/U < 100$ [b]	$Q/U > 100$ [b]	Expansion and Peak Years [c]	Contraction and Trough Years [c]	
Major industry aggregates						
1. Primary metal products	1948–55	8	0	13.6(6)	24.0(2)	order
2. Machinery	1946–55	10	0	15.8(7)	23.1(3)	order
3. Transportation equipment	1946–55	10	0	5.4(7)	6.6(3)	order
4. Paper and allied products	1946–55	10	0	35.7(7)	58.9(3)	order
5. Durable-goods industries, total	1939–55	17	0	11.3(13)	13.0(4)	order
6. Nondurable-goods industries, total	1939–55	4	13	162.1(13)	189.5(4)	stock
7. All manufacturing	1939–55	17	0	22.6(13)	26.6(4)	order
Individual industries or product categories						
8. Steel sheets	1919–36	17	1	30.6(11)	44.7(7)	order
9. Steel barrels and drums	1933–54	22	0	2.4(17)	0.7(5)	order
10. Oil burners	1929–52	6	18	190.7(17)	588.6(7)	stock
11. Oak flooring	1913–55	17	26	138.1(31)	157.1(12)	stock
12. Illuminating glassware	1923–37	0	15	223.6(10)	408.6(5)	stock
13. Hosiery	1924–30	1	6	146.5(4)	130.6(3)	stock
14. Men's wear, wool	1935–39	5	0	38.8(4)	71.1(1)	order

[a] Identifies the complete calendar years for which the average ratios of finished stocks to unfilled orders $\left(\frac{Q}{U} \times 100\right)$ were computed.

[b] The Q/U ratios are based on monthly averages of Q and U for each complete year covered.

[c] Identified according to the annual reference chronology of the National Bureau.

[d] See text for qualifying remarks on the meaning of such classifications for major industry groups (lines 1–7).

SOURCES: Lines 1–7: U.S. Department of Commerce, Office of Business Economics.
Line 8: National Association of Flat Rolled Steel Manufacturers.
Lines 9, 10, 13: U.S. Department of Commerce, Bureau of the Census.
Line 11: Oak Flooring Manufacturing Association.
Line 12: Illuminating Glassware Guild.
Line 14: Hiram S. Davis. *Inventory Trends in Textile Production and Distribution*, Number Seven of *Inventory Policies in the Textile Industries*, The Textile Foundation, Washington, 1941.

Interindustry Comparisons of Stock-Backlog Ratios. For goods made only to stock, unfilled orders (U) are nil. For goods made only to order, unsold stock tends to be nil and total inventory in finished-product form (Q) is small.[13] This suggests a method of appraising the relative importance of production to order versus production to stock in industries that apparently include both types of production in various proportions (for they report data on both U and Q). The method is simply to compare, for a given industry or product, the levels of Q and of U. Where Q is typically — not only in times of poor business — higher than U, production to stock is said to prevail. Where Q is typically — not just in boom periods — lower than U, the industry is identified as working predominantly to order.[14]

Table 2 shows the average stock-backlog ratios in percentage form for the major manufacturing industries for which the data were available; it also includes a few selected individual items from a much larger sample to be presented in my NBER monograph (see fn. 9). To take account of the cyclical factor, separate averages — medians, to avoid distortion by the unrepresentative extreme items — were computed of the ratios for the expansion (including peak) years and for the contraction (including trough) years. As one would expect, the aver-

[13] Capital letters denote aggregative variables for individual or major industries, while small letters refer to microvariables (for example, u is unfilled orders of a given product held by an individual firm; U is unfilled orders of an industry or group of firms). The available data pertain as a rule to aggregative variables. Equations (1) and (2) are valid *mutatis mutandis* (that is, when expressed in common units such as current or constant dollars) for the aggregative variables as well as the microvariables.

[14] This dichotomy fails to isolate the differential effects of current adjustments of outputs and prices. If sufficiently prompt and large, such adjustments would greatly reduce the volumes of both Q and U. If Q and U were typically very small, the usefulness of their average ratios could well be much impaired. In terms of our data, however, this problem does not seem very important. For example, where U is typically large relative to Q, it is also typically large relative to S. But there is one exception to this among our major industries — paper products — where unfilled orders, though larger than finished stock, average less than the mean value of monthly shipments.

TABLE 3. — RELATIONS BETWEEN MANUFACTURERS' NEW ORDERS AND SHIPMENTS, SUMMARY MEASURES, 1913–58

Item [a]	No. of Shipment Turns		Leads of New Orders		Average Lead (−) or Lag (+) (months) (5)	Highest Correlation Coefficient (r)	
	Covered (1)	Matched (2)	Number (3)	Per Cent of Turns Matched (4)		Lead of New Orders (6)	r (7)
Groups of products (1913–55)							
1. Goods made to order [b]	128	125	109	87	−6.3	—	—
2. Goods made to stock [c]	75	75	40	53	−1.2	—	—
Major industries (1948–58)							
3. Primary metals	8	8	6	75	−3.5	4	.798
4. Fabricated metal products	7	7	6	86	−3.9	2	.853
5. Electrical machinery	6	6	6	100	−3.5	2	.815
6. Nonelectrical machinery	6	6	5	83	−4.0	4	.854
7. Motor vehicles and parts [d]	8	8	6	75	−3.5	—	—
8. Nonautomotive transport. equip.	6	4	4	100	−11.5	11	.571
9. Other durable goods [e]	8	8	3	38	−0.9	1	.942
10. Textile-mill products	6	6	6	100	−3.3	4	.650
11. Leather and leather products	7	7	3	43	−1.1	—	—
12. Paper and allied products	6	6	3	50	−1.7	1	.983
13. Seven durable-goods industries [f]	49	47	36	77	−3.4	—	—
14. Three nondurable-goods industries [g]	19	19	12	63	−2.0	—	—

[a] The dates in parentheses identify the years of the earliest and the latest turns covered in shipments and/or production.
[b] Includes railroad passenger cars, locomotives, and freight cars; electric overhead cranes; fabricated structural steel; machine tools; merchant pig iron; steel sheets; paper, excl. building paper, newsprint, and paperboard; furniture (Grand Rapids district); and woodworking machinery (listed from the item with the largest to that with the shortest average lead in orders).
[c] Includes oak flooring; oil burners; southern pine lumber; kitchen sinks; bathtubs; lavatories; and miscellaneous enameled sanitary ware (listed from the item with the longest to that with the shortest average lead in orders).
[d] To a large extent, new orders for motor vehicles and parts are represented by the corresponding sales (value of shipments) figures. The reported data on advance orders are, for most producers of automobiles, confined to military orders.
[e] Includes professional and scientific instruments; lumber; furniture; stone, clay, and glass; and miscellaneous industries.
[f] Summary of the timing measures for the industries identified in lines 3–9.
[g] Summary of the timing measures for the industries identified in lines 10–12.
SOURCES: Lines 1–2: Based primarily on various trade association data.
Lines 3–14: Based on data on new orders and sales (value of shipments) compiled by the U.S. Department of Commerce, Office of Business Economics, and on production indexes of the Board of Governors of the Federal Reserve Board.

ages for the former are, with very few exceptions, lower than those for the latter. But virtually all of the ratio series examined, while showing as a rule strong inverse fluctuations with business cycles, can easily be grouped into two major categories: those which in most years, of expansion and contraction alike, move substantially above the level of 100 (that is, show $Q > U$) and those which move in a parallel fashion well below that level ($Q < U$). Accordingly, the inference is drawn that the first group represents mainly goods made typically to stock and the second group goods made typically to order.

The output of a major industry can be very heterogeneous in its composition by goods made to order and goods made to stock.[15] Where the figures compared for Q and U are not data on physical volume for individual commodities or groups of closely related products, but value data for broadly defined multiproduct industries, these figures may, and to a considerable extent probably will, represent aggregates of different goods. A predominance of, say, U over Q could mean then that most of the items produced by the given industry are made typically to order, but it could likewise mean that the order-made items, even though less numerous than the others, carry as a group the larger value weight. Nevertheless, the evidence in the first part of Table 2 clearly confirms, as would be expected, the heavy preponderance of production to order in such industry groups as primary metals, machinery, and transportation equipment. The ratios for the aggregates make it clear that industries which sell mainly from future output predominate 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

[15] A striking example is provided by textiles for which we were able to construct more than twenty stock-backlog ratio series. These were about evenly divided between finished staples made to stock and products that are style-sensitive or must meet individual buyer requirements and are thus made to order. Cf. lines 13 and 14 of Table 2 for these illustrations.

working to stock, and this despite the inclusion here of seven major nondurable-goods industries for which no unfilled orders are reported.[16]

Relationship Between New Orders and Shipments. For industries or groups of products which, according to the average Q/U ratios or other independent evidence, represent primarily production to order, incoming business tends to lead shipments by substantial intervals. For industries or products representing primarily production to stock, the timing of new orders and shipments roughly coincides, with some short leads in orders. The evidence on this is summarized in Table 3 (lines 1 and 2). It accords with the analysis in the first part of this section and confirms the usefulness of the stock-backlog ratio measures.

Of the major manufacturing industries, the one that shows by far the longest order lead is nonautomotive transportation equipment (line 8). This is easily understandable in view of the size and complexity of such items as ships, airplanes, and locomotives. The other extreme — the shortest leads — is represented by Other durable goods, a category composed largely of furniture, lumber, and stone, clay, and glass products (line 9). These are products made predominantly to stock, except furniture which is made mostly to order but apparently at rather short notice. In general, production to order is much more important for durable goods than for nondurable goods, and the production periods are, on the average, longer for the former (cf. Table 1); and, consistent with this, the order-shipments timing intervals tend to be considerably longer for the durables than for the nondurables (cf. lines 13 and 14).

Columns 7 and 6 of Table 3 identify, respectively, the highest simple correlations (r) between new orders and shipments and the leads that yield them. At leads longer or shorter than those shown in the table, the correlations are somewhat smaller. These measures are for major industries whose outputs include vast numbers of products with different delivery lags that also vary over time. Current shipments of these industries typically depend on orders received in several past months, for example, S_t in primary metals is almost as closely associated with O_{t-3} as with O_{t-4}. The autocorrelations of the orders series are substantial and there are no clear-cut patterns of lag distributions. Nevertheless, the assumption of a simple distributed-lag scheme leads to substantial increases in the correlations compared with the results listed in column 7, except for two industries with short average delivery lags, one characterized by a relatively stable demand and high flexibility of inputs (paper) and the other by a large proportion of manufacture to stock (other durables). In these industries, the simple r's for one-month leads are already so high that they leave little room for further increases (lines 9 and 12).[17]

Differentiation of Delivery Periods, Product Specifications, and Competition. Lead times allowed the supplier are a source of costs to the customer; and the larger and the more variable the leads are, the higher as a rule are these costs. Long and varying delivery lags that are difficult to predict make it more costly for the

[16] By the logic of our test, that is, assuming that the stock-backlog ratios tend to be considerably higher (lower) than 100 for all goods made typically to stock (to order), a ratio of 23–27, such as is found for total manufacturing in Table 2, would indicate that the greater part of industrial production is organized on the order, rather than on the stock, basis. Should the contrary situation obtain and production to stock be prevalent, then the average level of Q/U would have to exceed 50. For even if the average for all sectors working to stock were as low as 100 and that for all sectors working to order as low as zero, the over-all ratio could not be lower than 50 as long as production to stock accounted for not less than half of the total manufacturing output (it would equal 50 if it accounted for precisely half of the total). But we expect the average for the stock-oriented industries to be substantially above 100 and the average for the order-oriented industries to be higher than zero (just significantly lower than 100). This makes an over-all average ratio which is considerably smaller than 50 still more indicative of the prevalence of production to order.

It may also be noted that the period covered by our data 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 nondurables, respectively).

[17] We have tried modified Koyck distributions [L. M. Koyck, *Distributed Lags and Investment Analysis* (Amsterdam, 1954)] by assuming that the influence on shipments of new orders taken with leads longer than those listed in column 6 decreases infinitely in the direction of the past according to geometric progression. This model leads to regression equations of the form $S_t = aO_{t-j} + bS_{t-1} + c + u_t$, where $(t - j)$ is our estimate of the maximum correlation lead, all applied to monthly series. The multiple correlation coefficients R obtained from these regressions are all very high, ranging from .888 for primary metals to .991 for nonelectrical machinery. The R's for paper and other durables are .989 and .984, respectively.

buying firm to plan its own operations and to maintain adequate inventories. Hence, industrial purchasers seek to avoid such lags and usually wish to get their orders filled with as little delay as possible. In the absence of major imperfections in the market, therefore, a supplier whose deliveries lag behind those of other manufacturers of the same product would not be able to maintain his sales for long, assuming equality of other trade terms, including price.

However, a buyer may agree to accept a longer delivery period in return for a price concession; and, correspondingly, a premium may be paid for a reduction in the delivery period. This must indeed be recognized as the general situation, compared with the special model in which no such compensating relation or substitution between price and delivery period is possible. The special model would prevail in a market in which prompt delivery is insisted upon as a standard of product quality. There the equilibrium tendency under competitive conditions would be for the delivery period, just like the price, to be set by the market, and to be close to the minimum required by technology (in production to order) or approximately zero (in production to stock). Actually, however, differences in the delivery periods are perfectly compatible with competitive equilibrium if they are compensated for by price differentials in ways acceptable to the buyer and the seller.

It is true that such differentiation by delivery periods would lead to a segmentation of markets, but the resulting markets need not necessarily be small and, moreover, they will usually be closely connected. In a well-informed market, competition would then tend to equalize not just the selling price, but the price for the item with a given delivery period (and other terms of sale which this analysis will disregard); there would be no discrimination in terms of compensatory price and delivery period combinations.

For many goods made to order, customer specifications of the desired product characteristics would probably be a more important factor making for market segmentation. But again this need not lead to a very radical differentiation; the products and markets will often be closely related. Expert knowledge of industrial purchasers reduces the possibilities for sellers to promote *artificial* product differentiation in the markets for equipment and materials and is generally a force supporting competition.[18]

These arguments may be sufficient to refute the notion, which seems to be implicit in some comments on the subject, that the very *existence* of backlogs of unfilled orders is proof of a noncompetitive industry structure.[19] Nevertheless, the absence of empirical evidence to support such a notion should also be noted. Thus we have matched up a number of our Q/U ratios with concentration data for the same industries. The available comparisons are few and crude (the meaning of the evidence on comprehensive aggregates is particularly questionable), but they do suggest that there is little difference in competitiveness between manufacture to order and manufacture to stock. The concentration ratios are substantial or high for some of the goods made largely to order (for example, steel barrels, sheet and strip, pig iron) and low for others (for example, most types of machine tools).[20] For products

[18] Continuous production to order in a highly competitive setting would exist in an industry composed of many workshops producing goods on advance orders that each firm received from many customers. Though the goods are not "staple," well-defined standards for judging their quality exist. The influence on price (given quality and delivery period) of an individual contractor on either side of the market is small. Each firm strives to attract orders by good workmanship and prompt service, but each employs only the passive policy of following, not anticipating, the market. One would expect to find approximations to such a model, at least on the supply side, among the old handicrafts or the modern small-scale business of jobbers, subcontractors, etc.

[19] The following quotation from Murray Brown ["Ex Ante and Ex Post Data in Inventory Investment," *Journal of the American Statistical Association*, LVI (September 1961), 526] is a more radical statement of this position than others I have found, but it is representative:

The unfilled order variable applies only to an oligopolistic or imperfectly competitive firm and cannot be interpreted as a proxy for future demand for a firm in perfect competition. To show this, assume an increase in demand facing an industry; if each firm chooses to add to its order books and not raise price, the market price remains constant; this violates an assumption of perfect competition that no firm can influence price.

[20] "Low" concentration here means that the four leading firms produce less than 40 per cent of the industry's shipments in dollars; "high" — that they produce more than 60 per cent; "substantial" — 40 to 60 per cent. The observations are based on data given in U.S. Congress, Senate, *Report of the Subcommittee on Antitrust and Monopoly to the Committee on the Judiciary*, "Concentration in Ameri-

made primarily to stock, the ratios vary similarly from extremely high (for example, electric bulbs) to low (for example, hosiery, hardwood flooring). Examination of the data for major industries (where our criterion is the proportion of total value of shipments accounted for by component industries with high or low concentration ratios) leads to similar negative results.[21]

The *existence* of unfilled-order backlogs at any time is no more a symptom of departure from competition than is the existence of stocks. However, it is still important to consider the role of competition in the context of short-run, primarily cyclical, *changes* in backlogs, delivery periods, and prices. This topic will be taken up in the next section of this paper.

III. Fluctuations of Demand, Delivery Periods, and Prices

Interaction of Changes in Delivery Period and Price. As already suggested, industrial purchasers may often be prepared to pay more for a product if they can get it promptly, but less if their orders are to be filled only after a delay. In other words, the quantity demanded of a given good is likely to be a decreasing function of the length of the delivery period, given the price and other terms of sale. But the average costs of producing a certain output often depend on the delivery period too, increasing when production and shipment have to be accelerated. Hence, producers may ask for price premiums in return for speedier delivery and allow price discounts on longer-term orders. Thus, both the buyer and the seller have schedules of equivalent combinations of delivery period and price, the former for a given quantity demanded, the latter for a given quantity supplied. In the market there is an equilibrium process of weighing and reconciling these preferences of buyers and sellers.

A theoretical analysis of some basic aspects of this situation is given in the appendix at the end of this paper. There a simple criterion is defined for a choice by the firm of a unique profit-maximizing combination of price (p) and delivery period (k). The position is such that no alteration of p and k by the firm can increase profit because the associated changes in sales and costs would offset each other.[22]

Changes in demand, or the cost function, or both, would shift the equilibrium combination and bring about changes in p and k.[23] Given sufficient substitutability and variability of p and k, one would expect an expansion (contraction) of demand to be associated with increases (decreases) in both p and k. If substitutability or variability are low, however, the main burden of adjustment would presumably be shifted to one of the two variables and away from the other. What happens in any particular case depends on the pertinent demand and cost elasticities with respect to p and k and on the "shifts" on the demand and supply side; hence, ultimately, it depends upon the host of factors that determine these parameters. For example, if sales are regarded as much more sensitive to price increases than to delivery-period increases, this in itself would favor the latter over the former changes as a means of reacting to actual and expected increases in demand.

In the following parts of this section it will be shown that, for several major manufacturing industries, changes in U and in U/S are positively correlated with changes in P (price indexes). These findings support the notion that p and k tend to move in the same direction cyclically. Nevertheless, it should be helpful at

can Industry," 85th Cong., (1957). The limitations of concentration ratios as measures of competitiveness are well known, but so also is the fact that, in general, no better measures are available.

[21] For example, the electrical machinery industry is much more concentrated than the nonelectrical, and the weight of production to order in it is almost certainly considerably lower (note the importance of standardized electrical appliances for household use). A similar situation is found in transportation equipment, where the automobile industry, which is working to stock, is far more concentrated than the rest of the group, in which production to order dominates (aircraft, shipbuilding, railroad equipment). On the other hand, most of the nondurable-goods industries, in which manufacture to order is normally negligible or of little importance, also rank low among other industry groups in their over-all concentration levels (foods and beverages, apparel, petroleum, and chemicals). But here, too, there are two conspicuous exceptions: tobacco manufactures and rubber products.

[22] It is a "joint optimum" of p and k, graphically a point determined by two sets of indifference curves for each given quantity demanded and supplied. These sets consist of: (1) the pairs of k and p associated with each given volume of demand, according to the preferences of buyers; (2) the pairs of k and c (average costs) associated with each given volume of supply, as seen by the producer-seller. See Figure 1 (appendix) and related text.

[23] Cf. Figure 2 (appendix) and related text.