Volume Title: Cost, Prices, and Profits: Their Cyclical Relations

Volume Author/Editor: Thor Hultgren, assisted by Maude R. Pech

Volume Publisher: NBER

Volume ISBN: 0-870-14098-1

Volume URL: http://www.nber.org/books/hult65-1

Publication Date: 1965

Chapter Title: Manufacturing: Prices and Cost during Cycles in Quantity Sold or Produced

Chapter Author: Thor Hultgren

Chapter URL: http://www.nber.org/chapters/c1631

Chapter pages in book: (p. 13 - 58)

2

MANUFACTURING: PRICES AND COST DURING CYCLES IN QUANTITY SOLD OR PRODUCED

COMMODITIES CAN BE STUDIED ONLY IN GROUPS

In the preceding chapter the factors that influence profits were outlined in terms of the market for a single commodity. In practice, however, it is not possible to study profits derived from individual commodities on an extensive scale. Most business enterprises produce many products. Some of the costs such an enterprise incurs are exclusively connected with the sales of one product or another. They are direct or out-of-pocket costs. Other expenses are common to several products and cannot be apportioned among them except by some more or less arbitrary formula. Statistics that show the profits derived from individual items, after deducting either out-of-pocket or fully-allocated cost, are not ordinarily available.

We can, however, study the profits derived by industrial groups of firms from all the products they sell. Especially detailed data are available for manufacturing corporations. Beginning with the first quarter of 1947, the Federal Trade Commission and the Securities and Exchange Commission have jointly published estimates of the sales, expenses, and profits of all manufacturing corporations. They have also published the same information for each of twenty-two subdivisions of manufacturing, and have computed profit margins for all. We shall refer to each subdivision simply as an "industry," although in most cases each includes a wide range of manufacturing activity.

In dealing with the complex of commodities produced by such an industry, it is necessary to think in terms of index numbers combining the quantities of the various products and index

numbers combining their prices. If the index numbers are accurate and consistently designed, however, the relations among cost, prices, and margins which were outlined at the beginning of the last chapter hold good. [1]

Although the FTC-SEC figures were designed to provide totals for all corporations in each major industry, in the earlier years they fall short of the true totals because of difficulties in sampling and estimation. It is possible to raise the figures in such a way as to make allowance for the shortfall; the technique used to make that allowance is described in the appendix.

These data, when adjusted for coverage and seasonal variation, show what happened to the margin and aggregate profits of an industry between any specified dates. They do not indicate the extent to which the changes in margin were the result of changes in prices received or of changes in cost. They do not tell whether the changes in demand and quantity supplied were such as, for example, to permit both costs and profits to rise. To explore the influences affecting profits, data on prices received and quantity sold are also needed.

Often the available price data do not closely match the sales and profit data. One reason is that a corporation assigned by FTC-SEC to one industry makes not only products characteristic of that industry but items usually regarded as products of another industry. Suppose, for example, that a corporation makes both glass and paint, but derives more revenue from the sale of the

[1]For example, composite quantity sold in either of two periods can be defined as the sum of the quantities sold, each quantity being weighted by its average price in the first period. The composite quantity in the second period can then be symbolized by $\Sigma p_1 q_2$, and that in the first by $\Sigma p_1 q_1$. Using this definition of composite quantity,

$$\frac{\text{Unit cost II}}{\text{Unit cost I}} = \frac{\text{Cost ratio II}}{\text{Cost ratio I}} \times \frac{\text{Price index II}}{\text{Price index I}}$$

where the price index is weighted by quantities sold in the second period. For, if c = unit cost, E = aggregate expense, and S = aggregate sales revenue, then

$$c_2 = E_2/\Sigma p_1 q_2 = (E_2/S_2)\ (S_2/\Sigma p_1 q_2) = (E_2/S_2)\ (\Sigma p_2 q_2/\Sigma p_1 q_2)$$

$$c_1 = E_1/\Sigma p_1 q_1 = E_1/S_1$$

$$\frac{c_2}{c_1} = \left(\frac{E_2/S_2}{E_1/S_1}\right)\left(\frac{\Sigma p_2 q_2}{\Sigma p_1 q_2}\right)$$

From this formula, all the relations in Table 1 can be deduced.

former than of the latter. FTC-SEC count sales of paint as well as of glass in the sales of the stone, clay, and glass products industry. Paint prices are included in the wholesale price index for chemicals, not in that for stone, clay, and glass.

How serious are such discrepancies? A special study by the Census Bureau makes it possible to tell, for corporations assigned to each industry in 1954, how many of the employees of these corporations worked in factories making products of the industry, and how many worked in establishments making other products or performing some kind of nonmanufacturing service.

In most cases it appears that over 85 per cent of the workers employed by corporations assigned to an FTC-SEC industry made

TABLE 4

Employees of Manufacturing Corporations: Number in Industry to Which Corporation Is Assigned and in All Other Industries, Fifteen Industries, 1954

Industry to Which Corporation is Assigned	Number (thousands) in Establishments in				Percentage in Industry to Which Corporation is Assigned (3) ÷ (4) (5)
	Subindustry to Which Corporation is Assigned (1)	Other Subindustries in Same Industry[a] (2)	Industry to Which Corporation is Assigned (1) + (2) (3)	All Industries Including Nonmanufacturing (4)	
Food and beverages[b]	1,507.0	44.5	1,551.5	1,676.9	92.5
Tobacco	94.4	0	94.4	97.8	96.5
Textiles	952.6	37.0	989.6	1,052.6	94.0
Apparel	1,135.6	4.9	1,140.5	1,162.1	98.1
Lumber and products	598.7	15.1	613.8	638.2	96.2
Paper and products	403.3	73.6	476.9	514.7	92.7
Chemicals	582.9	29.6	612.5	794.2	77.1
Petroleum refining	235.3	1.9	237.2	359.6	66.0
Rubber	226.1	0	226.1	305.9	73.9
Leather and products	337.6	7.7	345.3	364.2	94.8
Stone, clay, glass	428.5	3.0	431.5	483.8	89.2
Primary metals	923.2	35.5	958.7	1,298.2	73.8
Fabricated metals	819.7	3.8	823.5	929.0	88.6
Machinery	1,232.1	29.3	1,261.4	1,456.5	86.6
Electric equipment	746.5	12.3	758.8	1,079.8	70.3

Source: *Company Statistics*, 1954 Censuses of Business, Manufactures, and Mining Industries. Does not include employees in central administrative offices, auxiliaries, sales branches, and sales offices of these companies.

[a] Incomplete; some subindustries not reported by Census.

[b] Does not include single-industry companies in sugar subindustry. Employment in miscellaneous food products estimated from payroll data.

products of that industry (Table 4). For petroleum refining, however, the figure is only 66.0, and for primary metals only 73.8 per cent. But the Census data show that many of the remaining workers were engaged in mining, transportation, or distribution. Most of them produced, carried, or sold raw materials or products for the companies. Their pay, and other expenses of the "establishments" in which they worked, are included in the expenses of the FTC-SEC industry, and the revenue from which the companies obtain compensation for such expenses is included in the FTC-SEC sales. The ratios for chemicals, rubber, and electric equipment (see col. 5, Table 4) are also rather low. Census antidisclosure rules prevent full reporting of the information called for in column 2. If it were available, the ratios in column 5 would be higher.

Quantity Sold

ESTIMATING QUANTITY SOLD

Price indexes are available for all of the twenty-two FTC-SEC industries except printing and publishing, motor vehicles, other transportation equipment, instruments, and miscellaneous. The indexes refer to products characteristic of an industry, not to all products made by corporations in the industry. But the ratio of the value of characteristic products to the value of all products must be somewhat similar to the ratios in the last column of Table 4, or rather to the higher, true ratios suggested in the discussion of that table. Accordingly we assume that the price index for an industry approximately represents the course of prices received by corporations in the industry.

We use the price index not only to measure that course but to estimate the quantity of goods the industry sells. An index of corporate sales in each industry is divided by its index of prices to get an index of quantity sold.

In the labor statistics to be considered later, the primary iron and steel and primary nonferrous metals industries are combined. We therefore combine the FTC-SEC data for these industries. Comparison of the FTC-SEC data for the furniture industry with labor data suggests that the former lose coverage rapidly with the

passage of time. Accordingly, we omit furniture. Of the twenty-two FTC-SEC industries, therefore, one is lost by statistical merger, one is dropped because of coverage, and five have no adequate price indexes. We are left with fifteen for which we can estimate quantity sold and compute indexes of cost per unit. They accounted for 81 per cent of the sales of all twenty-two industries in 1947 and 80 per cent in 1961.

CYCLES IN QUANTITY SOLD

The quarterly indexes of quantity sold were charted for each industry, and peaks and troughs in each were determined by inspection of the charts.

Most of the upswings and downswings in the several industries corresponded roughly in time to those in business at large, as indicated by the National Bureau business chronology (Table 5), and can be divided into three groups of expansions (1949–53, 1954–57, and 1958–60) and four groups of contractions (1948–49, 1953–54, 1957–58, and 1960–61). Only four industries —food, tobacco, rubber, and machinery—had upswings approximately as long as the 1949–53 business expansion. For others, this expansion was interrupted by a contraction of quantity sold after the surge of demand resulting from the outbreak of the Korean War subsided. We are therefore obliged to recognize two extra groups of industry expansions which we shall call early Korean and late Korean, and an extra group of contractions in the vicinity of 1951 which we shall call Korean.

The quantity sold by the food, leather, and stone-clay-glass industries was already contracting when the data began in 1947; hence these industries are not included in the 1948–49 group of contractions. The apparel industry was expanding at the beginning and continued to expand until 4Q 1952. After 3Q 1954, the food industry continuously increased the quantities it sold; it is therefore not represented in most groups of "phases" (expansions or contractions). The tobacco industry likewise increased its quantity from 4Q 1954 onward. For such reasons, the number of industries represented in the several temporal groups varies; and only one group includes all fifteen.

The index of quantity sold by each industry was weighted by the

TABLE 5
Peaks and Troughs in General Business and in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
General Business	4Q 1948	4Q 1949	--	--	2Q 1953	3Q 1954	3Q 1957	2Q 1958	2Q 1960	1Q 1961
Manufacturing Industries										
Food and beverages	--	3Q 1948	--	--	2Q 1953	3Q 1954	--	--	--	--
Tobacco	2Q 1948	1Q 1950	--	--	4Q 1952	4Q 1954	--	--	--	--
Textiles	2Q 1948	1Q 1949	3Q 1950	3Q 1951	4Q 1952	2Q 1954	3Q 1957	1Q 1958	3Q 1959	1Q 1961
Apparel	--	--	--	--	4Q 1952	4Q 1953	3Q 1956	4Q 1957	2Q 1959	1Q 1960
Lumber and products	1Q 1948	1Q 1949	1Q 1951	3Q 1951	4Q 1952	1Q 1954	3Q 1956	3Q 1957	1Q 1959	2Q 1961
Paper and products	3Q 1948	2Q 1949	2Q 1951	2Q 1952	3Q 1953	1Q 1954	3Q 1955	4Q 1957	3Q 1959	4Q 1960
Chemicals	3Q 1948	2Q 1949	3Q 1950	4Q 1951	1Q 1953	4Q 1953	1Q 1957	1Q 1958	2Q 1959	4Q 1960
Petroleum refining	--	--	--	--	2Q 1953	4Q 1953	4Q 1956	4Q 1957	2Q 1960	1Q 1961
Rubber	4Q 1947	4Q 1949	--	--	1Q 1953	1Q 1954	3Q 1957	1Q 1958	3Q 1959	1Q 1961
Leather and products	--	1Q 1950	3Q 1950	2Q 1951	4Q 1952	1Q 1954	1Q 1957	2Q 1958	2Q 1960	4Q 1960
Stone, clay, glass	--	2Q 1949	2Q 1951	2Q 1952	1Q 1953	1Q 1954	2Q 1956	2Q 1958	2Q 1959	4Q 1959
Primary metals	2Q 1948	4Q 1949	2Q 1951	2Q 1952	2Q 1953	2Q 1954	1Q 1956	2Q 1958	2Q 1959	1Q 1961
Fabricated metals	1Q 1948	2Q 1949	1Q 1951	3Q 1951	2Q 1953	1Q 1954	2Q 1957	2Q 1958	3Q 1959	2Q 1960
Machinery	2Q 1948	4Q 1949	--	--	2Q 1953	4Q 1954	2Q 1956	2Q 1958	2Q 1959	1Q 1961
Electric equipment	3Q 1948	1Q 1949	1Q 1951	3Q 1951	1Q 1953	3Q 1954	1Q 1957	1Q 1958	3Q 1960	1Q 1961
15-Industry composite	4Q 1947	4Q 1949	--	--	2Q 1953	1Q 1954	1Q 1957	1Q 1958	2Q 1960	1Q 1961

ratio of its 1947–49 sales to the 1947–49 sales of all, and the weighted indexes were combined to get a composite index of quantity (Chart 2). This index had upswings and downswings corresponding to those in business at large. There was no decided contraction after the Korean outbreak, but the curve is irregular with only a small upward tilt in the middle of the 1949–53 period.

Having located the upswings and downswings of quantity, we can now consider how changes in prices received, cost, and margins were related to fluctuations in that variable.

Prices Received

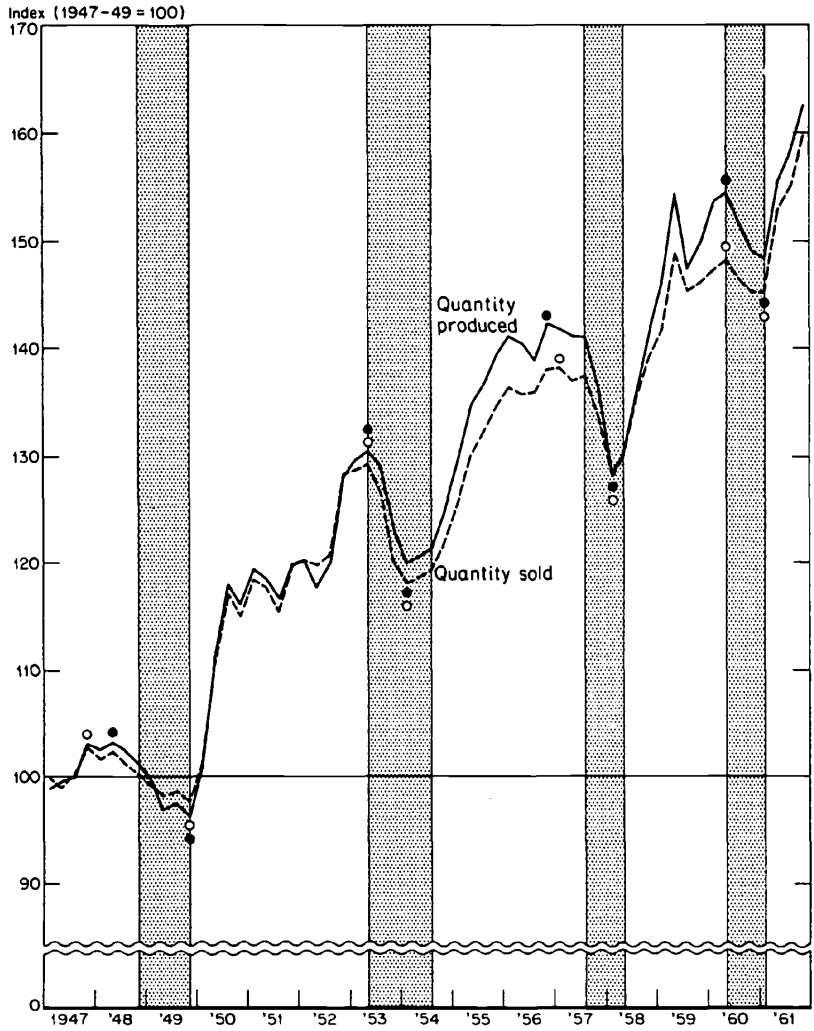
DEFECTS OF THE PRICE INDEXES

To indicate the course of prices received by the several industries, we used the Bureau of Labor Statistics wholesale price data. These represent prices "in the first important commercial transaction" and are therefore more appropriate to use in conjunction with data for revenues of manufacturing corporations than they would be if they pertained to later stages of distribution. BLS combines its price relatives into various groupings, some of which represent as nearly as practicable the group of products made by one or another of our fifteen industries; in other cases, it was necessary to make our own groupings. Details are shown in the appendix.

The percentage changes in the price index for an industry are probably only rough approximations of the true course of prices received by companies in the industry. Each industry sells a great variety of products, and each product is often sold in a variety of grades, models, sizes, and other specifications. Only a sample of the many separately priced items are included in the index, in the hope that their movement represents that of the whole complex of prices. Correspondingly, the weights of the index are crude; they do not represent the full diversity of production. Moreover, the weights of the index are changed only at intervals of years, while the composition of quantity sold varies more or less continuously. Products of other industries sold by corporations assigned to any one industry are not included in that industry's index. Even if price indexes for such products were available, we would not know what weight to assign to them.

CHART 2

Quantity Sold and Quantity Produced, Composite of Fifteen Manufacturing Industries, 1947–61



SOURCE: Appendix Tables B-1, B-2.

NOTE: Shaded areas are contractions in business. Dots are at peaks and troughs of quantity produced; circles are at peaks and troughs of quantity sold.

There is reason to suspect that the prices of the items included in the indexes fluctuate more than the BLS relatives for those items do.[2] Some critics think that true prices have a greater tendency to rise during periods of expanding output or business and a greater tendency to fall during periods of contraction than the indexes indicate. On the other hand, if the indexes included more items and products, there might be more offsetting changes and the indexes might fluctuate less than they do.

Our sales data for any quarter reflect the prices involved in contracts on which delivery is made during the quarter. Some of those goods may have been ordered in a previous quarter, and the price may have been determined at that time. According to BLS, "The prices reported for the wholesale price indexes are those in effect as of the mid-month pricing date. They are generally the prices at which new business will be booked."[3] There is some danger, therefore, that the sales reported for any quarter may best be represented by the BLS index for the previous quarter, or perhaps by some kind of weighted average of indexes for the current and earlier quarters. The accuracy of our work could be affected in either of two ways. Deflation by a price index that took account of prices preceding the quarter of delivery might change the comparative level of the quantity-sold index in successive quarters; in particular, it might locate the turning points in quarters different from those indicated by the procedure we regularly employ. Even if the turning points are correctly noted, perhaps we should use earlier indexes to indicate the change in prices reflected in deliveries. For example, if a trough in quantity sold occurred in 3Q 1954 and a peak in 2Q 1957, the prices applicable to these sales may have been the prices in 2Q 1954 and 1Q 1957, respectively.

We have 900 quarterly figures for sales in one industry or another, each of which has been deflated by the BLS index for the same quarter. To see how much difference allowance for the lag between contract and recorded sale might make, we could divide

[2]See the staff papers by Harry E. McAllister and John Flueck in Price Statistics Review Committee, *The Price Statistics of the Federal Government*, New York, NBER, 1961.

[3]Letter of October 31, 1962, from Arnold E. Chase, Chief, Division of Prices and Cost of Living, BLS.

each sales figure by the price index for the preceding quarter, or the second preceding quarter, or an arbitrarily weighted combination of quarters; but the operation would be tedious. We did, however, make a limited experiment for one industry in which the lag may be substantial, machinery; we deflated the sales in each quarter by the price index for the preceding quarter. Of eight turning points in quantity sold, two are changed (Table 6). The direction of stage-to-stage change in cost is the same in twenty-five of twenty-eight instances; in price, the same in twenty-three of twenty-eight. Percentage changes are not much affected.

TABLE 6

Effect of Alternative Deflation Procedures on Turning Points in Quantity Sold and on Amplitudes of Change in Cost and Price Indexes, Machinery Industry, 1947–61

Kind of Turn	Date of Turn		Cost Per Unit		Price Index	
	A	B	A	B	A	B
			(percentage change from preceding peak or trough)			
Peak	2Q 1948	3Q 1948	—	—	—	—
Trough	4Q 1949	4Q 1949	9.3	9.8	6.9	7.2
Peak	2Q 1953	2Q 1953	11.4	12.8	16.5	14.9
Trough	4Q 1954	4Q 1954	5.6	6.5	2.2	3.1
Peak	2Q 1956	4Q 1956	5.6	6.8	9.0	11.3
Trough	2Q 1958	2Q 1958	13.2	12.5	9.3	7.5
Peak	2Q 1959	2Q 1959	-1.9	-2.4	2.1	1.5
Trough	1Q 1961	1Q 1961	6.6	6.7	2.2	2.2

Note: Sales in each quarter are divided by price index for same quarter to compute A columns, for preceding quarter to compute B columns. Example of computation of price index, column B: price index for 3Q 1949 ÷ by price index for 2Q 1948 = 1.072.

On the assumption that turning points were correct, we made a simpler but more comprehensive test of the effect of various assumptions on the direction of changes in price. The first line of Table 7 gives the results of our standard procedure: the price change between trough and peak quarters in quantity is calculated from the price indexes for the same two quarters. The price change on the second line is computed from the price indexes for the respectively preceding quarters. Rises predominate both in

expansions and in contractions, with or without the lag (Table 7). Allowance for a two-quarter lag, or a three-quarter lag, does not upset the predominance.

TABLE 7

Price Indexes: Number of Rises and Falls During Phases of Quantity Sold, Based on Various Assumptions About Quarter in Which Price Is Determined, Fifteen Manufacturing Industries, 1947–61

Time at Which Price of Quantity Sold is Assumed to be Determined	Expansions		Contractions	
	Rises	Falls	Rises	Falls
Quantity peak and trough	35	13	42	18
One quarter before quantity turn	31	17	47	13
Two quarters before quantity turn	33	15	48	12
Three quarters before quantity turn	35	13	41	19

It is clear that the price indexes should be used with caution. It is also clear that major changes in the indexes reflect real movements in prices, although perhaps with some delay and some degree of overstatement or understatement. If we ignore the evidence of the indexes entirely, our understanding of changes in profits will be poorer than if we employ that evidence with circumspection.

PRICES ROSE APPRECIABLY IN SOME EXPANSIONS

The price indexes themselves have a net rise in most expansions and most contractions. The percentage of rises is larger, however, in the former than in the latter. There are also considerable differences among successive groups of cycles. In the late Korean group, six of nine indexes declined, and the median change is a small decline (Table 8). In the 1958–60 group, most indexes rise, but the median rise is small. A majority of the indexes rise in every group of contractions, except 1948–49, but again the median changes are small. Price rises were universal in the early Korean period and in 1954–57.

An over-all price index for the fifteen industries may complete

TABLE 8
Price Indexes: Changes in Successive Groups of Expansions and Contractions in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises	Median Percentage Change
Expansions			
Early Korean	9	9	9.2
Late Korean	9	3	-1.2
1949–53	4	3	11.1
1954–57	13	13	7.1
1958–60	13	7	0.8
Total	48	35	2.4
Contractions			
1948–49	10	6	2.6
Korean	9	5	0.1
1953–54	15	12	2.2
1957–58	13	11	1.2
1960–61	13	8	0.5
Total	60	42	1.1

the picture. To construct it, we weight the price index for each industry by the ratio of its 1947–49 sales to 1947–49 sales of the fifteen, and sum the products. This index rises substantially in the 1949–53 and 1954–57 expansions; the other changes are small (Table 9). Using prices for the quarter preceding each turn in quantity alters the direction of change in one phase.

TABLE 9
Composite Price Index: Net Change During Phases of Quantity Sold, Fifteen Manufacturing Industries Combined, 1947–61

Date of Turn in Quantity Sold	Price Index (1947–49 =100)	Percentage Change To Peak from Trough	Percentage Change To Trough from Peak	Quarter Preceding Turn in Quantity Sold	Price Index (1947–49 =100)	Percentage Change To Peak from Trough	Percentage Change To Trough from Peak
4Q 1947	99.7	--	--	3Q 1947	96.0	--	--
4Q 1949	98.2	--	-1.5	3Q 1949	98.5	--	2.6
2Q 1953	112.2	14.3	--	1Q 1953	111.5	13.2	--
1Q 1954	113.5	--	1.2	4Q 1953	113.8	--	2.1
1Q 1957	122.7	8.1	--	4Q 1956	121.4	6.7	--
1Q 1958	124.1	--	1.1	4Q 1957	123.9	--	2.1
2Q 1960	125.1	0.8	--	1Q 1960	125.0	0.9	--
1Q 1961	125.7	--	0.5	4Q 1960	125.6	--	0.5

PRICES ROSE MORE OFTEN AND FASTER NEAR PEAKS THAN NEAR TROUGHS IN QUANTITY

Even when there is little net change in price over an expansion or contraction as a whole, there may be a difference in this respect between early and late expansion, or early and late contraction. When sales are low and unused capacity is abundant, manufacturers may be eager enough for new business to cut prices; when production is running near capacity and demand is high, buyers may be eager to bid prices up. The price indexes rise much more often in the neighborhood of peaks in quantity than in the neighborhood of troughs. The frequency of rises increases steadily from the first to the last segment of expansions, and decreases steadily from the first to the last segment of contractions (Table 10).

TABLE 10

Prices Indexes: Direction of Change from Stage to Stage of Cycles in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

From Stage	To Stage	Number of Observations: With Rise	With Fall	Total	Percentage: Rising	Falling	Median Percentage Change
I	II	19	27	46	41	59	-0.3
II	III	29	17	46	63	37	0.6
III	IV	34	12	46	74	26	0.8
IV	V	37	9	46	80	20	0.4
V	VI	34	6	40	85	15	1.5
VI	VII	31	9	40	78	22	0.8
VII	VIII	18	22	40	45	55	-0.1
VIII	IX	14	26	40	35	65	-0.2
I	V	35	13	48[a]	73	27	2.4
V	IX	42	18	60[a]	70	30	1.1

[a] Includes phases too short for division into five stages.

The differences between first and last segments are quite consistent from one group of phases to the next. In every group of expansions, except the 1949–53 group, price increases are more frequent in the last than in the first segment (Table 11). The exception reflects the sharp rise in prices following the Korean outbreak early in the long phase. Again with the same exception,

the median change in price is algebraically larger in the last segment than in the first. In every group of contractions, rising prices are more numerous during the first segment than during the last; in every one, the median change in price is algebraically greater in the first segment than in the last.

It is hard to believe that these progressive and systematic differences can result from errors in the price indexes.

TABLE 11

Price Indexes: Changes in Early and Late Expansion or Contraction During Successive Groups of Phases in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises		Median Percentage Change	
		I-II	IV-V	I-II	IV-V
Expansions					
Early Korean	8	1	8	-2.5	4.5
Late Korean	8	1	7	-1.2	0.4
1949-53	4	3	2	3.0	-1.2
1954-57	13	10	11	0.4	1.6
1958-60	13	4	9	-0.3	0.2
Total	46	19	37	-0.3	0.4
		V-VI	VIII-IX	V-VI	VIII-IX
Contractions					
1948-49	6	6	1	6.0	-0.8
Korean	5	4	1	0.4	-0.6
1953-54	11	10	5	1.6	0.0
1957-58	11	9	5	1.1	-0.1
1960-61	7	5	2	0.2	-0.2
Total	40	34	14	1.5	-0.2

In twenty-one, or 44 per cent, of the forty-eight quantity expansions, prices followed a fall-rise pattern (Table 12). In each such instance, the prices received by an industry apparently declined, at least from the first to some intermediate stage, and rose from that stage to the fifth. Continuous rises, however, occurred in a substantial block: fifteen, or 31 per cent.

In twenty-eight, or 47 per cent, of the sixty contractions, the pattern was rise-fall. In each of these cases, price rose at least from stage V to some intermediate stage, and fell from that stage to IX. The most common pattern of price change in contraction was therefore the exact opposite of the most common pattern in

TABLE 12

Price Indexes: Patterns of Change During Expansions and Contractions in Quantity Sold, Fifteen Manufacturing Industries, 1947–61
(number of phases)

Pattern	Expansions			Contractions		
	Long Phases	Short Phases[a]	Total	Long Phases	Short Phases[a]	Total
Continuous rise	13	2	15	7	5	12
Rise, fall	4	0	4	20	8	28
Rise, fall, rise	2	0	2	6	0	6
Rise, fall, rise, fall	0	--	0	1	--	1
Continuous fall	2	0	2	2	6	8
Fall, rise	21	0	21	0	0	0
Fall, rise, fall	3	0	3	3	1	4
Fall, rise, fall, rise	1	--	1	1	--	1
Total	46	2	48	40	20	60

[a] Too short for division into five stages.

expansion. The second most common pattern, however, was the same in both—a continuous rise.

The percentage of net rises was larger in expansions than in contractions. Prices usually declined during the last half of contractions and the first segment of expansions. Price changes, therefore, showed some tendency to fluctuate with quantity, but with a lag.

RELATION OF PRICES TO QUANTITIES ORDERED

Table 10 shows that prices rose in some instances during the first segment of an expansion in quantity sold, and in most cases during the second, third, and fourth segments. The data suggest that advances in price were not sufficient to discourage customers from increasing their purchases; in other words, demand rose fast enough to more than offset those advances. But, as noted earlier, goods delivered late in expansion may have been ordered at an earlier time when prices were lower. To analyze the relations among price, demand, and purchasing, it might be more illuminating to study changes in prices during cycles in orders. The Department of Commerce estimates the value of new orders received by the fabricated metals, machinery, and electric equip-

TABLE 13
Price Indexes: Direction of Change from Stage to Stage of Cycles in Quantity Ordered and Sold, Three Manufacturing Industries, 1948–61

		STAGES OF QUANTITY ORDERED			STAGES OF QUANTITY SOLD		
		Number of Observations			Number of Observations		
From Stage	To Stage	With Rise in Price[a]	Total	Percentage Rising	With Rise in Price[a]	Total	Percentage Rising
I	II	2	11	18	4	11	36
II	III	8	11	73	8	11	73
III	IV	10	11	91	11	11	100
IV	V	10	11	91	9	11	82
V	VI	9	9	100	8	8	100
VI	VII	8	9	89	7	8	88
VII	VIII	8	9	89	4	8	50
VIII	IX	4	9	44	3	8	38
I	V	10	12[b]	83	8	11[b]	73
V	IX	11	14[b]	79	13	14[b]	93

[a] Price fell in all other observations.
[b] Includes phases too short for division into five stages.

ment industries—three of our fifteen groups. We deflated the orders estimates by the price indexes to get estimates of quantity ordered, noted the turning points and hence the cycles and stages in these figures, and computed a price index for each stage of each orders cycle in each of the three industries.

The orders data do not change the picture much (Table 13). In most instances, prices rose in the last three segments of expansions in quantity ordered. Prices often rose during segments of contractions in quantity ordered, presumably contributing to the decline in the latter. On the other hand, five price declines in fourth segments did not keep quantity ordered from declining.

Total Cost

COST ROSE IN MANY EXPANSIONS BUT IN EVEN MORE CONTRACTIONS OF QUANTITY SOLD

In each industry and quarter, we computed aggregate expense by deducting profits from sales. An index of aggregate expense was then divided by the index of quantity sold to get an index of cost.

TABLE 14

Cost Per Unit: Direction of Change from Stage to Stage of Cycles in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

From Stage	To Stage	Number of Observations: With Rise	With Fall	Total	Percentage: Rising	Falling	Median Percentage Change
I	II	10	36	46	22	78	-1.2
II	III	18	28	46	39	61	-0.2
III	IV	31	15	46	67	33	0.8
IV	V	34	12	46	74	26	0.7
V	VI	34	6	40	85	15	2.0
VI	VII	36	4	40	90	10	2.0
VII	VIII	26	14	40	65	35	0.4
VIII	IX	18	22	40	45	55	-0.2
I	V	27	21	48[a]	56	44	0.9
V	IX	54	6	60[a]	90	10	3.9

[a] Includes phases too short for division into five stages.

TABLE 15

Cost Per Unit: Changes in Successive Groups of Expansions and Contractions in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises	Median Percentage Change
Expansions			
Early Korean	9	7	4.9
Late Korean	9	4	-0.9
1949–53	4	3	10.4
1954–57	13	10	5.0
1958–60	13	3	-1.6
Total	48	27	0.9
Contractions			
1948–49	10	9	6.0
Korean	9	9	7.1
1953–54	15	13	5.2
1957–58	13	12	3.8
1960–61	13	11	1.9
Total	60	54	3.9

Since our price index for an industry does not include products of other industries produced by corporations in that industry, our estimates of quantity sold are in error insofar as a more inclusive index would have moved differently from the available index. If the more inclusive index would rise more than the available one when sales expand, our growth in quantity sold is too large. If it would fall more when sales were contracting, our decline in quantity sold is too large. If our quantity index rises too much, cost per unit may appear to fall in cases in which it actually rose. If our quantity index declines too much, cost per unit may appear to rise in cases in which it actually fell. Such cautions are especially relevant to figures for the chemicals, rubber, and electric equipment industries (cf. Table 4 and discussion).

Cost indexes prepared in this way indicate a net rise in a narrow majority of upswings in quantity, 56 per cent (Table 14). In downswings, net rises were much more numerous, occurring in 90 per cent of the observations.

INFLATION AND COST

Whether cost rises with increases in quantity sold appears to depend on the degree of inflation prevailing. In the early Korean, the 1949–53, and the 1954–57 expansions, cost rose in a majority of the industries, and the median net change was a rise (Table 15). In the late Korean and the 1958–60 groups, on the other hand, cost fell in most industries, and the median change was a decline.

COST, LIKE PRICES, ROSE MORE OFTEN AND FASTER NEAR PEAKS IN QUANTITY

Cost rose in only a minority of first segments of expansions in quantity (Table 14). It rose in a larger minority of the second segments, and in more than half of third and fourth segments. During contractions, it rose more often than not in all segments except the last. But the percentage of rises declines continuously from the first to the fourth segment.

The differences between early and late expansion is fairly consistent from one temporal group of expansions to another (Table 16). From stage I to stage II, cost fell in a majority of the expansions in each group except 1949–53, and the median change was

a fall. From stage IV to stage V, however, the median either rose or declined less than from I to II, again with an exception in the

TABLE 16

Cost Per Unit: Changes in Early and Late Expansion or Contraction During Successive Groups of Phases in Quantity Sold, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises		Median Percentage Change	
		I–II	IV–V	I–II	IV–V
Expansions					
Early Korean	8	0	8	-3.4	5.2
Late Korean	8	3	6	-0.8	0.0
1949–53	4	2	2	0.4	-1.5
1954–57	13	3	12	-1.1	1.7
1958–60	13	2	6	-1.1	-0.1
Total	46	10	34	-1.2	0.7
		V–VI	VIII–IX	V–VI	VIII–IX
Contractions					
1948–49	6	6	2	5.5	-0.9
Korean	5	5	3	2.1	1.0
1953–54	11	9	6	1.6	0.0
1957–58	11	8	5	1.4	-0.1
1960–61	7	6	2	0.9	-1.0
Total	40	34	18	2.0	-0.2

1949–53 group. In every group of contractions, the median rise in the first segments was larger than the median rise, if any, in the last segments. In every group most industries had rising cost as the quantity they sold began to decline, but rising cost was less common toward the end.

The most frequent sequence of change was a fall in the earlier and a rise in the later part of a quantity expansion (Table 17). In contractions the most common sequence was a continuous rise.

The frequently expressed belief that prices generally rise only when "full" employment or some other rigid barrier to expansion is encountered needs to be modified. Price increases predominated in the third, not only in the fourth, segment of expansion. Increases in earlier segments were by no means rare. Early rises were found in supposedly competitive as well as in supposedly "price-administered" industries. Considerable possibilities of physical expansion still exist when prices begin to rise. Furthermore,

TABLE 17
Cost Per Unit: Patterns of Change During Expansions and Contractions in Quantity Sold, Fifteen Manufacturing Industries, 1947–61
(number of phases)

Pattern	Expansions			Contractions		
	Long Phases	Short Phases[a]	Total	Long Phases	Short Phases[a]	Total
Continuous rise	4	1	5	11	12	23
Rise, fall	3	1	4	15	5	20
Rise, fall, rise	3	0	3	6	1	7
Rise, fall, rise, fall	0	--	0	2	--	2
Continuous fall	3	0	3	0	1	1
Fall, rise	26	0	26	1	1	2
Fall, rise, fall	6	0	6	5	0	5
Fall, rise, fall, rise	1	--	1	0	--	0
Total	46	2	48	40	20	60

[a] Too short for division into five stages.

prices often continue to rise after sales begin to recede—i.e., as an industry moves away from, not toward, a capacity level of operations.

Labor Cost

In the introductory chapter, we noted three major categories into which the expenses of an industry can be divided. If we had separate data on each, we could compute each kind of cost on a per-unit-of-product basis. There are no data on expenditures for purchased products or on property taxes, etc., for our fifteen manufacturing groups; but we can make rough estimates of labor cost per unit. The latter is the product of man-hours per unit and average hourly earnings; both factors can be studied.

ESTIMATING MAN-HOURS PER UNIT OF PRODUCT

For each manufacturing group, the Bureau of Labor Statistics publishes figures on hours per week for production workers and on the number of such workers in the middle week of each month. Multiplying these figures together for any month gives

aggregate man-hours for the middle week. Averaging the products for three months gives quarterly figures. Dividing each quarterly figure by average quarterly man-hours in 1947–49 gives a quarterly index of man-hours. Dividing this index by the index of quantity yields an index of production-worker hours per unit of quantity.

BLS also reports the number of other than production workers, although not their hours per week. Assuming that they worked the same hours as production workers, we estimate aggregate mid-week man-hours of all workers in each industry and, proceeding as before, get an index of all-worker hours per unit.

ESTIMATING QUANTITY PRODUCED

The BLS data are for "establishments" making the products of an industry, regardless of whether those establishments are owned by corporations assigned to that industry. The figures for any quarter do not include any labor performed in an earlier quarter on goods sold in the quarter for which the figures are reported. They do include labor performed during a quarter even if the goods were not sold until later. The estimates of quantity sold include goods drawn from initial finished inventory and do not include quantities produced during the quarter but left in inventory at the end. The labor data are, therefore, not ideally comparable with data on quantity sold. In computing indexes of man-hours or payrolls per unit of product it would be preferable to use indexes of production, rather than of quantity sold, in assigned establishments, rather than in assigned corporations.

A large number of production indexes are constructed monthly for the Board of Governors of the Federal Reserve System. They are combined into groups which are more nearly on an establishment than a corporate basis, and they aim to measure production, not quantity sold. On first thought they appear to be comparable with the labor data, and in fact we have used quarterly averages of the Federal Reserve indexes for four industries—tobacco, paper and products, petroleum products, and primary metals—to compute indexes of man-hours per unit of production and labor cost per unit of production.

But there is a basic objection to using other FR indexes for this

purpose, however useful they may be for other purposes. Because no direct monthly (or quarterly) figures are available for many kinds of production, the FR statisticians construct annual indexes of "productivity," dividing an annual index of man-hours of production workers into an annual index of production based on independent annual data for output (or, in some cases, deflated value). A monthly index of productivity is interpolated between the annual data by a standard formula. The course of the monthly index during any calendar year is governed entirely by the annual figures for that year, the preceding year, and the following year (Table 18). Almost always, productivity is assumed to move

TABLE 18

Effect of Direction of Change in Annual Productivity Ratios on Direction of Monthly Change in Ratios Interpolated by Federal Reserve Method

Annual Ratio		Monthly Ratio in Second Year	
First Year to Second	Second Year to Third	Jan. to June or July	June or July to Dec.
+	+	+[a]	+[a]
+	0	+	-
+	-	+	-
0	+	-	+
0	0	0	0
0	-	+	-
-	+	-	+
-	0	-	+
-	-	-[a]	-[a]

Note: Call three successive annual productivity indexes r_1, r_2, r_3. Each index is multiplied by a factor which varies from month to month. Call them f_1, f_2, f_3. Call the productivity index desired for any month in the second year m. Then $m = f_1r_1 + f_2r_2 + f_3r_3$. For example, in January 1953, $m = .421\ r_{52} + .616\ r_{53} + (-.037)\ r_{54}$.

Let a = the numerical value of the difference between r_1 and r_2, and c = the numerical value of the difference between r_2 and r_3. Then $m = f_1\ (r_2 \pm a) + f_2r_2 + f_3\ (r_2 \pm c)$. Although the individual factors vary from month to month, their total is always unity. Consequently, $m = r_2 \pm f_1\ a \pm f_3c$. The directions of change in the table above were worked out from this formula.

[a]Except when changes in annual ratios are numerically very unequal, i.e., the larger is at least 2.73 times the smaller.

in one direction continuously for half a year or throughout the year. A monthly index of man-hours is multiplied by the interpolated index to get monthly production.

A group index may consist entirely of components based on independent monthly production data, or it may be composed largely of components based on productivity interpolation. The monthly Federal Reserve indexes for the four industries previously mentioned are based entirely on independent production data. All the other groups rely, at least in part, on productivity interpolation (Table 19).

The effect of the interpolator on the index of output itself may be small, and not objectionable if all one desires is a rough

TABLE 19

Federal Reserve Production Indexes: Importance of Components Based on Deflated Value and Man-Hours

Industry Group	Weight of Entire Group, 1957 (1)	Annual Series Based on Deflated Value[a]		Monthly Series Based on Man-Hours	
		Weight (2)	Per Cent of (1) (3)	Weight (4)	Per Cent of (1) (5)
Food and beverages	9.87	3.62	37	4.19	42
Tobacco	.77	.00	0	.00	0
Textiles	2.78	1.45	52	.50	18
Apparel	3.44	.45	13	1.33	39
Lumber and products	1.65	.00	0	.74	45
Paper and products	3.27	.00	0	.00	0
Chemicals	7.10	4.90	69	4.67	66
Petroleum refining	1.93	.00	0	.00	0
Rubber	1.91	1.25	65	.47	25
Leather and products	1.10	.26	24	.26	24
Stone, clay, glass	2.92	1.80	62	2.06	71
Primary metals	7.73	.00	0	.00	0
Fabricated metals	5.42	4.89	90	4.89	90
Machinery	8.92	8.44	95	8.78	98
Electric equipment	6.39	4.95	77	4.60	72
Total of 15 groups	65.20	32.01	49	32.49	50
Furniture and fixtures	1.48	1.48	100	1.48	100
Printing and publishing	4.66	3.13	67	3.13	67
Motor vehicles	5.04	.66	13	1.97	39
Other transportation equipment	5.72	3.00	52	5.72	100
Instruments	1.66	1.54	93	1.66	100
Miscellaneous and ordnance	2.73	2.26	83	2.73	100
Total of 21 groups	86.49	44.08	51	49.18	57

Source: *Industrial Production, 1959 Revision*, Board of Governors of the Federal Reserve System, Washington, 1960, pp. S-4 through S-19.

[a]Includes a few series, not separately indicated by the Federal Reserve, based on man-hour data.

measure of the approximate course of output. But precise comparison of output with related variables is another matter. Changes in man-hours per unit of product influence cost, and information about them is therefore highly pertinent to the present inquiry. But suppose "production" in an industry is estimated from labor data. Then if we divide man-hours by production, all we get is the reciprocal of the interpolated productivity ratio. If half of the production is so estimated, it is difficult to describe just what we do get, but it can hardly be a true index of hours per unit.

If the interpolated productivity factors are in error, the changes in production from quarter to quarter may be overstated, understated, or wrong in direction. If aggregate expenses are divided by such an index, the true change in cost may be understated, overstated, or reversed.

An alternative would be to divide man-hours and payroll indexes by the indexes of quantity sold used in earlier sections of this chapter. True, in addition to their more general imperfections, these indexes reflect corporate quantity sold rather than establishment quantity produced. On the other hand, they make no explicit or systematic assumption about hours per unit of product. Comparisons of their year-by-year, industry-by-industry changes with those in the annual FR indexes (which do not depend on "productivity" assumptions) indicate much similarity of movement, but some divergence. Over the fifteen years from 1947 to 1961, the trend of the annual FR index for some industries differs considerably from that of the annual deflated sales, and it probably reflects the trend of production more accurately. We therefore use the annual FR indexes to indicate the general level of quantity produced within each calendar year, and the deflated value indexes to indicate the distribution of quantity produced among the four quarters. In every industry where the FR quarterly indexes depend in part on productivity assumptions, and a price index for the industry is available, we have adopted this solution. Specifically, for each industry we calculate for each calendar year the ratio of the FR index to the deflated sales index. The ratio for any year is assumed to be correct for the middle of the year. One-fourth of the change in the ratio from one mid-year to the next is assumed to occur in each quarter. The resulting ratios for

TABLE 20

Peaks and Troughs in General Business and in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough
General Business	4Q 1948	4Q 1949	--	--	2Q 1953	3Q 1954	3Q 1957	2Q 1958	2Q 1960	1Q 1961
Manufacturing Industries										
Food and beverages	--	3Q 1948	--	--	--	--	--	--	--	--
Tobacco	2Q 1948	4Q 1949	--	--	3Q 1952	4Q 1954	--	--	--	--
Textiles	2Q 1948	1Q 1949	3Q 1950	3Q 1951	2Q 1953	2Q 1954	4Q 1955	1Q 1958	3Q 1959	1Q 1961
Apparel	--	--	3Q 1950	3Q 1951	4Q 1952	4Q 1953	3Q 1956	4Q 1957	2Q 1959	1Q 1960
Lumber and products	1Q 1948	1Q 1949	1Q 1951	2Q 1952	1Q 1953	1Q 1954	1Q 1955	2Q 1958	2Q 1959	2Q 1961
Paper and products	2Q 1948	2Q 1949	2Q 1951	4Q 1951	3Q 1953	1Q 1954	3Q 1956	1Q 1958	3Q 1959	4Q 1960
Chemicals	3Q 1948	2Q 1949	--	--	1Q 1953	4Q 1953	1Q 1957	1Q 1958	--	--
Petroleum refining	2Q 1948	2Q 1949	--	--	3Q 1953	1Q 1954	3Q 1957	1Q 1958	3Q 1960	1Q 1961
Rubber	4Q 1947	1Q 1949	3Q 1950	3Q 1951	1Q 1953	1Q 1954	3Q 1957	1Q 1958	3Q 1959	1Q 1961
Leather and products	--	1Q 1950	3Q 1950	3Q 1951	4Q 1952	4Q 1953	1Q 1957	2Q 1958	1Q 1959	4Q 1960
Stone, clay, glass	4Q 1948	2Q 1949	2Q 1951	2Q 1952	1Q 1953	1Q 1954	2Q 1956	2Q 1958	2Q 1959	4Q 1959
Primary metals	3Q 1948	4Q 1949	2Q 1951	2Q 1952	2Q 1953	2Q 1954	4Q 1955	1Q 1958	2Q 1959	1Q 1961
Fabricated metals	1Q 1948	2Q 1949	1Q 1951	3Q 1951	2Q 1953	1Q 1954	2Q 1957	2Q 1958	3Q 1959	3Q 1961
Machinery	1Q 1948	4Q 1949	--	--	2Q 1953	4Q 1954	2Q 1956	2Q 1958	2Q 1960	1Q 1961
Electric equipment	2Q 1948	1Q 1949	3Q 1950	3Q 1951	2Q 1953	2Q 1954	1Q 1957	2Q 1958	2Q 1960	1Q 1961
15-Industry composite	2Q 1948	4Q 1949	--	--	2Q 1953	1Q 1954	4Q 1956	1Q 1958	2Q 1960	1Q 1961

the beginning and end of each quarter are averaged. The deflated sales figure for the quarter is multiplied by the average ratio to get an index of quantity produced. It was possible to apply this method to eleven industries; lack of adequate price data prevented its application to five; lack of comparability in sales and output coverage prevented its application in one (furniture). The eleven industries for which the method was used, plus the four for which the FR quarterly indexes were used, are the same as the fifteen industries discussed earlier in this chapter.

Turning points in quantity produced, like those in quantity sold, corresponded in a general way to turns in business, with numerous "extra" turns in 1950–51 (Table 20).

TABLE 21

Man-Hours Per Unit: Direction of Change from Stage to Stage of Cycles in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

From Stage	To Stage	Number of Observations: With Rise	With Fall	Total	Percentage: Rising	Falling	Median Percentage Change
			PRODUCTION WORKERS				
I	II	2	42	44	5	95	-5.6
II	III	7	37	44	16	84	-2.8
III	IV	12	32	44	27	73	-1.8
IV	V	7	37	44	16	84	-2.0
V	VI	31	13	44	70	30	2.0
VI	VII	13	31	44	30	70	-1.4
VII	VIII	17	27	44	39	61	-1.0
VIII	IX	22	22	44	50	50	-0.1
I	V	0	48	48[a]	0	100	-11.0
V	IX	34	27	61[a]	56	44	0.7
			ALL WORKERS				
I	II	1	43	44	2	98	-5.5
II	III	5	39	44	11	89	-3.0
III	IV	11	33	44	25	75	-1.6
IV	V	8	36	44	18	82	-2.0
V	VI	34	10	44	77	23	2.4
VI	VII	15	29	44	34	66	-0.6
VII	VIII	21	23	44	48	52	-0.2
VIII	IX	24	20	44	55	45	0.2
I	V	0	48	48[a]	0	100	-11.4
V	IX	45	16	61[a]	74	26	1.9

[a]Includes phases too short for division into five stages.

INVERSE RELATION OF MAN-HOURS PER UNIT TO QUANTITY

In each industry, we have computed production-worker man-hours per unit at each stage in each cycle of quantity. Hours per unit were lower at the peak than at the preceding trough in all of the forty-eight upswings of quantity (Table 21). They were higher at the trough than at the preceding peak in 56 per cent of sixty-one downswings of quantity.

Production-worker hours per unit were also studied in my report on *Changes in Labor Cost during Cycles in Production and Business.*[4] Quantity was measured without the aid of price deflation; only industries with output measured in physical units or weighted indexes of physical measures were included. Because of this restriction, the portion of manufacturing covered was much smaller than in the present study. On the other hand, the "industries" were more narrowly and precisely defined; there was less danger of mingling industries with unlike characteristics in one set of figures; each of our present fifteen "industries" is usually a combination of more specifically definable industries. The span of time varied from industry to industry, beginning in 1932 or later and ending in 1958 or earlier. A few nonmanufacturing industries were included in the tabulations. Nevertheless, the conclusions of the two studies are similar. The earlier study revealed a net fall in hours per unit during 92 per cent of the expansions, and a net rise in 71 per cent of the contractions.[5] Both investigations suggest that hours per unit are inversely related to quantity.

For the present study, we have also all-worker hours per unit. Once more we find a net fall in every expansion. There was a net rise in 74 per cent of the contractions, much higher than the 56 per cent for production workers only. When all workers are considered, the inverse relation between hours per unit and quantity is even more strongly marked. Rises outnumbered declines in each temporal group of contractions, except 1948–49, and the median change was a rise in every group (Table 22).

Although it was, in effect, assumed that hours per week of other workers fluctuate by the same percentages as hours of production workers, it is likely that they fluctuate somewhat less. Consequently,

[4]New York, NBER Occasional Paper 74, 1960.
[5]*Changes in Labor Cost*, Table 10, p. 26.

TABLE 22

Man-Hours Per Unit: Changes in Successive Groups of Expansions and Contractions in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises	Median Percentage Change
		PRODUCTION WORKERS	
Expansions			
Early Korean	9	0	-14.8
Late Korean	10	0	-7.4
1949-53	4	0	-18.2
1954-57	13	0	-12.7
1958-60	12	0	-9.1
Total	48	0	-11.0
Contractions			
1948-49	12	4	-1.1
Korean	10	8	6.6
1953-54	14	10	1.4
1957-58	13	6	-0.3
1960-61	12	6	0.2
Total	61	34	0.7
		ALL WORKERS	
Expansions			
Early Korean	9	0	-15.0
Late Korean	10	0	-6.4
1949-53	4	0	-15.5
1954-57	13	0	-12.4
1958-60	12	0	-10.1
Total	48	0	-11.4
Contractions			
1948-49	12	6	0.4
Korean	10	9	8.2
1953-54	14	11	2.9
1957-58	13	10	1.9
1960-61	12	9	1.3
Total	61	45	1.9

aggregate hours of all workers may have increased less during expansions of quantity and fallen less during contractions than assumed. In that case, the declines in hours per unit during expansions and the rises during contractions were even more pronounced than our figures would indicate. With respect to our conclusion, the assumption about hours per week is on the conservative side.[6]

[6]In estimating annual productivity, the BLS has assumed that nonproduction workers always work a 40 hour week. Using that figure, the inverse fluctuations of all-worker hours per unit would be even greater.

HOURS PER UNIT FELL EVEN IN LATE EXPANSION

In every segment of quantity expansions, instances of falling man-hours per unit outnumbered instances of rising man-hours per unit (Table 21). Declines were most common in first segments, where they occurred in 95 per cent of the observations for production workers and 98 per cent of those for all workers. But even the lowest percentage is 73 (production workers, third segments). In my earlier work on labor costs during cycles, declines in production-worker hours per unit were also found to outnumber rises in every segment. There was a somewhat more systematic progression. The percentage of observations with rising man-hours

TABLE 23
Man-Hours Per Unit: Patterns of Change During Expansions and Contractions in Quantity Produced, Fifteen Manufacturing Industries, 1946–61
(number of phases)

Pattern	Expansions			Contractions		
	Long Phases	Short Phases[a]	Total	Long Phases	Short Phases[a]	Total
			PRODUCTION WORKERS			
Continuous rise	0	0	0	0	6	6
Rise, fall	2	0	2	11	6	17
Rise, fall, rise	0	0	0	15	1	16
Rise, fall, rise, fall	0	--	0	5	--	5
Continuous fall	20	2	22	1	2	3
Fall, rise	6	2	8	6	2	8
Fall, rise, fall	15	0	15	5	0	5
Fall, rise, fall, rise	1	--	1	1	--	1
Total	44	4	48	44	17	61
			ALL WORKERS			
Continuous rise	0	0	0	0	7	7
Rise, fall	1	0	1	12	6	18
Rise, fall, rise	0	0	0	18	1	19
Rise, fall, rise, fall	0	--	0	4	--	4
Continuous fall	23	2	25	0	0	0
Fall, rise	7	2	9	5	3	8
Fall, rise, fall	12	0	12	4	0	4
Fall, rise, fall, rise	1	--	1	1	--	1
Total	44	4	48	44	17	61

[a]Too short for division into five stages.

per unit of product increased steadily from 8 in first segments of production expansions to 29 in fourth segments.

A continuous fall from stage to stage was the most common pattern of change during individual expansions (Table 23).

HOURS PER UNIT ROSE MOST OFTEN AT BEGINNING OF CONTRACTION

During contractions of quantity, there is less similarity between the early and late portions. The net rises over the phase as a whole seem to be concentrated in the earliest segment. Hours per unit rise in a large majority of first segments, fall in a large majority of second segments; thereafter, the observations are more evenly divided. In my earlier study, a more regular progression was found. The percentages of rises, for production workers, in successive segments, were 74, 60, 57, 56. The absence of an equally smooth rise and fall in the present data may be a consequence of the smaller number of observations (forty-four instead of eighty-nine expansions, forty-four instead of ninety-seven contractions), the poorer comparability of the labor and production data, or the broader and less homogeneous industrial categories. Although the progression in the earlier study was downward, the figures indicate a predominance of rises in every segment. In any case, there seems to be little doubt that hours per unit rise sharply immediately after a downturn in quantity, or that the early rise usually exceeds any later decline.

During the contractions in the present study, the most common pattern of change was an initial rise and a subsequent fall or a rise-fall-rise pattern.

HOURLY EARNINGS ROSE IN ALL SEGMENTS OF EXPANSION AND CONTRACTION

Labor cost per unit of product depends not only on hours per unit but on the amount of wages paid per hour. Average hourly earnings (available only for production workers) were higher at the peak than at the trough in every quantity expansion (Table 24). They were higher at the trough than at the peak in all but two of the contractions. In every segment of expansion and of contraction, rises greatly outnumbered declines. Hourly earnings followed a continuously rising pattern in forty, or 83 per cent, of the

TABLE 24

Hourly Earnings of Production Workers: Direction of Change from Stage to Stage of Cycles in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

From Stage	To Stage	Number of Observations: With Rise	With Fall	Total	Percentage: Rising	Falling	Median Percentage Change
I	II	42	2	44	95	5	1.4
II	III	38	6	44	86	14	2.4
III	IV	44	0	44	100	0	3.0
IV	V	43	1	44	98	2	2.2
V	VI	40	4	44	91	9	1.3
VI	VII	42	2	44	95	5	1.3
VII	VIII	37	7	44	84	16	1.0
VIII	IX	37	7	44	84	16	0.4
I	V	48	0	48[a]	100	0	9.2
V	IX	59	2	61[a]	97	3	3.7

[a]Includes phases too short for division into five stages.

TABLE 25

Hourly Earnings of Production Workers: Patterns of Change During Expansions and Contractions in Quantity Produced, Fifteen Manufacturing Industries, 1947–61
(number of phases)

Pattern	Expansions: Long Phases	Short Phases[a]	Total	Contractions: Long Phases	Short Phases[a]	Total
Continuous rise	36	4	40	29	13	42
Rise, fall	1	0	1	6	3	9
Rise, fall, rise	5	0	5	5	1	6
Rise, fall, rise, fall	0	--	0	0	--	0
Continuous fall	0	0	0	0	0	0
Fall, rise	2	0	2	2	0	2
Fall, rise, fall	0	0	0	1	0	1
Fall, rise, fall, rise	0	--	0	1	--	1
Total	44	4	48	44	17	61

[a]Too short for division into five stages.

quantity upswings, and in forty-two, or 69 per cent, of the downswings (Table 25).

In many cases, however, earnings rose faster when quantity was expanding than when it was contracting. We have compared the change per quarter in each phase of quantity with the change per quarter in the following phase of opposite character. In seventy-one of ninety-five comparisons, hourly earnings increased more rapidly in the expansion than in the contraction. The figures are affected by changes not only in wage rates but in the proportion of overtime, which tends to rise in expansion and fall in contraction. Overtime accounts for at least part of the differences in the rate of increase.[7]

Average hourly earnings in manufacturing as a whole had a similar history from 1932 to 1961. They increased in the six expansions of manufacturing production (measured between turning points in the Federal Reserve index of production) and also in five of the six contractions, falling slightly in 1937–38. The rate of increase in each of the five contractions was smaller than in the neighboring expansions.

ESTIMATING LABOR COST

Since rising hourly earnings were so common in all segments of expansions and contractions, one would expect rises in labor cost to be more numerous than rises in hours per unit. Unfortunately, the payroll data relate to production workers only; there is no quarterly information on the compensation of other workers in separate industries. Even the production-worker data do not include social security taxes or the cost of other "fringe benefits." But at least we can construct indexes of payrolls for production workers in each industry, and can divide them by our indexes of quantity to get indexes of production labor cost per unit.

PRODUCTION LABOR COST FELL IN MOST EXPANSIONS

The indexes do show that labor cost per unit increased more often than man-hours per unit. The "percentage rising" figure on

[7]Separate indexes of wage rates are scarce. For a discussion of some that are available, see Daniel Creamer, *Behavior of Wage Rates during Business Cycles*, New York, NBER, OP 34, 1950.

TABLE 26

Labor Cost Per Unit (Production Workers): Direction of Change from Stage to Stage of Cycles in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

From Stage	To Stage	Number of Observations: With Rise	With Fall	Total	Percentage: Rising	Falling	Median Percentage Change
I	II	6	38	44	14	86	-4.2
II	III	18	26	44	41	59	-1.0
III	IV	36	8	44	82	18	1.6
IV	V	21	23	44	48	52	-0.2
V	VI	37	7	44	84	16	3.8
VI	VII	27	17	44	61	39	0.6
VII	VIII	26	18	44	59	41	0.3
VIII	IX	25	19	44	57	43	0.4
I	V	15	33	48[a]	31	69	-2.8
V	IX	52	9	61[a]	85	15	4.3

[a]Includes phases too short for division into five stages.

TABLE 27

Labor Cost Per Unit (Production Workers): Changes in Successive Groups of Expansions and Contractions in Quantity Produced, Fifteen Manufacturing Industries, 1947–61

Group of Phases	Number of Observations	Number of Net Rises	Median Percentage Change
Expansions			
Early Korean	9	2	-3.4
Late Korean	10	5	-0.4
1949–53	4	2	-1.4
1954–57	13	4	-2.7
1958–60	12	2	-3.7
Total	48	15	-2.8
Contractions			
1948–49	12	10	3.2
Korean	10	10	11.0
1953–54	14	11	3.6
1957–58	13	11	4.1
1960–61	12	10	3.5
Total	61	52	4.3

every line of Table 26 is higher than the corresponding figure in Table 21. Nevertheless, labor cost, like hours per unit, fell in a majority of the expansions and rose in a majority of the contractions. The inverse relation predominated in every group of phases except the late Korean and 1949–53 expansions, in which the number of falls equaled the number of rises (Table 27).

The changes during expansions ranged from a decline of 19.7 per cent to an increase of 15.9 per cent; the median change was −2.8 per cent. The changes during contractions ranged from −7.6 to +33.8 per cent; the median was +4.3 per cent.

In the earlier and more precise labor cost study, it was likewise found that production labor cost fell in a majority of the quantity expansions (62 per cent) and rose in a majority of the contractions (91 per cent).[8]

Man-hours per unit, including all workers, fell in every expansion. The more inclusive figure rose even more often in contractions than the less inclusive one (Table 21). If the hourly compensation of other workers fluctuated by about the same percentage as that of production workers, labor cost per unit, including all workers, must have had a net fall in most expansions and a net rise in most contractions.

RISING PRODUCTION LABOR COST MOST COMMON IN FIRST HALF OF CONTRACTION

Declines in labor cost outnumbered rises in all except third segments of expansions (Table 26). Rises in cost were most numerous immediately after the peak, in first segments of contractions, when they occurred in 84 per cent of the observations. The percentage declines progressively thereafter; but rises outnumber falls in all segments.

In eighteen, or 38 per cent, of the expansions, labor cost fell at first but rose later (Table 28). The more complicated fall-rise-fall pattern, however, was almost equally common. In seventeen, or 28 per cent, of the contractions, labor cost rose continuously; in an equal number it rose at first, but later fell.

[8] *Changes in Labor Cost*, Table 15, p. 39.

TABLE 28
Labor Cost Per Unit (Production Workers): Patterns of Change During Expansions and Contractions in Quantity Produced, Fifteen Manufacturing Industries, 1947–61
(number of phases)

Pattern	Expansions			Contractions		
	Long Phases	Short Phases[a]	Total	Long Phases	Short Phases[a]	Total
Continuous rise	1	0	1	7	10	17
Rise, fall	2	0	2	13	4	17
Rise, fall, rise	2	1	3	14	1	15
Rise, fall, rise, fall	1	—	1	3	—	3
Continuous fall	4	2	6	0	0	0
Fall, rise	17	1	18	3	2	5
Fall, rise, fall	16	0	16	3	0	3
Fall, rise, fall, rise	1	—	1	1	—	1
Total	44	4	48	44	17	61

[a]Too short for division into five stages.

AGGREGATIVE FIGURES CONCEAL CYCLICAL VARIATION

We have constructed indexes of hours per unit and labor cost for the fifteen industries combined, i.e., treating them as one vast industry, by the methods used to construct the individual indexes.[9] Nobody who looked at the composite indexes only, however, would suspect that there is an inverse relation between hours per unit or labor cost and quantity. Composite hours per unit declined in contractions of composite output as well as in expansions (Table 29). Composite cost rose in two of the three expansions and fell in some of the contractions. The differences between the composite "industry" and the individual industries is explained by differences in the size of the quantity fluctuations in conjunction with technological change and the upward trend of hourly earnings.

A composite tends to have smaller cyclical fluctuations than its

[9]Composite man-hours and labor cost are aggregates of the fifteen-industry data. Composite quantity produced is an average of the quantity indexes for the fifteen industries weighted in the same manner as the composite price index, namely, by the percentage distribution of sales in 1947–49.

TABLE 29

Quantity Produced, and Man-Hours and Labor Cost Per Unit: Percentage Changes in Composite and Individual Cycles, 1947–61

	Quantity Produced	Hours Per Unit		Cost Per Unit		Hourly Earnings, Production Workers
		Production Workers	All Workers	Production Workers	All Workers	
			EXPANSIONS			
Composite						
4Q 1949–2Q 1953	35.3	-7.8	-6.8	16.3	19.5	26.2
1Q 1954–4Q 1956	18.6	-11.0	-9.8	1.3	3.5	13.9
1Q 1958–2Q 1960	20.3	-9.9	-9.8	-2.2	-1.0	8.6
Average	24.7	-9.6	-8.8	5.1	7.3	16.2
Individual						
a. Between composite dates	25.4	-10.5	-9.4	2.8	--	14.8
b. Between own dates	30.8	-11.9	-12.0	-3.4	--	9.8
			CONTRACTIONS			
Composite						
2Q 1948–4Q 1949	-6.6	-8.3	-6.7	-4.4	-1.4	4.2
2Q 1953–1Q 1954	-8.0	-3.3	-1.5	-1.4	3.1	1.9
4Q 1956–1Q 1958	-9.8	-3.3	-0.6	0.3	5.7	3.7
2Q 1960–1Q 1961	-3.9	-5.3	-3.4	-4.0	-2.0	1.3
Average	-7.1	-5.0	-3.0	-2.4	1.4	2.8
Individual						
a. Between composite dates	-7.1	-3.4	-1.7	-0.1	--	3.4
b. Between own dates	-12.8	1.3	3.2	5.6	--	4.2

components. One reason is that turning points in a component often do not coincide with turning points in the composite. In such cases, the change in the component between turning points in the composite is smaller than the change between the component's own turning points, and may even be in the opposite direction. The situation is illustrated by lines a and b of Table 29. To derive line a, the percentage change in each industry between the composite peaks and troughs is computed, yielding fifteen changes from 4Q 1949 to 2Q 1953, fifteen from 1Q 1954 to 4Q 1956, and so forth. The average of the forty-five changes during composite expansions, and of the sixty for composite contractions, is shown on the line. For example, from the composite peak in 2Q 1948 to the composite trough in 4Q 1949, the quantity of lumber products fell 5.3 per cent; this figure is used in calculating the average of −7.1 per cent.

In computing line b, the percentage change in each industry from each trough in its own quantity to the following peak, or vice versa, is computed, and the average of the changes in the forty-eight specific cycle expansions and the sixty-one contractions is shown on the line. From its own peak in 1Q 1948 to its own trough in 1Q 1949, the quantity of lumber products fell 19.7 per cent; this figure is used in calculating the average of −12.8 per cent.

Falling quantity tends to raise hours per unit. But technological progress tends to reduce hours per unit not only in expansions but in contractions of quantity. If the fall in quantity is small, the rise in hours per unit that it would cause in the absence of technological change is likely to be small, and the influence of technology may preponderate over the influence of volume.

Since the rise in quantity during the composite expansions is smaller than in the individual expansions, the fall in hours per unit during the composite expansions tends to be smaller than during the individual expansions. If the fall in hours per unit is small, the influence of the rising hourly earnings factor in labor cost can preponderate over the influence of the falling hours per unit factor.

Although cost including nonproduction workers is not available for individual industries, it was possible to make estimates for the composite. The Department of Commerce supplies quarterly estimates of total labor expense—salaries, wages, and fringe benefits received by all workers—for all manufacturing; and production-worker wages can be computed for all manufacturing from BLS data. The ratio of total compensation to total production-worker payrolls can therefore be computed. The cyclical variations in the ratio are probably similar to those in the corresponding ratio for the fifteen industries combined. Multiplying our index of production-worker cost per unit by an index of the ratio yields an approximate index of all-worker cost per unit.

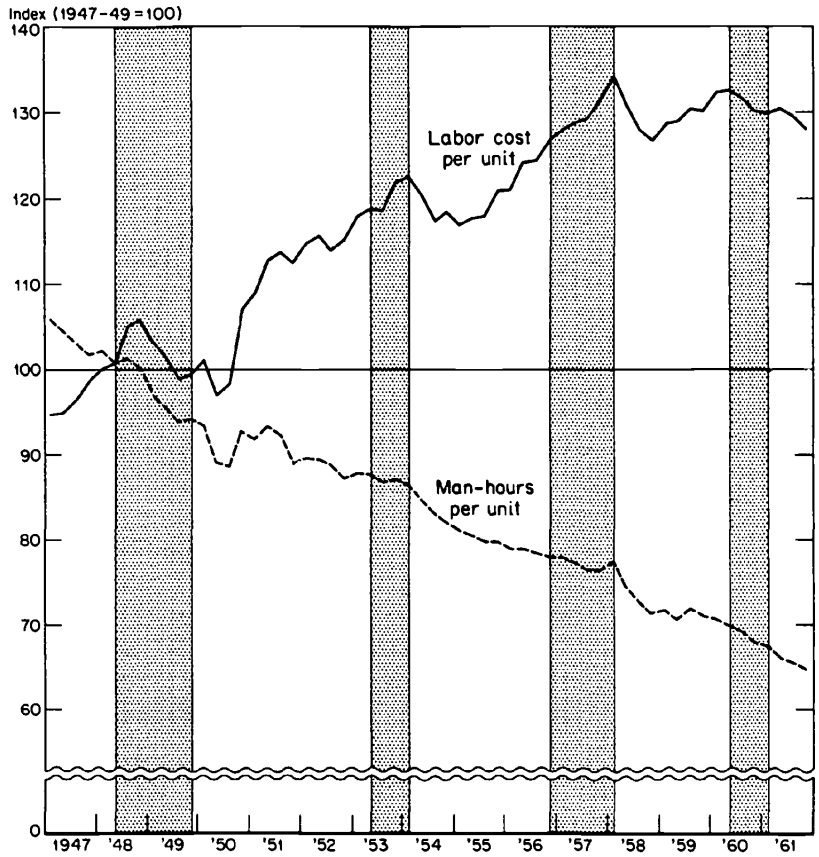
The downward trend in composite hours per unit was remarkably persistent. So was the upward trend in hourly earnings (Charts 3 and 4). The effect of one trend on production-worker cost virtually neutralized the effect of the other. But there was also an upward trend in the proportion of nonproduction to production

workers, and hours of all workers per unit trended downward more slowly. Rising rates of pay more than offset falling hours per unit; the more inclusive measure of labor cost per unit had an upward trend at least through 1958.

ANNUAL FIGURES SUPPORT CONCLUSIONS ON LABOR COST

Our quarterly indexes of output, and therefore the indexes of hours and cost per unit, are defective to some extent because of

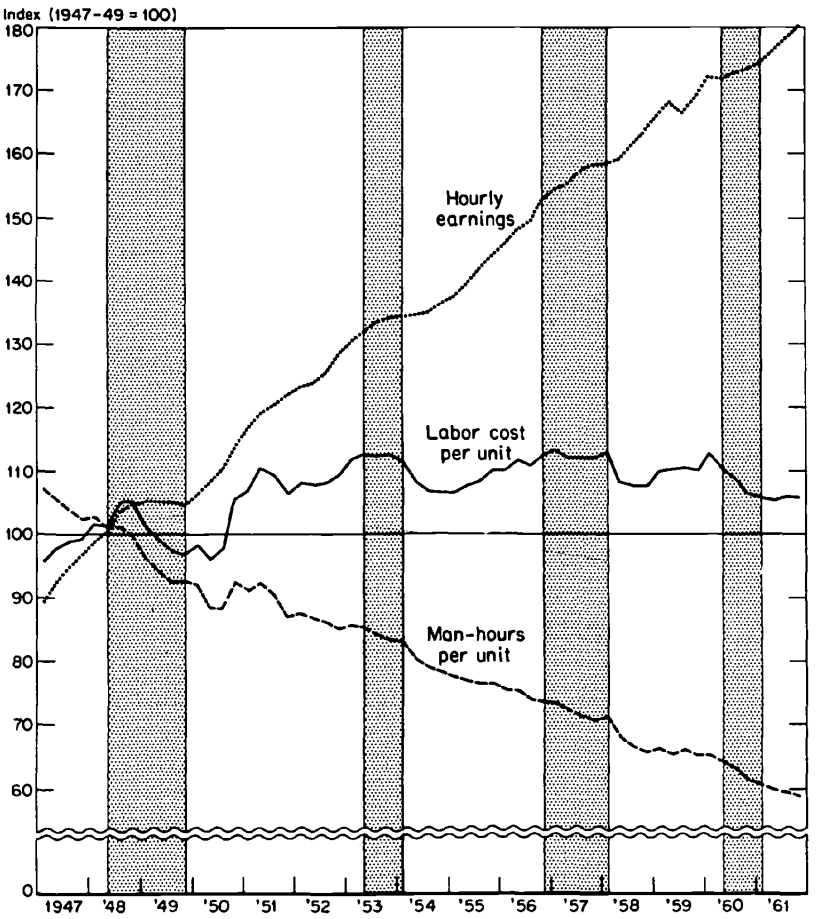
CHART 3
All-Worker Man-Hours and Labor Cost Per Unit, Composite of Fifteen Manufacturing Industries, 1947–61



SOURCE: Appendix Table B-2.
NOTE: Shaded areas are contractions in composite quantity produced.

inaccuracies in the price indexes used to derive them. Deflation of sales by prices was used as a means of obtaining quarterly from annual figures. If the deflation by price indexes is distrusted, can anything about cyclical fluctuations in hours per unit and cost be learned from annual figures alone? In the first place, the distrust would presumably extend to the yearly figures for industries where

CHART 4
Production-Worker Man-Hours Per Unit, Hourly Earnings, and Labor Cost Per Unit, Composite of Fifteen Manufacturing Industries, 1947–61



SOURCE: Appendix Table B-2.
NOTE: Shaded areas are contractions in composite quantity produced.

components based on price deflation make up more than half of the weight assigned to the industry. This leaves nine industries with usable data (Table 19).

Annual figures, even if accurate, tend to minimize cyclical fluctuations. Some fluctuations in quantity that appear in quarterly data do not show up at all in yearly data. When they do, a trough quarter often appears in a trough year and a peak quarter in a peak year. In such instances, the percentage change between the annual peak and trough is smaller than that between the quarterly peak and trough. When quantity fluctuations are minimized, any tendency for hours per unit and cost to fluctuate inversely with quantity is likewise minimized. The influence of technology on hours per unit can more often preponderate over the influence of falling volume, and the influence of rising hourly earnings on cost can more often preponderate over the influence of falling hours per unit. We have nevertheless computed annual indexes for the nine industries from 1947 to 1961, using the same sources and methods as for quarterly data.

The effect of using annual statistics was explored in my earlier study. Calculations were made both from annual data and from monthly data for the same industries and approximately the same periods of time. The yearly data indicated declines in hours per unit during most contractions as well as most expansions; but the percentage was lower in the former than in the latter (Table 30). The monthly data indicated a rise in most contractions. In the nine industries considered here, the annual data again indicate a fall in most contractions; but again the percentage is smaller than in expansions. It is likely that if quarterly figures based on independent physical measures of output were available for the nine industries, they would show a majority of rises in contraction as well as of declines in expansion. That is what the quarterly data we actually use indicate (Table 21).

In the earlier study, yearly data indicated a slight majority of increases in labor cost during expansions, but a much larger majority during contractions. The monthly data indicated a clear inverse relation. The annual figures for the nine industries also indicate a slight majority of rises in expansion, but again the

percentage is much smaller than in contraction. It is likely that quarterly indexes based on physical measures of output would reveal a majority of declines in expansion as well as of rises during contraction, as the actually available quarterly indexes do (Table 26).

Only thirteen of the expansions and seven of the contractions in the nine industries lasted more than one year. Rises in hours per unit and labor cost were more numerous in the last than in the first year of expansions, and in the first than in the last year of contractions (Table 31). Although the data are skimpy, they agree with our previous finding, based on the available quarterly data, that rises are more numerous around quantity peaks than around

TABLE 30

Hours and Labor Cost Per Unit: Frequency of Net Rises and Falls in Phases of Quantity, Monthly Compared with Annual Data

	EXPANSIONS			CONTRACTIONS		
	Number of Observations	Percentage		Number of Observations	Percentage	
		Rising	Falling		Rising	Falling
		HOURS PER UNIT				
Earlier study[a]						
Production workers, monthly	90	8	92	99	71[c]	28[c]
Production workers, annual	87	11	89	94	40	60
Present study[b]						
Production workers, annual	25	4	96	28	29	71
All workers, annual	25	0	100	28	46	54
		LABOR COST PER UNIT				
Earlier study[a]						
Production workers, monthly	90	38	62	99	91	9
Production workers, annual	87	51	49	94	68	32
Present study[b]						
Production workers, annual	25	52	48	28	64	36
All workers, annual[d]	25	56	44	28	86	14

[a] Hultgren, *Changes in Labor Cost*, pp. 9, 26, 35, 39.

[b] Nine industries.

[c] One observation showed no change.

[d] Based on Department of Commerce annual data for compensation of all employees.

TABLE 31

Hours and Labor Cost Per Unit: Number of Rises and Falls During First and Last Year of Expansions and Contractions in Quantity Produced, Nine Manufacturing Industries, 1947–61

	Expansions		Contractions	
	Production Workers	All Workers	Production Workers	All Workers
	HOURS PER UNIT			
First year				
Rises	0	0	5	5
Falls	13	13	2	2
Last year				
Rises	3	2	3	3
Falls	10	11	4	4
	LABOR COST PER UNIT			
First year				
Rises	3	4	7	7
Falls	10	9	0	0
Last year				
Rises	11	11	4	5
Falls	2	2	3	2

troughs, and that declines are most common in early expansion.[10]

Other Kinds of Cost

For an individual enterprise or industry, expenditures on commodities and services purchased from other business enterprises

[10]Sho-Chieh Tsiang, in *The Variations of Real Wages and Profit Margins in Relation to the Trade Cycle,* London, 1947, studied productivity (the reciprocal of hours per unit) in cotton textiles, paper, steel, and all manufacturing, using annual data. His findings (pp. 65, 94, 101, 108) in terms of the relation of production-worker hours per unit to quantity, may be compared with ours as follows. The blurring effects of annual data and broad aggregation account for Tsiang's finding little relation between productivity and quantity.

	Tsiang (annual data)	*Earlier Study* (monthly data)	*Present Study* (quarterly data)
Cotton textiles	None	Inverse	None[a]
Paper	None	Inverse	Inverse
Steel	Inverse	Inverse	Inverse[b]
All manufacturing	None	None[c]	None[c]

[a]All textiles.
[b]Primary metals.
[c]Composite of fifteen industries (different list in the two studies).

are often comparable in size with labor expenses. Like labor cost, materials cost has a physical and a price component—materials used per unit of product and their prices. There is very little information on how the input of materials per unit of product changes during output cycles, but it probably does not fluctuate inversely with output as input of labor per unit does. It may even vary directly with volume to some extent, because of greater spoilage and resort to inferior materials in busy times. It seems likely, however, that fluctuations in materials cost are similar to those in prices of materials.

We have not ventured to construct indexes of prices paid for materials by individual industries. However, a weighted general index of BLS prices of materials used by manufacturers rose 12.0 per cent in the 1949–53 upswing in production and 5.8 per cent in the 1954–57 upswing, but fell 0.1 per cent in 1958–60 (Table 32). Since some industries had "extra" contractions in quantity sold, with peaks around 1Q 1951 and troughs around 3Q 1951, the table also shows changes during three subphases of the 1949–53 upswing. The sharp rise in demand at the Korean outbreak brought a very sharp rise in prices of materials (Chart 5). The subsequent decline continued at a diminished pace in the second expansion subphase.

In contractions, with demand for final products falling, there is no growing eagerness to purchase materials. The index of materials prices fell 9.6 per cent in 1948–49 and 4.3 per cent in 1951, rose only 0.8 per cent in 1953–54 and 1.5 per cent in 1957–58, and fell 0.6 per cent in 1960–61.

Changes in materials prices between peaks and troughs in fifteen-industry composite quantity were broadly similar (Chart 5).

Factories buy not only crude materials, such as cotton or coal, but materials which have already been fabricated to some extent by other factories; e.g., steel bars and bolts, plastic materials, parts for assembly. Since 1953 the prices of crude materials have fluctuated inversely rather than positively with fluctuations in output.

These indexes do not include prices of services rendered by other business enterprises; e.g., transportation, supply of electric power, legal services, auditing services, etc. In Chapter 5 it will be shown that prices of railroad service ordinarily have little cyclical

TABLE 32
Wholesale Prices of Materials Used by Manufacturers: Changes During Cycles in Manufacturing Production, 1947–61

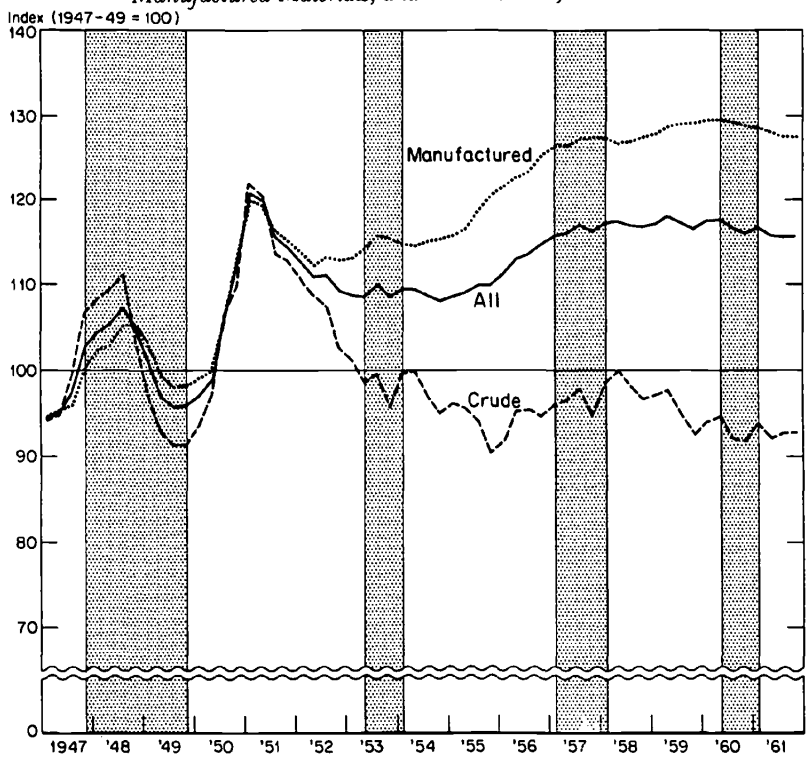
Turns in Federal Reserve Index of Production		ALL MATERIALS PRICES			CRUDE MATERIALS PRICES			MANUFACTURED MATERIALS PRICES		
			Percentage Change			Percentage Change			Percentage Change	
Date	Level	Index (1947–49 = 100)	To Peak from Trough	To Trough from Peak	Index (1947–49 = 100)	To Peak from Trough	To Trough from Peak	Index (1947–49 = 100)	To Peak from Trough	To Trough from Peak
3Q 1948	Peak	107.3	--	--	111.1	--	--	105.2	--	--
2Q 1949	Trough	97.0	--	-9.6	92.7	--	-16.6	99.3	--	-5.6
2Q 1953	Peak	108.6	12.0	--	98.5	6.3	--	114.1	14.9	--
1Q 1954	Trough	109.5	--	0.8	99.7	--	1.2	114.9	--	0.7
1Q 1957	Peak	115.8	5.8	--	95.9	-3.8	--	126.3	9.9	--
2Q 1958	Trough	117.5	--	1.5	99.9	--	4.2	126.8	--	0.4
1Q 1960	Peak	117.4	-0.1	--	93.9	-6.0	--	129.5	2.1	--
1Q 1961	Trough	116.7	--	-0.6	93.6	--	-0.3	128.7	--	-0.6
2Q 1949	Trough	97.0	--	--	92.7	--	--	99.3	--	--
1Q 1951	Quasi-peak	120.7	24.4	--	122.0	31.6	--	120.0	20.8	--
3Q 1951	Quasi-trough	115.5	--	-4.3	113.7	--	-6.8	116.4	--	-3.0
2Q 1953	Peak	108.6	-6.0	--	98.5	-13.4	--	114.1	-2.0	--

fluctuation, and this appears to be true of public utility service also. The price indexes in Table 32, therefore, probably overstate the fluctuation in prices of all privately supplied products and services.

Other costs include such overhead items as interest, depreciation and depletion, and property taxes. In manufacturing we have data only on depreciation and depletion. Aggregate charges of this kind increased somewhat faster than production in the 1949–53 expansion of manufacturing output, and decidedly faster in the 1954–57 expansion (Table 33). In other words, depreciation per unit of product increased. In 1958–60, however, it decreased. Even at the peak in 1960, these charges were only 3.12 per cent of total sales.

CHART 5

Prices Paid by Manufacturers for Crude Materials, Manufactured Materials, and All Materials, 1947–61



NOTE: Shaded areas are contractions in composite quantity sold (15 industries).

Interest and taxes (other than income taxes) are likewise comparatively unimportant in manufacturing.[11]

TABLE 33

Depreciation and Depletion, All Manufacturing Corporations: Changes Compared with Changes in Manufacturing Production; and Ratio of Depreciation and Depletion to Sales

Turns in Federal Reserve Index of Production		Production		Depreciation and Depletion		
Date	Level	Index (1947-49 = 100)	Percentage Change	Amount (million dollars)	Percentage Change	Ratio to Sales (per cent)
3Q 1948	Peak	104.0	--	957	--	1.88
2Q 1949	Trough	96.3	-7.4	1,027	7.3	2.20
2Q 1953	Peak	141.3	46.7	1,587	54.5	2.25
1Q 1954	Trough	127.7	-9.6	1,703	7.3	2.64
1Q 1957	Peak	153.3	20.0	2,275	33.6	2.80
2Q 1958	Trough	133.3	-13.0	2,431	6.9	3.31
1Q 1960	Peak	166.3	24.8	2,700	11.1	3.12
1Q 1961	Trough	152.7	-8.2	2,831	4.9	3.40

[11]The tobacco industry, however, pays high excise taxes. Income statements of the five largest companies show that these are included in revenues and in expenses. The taxes are on a so-much-per-unit basis, and are not often changed. Between changes, this kind of cost tends to be constant on a per-unit-of-product-sold basis. Similar remarks apply to the liquor industry, but the latter is only a small part of the FTC-SEC food group.