4

Changes During Cycles in Business at Large

Production in a single industry often follows a different course from that of general business activity. When most industries are expanding their output, some are nevertheless contracting theirs, and vice versa. A poor crop, for example, occurring during times of advancing prosperity, may force an industry that depends on an agricultural raw material to curtail its operations. Some of the expansions in the national economy have themselves been rather fitful. At the beginning of the 1933-37 business expansion, the recovery from the banking holiday and the imminence of the Blue Eagle and NRA seem to have stimulated a vigorous wave of buying and production. For many industries the rise proved to be temporary, although a good number had a second upswing after an intervening decline in production.

In the 1938-45 business upswing, the construction phase of the war effort reached a comparatively early climax. This meant an early downswing for industries heavily dependent on construction. Production of cement, for example, declined after April 1942. Manpower shortages apparently caused such a decline in others. In the 1949-53 business expansion, the Korean crisis caused a tremendous upswing in demand from consumers and from business itself; but as inventories accumulated, demand receded and presently restrictions on use of materials for non-defense purposes also limited production in some industries. Consequently there were a number of contractions in production, more or less in the middle of the business upswing, often followed by renewed rises in output during its later stretches.

From some points of view, it may be more interesting to compare the changes in hours per unit or labor cost between turning points in aggregate business instead of in each industry's own production. The National Bureau has worked out a chronology of turning points, and therefore cycles, in business at large, which may be used for this purpose. From here on we no longer, for example, compare man-hours per barrel of cement around February 1938 with hours per barrel around April 1942 (as in Table 9); instead we compare man-hours per barrel around May 1938 with hours per barrel around February 1945; these dates are the trough and peak of a business expansion.[1] We have hours per unit and labor cost data for these two dates in 11 industries, giving us 11 observations in that business phase. For one business expansion or another in one industry or another, we have 72 observations altogether, and 83 for contractions.

Growth of Divergent Tendencies in Production

These observations provide numerous illustrations of production moving contrary to the general current of business (Table 21). In ten instances,

TABLE 21

Production, Number of Changes from Stage to Stage of Business Cycles, Classified by Direction, Twenty-three Industries

From Stage	To Stage	Rises	Zero Changes	Falls	Observations	Per Cent		
						Rising	Unchanged	Falling
I	II	67	1	4	72	93	1	6
II	III	50	2	20	72	69	3	28
III	IV	42	1	29	72	58	1	40
IV	V	36	1	35	72	50	1	49
V	VI	24	1	58	83	29	1	70
VI	VII	18	0	65	83	22	0	78
VII	VIII	30	1	52	83	36	1	63
VIII	IX	39	7	37	83	47	8	45
I	V	62	0	10	72	86	0	14
V	IX	17	1	65	83	20	1	78

production was lower at a business peak than at the preceding trough. At the trough in October 1945, for example, manufacturers of shoes made 40.1 million pairs per month; at the following peak in November 1948, they made only 37.9 million pairs per month. Conversely, in seventeen instances production was higher at a business trough than at the preceding peak.

Examples of contracyclical declines in production are rare in the earliest stage of a business expansion, but they gradually become more numerous as

[1] The 1938 date has been revised to June; but to keep our work consistent with other studies we use the old date. The effect on our conclusions is negligible.

expansion proceeds. Production fell from business cycle Stage IV to Stage V in almost half of our observations. In the first part of a business contraction, most industries participate in the general decline, but toward the end, an increasing number cease to participate. Production fell during the first segment of business contraction in 70 per cent of our observations, and during the second segment in 78 per cent; but thereafter the percentage fell to 63 per cent in the third segment and 45 per cent in the fourth. (In the latter, however, quite a few had no change; but 47 per cent had a rise.)

Falling Hours per Unit Predominant in Expansions and, by a Narrower Margin, in Contractions

With these diversities of productive behavior in mind, let us see how hours per unit changed in the various industries between business cycle dates. In 81 per cent of the observations for business expansions hours per unit declined, as they also did in 67 per cent of the observations for contractions (Table 22, last two lines). Falls predominated in both kinds of phases. In

TABLE 22

Man-Hours per Unit of Product, Number of Changes from Stage to Stage of Business Cycles, Classified by Direction, Twenty-three Industries

From Stage	To Stage	Rises	Zero Changes	Falls	Observations	Per Cent		
						Rising	Unchanged	Falling
I	II	13	2	57	72	18	3	79
II	III	23	0	49	72	32	0	68
III	IV	24	1	47	72	33	1	65
IV	V	25	2	45	72	35	3	62
V	VI	38	1	44	83	46	1	53
VI	VII	44	1	38	83	53	1	46
VII	VIII	25	3	55	83	30	4	66
VIII	IX	27	0	56	83	33	0	67
I	V	14	0	58	72	19	0	81
V	IX	27	0	56	83	33	0	67

NOTE: Man-hours of production workers only.

a sense, however, the relation of hours per unit to business was inverse: declines were more frequent when business was expanding than when it was contracting.

The percentage of declines in business expansions, 81, is smaller than that of declines in expansions of production, 92 (Table 10), and the percentage of rises in business contractions, only 33, is much smaller than that of rises in contractions of production, 71. The inverse relation of hours per unit to business was not as clear or as strong as its inverse relation to production. One reason for this difference is the failure of production to move with business in some industries. In seven of the ten instances in which production had a net fall during a business expansion, hours per unit had a net rise (Table 23). In all of the seventeen instances in which production had a net rise during a business contraction, hours per unit fell.

If we confine our attention to the far more numerous instances in which the direction of change in an industry's production conformed to the direction in business at large, we find that the percentage with a net decline in hours per unit during expansion rises from 81 to 89 and during contraction the percentage falls from 67 to 58. The difference in frequency of declines becomes more pronounced, although hours per unit still have a prodominance of declines in contraction.

These differences can be explored more fully by comparing the net change in hours per unit during each production expansion with the change in the same industry during the most nearly corresponding business expansion. One of the former usually includes some months of one and only one of the latter. For example, the expansion in textile production from December 1953 to February 1956 includes many months of the business expansion from August 1954 to July 1957, but none of the one that ended in July 1953 or the one that began in April 1958. Sometimes an industry has two short production expansions (separated of course by an intervening contraction) both of which correspond to a single business expansion. In a few instances, a production expansion straddles a business contraction and consequently overlaps part of two business expansions. In such cases we regard it as corresponding to the business phase with which it has the longer overlap.

Hours per unit fell, as previously noted, in 83 expansions of production. In fifteen of these instances, there was a rise in hours per unit during the most nearly corresponding phase of business. In seven of the fifteen, there was actually a net decline in production from the business trough to the peak. Production of cotton goods, for example, expanded 16.1 per cent from August 1945 to November 1946, but had a net decline of 9.0 per cent from the business trough in October 1945 to its peak in November 1948. These seven instances, therefore, are not real cases of different responses to rising production in the two kinds of time periods. In six other instances, the rise in production between its own turning points was greater than that between the corresponding business dates, and its influence on hours per unit was

TABLE 23

Man-Hours per Unit of Product, Number of Changes from Stage to Stage of Business Cycles, Observations with Rising and Falling Production Considered Separately

From Stage	To Stage	Number of Changes in Hours per Unit				Per Cent with Hours per Unit		
		Rises	Zero Changes	Falls	Total	Rising	Unchanged	Falling
Observations with Rising Production								
I	II	10	2	55	67	15	3	82
II	III	12	0	38	50	24	0	76
III	IV	10	0	32	42	24	0	76
IV	V	7	2	27	36	19	6	75
V	VI	3	0	21	24	12	0	88
VI	VII	1	0	17	18	6	0	94
VII	VIII	2	0	28	30	7	0	93
VIII	IX	8	0	31	39	21	0	79
I	V	7	0	55	62	11	0	89
V	IX	0	0	17	17	0	0	100
Observations with Falling Production								
I	II	3	0	1	4	75	0	25
II	III	10	0	10	20	50	0	50
III	IV	14	1	14	29	48	3	48
IV	V	17	0	18	35	49	0	51
V	VI	35	1	22	58	60	2	38
VI	VII	43	1	21	65	66	2	32
VII	VIII	23	3	26	52	44	6	50
VIII	IX	16	0	21	37	43	0	57
I	V	7	0	3	10	70	0	30
V	IX	27	0	38	65	42	0	58

presumably stronger, and less easily offset by other circumstances, in the expansions of production.

We cannot match all of our contractions in production with contractions in business, for 33 of those in production occurred while the economy at large was expanding. Consequently, we cannot use the detailed procedure described in the preceding paragraphs to explore the difference between the two kinds of phases. In general, however, the decline in output was larger in the production than in the business phases. In the 33 the average fall in production was 20.7 per cent, and in the other 66 it was 25.1 per cent. In our 83 observations of change in production between business contraction dates, on the other hand, the average change was a decline of only 12.8 per cent. In contractions of either kind, the influence of technology opposes that of declining volume. Technical improvement tends to reduce hours per unit even in contractions, while falling volume usually raises it. The small decline in production during a business contraction makes it more probable that the influence of technology will prevail.

An annual index of production man-hours per unit in all manufacturing changes during business cycles in the same way as most of our monthly indexes for individual industries. Hours per unit fell in all expansions and all contractions of business (Table 24).

The peaks and troughs in the index of production used to compute the index of hours per unit (h/p) coincide with those in business. The relation of h/p to production in contractions of the latter is therefore contrary to what we found in most individual instances on the basis of monthly data. As noted earlier, annual data tend to obscure the influence of contractions in output and to exaggerate the influence of a technological downward trend. Furthermore, some components of the index at times do not move in the same direction as the total index. Such divergent movements, as we have just noted in the case of changes between business cycle dates, also blur the relation between h/p and output.

In spite of obscuring influences, the fact remains that declines in h/p, according to the monthly data, were more common in business expansions than in business contractions. The difference must reflect the effect of changes in the scale of production. Although in some industries volume contracts during parts of a business expansion and may even decline throughout the whole period, it is rising most of the time in most industries. Otherwise the period would hardly have been described as one of business expansion in the first place. Likewise, the general picture in a business contraction is one of declining production. The influence of volume, blurred though it is by noncoincident dates and by other circumstances, works in the main toward falling h/p in business expansions and rising h/p in business contractions.

It is possible, furthermore, that if we could take into exact account the

TABLE 24

Man-Hours per Unit of Product, All Manufacturing, Changes Between Peak and Trough Years in Business, 1919-38, 1946-58

Date of Peak or Trough [a]	Level of Business	Years from Preceding Date	Index of Hours per Unit [b]	Change from Preceding Date			Phase with More Rapid Decline [c]
				Total	Per Year: To Peak from Trough	Per Year: To Trough from Peak	
1919	Trough	...	157.5	...	...	...	...
1920	Peak	1	149.3	−8.2	−8.2	...	...
1921	Trough	1	139.9	−9.4	...	−9.4	Contraction
1923	Peak	2	123.3	−16.6	−8.3	...	Contraction
1924	Trough	1	119.0	−4.3	...	−4.3	Expansion
1926	Peak	2	109.4	−9.6	−4.8	...	Expansion
1927	Trough	1	108.1	−1.3	...	−1.3	Expansion
1929	Peak	2	100.0	−8.1	−4.0	...	Expansion
1932	Trough	3	96.5	−3.5	...	−1.2	Expansion
1937	Peak	5	83.6	−12.9	−2.6	...	Expansion
1938	Trough	1	82.1	−1.5	...	−1.5	Expansion
1946	Trough	...	110.0	...	...	...	...
1948	Peak	2	100.3	−9.7	−4.8	...	...
1949	Trough	1	94.9	−5.4	...	−5.4	Contraction
1953	Peak	4	83.5	−11.4	−2.8	...	Contraction
1954	Trough	1	79.8	−3.7	...	−3.7	Contraction
1957	Peak	3	71.9	−7.9	−2.6	...	Contraction
1958	Trough	1	68.1	−3.8	...	−3.8	Contraction

NOTE: Before 1932 the index pertains to only part of manufacturing, since hours per unit could not be estimated for the rest. Man-hours of production workers only.

[a] The wartime peak in 1943 is omitted because of the greatly different composition of production.

[b] 1929 = 100, 1919-38; 1947-49 = 100, 1946-58.

[c] Based on comparison of each change-per-year figure with preceding figure in other column.

hours of other than "production" workers, we would find an actual preponderance of mild increases in hours per unit during contractions. We have not thought it worth while to adjust seasonally the data on other workers for each industry separately, since we know only how many of them there were and not how long they worked. But for all manufacturing the increases in the ratio of all workers to production workers in the four reference contractions are successively 3.8, 2.9, 1.4, 2.4, and 2.3 per cent. For example, the three-month average ratio for July 1953 is 1.244, and for August 1954 1.274, and the latter is 102.4 per cent of the former.

The percentage changes in individual industries must often have been comparable in size or larger, and must sometimes have exceeded the decline in h/p. In one manufacturing industry or another (i.e., excluding anthracite, bituminous, and railroads), we have 65 observations of change in h/p during a reference contraction. In 43, h/p declined; the average percentage change was -5.5. For all 65, it was only -1.4. The rise in the all worker/production worker ratio may often have exceeded the decline in production worker hours per unit by a margin wide enough to produce a rise in all-worker hours per unit.[2]

Falling Hours per Unit More Common Around Troughs Than Around Peaks

Instead of indicating periods of contraction in production of non-ferrous shapes on Chart 3, we could have indicated the periods of contraction in business at large by similar shading. We could then describe the sequence of change in hours per unit from asterisk to asterisk during the course of each expansion or contraction in business. In effect we have done this on our working charts for the several industries, and have summarized our findings in Table 25.

For example, in one of the three business expansions for which we have data on only one industry, railroads, we find first a fall, then a rise in h/p in that industry. One industry had such a sequence in the 1933-37 business expansion. Three industries had it in 1938-45, four in 1945-48, two in 1949-53, and five in 1954-57. Altogether, therefore, we record 16 instances

[2] Our formula for h/p is equivalent to nm/p where n = the number of production workers and m the average hours per production worker per month. Let r = the ratio of the total number of workers to the number of production workers, M = hours per month for all workers, and H their aggregate hours. Then hours per unit for all workers $= H/p = rnM/p$. In two periods,

$$\frac{h_2}{p_2} \div \frac{h_1}{p_1} = \frac{n_2}{n_1}\frac{m_2}{m_1}\frac{p_1}{p_2} \quad \text{and} \quad \frac{H_2}{p_2} \div \frac{H_1}{p_1} = \frac{r_2}{r_1}\frac{n_2}{n_1}\frac{M_2}{M_1}\frac{p_1}{p_2}.$$

If hours per worker per month change by the same percentage for all as for production workers,

$$\frac{H_2}{p_2} \div \frac{H_1}{p_1} = \frac{r_2}{r_1}\frac{n_2}{n_1}\frac{m_2}{m_1}\frac{p_1}{p_2} = \frac{r_2}{r_1}\frac{h_2/p_1}{h_1/p_2}.$$

In that case, if for example, $r_2/r_1 = 1.04$ and $h_2/p_2 \div h_1/p_1 = .98$, $H_2/p_2 \div H_1p_1 = 1.04 \times .98 = 1.0192$.

TABLE 25

Man-Hours and Labor Cost per Unit of Product, Sequences of Change During Business Expansions and Contractions, Twenty-three Industries

	Number of Observations with Indicated Sequence			
	In Hours per Unit		In Labor Cost	
	During Expansions	During Contractions	During Expansions	During Contractions
Rise	3	6	11	21
Rise, fall	5	27	6	34
Rise, fall, rise	...	...	4	2
Rise, fall, rise, fall	2	1	2	...
Fall	20	42	...	21
Fall, rise	16	6	32	5
Fall, rise, fall	15	1	7	...
Fall, rise, fall, rise	10	...	10	...
Fall, rise, fall, rise, fall, rise	1	...	...	...
All sequences	72	83	72	83
Rising at beginning	10	34	23	57
Falling at beginning	62	49	49	26
Rising at end	30	12	57	28
Falling at end	42	71	15	55

NOTE: Production workers only. Cost does not include social security, pensions, etc.

of "fall, rise" in the table. Adding all sequences that begin with a fall, we find h/p declining during the opening months in 62 of the 72 observations. As the end of a business expansion approached, h/p declined in only 42 of the 72. In the earliest months of business contraction, hours per unit fell in 49 of 83 instances; in the latest months, it fell in 71.

Varying our procedure again, we can divide each business cycle into stages, on the same plan that we employed for production cycles, and in each industry we can strike an average of h/p for the months comprising each stage of business. This technique yields conclusions similar to those just obtained. Hours per unit fell more frequently in the first two than in the last two stages of expansion, and also fell more frequently in the last than in the first two stages of contraction (Table 22).

Viewed either way, therefore, the decline in hours per unit that is characteristic of business expansions, and, by a more precarious margin, of contractions, is concentrated around the troughs. It is more common just after a trough than just before the peak, and less common just after the peak than just before the trough.

A gradual increase in contracyclical movements of production helps to explain these differences between early and late business expansion, and early and late business contraction. 93 per cent of the observations for the first segment of business expansion, but only 50 per cent of those for the last segment, refer to industries with growing production (Table 21). Likewise, 70 per cent of the observations for the first segment of contraction, but only 45 per cent of those for the last segment, refer to industries with diminishing production. In every segment either of business expansion or of business contraction, increasingly effective use of labor is more frequent among the industries with rising production in that segment than among those with falling production (Table 23).

Cost Rises and Falls with Business

Average hourly earnings in our various industries almost always rose from a business trough to the following peak. At the trough in March 1933, for example, workers in anthracite mines received 82.5¢ per hour, on the average; in May 1937 they received 87.2¢. In the other eight industries for which we have monthly data on labor cost, there was likewise a net increase between the same two dates. In one industry or another, in one business expansion or another, earnings increased in 99 per cent of all instances. They also increased in 73 per cent of the contractions (Table 26). The change in earnings therefore tended to increase cost in both phases, but the tendency was more widespread during periods of rising economic activity.

In expansions, the influence of hourly earnings on cost usually opposed that of hours per unit, since, as we have seen, h/p fell in 81 per cent of the observations. In most cases, the change in earnings was greater than the change in hours, for cost rose in 54, or 75 per cent, of the observations (Table 27). In 14 of the 54 instances, both hours per unit and earnings increased; but in the other 40, the rise in cost was caused entirely by the earnings component (Table 28).

In contractions also, the change in earnings tended to raise cost in most instances, while the change in hours tended to reduce it. The influence of hours predominated, although not by a wide margin, for labor cost fell in 45, or 54 per cent, of the 83 observations. In 30 of the 45, the decline was caused entirely by the h/p component, in 13 both c/h and h/p declined; earnings alone were responsible for the decline in only two.

TABLE 26

Average Hourly Earnings, Number of Changes from Stage to Stage of Business Cycles, Classified by Direction, Twenty-three Industries

From Stage	To Stage	Number of Rises	Number of Zero Changes	Number of Falls	Number of Observations	Per Cent Rising	Per Cent Unchanged	Per Cent Falling
I	II	65	0	7	72	90	0	10
II	III	70	0	2	72	97	0	3
III	IV	70	0	2	72	97	0	3
IV	V	67	1	4	72	93	1	6
V	VI	53	2	28	83	64	2	34
VI	VII	53	2	28	83	64	2	34
VII	VIII	47	2	34	83	57	2	41
VIII	IX	51	1	31	83	61	1	37
I	V	71	0	1	72	99	0	1
V	IX	61	0	22	83	73	0	27

NOTE: Production workers only. Does not include social security, pensions, etc.

TABLE 27

Labor Cost per Unit of Product, Number of Changes from Stage to Stage of Business Cycles, Classified by Direction, Twenty-three Industries

From Stage	To Stage	Rises	Zero Changes	Falls	Observations	Per Cent Rising	Per Cent Unchanged	Per Cent Falling
I	II	29	0	45	72	40	0	60
II	III	58	0	14	72	81	0	19
III	IV	54	0	18	72	75	0	25
IV	V	55	0	17	72	76	0	24
V	VI	44	2	37	83	53	2	45
VI	VII	51	0	32	83	61	0	39
VII	VIII	25	1	57	83	30	1	69
VIII	IX	31	0	52	83	37	0	63
I	V	54	0	18	72	75	0	25
V	IX	38	0	45	83	46	0	54

NOTE: Production workers only. Does not include social security, pensions, etc.

TABLE 28

Contributions of Components to Rises and Falls in Labor Cost During Business Cycles

From Stage	To Stage	Number of Rises in Labor Cost, Caused by			Number of Falls in Labor Cost, Caused by		
		Rise in Man-Hours per Unit Only [a]	Rise in Hourly Earnings Only [b]	Rise in Both	Fall in Man-Hours per Unit Only	Fall in Hourly Earnings Only	Fall in Both
I	II	0	17	12	36	1	6
II	III	0	36	22	12	1	1
III	IV	0	30	24	16	0	2
IV	V	2	30	23	15	0	2
V	VI	10	9	25	18	3	16
VI	VII	15	8	28	18	1	13
VII	VIII	7	3	15	31	4	22
VIII	IX	12	7	12	33	3	16
I	V	0	40	14	17	0	1
V	IX	7	13	18	30	2	13

[a] I.e., hourly earnings falling or unchanged.
[b] I.e., man-hours per unit falling or unchanged.

In most instances, therefore, cost rose as business expanded, and declined as business contracted. In this respect business cycles differed from production cycles, for in the latter cost varied inversely, not directly, with production. What explains this difference? Labor cost fell in 56 expansions of production. In the business phases most nearly corresponding to 40 of these, it rose. The explanation must lie in the comparative changes in hours per unit, or hourly earnings, or both. Hours per unit declined in all of the production phases, but they also declined in all but eight of the forty corresponding observations for business phases (Table 29); they do not account for much of the difference. If hourly earnings had not changed, cost would have declined in thirty-two of those observations. But in fact hourly earnings increased in all of the business observations, while they declined or increased by a lesser percentage in the production phases, with only one exception. (In that instance, earnings rose a little more in the production than in the

TABLE 29

Production Phases in which Cost Declined, Although It Rose in Corresponding Business Phase, Classified According to Changes in Components of Cost
(Number of production phases)

Change in Hours per Unit	Change in Hourly Earnings: Fall in Production Phase, Rise in Business Phase	Rise in Production Phase: Greater Percentage Rise in Business Phase	Rise in Production Phase: Smaller Percentage Rise in Business Phase	Total Number
Fall in production phase:				
Rise in business phase	1	7	0	8
Smaller percentage fall in business phase	1	17	1	19
Greater percentage fall in business phase	5	8	0	13
Total number	7	32	1	40

business phase, but the decline in hours per unit in the former was nevertheless great enough to produce a fall in cost.)

In some cases, the percentage fall in hours per unit was not as large in the business phase as in the production phase. If it had been that large, cost would have fallen in ten of these cases during the business phase in spite of the rise in earnings.

The production expansions were in all cases, with the same exception, much shorter than the business expansions; consequently the rise in hourly earnings had much more time to operate during the business phases. Production of suits and coats, for example, increased from March 1954 to April 1956 (25 months), with a rise of 3.9 per cent in hourly earnings; between the business trough in August 1954 and the business peak in July 1957 (35 months), hourly earnings in the same industry increased 10.4 per cent.

In contractions, on the other hand, the change in hourly earnings was not as great. The difference between production and business contractions can be explained largely in terms of the hours-per-unit component, which, as we have already explained, declines more frequently in the business contractions.

An annual index of production labor cost in all manufacturing fluctuates in much the same way between peaks and troughs in business. Cost rose in a majority of the expansions and fell in all contractions (Table 30). Changes

TABLE 30

Labor Cost, All Manufacturing, Changes Between Peak and Trough Years in Business, 1919-38, 1946-58

Date of Peak or Trough	Level of Business	Years from Preceding Date	Index of Labor Cost Per Unit [a]	Change in Index		
				Total	Per Year	
					To Peak from Trough	To Trough from Peak
1919	Trough	...	145.4	...	...	...
1920	Peak	1	159.3	13.9	13.9	...
1921	Trough	1	127.9	−31.4	...	−31.4
1923	Peak	2	121.2	−6.7	−3.4	...
1924	Trough	1	119.5	−1.7	...	−1.7
1926	Peak	2	108.8	−10.7	−5.4	...
1927	Trough	1	106.4	−2.4	...	−2.4
1929	Peak	2	100.0	−6.4	−3.2	...
1932	Trough	3	78.0	−22.0	...	−7.3
1937	Peak	5	89.7	11.7	2.3	...
1938	Trough	1	87.7	−2.0	...	−2.0
1946	Trough	...	90.2	...	...	...
1948	Peak	2	102.0	11.8	5.9	...
1949	Trough	1	100.2	−1.8	...	−1.8
1953	Peak	4	111.3	11.1	2.8	...
1954	Trough	1	108.4	−2.9	...	−2.9
1957	Peak	3	112.2	3.8	1.3	...
1958	Trough	1	109.3	−2.9	...	−2.9

NOTE: Production workers only. Does not include social security, pensions, etc.
[a] 1929 = 100, 1919-38; 1947-49 = 100, 1946-58. This index, unlike the one for hours per unit in Table 24, pertains to all manufacturing in all years, since an annual payroll index is available for the entire period.

in average hourly earnings are responsible for the exceptions. Earnings per hour increased only 0.7¢ in 1921-23, 0.1¢ in 1924-26, and 1.6¢ in 1927-29; these changes were not large enough to offset the decline in h/p. In 1919-20, on the other hand, hourly earnings rose 7.8¢, and in the five expansions beginning with 1932-37 the increases were, successively, 17.8¢, 39.2¢, 26.4¢, 37¢ and 26¢.

The peaks and troughs in the index of manufacturing production used to compute the index of cost coincide with those in business, except in 1927. (Annual data, unlike monthly data, indicate no 1926-27 decline in production.) Table 30 therefore indicates rising cost in five expansions of output, whereas our monthly data indicate a preponderance of declines in expansions of output. The annual index of production has no contractions of less than business cycle length; the annual and composite data minimize the influence of rising volume. For both reasons, the influence of rising hourly earnings on cost appears more strongly in the annual data for the five expansions.

If our data included cost of non-production workers, we might find a majority of rises in cost per unit during contractions. The changes in the ratio of all workers to production workers in manufacturing as a whole, previously cited, are large compared with those in cost in our 65 observations for individual manufacturing industries. Production-worker cost per unit fell in 35; the average percentage change was —6.1 in these, —0.4 in all 65. In some of the 35, the rise in the all-to-production-worker ratio may have exceeded the decline in production labor cost by enough to produce a rise in all-worker labor cost.[3]

Allowance for non-production workers would not change our conclusion about business expansions. The all worker/production worker employment ratio fell 4.1 per cent in 1933-37, 6.7 per cent in 1938-45, 0.1 per cent in 1945-48, and rose 1.5 per cent in 1949-53.[4] Production labor cost rose in 44 of 55 observations for manufacturing industries; the average change in these was +29.4 per cent and for all 55, it was 22.5 per cent. Even if the

[3] Let aggregate compensation of all workers equal C and their compensation per hour, W. Then cost of all workers per unit $= C/p = HW/p = rnMW/p$ and cost of production workers per unit $= c/p = nmw/p$ (see footnote 2 on hours per unit), where w equals hourly compensation of production workers.

$$\frac{C_2}{p_2} \div \frac{C_1}{p_1} = \frac{r_2}{r_1}\frac{n_2}{n_1}\frac{M_2}{M_1}\frac{W_2 p_1}{W_1 p_2} \quad \text{and} \quad \frac{c_2}{p_2} \div \frac{c_1}{p_1} = \frac{n_2}{n_1}\frac{m_2}{m_1}\frac{w_2 p_1}{w_1 p_2}.$$

If the percentage change in hours per month, hourly compensation, or their product is the same for other workers as for production workers

$$\frac{C_2}{p_1} \div \frac{C_1}{p_1} = \frac{r_2 c_2/p_2}{r_1 c_1/p_1}.$$

For example, if

$$r_2/r_1 = 1.04 \quad \text{and} \quad c_2/p_2 \div c_1/p_1 = .99,$$

then

$$C_2/p_2 \div C_1/p_1 = 1.04 \times .99 = 1.0296.$$

[4] I.e., the values of r_2/r_1 are .959, .933, .999, and 1.015.

more inclusive labor cost rose in most instances during contractions, the rises must have been much smaller, on the average, than during expansions.

Rising Cost More Common Around Business Peaks

The frequency of rising cost does not increase or decrease progressively in business expansions or contractions (Table 27). In expansions the first segment has the lowest frequency; but the second, not the fourth, has the highest. In contractions the second, not the first, has the highest frequency. We can nevertheless draw a distinction between the vicinity of peaks and troughs. Declines in cost predominated in the first segment of expansion, rises in the other three, nearer the peak. Rises predominated in the first two segments after the peak, declines in the last two. If we use the alternative to the stage-by-stage approach (Table 25), we come to similar conclusions. In a majority of instances, cost was falling at the beginning, rising at the end of expansions; it was rising at the beginning, falling at the end of contractions.

Rise in Cost During Expansion Bigger Than Fall During Contraction: Rises Cumulate

Although labor cost in most cases rises during business expansions and falls during contractions, the decline during the latter was seldom large enough to bring cost back down to its original level at the beginning of a trough-to-trough cycle (Table 31). At the peak in May 1937, for example, cost in meat packing was 93.2 per cent above its level at the preceding trough in March 1933. During the following contraction it fell, but by the time of the trough in May 1938 it was still 69.8 per cent above March 1933. Table 31 contains 65 comparisons of a trough with the preceding trough (excluding the median line); only 14 of these fail to show a net rise over the cycle as a whole. (Ten of the 14 exceptions occur in the last two cycles, which have the mildest rises during expansions.) The median line indicates a net rise in each cycle; successive increases were piled on top of each other, even though the percentage rises in the several cycles became successively smaller (46.1, 38.8, 33.6, 6.0, 3.9). The annual figures from 1932 to 1938 and 1946 to 1958 (Table 30) indicate a cumulative rise in manufacturing as a whole.

These conclusions pertain to the four business cycles since 1933 for which we have monthly data on more than one industry. It is possible that if we had such data for 1927-33 and earlier cycles with severe contractions, they would show a predominance of net declines from trough to trough.

TABLE 31

Percentage Ratio of Labor Cost at Each Business Peak or Trough to Labor Cost at Preceding Business Trough

	May 37 ÷ Mar. 33	May 38 ÷ Mar. 33	Feb. 45 ÷ May 38	Oct. 45 ÷ May 38	Nov. 48 ÷ Oct. 45	Oct. 49 ÷ Oct. 45	July 53 ÷ Oct. 49	Aug. 54 ÷ Oct. 49	July 57 ÷ Aug. 54	Apr. 58 ÷ Aug. 54
Anthracite	97.2	98.0	133.4	144.0	137.2	177.3	96.2	66.2	115.7	85.6
Bituminous	...	...	134.0	128.2	162.9	133.6	117.8	97.2	118.9	109.1
Meat	193.2	169.8	148.6	142.2	142.4	102.0	...	...	...	...
Confectionery	...	...	...	...	172.4	...	...	...	...	...
Cigars	...	...	...	...	108.3	102.7	111.7	111.1	93.2	85.4
Cotton	157.2	157.7	147.3	158.5	174.5	...	...	...	...	...
Wool	132.0	146.1	115.8	112.1	151.5	...	...	...	...	...
Textiles	...	...	...	...	...	...	105.7	96.2	98.9	95.0
Hosiery	...	...	95.2	100.0	176.9	...	...	...	...	...
Suits and coats	...	...	...	...	...	...	117.6	121.6	105.0	100.3
Outerwear	...	...	...	...	...	...	97.2	91.0	105.3	105.6
Lumber	...	...	...	...	...	...	101.5	100.7	99.4	102.0
Millwork and plywood	...	...	...	...	...	...	102.8	104.0	78.1	84.8
Paper	125.5	135.1	150.5	152.9	150.2	143.5	110.5	112.0	105.4	105.5
Petroleum	...	...	...	...	...	...	92.6	95.3	96.0	102.3
Tires and tubes	141.2	157.7	...	...	...	...	121.6	112.0	110.6	110.2
Shoes	...	...	136.1	138.8	149.4	136.4	113.6	108.9	103.0	101.8
Cement	154.1	156.9	174.1	150.8	112.2	113.2	107.0	103.7	96.0	114.8
Steel	119.3	144.7	98.0	94.4	124.6	124.2	108.3	120.6	103.2	128.8
Iron and steel foundries	...	...	...	...	...	...	114.4	113.0	112.8	123.2
Copper and aluminum	...	...	...	...	...	...	133.7	125.4	118.8	129.9
Nonferrous foundries	...	...	...	...	...	...	125.9	108.1	96.7	99.3
Railroads	88.0	100.2	79.8	87.2	143.5	166.1	102.4	103.4	100.3	107.4
Median	132.0	146.1	134.0	138.8	149.4	133.6	109.4	106.0	103.1	103.9

NOTE: Production workers only. Does not include social security, pensions, etc.