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CHAPTER 3

CYCLES IN OUTPUT AT FIVE STAGES

A bird's-eye view of sales and output in the shoe, leather, hide industry for the period between World Wars I and II can be gained from examining five sets of monthly statistics—data on sales of shoes by retailers and by wholesalers, output of shoe factories and of tanneries, and the appearance of hides on the markets of the country. These quantitative histories present a fundamental enigma: with the exception of wholesale sales, which lead by several months, all of these processes seem to move up and down at, on the average, virtually the same time.

This strange fact, for which we must review the evidence, is not the result of physical necessity. Were the whole sequence of processes whereby raw hides are converted into finished shoes, shelved in retail stores, as rigid in its timing as the several stands of a continuous-strip rolling mill, the movement of hides "into sight" would have to precede the sale of shoes by almost one half a year. But the statistics show that the timing relationships are not rigid. On the contrary, stocks of hides, leather, and shoes—raw, in process, and finished—are large and flexible, thus making it feasible for distributor and producer to elect on economic grounds the moment when the various operations are performed. The fact that the large stocks actually vary suggests that the power to elect is exercised. Also, since decisions concerning when hides, leather, or shoes move through each stage are typically made by different people, synchronous timing cannot often be the result of a single control tower for the whole sequence.

Reflection of this sort only deepens the mystery, and, I might add, it will take most of the book to unravel it. For the moment, we turn to the evidence on which the assertion of synchronous timing is based.

Physical Volume

For five of the chief production or marketing operations performed by each of the major groups of firms included in the industry, we have monthly statistics on the volume of flow. I shall not stop now to describe the data or present their credentials; this will be done, in later chapters, as they are studied more intimately; in the meantime general questions can be answered by reference to the descriptions given in Appendix B.

To obtain a record of physical units, retail and wholesale sales (originally reported in dollars) are divided by a price index purporting to trace the average price at which all shoes are sold each month. The other data are shown in the physical units in which they were originally reported. Chart 1 exhibits the monthly figures.

Two questions are put to the data: How do the five activities behave with respect to fluctuations in general business—business cycles? How do their own peculiar fluctuations behave with respect to one another?

Fluctuations in general business may be conveniently designated by the business-cycle chronology of the National Bureau of Economic Research. The manner in which it was determined is described by Burns and Mitchell in *Measuring Business Cycles*.¹ For each series, fluctuations peculiar to it—"specific cycles"—of the "same order of duration as business cycles" are selected by an experienced staff; typically, movements are chosen separately for each series without the aid of interseries comparisons.²

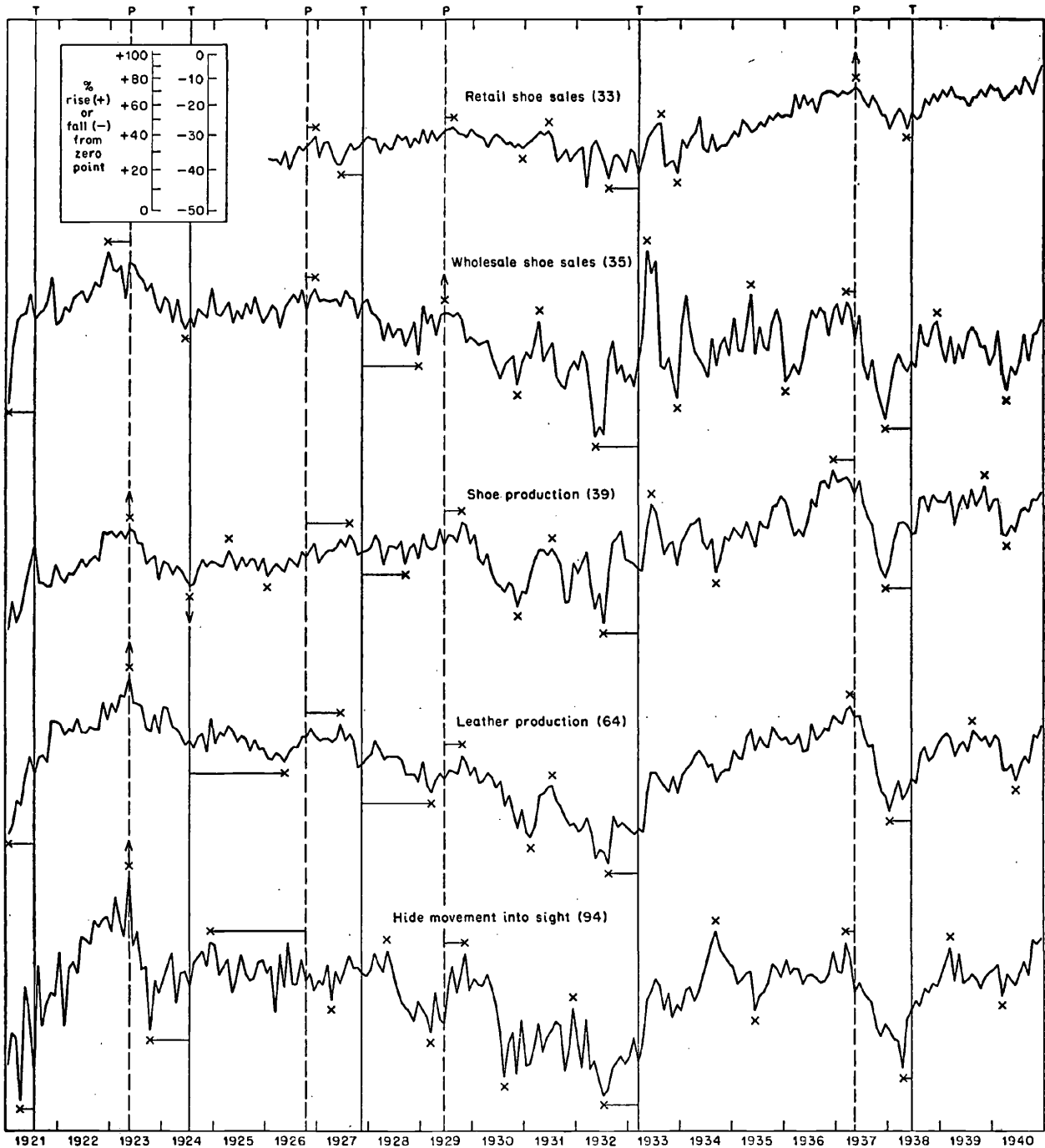
In order to decide whether a particular activity moves up and down with the business tide and, if so, whether it exhibits a systematic tendency to lead or lag the general movements, it is desirable to relate the turning points in specific cycles to the corresponding turning points in the reference chronology. The judgment is based on the application of a set of rules

¹ Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, National Bureau of Economic Research, 1946 (see especially pp. 13 and 76-81). Since the publication of *Measuring Business Cycles*, three reference dates have been revised. The new dates have been used for timing comparisons, though not for conformity or amplitude measures. The old and new dates, respectively, are September 1921 and July 1921, December 1927 and November 1927, and May 1938 and June 1938.

² *Ibid.*, pp. 57-58. There are always marginal decisions that are difficult to make. Take, for example, the rise in leather tanning in 1924 and 1925 (corresponding to a contemporaneous one in shoe production). This was a marginal case, for it is only slightly less eligible than the rise marked in 1929. However, it is only slightly more eligible than the fall in late 1935 and early 1936 or the one in 1934. In shoe production, on the other hand, the fall in 1935/1936 (corresponding to the contemporaneous one in wholesaling) is a marginal exclusion. In general, I have been extremely hesitant to revise the routine selections of turns on the basis of inequities disclosed by interseries comparisons. Since one of the most interesting questions is the extent to which the several series show similar movements, I do not care to find them similar because I have made them so.

CHART 1

Specific Cycles in Output Measured in Physical Units, at Five Stages, 1921-1940



P and T (broken and solid vertical lines) are peaks and troughs in the business-cycle reference chronology. Specific-cycle turns are marked by X. When a specific turn is matched with a reference turn, a horizontal line or vertical arrow indicates the association. For matching under relaxed rules and for tentative selections of turns, see notes to Table 4. Parenthetical figures after names of series identify their descriptions in Appendix B. "Leather production" refers here as elsewhere to the production of cattle-hide leather only.

developed by the National Bureau to eliminate as far as practicable the personal element in this operation.³ Table 2 shows the number of months' lead or lag for those specific turns that were judged related to each reference turn for each of the five series. Just how the comparisons were made can be seen in the chart where specific turns are marked by x and those related to reference turns (designated by the vertical grid) are indicated.

was subjected to a group of strong special influences during this period when women's shoes were converting from a utility to a decoration and the large stocks of World War I were being reduced—excessively so by 1927, thus sending hide prices skyrocketing.

Nevertheless, the six major business turns of the interwar period are found in the shoe, leather, hide industry. At these six turning dates—1921, 1923, 1929,

TABLE 2
Reference Timing of Specific-Cycle Turns in Output Measured in Physical Units, at Five Stages, 1921-1940

	NUMBER OF MONTHS' LEAD (-) OR LAG (+) OF SPECIFIC TURNS RELATED TO BUSINESS-CYCLE REFERENCE TURNS:													
	T		P		T		P		T		P		Mean of:	
	July 1921 (1)	May 1923 (2)	July 1924 (3)	Oct. 1926 (4)	Nov. 1927 (5)	June 1929 (6)	Mar. 1933 (7)	May 1937 (8)	June 1938 (9)	Four Turns ^a (10)	Six Turns ^b (11)	All Turns (12)		
Retail shoe sales (33)	n.a.	n.a.	n.a.	+2	-5	+2	-7 ^c	0	-1	-1.5		-1.5		
Wholesale shoe sales (35)	-6	-5	-1	+2	+13	0	-10 ^c	-2	-6 ^c	-4.5	-4.8	-1.7		
Shoe production (39)	-8	0	0	+10 ^c	+10	+4	-8 ^c	-5	-6 ^c	-3.8	-3.8	-0.3		
Leather production (64)	-6 ^d	0	+22	+8	+16	+4	-7	-1	-5 ^c	-2.2	-2.5	+3.4		
Hide movement into sight (94)	-3 ^e	0	-9	-22	^f	+5 ^g	-8 ^g	-2	-2	-1.8	-1.7	-5.1		
Mean lead or lag	-5.8	-1.2	+3.0	0	+8.5	+3.0	-8.0	-2.0	-4.0					
Average deviation, months	1.4	1.8	9.5	8.8	6.8	1.6	0.8	1.2	2.0					
	RANK STANDING OF TIMING AS GIVEN ABOVE													
Retail shoe sales				2.5	1	2	4.5	5	5	5		3		
Wholesale shoe sales	2.5	1	2	2.5	3	1	1	2.5	1.5	1	1	2		
Shoe production	1	3	3	5	2	3.5	2.5	1	1.5	2	2	4		
Leather production	2.5	3	4	4	4	3.5	4.5	4	3	3	3	5		
Hide movement into sight	4	3	1	1		5	2.5	2.5	4	4	4	1		

Parenthetic figures in the stub identify descriptions of the series in Appendix B. "Leather production" refers henceforth to the production of cattle-hide leather only.

P = peak, T = trough in National Bureau of Economic Research business-cycle reference chronology.

n.a. = time series not available.

^a 1929 through 1938.

^b 1921, 1923, and 1929 through 1938.

^c Related under relaxed rules (see Appendix A, sec. 10c).

^d The selection of this turn is tentative, since the data are available only from December 1920.

^e The selection of this turn is tentative, since the data are available only from January 1921.

^f No related turn under either standard or relaxed rules.

^g The usual procedure for relaxing rules was further modified:

the turns in hide movement into sight in 1929 and 1932 are related under relaxed rules to the 1929 and 1933 business-cycle turns respectively. Because hide movement into sight exhibits a rather poor general conformity to business cycles, the relaxation of timing rules would not be tolerated in the standard procedure. In the special context of this study, however, it seemed proper not to discriminate against hide movements since rules were relaxed for most of the other series in connection with the 1933 trough and a clear trough in hide movement occurred at that time; in 1929 similar peaks were present for the other data.

Methods: Descriptions of the way specific-cycle turns are chosen and of how they are related to reference turns by either "standard" or "relaxed" rules are in the text of this chapter, note 2 in the text, and Appendix A, secs. 10a, b, and c.

Both the table and chart indicate that there is a marked tendency for the five series to move up and down with the business tide. But these physical volume measures display additional fluctuations that do not correspond to movements designated as cycles for industry as a whole. Also, between 1924 and 1928 long and irregular leads and lags appear in the table. They seem to be the product of small differences in the series that cause roughly corresponding movements to be considered specific cycles in some series but not in others. Actually, the shoe, leather, hide industry

1933, 1937, and 1938—the five series show considerable herd spirit; at each turn most of them either lead, lag, or synchronize with the reference dates.⁴ For the six turns as a whole, the shoe, leather, hide series tend to lead the business chronology. Out of 28 timing com-

⁴ In 1921 there was a strong tendency to lead by sizable amounts; in 1923 all but wholesale sales synchronized precisely with the reference peak; in 1929 the shoe, leather, hide data reached a peak after the turn in business; in connection with the 1933 turn, these series responded to the first low in the double trough that ended the long and severe depression, thus leading the reference turn; in both 1937 and 1938 the five series also tended to lead.

³ See Appendix A, sec. 10.

parisons, 19 lead, 5 are synchronous, and 4 lag; and the lags all occurred at the 1929 peak. There is a suggestion in the few scraps of information available for a longer period that this lead may have characterized the industry for some time.⁵

timing relations and a more reliable one. The lower section of the table suggests that there is some, though not very impressive, consistency in the rank position of the various series at each of the six turns.⁶ Wholesale sales is the first to turn, and the earlier stages tend to

TABLE 3
Average Specific-Cycle Amplitude of Output Measured in Physical Units, at Five Stages, 1921-1940

	ALL SPECIFIC CYCLES				SPECIFIC CYCLES RELATED TO FOUR BUSINESS-CYCLE REFERENCE TURNS ^a	
	1921-1940		1929-1938		Number	Amplitude per Mo. ^b
	Number	Amplitude per Mo. ^b	Number	Amplitude per Mo. ^b		
Retail shoe sales (33)	4.5 ^c	0.90 ^c	3.5	0.99	1.5	0.60
Wholesale shoe sales (35)	8	2.16	4.5	2.34	1.5	1.21
Shoe production (39)	7.5	1.50	3.5	1.99	1.5	1.23
Leather production (64)	6	1.44	2.5	1.69	1.5	1.33
Hide movement into sight (94)	8	1.79	3.5	2.03	1.5	1.34

Parenthetic figures in the stub identify descriptions of the series in Appendix B.

^a June 1929, March 1933, May 1937, and May 1938 in the National Bureau of Economic Research business-cycle reference chronology (unrevised dates as given in Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, NBER, 1946, Table 16).

^b The average per month amplitude was obtained as follows: The standing at each peak and trough month was calculated as a centered three-month average and converted to cycle relatives by dividing by the average monthly value during each cycle. From the standing at each peak was subtracted the standing at first the initial, and then the terminal, trough. The rise during all expansions and the fall during all contractions were summed and divided by the number of months between the initial and terminal turns included in the calculations (for a more complete description, see *ibid.*, pp. 131-141).

^c Data are available only from 1926.

The second question that may be put to the table concerns comparisons among the steps in the vertical sequence: Do certain steps in the creation of the finished shoe react to changing conditions before or after other steps? Information of this sort is essential to a description of behavior. Further, it can help us in understanding the process of demand transmission, since temporal sequence may speak indirectly of cause and effect.

The average timing for all turns for each of the five series is given in column 12 of Table 2. But these figures include the long leads or lags for the turns of the middle twenties, which were thought to have a heavily fortuitous character. If they are excluded, the averages given in column 11 are derived; and these figures certainly give a different picture of interseries

⁵ Data on cattle slaughtered under federal inspection from 1907 to 1940 show 9 matched turns; 6 lead and 3 lag, and the average timing is -1.1 months. Boot and shoe shipments, Boston, are recorded from 1859 to 1910, and 20 turns have been matched; 14 lead, 4 lag, and 2 are synchronous, and the average timing is -4.2 months. The price of packers' heavy native steers, 1890-1941, has 23 matched turns; 14 lead, 5 lag, 4 are synchronous, and the average timing is -3.0 months. The price of sole leather, 1890-1941, has 23 matched turns; 10 lead, 11 lag, and 2 are synchronous, and the average timing is zero.

turn successively later, but retail sales, at the opposite end of the sequence, turns last.⁷

Another interesting type of information concerns the relative amplitude of cyclical fluctuation at the various stages in the vertical line-up. The average percentage rise and fall per month during specific cycles is given in Table 3. But it will be recalled that the shoe series

⁶ The application of a test for significance in the consistency of rank standing devised by Milton Friedman showed that the data very nearly achieve significance at the 5 per cent level (see Milton Friedman, "A Comparison of Alternative Tests of Significance for the Problem of *m* Rankings," *Annals of Mathematical Statistics*, 1940, pp. 86-92).

⁷ This lead of wholesale sales of shoes, as well as of several other commodities, over retail sales (though not necessarily over production) was noted by Simon Kuznets in a most interesting pioneer study, *Cyclical Fluctuations, Retail and Wholesale Trade, United States, 1919-1925*, Adelphi, 1926. Turns in physical volume for sales of four shoe chains, a group of shoe wholesalers, and production of eight shoe manufacturers may be read from charts on pages 96, 102, and 103 and accompanying tables. I give the timing of the three series—retail sales, wholesale sales, and production—at each of the three business-cycle reference dates: peak, January 1920: -5, -6, -1; trough, July 1921: -10, -6, -8; peak, May 1923: +1, -4, -3. Thus though wholesale sales lead at two of the three turns, retail sales turn earlier than production at two. This increases my hesitancy to find a consistent tendency for retail sales to lag in spite of their behavior at the three post-1929 peaks.

had several specific cycles that did not correspond to cycles in general business and it is important to be able to distinguish between the strength of a series' participation in general business fluctuation and its own innate variability. To separate these reactions, the second and third pairs of columns single out the period covered by reference turns for which all the data had related turns; they give the amplitude first for all specific cycles and then for only those associated with the reference scheme. One fact is strongly apparent in any calculation—retail sales of shoes is characterized by far milder fluctuation than the earlier activities. Each of the other steps seems to respond with approximately equal vigor to business cycles. The greater amplitude of wholesale sales and hide movement into sight, relative to the two production series, seems due to extra specific cycles. Especially important in wholesale sales was the cycle at the time of the National Recovery Administration boom in 1933, whereas the severe drought in 1934 decimated herds and greatly increased the movement of hides into central markets.⁸

Dollar Volume

Retail and wholesale sales are ordinarily experienced by top executives primarily as dollar rather than physical magnitudes. Accordingly, it is important to study the dollar figures to which the business world may respond directly. But if wholesale and retail trade is to be studied in this form, it is necessary to transpose the other data to dollars, too. Often comparisons of sales and production are made between sales in dollars and production in physical units, since this is the way they are typically reported, and such comparisons invite error. Consistent treatment—first all

⁸ The smaller amplitude of retail sales is also brought out by reference-cycle amplitude measures. But these measures, which trace the rise and fall during periods marked off by reference—rather than specific-cycle turning points, suggest that leather production has a clearly greater amplitude than the other stages. Yet this seems due to more or less fortuitous elements in the measurements, restricted as they must be to a very few cycles. The figures for the average per month reference-cycle amplitude at the five stages of the physical-unit series follow:

	Two Cycles, 1927-1938	Four Cycles, 1921-1938	Stages Matched with Reference Expansion
Retail shoe sales (33)	0.49		I-V
Wholesale shoe sales (35)	0.57	0.59	VIII-V
Shoe production (39)	0.64		VIII-V
Leather production (64)	0.82	0.82	VIII-V
Hide movement into sight (94)	0.44	0.63	VIII-V

Note: for description of how reference-cycle patterns are broken into nine stages, see Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, NBER, 1946, p. 29, and my Appendix A, sec. 7. The parenthetic figures in the stub identify descriptions in my Appendix B.

physical and then all dollar aggregates—reveals a few interesting facts in this industry and might well for others.

The dollar measures for the five stages of sales and output are shown in Chart 2. Retail and wholesale sales are now used in their original form. The production figures, originally supplied in physical volume units, were multiplied by prices that reflect, as far as practicable, changes in the average price of all units sold or produced each month (rather than the changes in price of identical articles). They refer for the most part to the price at which current sales are presumably made. Applied to the volume of production, the figures merely present (if inadequacies in estimates are ignored) what current output is worth at current market prices, and must be used with caution.

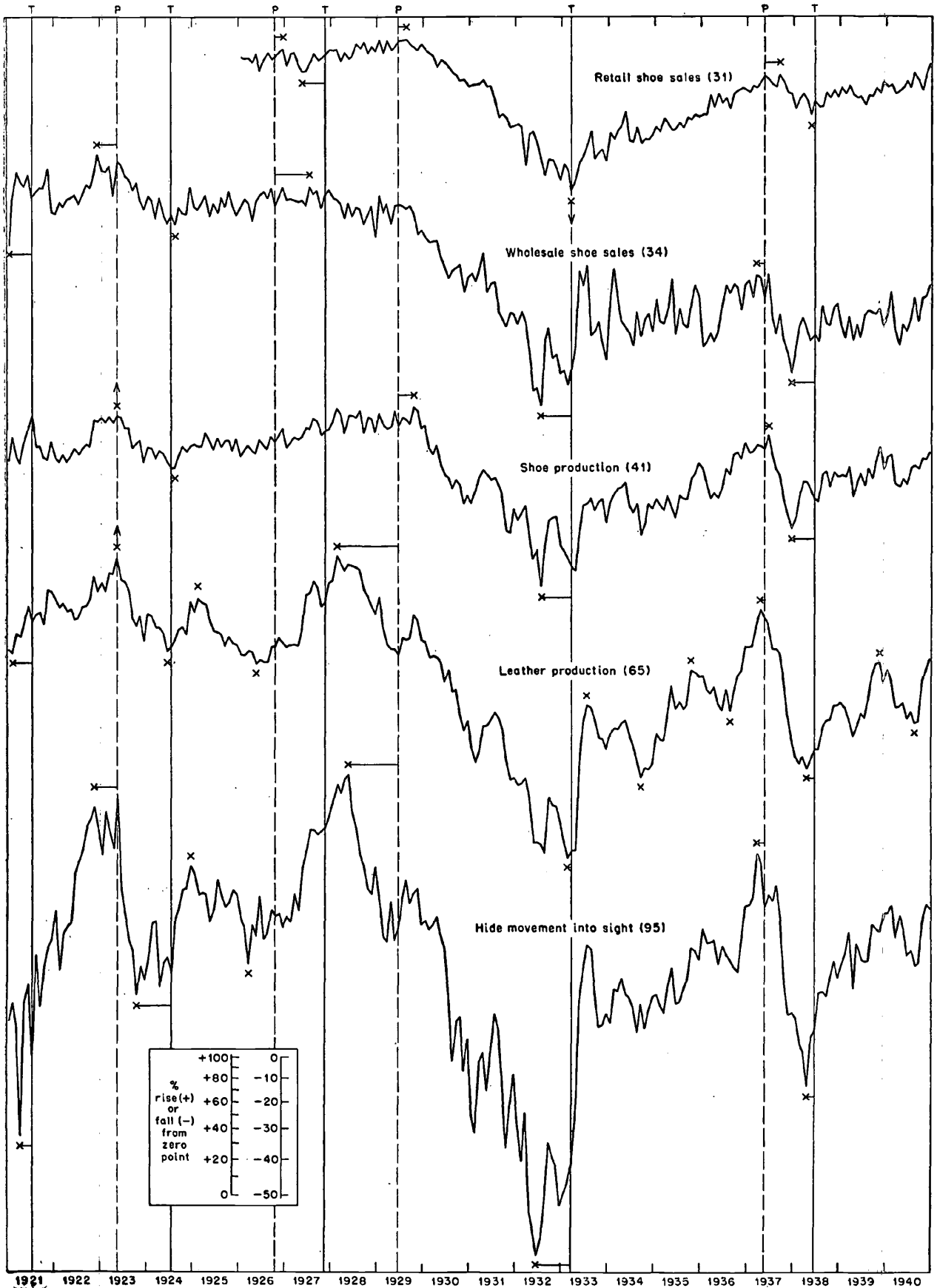
Chart 2 makes immediately apparent the fact that this set of data has an even stronger tendency than the physical volume measures of Chart 1 to move up and down with general business conditions. Further, most of the extra specific cycles vanish. Table 4 gives the timing comparison for each turn. The figures and the chart agree with the testimony in physical units with respect to the independent behavior of the shoe, leather, hide data during the 1924-1928 period. But there is perhaps somewhat less tendency toward homogeneity among the five sets of data in their timing at the other reference turns. Both leads and lags appear at several turns, and the dispersion, as indicated by the average deviation, is high—typically considerably higher than for the physical volume series.

The average sequence in which each of the five activities reaches peaks and troughs has also changed somewhat. Retail sales now show a clear tendency to lag. Wholesale sales still tend to lead though they do so in partnership with the earliest stage—hide movement into sight. But the differentiation suggested by the average timing is not, except for retail trade, well supported by the rank position at individual turns so that conclusions as to sequence remain hazy.⁹ In general, when the timing of turns is changed by the conversion to dollar units, they are made later for the shoe data, sometimes later and sometimes earlier for

⁹ The Friedman test for consistency in rank standings (see note 6) showed lack of significance at the 5 per cent level. A rough comparison of consistency in rank position for the physical and dollar units can be made by noting the extent to which the rank position of the five series, averaged for the four turns for which most series may be compared, departs from 3.0. The figures are:

	Physical Units	Dollar Units
Retail shoe sales (33 and 31)	4.1	4.5
Wholesale shoe sales (35 and 34)	1.5	1.8
Shoe production (39 and 41)	2.1	3.0
Leather production (64 and 65)	3.7	2.9
Hide movement into sight (94 and 95)	3.5	2.0

CHART 2: Specific Cycles in Output Measured in Dollars, at Five Stages, 1921-1940



P and T (broken and solid vertical lines) are peaks and troughs in the business-cycle reference chronology. Specific-cycle turns are marked by X. When a specific turn is matched with a reference turn, a horizontal line or vertical arrow indicates the association. For matching under relaxed rules and for tentative selections of turns, see notes to Table 4.

TABLE 4

Reference Timing of Specific-Cycle Turns in Output Measured in Dollars, at Five Stages, 1921-1940

	NUMBER OF MONTHS' LEAD (-) OR LAG (+) OF SPECIFIC TURNS RELATED TO BUSINESS-CYCLE REFERENCE TURNS:											
	T	P	T	P	T	P	T	P	T	Mean of:		
	July 1921 (1)	May 1923 (2)	July 1924 (3)	Oct. 1926 (4)	Nov. 1927 (5)	June 1929 (6)	Mar. 1933 (7)	May 1937 (8)	June 1938 (9)	Four Turns ^a (10)	Six Turns ^b (11)	All Turns (12)
Retail shoe sales (31)	n.a.	n.a.	n.a.	+2	-6	+2	0	+4	-1	+1.2		+0.2
Wholesale shoe sales (34)	-6	-5	+1	+9	c	c	-8	-2	-6 ^d	-5.3 ^e	-5.4 ^e	-2.4
Shoe production (41)	-8	0	+1	c	c	+4	-8	+1	-6 ^d	-2.2	-2.8	-2.3
Leather production (65)	-5 ^f	0	-1	c	c	-16	-1	-1	-2	-5.0	-4.2	-3.7
Hide movement into sight (95)	-3 ^f	-6	-9 ^g	c	c	-13	-9	-2	-2	-6.5	-5.8	-6.3
Mean lead or lag	-5.5	-2.8	-2.0	+5.5		-5.8	-5.2	0	-3.4			
Average deviation, months	1.5	2.8	3.5	3.5		8.8	3.8	2.0	2.1			

RANK STANDING OF TIMING AS GIVEN ABOVE

Retail shoe sales					3	5	5	5	5			5
Wholesale shoe sales	2	2	3.5			2.5	1.5	1.5	2	2		3
Shoe production	1	3.5	3.5		4	2.5	4	1.5	4	4		4
Leather production	3	3.5	2		1	4	3	3.5	3	3		2
Hide movement into sight	4	1	1		2	1	1.5	3.5	1	1		1

Parenthetic figures in the stub identify descriptions of the series in Appendix B.

P = peak, T = trough in National Bureau of Economic Research business-cycle reference chronology.

n.a. = time series not available.

^a 1929 through 1938.

^b 1921, 1923, and 1929 through 1938.

^c No related turn under either standard or relaxed rules.

^d Related under relaxed rules (see Appendix A, sec. 10c).

^e Only three turns in column 10 and five turns in column 11 are included in the average, because there is no specific turn related to the June 1929 reference turn.

^f The selection of this turn is tentative, since the data are available only from December 1920.

^g The usual procedure for relaxing rules was further modified to improve comparability of timing among series (see Table 2, note g).

Methods: Descriptions of the way specific-cycle turns are chosen and of how they are related to reference turns by either "standard" or "relaxed" rules are in the text of this chapter, note 2 in the text, and Appendix A, secs. 10a, b, and c.

leather production, and earlier for movement of hides into sight.

Turning to Table 5, we find that the relative amplitude of the cyclical movements of these value series is very different from that of the physical units. Retail

sales still have the flattest movements, but the value of cattle hide coming on the markets now has the steepest movements, with the intermediate steps falling somewhere between the retail sales and the value of cattle hide series.

TABLE 5

Average Specific-Cycle Amplitude of Output Measured in Dollars, at Five Stages, 1921-1940

	ALL SPECIFIC CYCLES				SPECIFIC CYCLES RELATED TO FOUR BUSINESS-CYCLE REFERENCE TURNS ^a	
	1921-1940		1929-1938		Number	Amplitude per Mo. ^b
	Number	Amplitude per Mo. ^b	Number	Amplitude per Mo. ^b		
Retail shoe sales (31)	2.5 ^c	1.03 ^c	1.5	1.14	1.5	1.14
Wholesale shoe sales (34)	3.3	1.10	1.5	1.50	1.5	1.50
Shoe production (41)	2.5	1.16	1.5	1.59	1.5	1.59
Leather production (65)	7	2.86	3.5	3.05	1.5	2.55
Hide movement into sight (95)	4	3.93	1.5	3.67	1.5	3.67

Parenthetic figures in the stub identify descriptions of the series in Appendix B.

^a See Table 3, note a.

^b See Table 3, note b.

^c Data are available only from 1926.

TABLE 6

Reference Timing of Specific-Cycle Turns in Shoe, Leather, and Hide Prices, 1921-1940

	NUMBER OF MONTHS' LEAD (-) OR LAG (+) OF SPECIFIC TURNS RELATED TO BUSINESS-CYCLE REFERENCE TURNS:										
	T	P	T	P	T	P	T	P	T	Mean of:	
	July 1921 (1)	May 1923 (2)	July 1924 (3)	Oct. 1926 (4)	Nov. 1927 (5)	June 1929 (6)	Mar. 1933 (7)	May 1937 (8)	June 1938 (9)	Four Turns ^a (10)	All Turns (11)
Shoes, retail (9)	n.a.	n.a.	n.a.	b	0	-9	+2	+5 ^c	+15	+3.2	+2.6
Shoes, factory (2)	+11	+3	+2	-9	-6	-9	+2	+5 ^d	+14	+3.0	+1.4
Leather (19)	b	b	b	b	b	-13	-1	0	+11	-0.8	-0.8
Hides (22)	-3	-6	-2	b	b	-14	-9 ^d	+3	-2	-5.5	-4.7
Mean lead or lag	+4.0	-1.5	0		-3.0	-11.2	-1.5	+3.2	+9.5		
Average deviation, months	7.0	4.5	2.0		3.0	2.2	3.8	1.8	5.8		
RANK STANDING OF TIMING AS GIVEN ABOVE											
Shoes, retail						3.5	3.5	3.5	4	4	4
Shoes, factory						3.5	3.5	3.5	3	3	3
Leather						2	2	1	2	2	2
Hides						1	1	2	1	1	1

Parenthetic figures in the stub identify descriptions of the series in Appendix B. "Leather price" always refers to the price of cattle-hide leather only.

P = peak, T = trough in National Bureau of Economic Research business-cycle reference chronology.

n.a. = time series not available.

^a 1929 through 1938.

^b No related turn under either standard or relaxed rules.

^c Related under relaxed rules (see Appendix A, sec. 10c).

^d The usual procedure for relaxing rules was further modified to improve comparability of timing among series (see Table 2, note g).

Methods: Descriptions of the way specific-cycle turns are chosen and of how they are related to reference turns by either "standard" or "relaxed" rules are in the text of this chapter, note 2 in the text, and Appendix A, secs. 10a, b, and c.

Prices

Whether and how conversion to dollar units shifts the location of turns depend on the timing of the relevant price data and their steepness, relative to the steepness of the physical measures, in the neighborhood of the turns. Chart 3 and Table 6 reveal a tendency for shoe prices to turn systematically later than leather prices, and hide prices, earlier.¹⁰ For the dollar volume measures, then, the confused sequence for the individual turns results from the fact that now the history of prices and now the history of physical flow of goods dominates the location of the turns.¹¹

¹⁰ The Friedman test reveals significance at the 1 per cent level.

¹¹ The relative importance of price and physical flow differs

Chart 3 and Table 7 show the reason for the transformation at a glance. The price of hides swings up and down with business conditions with several times the vigor of the price of shoes. Leather prices are intermediate. Consequently, for the four stages for which the amplitude of the physical measures were roughly similar, the earliest, involving hides, has the greatest dollar amplitude; that involving leather, the next greatest. Though less volatile than the earlier stages, shoe production and wholesaling maintain in the dollar measures the characteristic displayed in the physical

at various turns. In 1921, for example, the timing of the physical volume data dominates the value figures. In 1929, the long lead in prices is strongly imprinted on leather and hide value figures, though not on shoe sales.

TABLE 7

Average Specific-Cycle Amplitude of Shoe, Leather, and Hide Prices, 1921-1940

	ALL SPECIFIC CYCLES				SPECIFIC CYCLES RELATED TO FOUR BUSINESS-CYCLE REFERENCE TURNS ^a	
	1921-1940		1929-1938		Number	Amplitude per Mo. ^b
	Number	Amplitude per Mo. ^b	Number	Amplitude per Mo. ^b		
Shoes, retail (9)	3 ^c	0.67 ^c	2.5	0.70	1.5	0.65
Shoes, factory (2)	6	0.64	3.5	0.84	1.5	0.72
Leather (19)	6	2.20	3.5	2.25	1.5	1.56
Hides (22)	6	3.23	2.5	3.61	1.5	2.80

Parenthetic figures in the stub identify descriptions of the series in Appendix B.

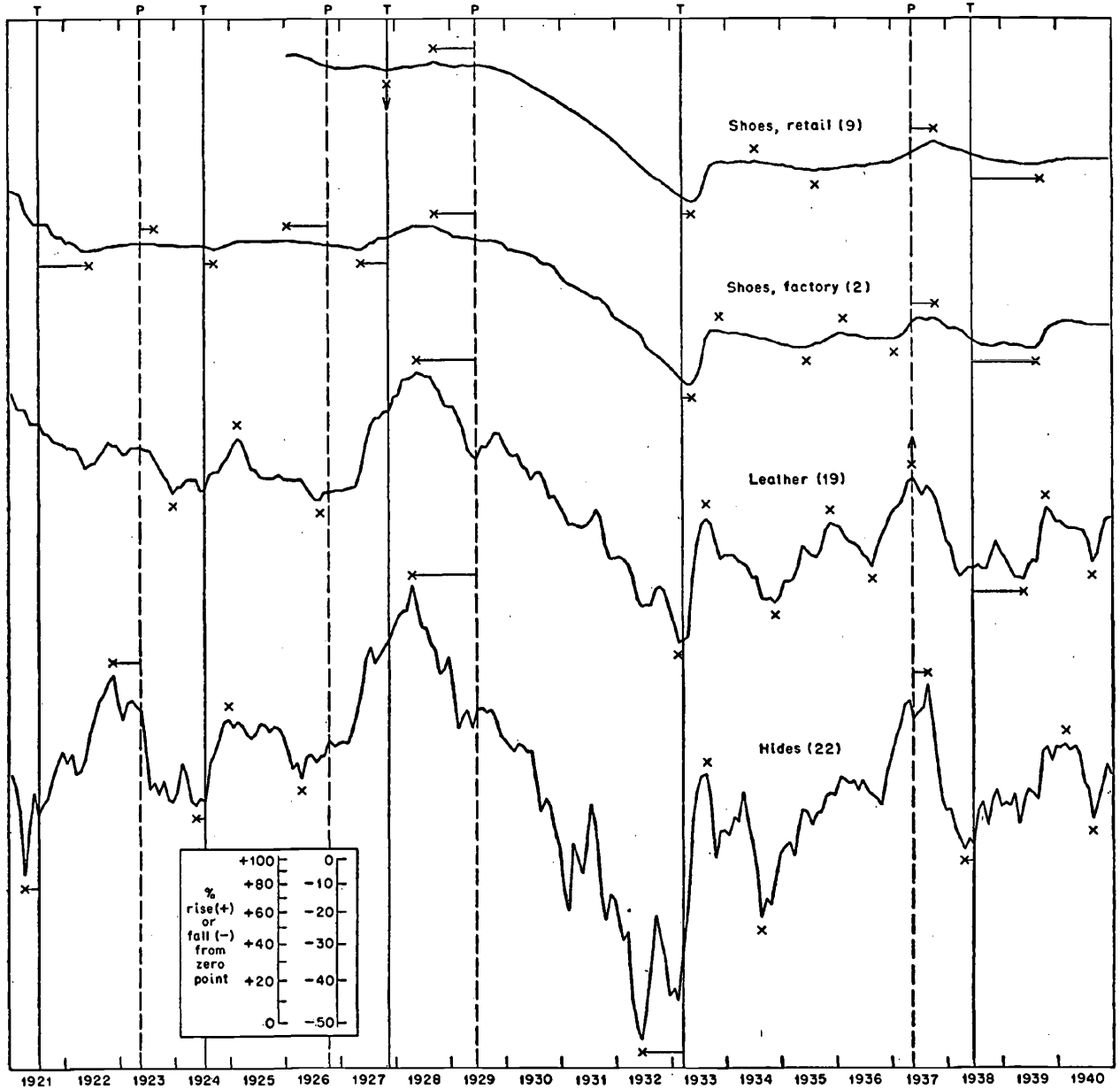
^a See Table 3, note a.

^b See Table 3, note b.

^c Data are available only from 1926.

CHART 3

Specific Cycles in Shoe, Leather, and Hide Prices, 1921-1940



P and T (broken and solid vertical lines) are peaks and troughs in the business-cycle reference chronology. Specific-cycle turns are marked by X. When a specific turn is matched with a reference turn, a horizontal line or vertical arrow indicates the association. For matching under relaxed rules and for tentative selections of turns, see notes to Table 6. Parenthetic figures after names of series identify their descriptions in Appendix B. "Leather price" refers here as elsewhere to the price of cattle-hide leather only.

measures—that of being more volatile than consumers' takings.

Summary

That business cycles do not pass over the shoe and leather industry without eliciting a sympathetic undula-

tion is the dominant fact the figures bring out. Further, it is clear that the five stages of the industry do not act like strangers. From these sure observations we proceed more hesitantly.

Concerning the timing of physical volume measures, one can say little more than that wholesale sales lead and the rest move substantially together. This is a puz-

zling finding, for how is it possible for wholesalers to foretell demand? The dollar measures fail to illuminate the enigma. They do, however, bring out one interesting fact: the tendency for dollar retail sales to lag retail sales expressed in pairs, the reference frame, and other series in the chain. Though there was a suggestion of this lag in the pair figures, it is not reliably indicated. For dollar measures, the lag of retail prices and the gentle variations in the physical volume of sales to consumers are responsible. Both characteristics often appear in other commodities. Because of this distinctive behavior of retail prices, direct comparison of the timing of retail sales (typically reported in dol-

lars) with production (typically reported in physical units) can readily be misleading.

The amplitude of fluctuation is obviously less at the retail stage than the others, though for the physical volume measures there seems no clear further sequence as the earlier stages are reached. When converted to dollars, the progressively greater cycle sensitivity of shoe, leather, and hide prices is imprinted on the flow data.

This is a meager crop of information. Yet it provides the scaffold for an investigation that must, if it is not to yield sterile information, not only elaborate description but also answer the question, "Why?"