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CHAPTER 11

Cyclical Changes in Cyclical Behavior

THE HYPOTHESIS that business cycles are minor subdivisions of 'major' or 'long' cycles raises the same fundamental question concerning the use of averages as the hypothesis of secular change in cyclical behavior. If business cycles differed radically from one another according to their position within major cycles, we would not be justified in striking averages on our standard plan. One of our main objectives would then be to bring out this variation, and for that purpose we would require separate averages of the cycles occupying corresponding positions within major cycles. Even in contrasting the cyclical behavior of different activities in the long run it would be necessary to take account of the major cycles; for the averages would be biased unless they covered periods including an integral number of major cycles.

In this chapter we shall examine several outstanding hypotheses concerning major cycles to see if we can find pronounced and repetitive changes in business cycles within the periods suggested by the hypotheses. Our problem is not whether long cycles exist in general economic activity, but whether they are so strongly impressed on economic time series that they should control working plans at this stage of our study. In making this survey we use the seven time series and the measures of business-cycle duration analyzed in the preceding chapter.

I Long Cycles Marked Off by Long Waves in Building

We begin with a hypothesis suggested by the behavior of the building industry. Our studies indicate that building construction is characterized by long cycles of remarkably regular duration. They run usually from about fifteen to twenty years; they are clear-cut in outline, attain enormous amplitudes, and are paralleled by long cycles in other real estate

TABLE 161

Average Duration and Amplitude of Long Cycles in Building Construction
Twenty-five Annual American Series

Series	Period covered	No. of long cycles	Average duration in months			Average in long-cycle relatives					
						Amplitude of			Per month amplitude[a] of		
			Expansion	Contraction	Full cycle	Rise	Fall	Rise & fall	Rise	Fall	Rise & fall
PER CAPITA PERMITS, U.S.											
Unadjusted	1830–1933	6	106	100	206	130	128	259	1.4	1.3	1.4
Unadjusted	1878–1933	3	112	108	220	111	110	221	1.1	1.0	1.1
Adjusted	1830–1933	6	102	104	206	115	120	235	1.2	1.2	1.2
Adjusted	1878–1933	3	112	108	220	107	120	227	1.1	1.2	1.1
ADJUSTED PER CAPITA PERMITS BY REGIONS											
New England	1879–1933	3	124	92	216	117	122	239	1.1	2.3	1.3
Middle Atlantic	1878–1933	3	96	124	220	112	126	238	1.3	1.1	1.1
South Atlantic	1879–1933	3	92	124	216	105	121	226	1.2	1.0	1.1
East North Central	1878–1933	3	128	92	220	118	138	256	1.0	1.5	1.2
West North Central	1877–1932	3	112	108	220	115	122	238	1.1	1.2	1.1
South Central	1878–1933	3	140	80	220	111	130	241	1.0	1.6	1.2
Western	1878–1932	3	100	116	216	157	161	317	1.7	1.5	1.5
NEW BUILDING PERMITS											
Manhattan	1877–1933	3	140	84	224	148	134	282	1.3	1.5	1.3
Brooklyn	1879–1933	3	96	120	216	159	143	302	1.9	1.2	1.4
Chicago	1862–1933	4	126	87	213	213	187	400	1.8	2.2	1.9
Philadelphia	1900–1933	2	96	102	198	140	154	294	1.6	1.6	1.6
Detroit	1878–1933	2	264	66	330	258	232	490	0.9	3.0	1.4
St. Louis	1878–1932	3	108	108	216	163	152	314	1.7	1.5	1.5
Minneapolis	1897–1933	2	144	72	216	193	182	375	1.7	4.8	1.8
Pittsburgh	1918–1934	1	96	96	192	158	186	344	1.6	1.9	1.8
RESIDENTIAL PERMITS											
Manhattan	1877–1932	3	116	104	220	159	158	317	1.5	1.6	1.5
Philadelphia	1900–1933	2	96	102	198	176	191	366	2.0	1.9	2.0
St. Louis	1900–1933	2	90	108	198	202	214	416	2.3	2.0	2.2
COMMERCIAL & INDUSTRIAL PERMITS											
Manhattan	1877–1933	2	252	84	336	250	244	494	1.5	3.0	1.7
Philadelphia	1908–1935	1	204	120	324	238	254	492	1.2	2.1	1.5
SUBDIVISION ACTIVITY											
Chicago	1843–1932	5	122	91	214	323	325	648	2.8	3.9	3.0
Detroit area	1841–1918	4	180	51	231	429	408	837	2.3	11.3	3.6
Pittsburgh area	1831–1932	6	112	90	202	248	248	496	2.5	3.5	2.5

The series on 'per capita permits' are index numbers of building permits issued in a sample of American cities. The 'unadjusted' data are corrected for changes in population only; the 'adjusted' data are corrected for changes in population, construction costs, and secular trend. The index numbers were taken from John R. Riggleman, *Variations in Building Activity in United States Cities* (unpublished Johns Hopkins dissertation, 1934). See John R. Riggleman and Ira N. Frisbee, *Business Statistics* (McGraw-Hill, 1938, 2nd ed.), Appendix VI.

The series on building permits in individual cities are expressed in dollars, except residential permits in St. Louis which refer to number of dwelling units.

Except for St. Louis, the series on 'new' building permits exclude alterations and additions. Full descriptions and references will be supplied in our monograph on construction work, which will discuss in detail long cycles in building construction and related activities in the United States and foreign countries.

All measures in this table are subject to revision. Since the preparation of the table, improved data for a few series have become available. Also, the amplitude measures shown here are expressed as relatives of cycle bases which assign the same weight to every year from the initial through the terminal trough—a plan we formerly followed in handling annual data. At present we compute cycle bases by assigning a weight of one-half each to the initial and terminal troughs.

[a] Unweighted average.

processes. Table 161 shows the average durations and amplitudes of the long cycles found in twenty-five annual series on American building activity. Table 162 shows how the specific cycles in building vary according as they occur during the upswing or the downswing of the long building cycles.[1] The specific cycles that follow a protracted lull in building tend to have long expansions and short contractions, rapid rises and slow declines; therefore the rises are especially large relatively to the declines. Once the tide of building activity turns, these relations between expansions and contractions are reversed. We may say that the structure of the first group of specific cycles constitutes the upswing of a long cycle, and the structure of the second group of specific cycles constitutes the downswing of the long cycle. Or we may look at these relations from the viewpoint of long cycles and say that, as a rule, during long-cycle expansions the specific-cycle expansions are relatively long and pronounced, while during long-cycle contractions the specific-cycle expansions are relatively brief and mild. Opposite relations characterize specific-cycle contractions.

In view of the magnitude of the building industry and the amplitude of its long waves, it is desirable to see whether the cyclical alternations in the specific cycles of building construction are paralleled by similar alternations in business cycles. Presumably the long cycles in building influence industrial activity at large by producing retardations and accelerations in growth, not actual declines and rises. Perhaps in financial and monetary series we may find actual declines and rises as frequently as retardations and accelerations. But whatever may be the intensity of the reaction of other processes to long building cycles, so long as these reactions are regular and recurrent the durations and amplitudes of the expansions of specific cycles in leading activities should be larger relatively to the durations and amplitudes of full specific cycles when the 'trend' of building is upward than when it is downward. According as the 'trend' of building is upward or downward, we may also expect the durations and amplitudes of specific-cycle expansions to be comparatively large or small, and the durations and amplitudes of specific-cycle contractions to be small or large.

To test these expectations we compare averages of the business and specific cycles that come during the upswing of long building cycles with averages of the business and specific cycles that come during the downswing of long building cycles. The first step is to fit business and specific cycles into the periods of long building cycles (Table 163). In distributing business cycles between the upswings and downswings of the successive long cycles, we follow the rule that the period matched with an upswing

[1] By 'long building cycles' or 'long cycles in building construction' we mean long cycles in the construction of buildings, not long cycles in the aggregate volume of construction work. The existence of long cycles in aggregate construction has not been definitely established.

TABLE 162

Average Duration and Amplitude of Specific Cycles during the Upswings and Downswings of Long Cycles in Building Construction
Twenty-five Annual American Series

Series	Period covered	Specific cycles during upswings of long cycles						Specific cycles during downswings of long cycles					
		Average duration in months		Average in specific-cycle relatives				Average duration in months		Average in specific-cycle relatives			
				Amplitude of		Per month amplitude[a] of				Amplitude of		Per month amplitude[a] of	
		Expansion	Contraction	Rise	Fall	Rise	Fall	Expansion	Contraction	Rise	Fall	Rise	Fall
PER CAPITA PERMITS, U. S.													
Unadjusted	1830 – 1933	41	15	70	17	1.8	1.3	15	34	15	62	1.0	1.8
Adjusted	1830 – 1933	46	22	66	11	2.2	0.5	14	30	11	53	0.8	2.0
ADJUSTED PER CAPITA PERMITS BY REGIONS													
New England	1879 – 1933	28	20	54	21	2.2	1.0	14	21	13	50	0.9	2.2
Middle Atlantic	1878 – 1933	40	16	71	23	3.0	1.5	14	28	22	54	1.7	2.2
South Atlantic	1879 – 1933	32	28	60	15	2.8	0.7	19	24	14	48	0.8	2.4
East North Central	1878 – 1933	34	22	56	23	2.2	1.3	18	48	12	86	0.7	2.4
West North Central	1877 – 1932	23	15	45	17	2.3	1.1	12	28	11	47	0.9	1.7
South Central	1878 – 1933	40	19	58	25	1.4	1.4	12	57	6	94	0.5	1.8
Western	1878 – 1932	63	48	120	53	2.0	1.1	12	36	13	66	1.1	1.7
NEW BUILDING PERMITS													
Manhattan	1877 – 1933	30	17	69	36	2.8	2.4	21	24	77	99	3.3	3.7
Brooklyn	1879 – 1933	34	12	79	18	3.1	1.5	14	31	22	59	1.6	1.7
Chicago	1862 – 1933	30	13	82	23	3.0	1.9	18	34	31	85	1.9	3.2
Philadelphia	1900 – 1933	26	20	86	46	4.3	2.1	16	31	19	69	1.0	2.0
Detroit	1878 – 1933	34	17	69	28	2.5	1.4	12	40	28	91	2.3	2.7
St. Louis	1878 – 1932	23	14	55	9	3.1	0.5	12	28	16	57	1.3	2.0
Minneapolis	1897 – 1933	40	12	76	11	2.6	0.9	18	27	25	90	1.6	3.7
Pittsburgh	1918 – 1934	42	12	80	7	1.8	0.6	12	42	38	119	3.2	2.6
RESIDENTIAL PERMITS													
Manhattan	1877 – 1932	34	14	99	50	3.8	4.1	17	28	77	108	4.5	4.0
Philadelphia	1900 – 1933	22	15	92	44	5.2	3.2	36	56	57	134	1.6	2.4
St. Louis	1900 – 1933	29	12	85	8	3.4	0.7	12	48	32	126	2.7	2.6
COMMERCIAL & INDUSTRIAL PERMITS													
Manhattan	1877 – 1933	41	19	103	60	3.4	3.6	18	33	56	122	2.6	4.0
Philadelphia	1908 – 1935	24	21	93	76	5.7	3.7	18	28	55	97	3.0	3.1
SUBDIVISION ACTIVITY													
Chicago	1843 – 1932	34	15	182	122	7.8	8.3	12	45	99	210	8.3	6.4
Detroit area	1841 – 1918	33	16	124	57	5.1	3.9	16	22	59	142	4.2	7.8
Pittsburgh area	1831 – 1932	34	17	130	70	5.2	4.2	16	37	38	123	2.0	3.9

See note to Table 161. Each series is broken according to the upswings and downswings of the long cycles in that series. The results would not differ materially if all series were broken according to the long cycles in the national index, since the long cycles of different regions and cities synchronize fairly closely. See Ch. 6 concerning biases of cyclical measures made from annual data.

[a] Unweighted average.

TABLE 163

Relations in Time between Business Cycles and Long Building Cycles
United States, 1853–1933

Long building cycles[a]			Business cycles		
Phase	Nature of phase[b]	Duration of phase (years)	Corresponding period[c]	No. of phases during this period	
				Expansion	Contraction
1853–1862	D	9	*1853* – June 1861	2	3
1862–1871	U	9	June 1861 – *Oct. 1873*	3	2
1871–1878	D	7	*Oct. 1873* – Mar. 1879	0	1
1878–1890	U	12	Mar. 1879 – *July 1890*	3	2
1890–1900	D	10	*July 1890* – Dec. 1900	3	4
1900–1909	U	9	Dec. 1900 – *Jan. 1910*	3	2
1909–1918	D	9	*Jan. 1910* – Apr. 1919	2	3
1918–1925	U	7	Apr. 1919 – *Oct. 1926*	3	2
1925–1933	D	8	*Oct. 1926* – Mar. 1933	1	2

[a] As shown by Riggleman's annual index of building permits per capita in the United States (unadjusted). See note to Table 161.

[b] D stands for downswing (contraction), U for upswing (expansion).

[c] The italicized dates are cyclical peaks, according to our reference dates in Table 16. The monthly reference dates start in Dec. 1854; hence the peak of 1853 omits the month.

in building must start with a trough and end with a peak and that the period matched with a downswing in building must start with a peak and end with a trough. The specific cycles of our sample series in turn are fitted as closely as possible into the distribution of business cycles.[2] In distributing the expansions and contractions of specific and business cycles we include virtually every cycle covered by our analysis.[3] But in distributing full cycles we omit the cycles that overlap periods of rising and falling building 'trends'.[4]

Chart 60 shows average patterns of the specific cycles of each series that occur during the upswings and during the downswings of long building cycles. Chart 61 shows average reference cycles on the same basis, except that it is restricted to the period since 1879, which is covered by all seven series. The outstanding feature of the charts is the similarity between the two specific-cycle and between the two reference-cycle patterns of each series. There are indeed numerous divergencies; sometimes they are considerable, as in the specific-cycle patterns of railroad stock prices and in the reference-cycle patterns of share trading. But the dominating impression is that the differences among the cyclical patterns of our several series are far greater than the differences between the patterns for

[2] In a few instances, especially in railroad bond yields, arbitrary decisions are unavoidable. Appendix Table B5 shows what cycles are placed in each group for the characteristics that we measure. Appendix Tables B1-B4 supply measures for individual cycles, both specific and reference.

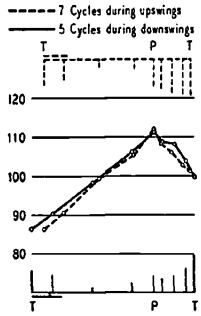
[3] Four phases are omitted; in these instances it was impossible to fit the specific-cycle phases into the business-cycle phases without infringing the principle of the classification. See Appendix Table B5.

[4] If specific cycles were marked off by peaks instead of by troughs, the cycles now excluded would have to be included, while the cycles overlapping periods of falling and rising building 'trends' would be excluded. Inverted analysis can thus serve as a check upon positive analysis.

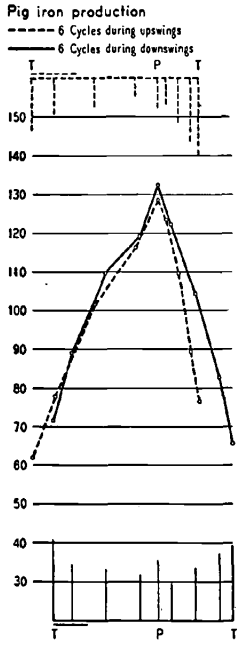
CHART 60

Average Specific-cycle Patterns during the Upswings and Downswings of Long Cycles in Building Construction
Seven American Series

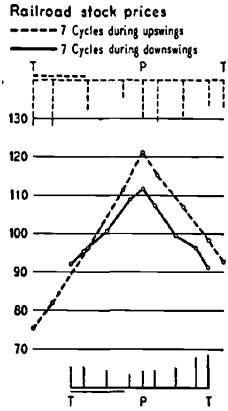
Deflated clearings



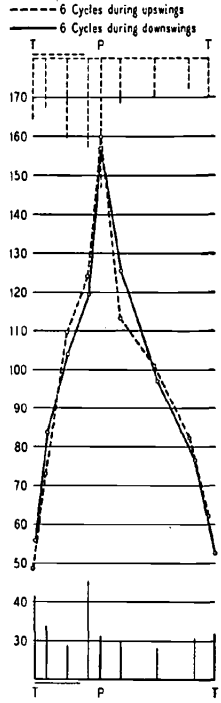
Pig iron production



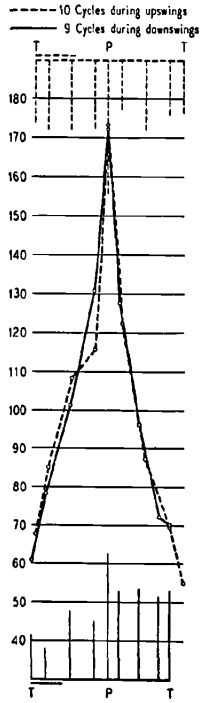
Railroad stock prices



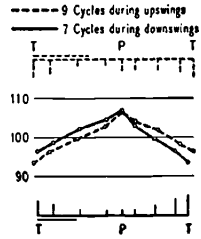
Shares traded



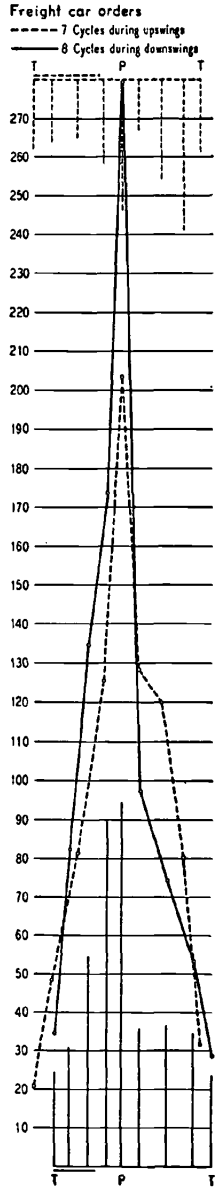
Call money rates



Railroad bond yields



Freight car orders



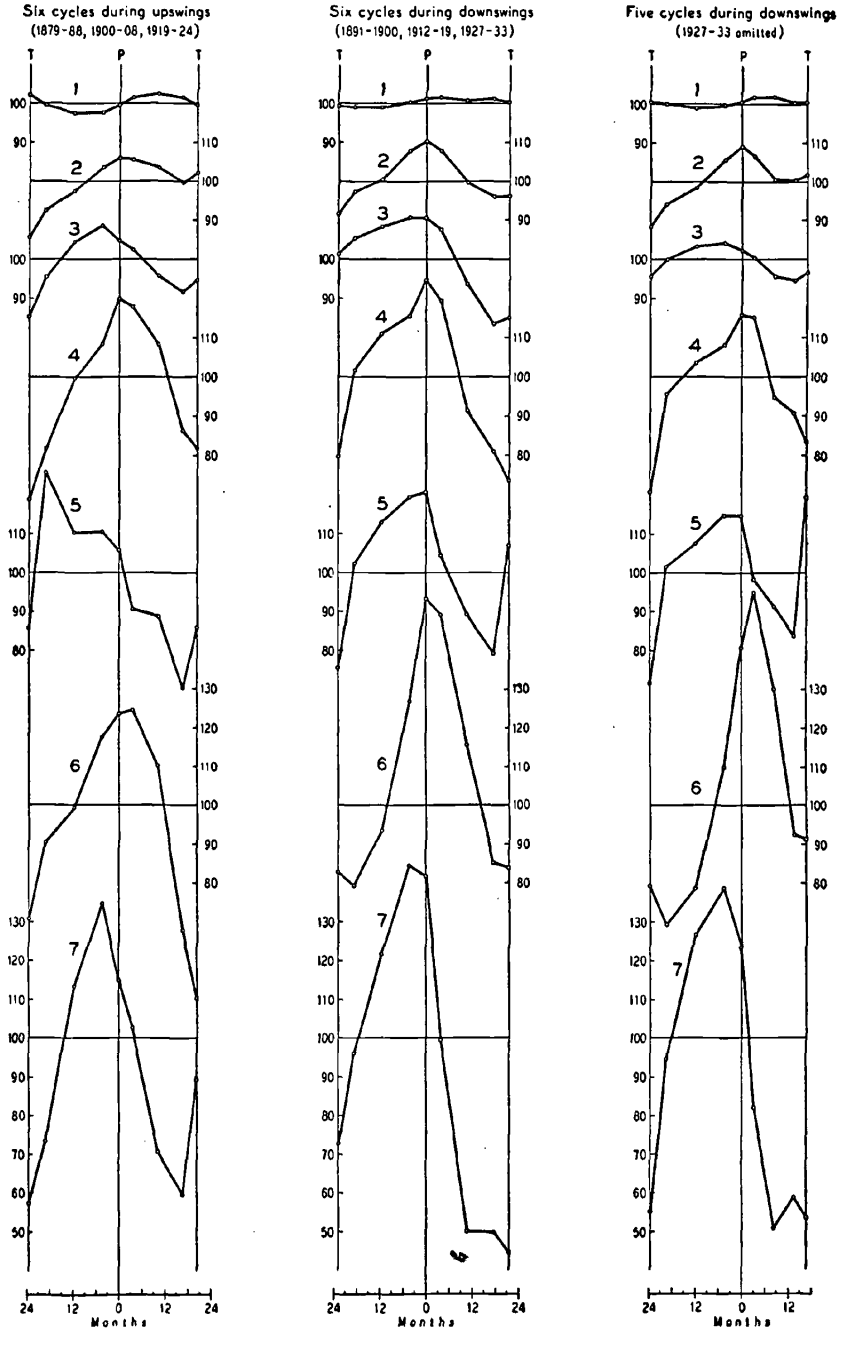
Horizontal scale, in months 0 12 24 36 48 60

See Appendix Tables B1 and B5. For explanation of chart, see Ch. 5, Sec. VI.

CHART 81

Average Reference-cycle Patterns during the Upswings and Downswings of Long Cycles in Building Construction, 1879–1933
Seven American Series

1 Railroad bond yields
2 Deflated clearings
3 Railroad stock prices
4 Pig iron production
5 Shares traded
6 Call money rates
7 Freight car orders[a]



See Appendix Table B3.

[a] See Chart 98, note 'a'.

each series. Chart 60 suggests that any description we might frame of specific cycles would be fundamentally similar whether we looked at the specific cycles that come during the upswings of long building cycles, at those that come during downswings, or ignored this principle of classification and drew our account from the full list of cycles. Chart 61 suggests that there is also little difference between the business cycles that come during the upswings of long building cycles and those that come during the downswings; though we should bear in mind that no small sample of business activities can depict adequately the characteristics of business cycles. On the whole the reference-cycle patterns during periods of rising building 'trends' appear to be much like the reference-cycle patterns during periods of declining building 'trends'; the similarity is especially close if we ignore share trading and drop the exceptional cycle of 1927–33 from the averages.

We pass to the question whether the differences in cyclical behavior between periods of rising and falling building 'trends' are statistically significant. The long lines representing average deviations in Chart 60 suggest that many of the differences within each pair of patterns arise from 'random' factors. To judge this point objectively we analyze the cyclical durations and amplitudes in Table 164. Columns (2), (3), (5)-(7), and (9) are designed to show whether there are cyclical alternations in specific and business cycles that parallel the cyclical alternations in the specific cycles of building construction. Of the 45 comparisons in these columns the 30 marked by an asterisk show differences in the direction one expects long building cycles to produce, 11 show differences in the opposite direction and 4 are neutral. But the variance ratios indicate that none of the differences in these columns are 'significantly large'; also, that when the averages differ in the expected direction, the variance between periods of rising and falling building 'trends' is frequently smaller than the variance within these periods. The preponderance of differences in the direction suggested by the hypothesis under test would carry weight if our sample series were independent. But we know that they are more or less closely correlated. Chart 61 shows that if we include observations on all business cycles from 1879 to 1933 business-cycle contractions seem to be longer and more intense during downswings than during upswings of long building cycles; but this showing is nearly reversed when the 1927–33 cycle is excluded from the averages.

The specific cycles in building construction do not lead us to expect any regular differences in the duration or amplitude of full cycles between periods of rising and falling building 'trends'. It is conceivable, nevertheless, that business cycles might be shorter during upswings than during downswings of long building cycles, while the secular trends of individual economic activities rose more swiftly during the upswings than during the downswings. Under these circumstances the rise of the

TABLE 164

Average Duration and Amplitude of Specific Cycles in Seven Series and Average Duration of Business Cycles during the Upswings and Downswings of Long Cycles in American Building Construction

Series and phase of long cycles in building (1)	Av. duration of specific or business cycles in months: Expansion (2)	Contraction (3)	Full cycle (4)	Av. ratio of expansion to full cycle (5)	Av. amplitude in specific-cycle relatives: Rise (6)	Fall (7)	Rise & fall (8)	Av. ratio of rise to total rise & fall (9)
DEFLATED CLEARINGS								
Upswings	28	9	38	.74	27	11	37	.66
Downswings	32	13	42	.75	25	16	37	.66
Difference	−3	−4*	−5	−.02	+2*	−5*	0	0
PIG IRON PRODUCTION								
Upswings	30	11	43	.75	63	52	119	.57
Downswings	27	17	46	.58	61	57	128	.50
Difference	+3*	−6*	−3	+.17*	+2*	−4*	−9	+.07*
FREIGHT CAR ORDERS								
Upswings	19	20	43	.51	190	172	354	.52
Downswings	17	22	40	.41	245	235	496	.50
Difference	+2*	−2*	+2	+.10*	−55	−63*	−141	+.02*
RAILROAD STOCK PRICES								
Upswings	32	21	49	.58	41	29	75	.59
Downswings	19	21	36	.50	20	34	41	.47
Difference	+13*	0	+14	+.08*	+21*	−5*	+34	+.12*
SHARES TRADED								
Upswings	18	28	46	.40	96	98	209	.54
Downswings	17	25	46	.34	101	89	205	.49
Difference	+1*	+3	−1	+.06*	−5	+9	+3	+.05*
CALL MONEY RATES								
Upswings	20	20	39	.46	119	118	223	.46
Downswings	20	17	36	.58	111	115	214	.54
Difference	0	+3	+3	−.12	+8*	+4	+10	−.08
RAILROAD BOND YIELDS								
Upswings	22	18	41	.56	12	10	23	.52
Downswings	20	18	39	.56	9	14	24	.47
Difference	+2*	0	+2	+.01*	+2*	−3*	−1	+.05*
BUSINESS CYCLES								
Upswings	26	21	47	.54	..	..	..	..
Downswings	24	22	43	.56	..	..	..	..
Difference	+2*	−1*	+4	−.02	..	..	..	..
	Ratio of variance between groups to variance within groups							
Deflated clearings	0.42	0.63	0.95	0.03	0.05	0.46	0.00§	0.00†
Pig iron production	0.21	1.55	0.17	2.44	0.03	0.06	0.19	0.53
Freight car orders	0.12	0.10	0.06	0.99	1.08	1.16	1.34	0.41
Railroad stock prices	2.00	0.00§	1.79	0.66	4.32	0.12	6.14‡	1.65
Shares traded	0.06	0.19	0.01	0.29	0.05	0.17	0.01	1.36
Call money rates	0.00†	0.80	0.35	1.74	0.07	0.01	0.04	3.33
Railroad bond yields	0.06	0.01	0.10	0.00†	0.40	0.81	0.02	0.21
Business cycles	0.31	0.02	0.29	0.04	..	..	..	..

All measures are made from specific or business cycles marked off by troughs. The measures for business cycles are derived from the monthly reference dates in Table 16. The measures for cyclical phases include some cycles not covered by the measures for full cycles; hence the discrepancies between the averages. For a full list of the cycles included in each group, see Appendix Table B5. The entries designated 'difference' are computed from averages carried to one more place than is shown in the table.

*Indicates that the difference accords with expectations stated in the text; no definite expectations are advanced for col. (4) and (8).

‡Larger than the value that would be exceeded once in twenty times by chance.

†Smaller than the value that would be fallen short of once in twenty times by chance.

§Smaller than the value that would be fallen short of once in a thousand times by chance.

specific cycles in individual activities could be the same during upswings and downswings; likewise the fall, the ratio of the rise to the total rise and fall, and the ratio of the expansion to the duration of full cycles. But column (4) in Table 164 does not suggest any cyclical alternation in the durations of specific or business cycles within the periods of long building cycles. Nor does column (8) suggest a cyclical alternation in the amplitudes of full specific cycles. The average durations and amplitudes of full cycles differ from upswing to downswing in almost every instance; but the differences lack consistency, few are substantial, and only one is 'significantly large'.

It does not follow from the evidence we have presented that long cycles in building construction fail to leave their stamp on economic activity at large. This important industry must make its influence felt in many branches of economic life.[5] The fact that most of the differences between the phases of the specific cycles in our series are in the direction that we should expect long building cycles to produce, that this is true without exception of pig iron production, and that several variance ratios for railroad stock prices are moderately high, may well be more than a statistical accident. It is even possible to argue from the evidence as it stands that long building cycles *tend* to give rise to a cyclical rhythm in business cycles, though as already stated we doubt that this argument can carry much conviction. Letting that be as it may, two features of the evidence seem incontestable and they suffice for our present purpose. First, the behavior of specific and business cycles does not differ greatly during periods of rising and falling building 'trends'. Second, the differences between these periods are by no means clear or uniform. We therefore see no compelling reason at the present time, nor even any real justification, for organizing cyclical measures of our time series on the assumption that business cycles undergo cyclical swings within periods of long building cycles.

II Long Cycles as Deviations from Trends

Hypotheses of long economic cycles are usually more sophisticated than the building hypothesis we have just investigated. Most students writing on this subject in recent years have worked out their hypotheses with the aid of collections of time series representing broad ranges of activities. In handling these records they use mathematical techniques to isolate long cycles, since the cycles they have in mind appear usually as accelerations and retardations in the original data, not as actual rises and declines. Thus

[5] Note again, however, that the construction of buildings is only a part of total construction work. During 1925–33 it accounted for approximately 60 per cent of the total value of construction in the United States.

by one device or another they fit lines of 'intermediate trend' which are supposed to free the original data from what we call specific cycles. Next they fit lines of 'primary trend' which are supposed to free the data from intermediate trends as well as specific cycles. Finally, they express the ordinates of intermediate trend as deviations from ordinates of primary trend, and in this way expose what they consider major cycles. The studies of 'major cycles' by Wardwell, 'secondary secular variations' by Kuznets, 'long waves' by Kondratieff, and 'trend cycles' by Burns follow this general plan.

The studies by Kuznets and Burns are the most extensive statistical investigations in this field, but unfortunately they are not suited to our present needs. Burns' investigation of 'trend cycles' covers the period from 1870 to 1930 in the United States. It concludes with a chronology of decades during which production and other economic activities increased at a particularly rapid or moderate pace. This chronology is much too coarse for our needs.[6] We are also forced to pass by Kuznets' investigation which covers a still longer period and several countries besides the United States, because Kuznets did not draw up a list of dates showing the peaks and troughs of his 'secondary secular variations'. In attempting to determine such a chronology from his American series, we found their turning points so widely dispersed that we could have little confidence in any list we ourselves might extract.[7]

Wardwell's investigation supplies what the studies by Kuznets and Burns lack—an annual chronology of major economic cycles. This investigation is based upon ten American, three British and four German quarterly series, covering from 37 to 71 years. Wardwell finds 'major cycles' in all his series. Their average duration varies from seven to nineteen years. He believes that the clusters of the peaks and troughs of the American series are so well defined that "it seems safe to conclude that the year 1890 marked the peak of a major cycle common to those series, the year 1895 the trough of this common major cycle, 1906 the next peak, 1914 the succeeding trough, and 1918 the most recent peak." The British materials seem inconclusive, but the German series "indicate, with considerable probability, the existence of a major cycle common to all of them, reaching a peak in 1890, a trough in 1892, a peak in 1898, and a trough in 1903." Wardwell speaks of his major cycles as comprising typically three or four business cycles; the initial trough of the major cycle is supposed to coincide with the trough of a severe business-cycle depression, and the peak of the major cycle is supposed to come at the time of the peak of the second business cycle in the group of three or four.[8]

[6] See A. F. Burns, *Production Trends in the United States since 1870*, Ch. V.

[7] See Simon Kuznets, *Secular Movements in Production and Prices*, Ch. IV.

[8] Charles A. R. Wardwell, *An Investigation of Economic Data for Major Cycles* (Philadelphia, 1927), especially pp. 83-5, 125-32.

Our reference dates for business cycles do not support Wardwell's chronology of major cycles in Germany. Wardwell finds a major cycle between 1890 and 1898; we find merely one business cycle instead of three or four during a slightly longer period, 1890 to 1900. Our list of American business cycles agrees better with Wardwell's scheme, but again discrepancies turn up. We find three business cycles between 1907 and 1918, but as many as five from 1890 to 1907 and again from 1896 to 1914. The peaks of Wardwell's major cycles come in the third business cycle of the major cycle starting in 1895 and in the first business cycle of the major cycle starting in 1914, instead of in the second business cycle as expected. In view of these discrepancies we must reject Wardwell's suggestion concerning the manner in which business cycles group themselves into major cycles.

Wardwell's findings on major cycles can, of course, be divorced from his suggested grouping of business cycles. But the alleged major cycles cover much too short a period to justify detailed testing. As things stand we can learn merely what happened during a period of less than thirty years, including only two major cycles, one of which is dominated by war. During the upswing from 1895 to 1906 we find two business-cycle contractions, in 1899–1900 and 1903–04. Since they are the only contractions during the upswings dated by Wardwell, we should not regard any difference between them and the contractions during downswings as important evidence for or against the hypothesis that business cycles vary cyclically. The second upswing consists entirely of the war prosperity from 1914 to 1918, which is more properly regarded as a cyclical expansion dominated by 'random forces' than as a member of a sequence of business cycles that regularly generate major cycles. This expansion was exceptionally long; [9] if we include it we are bound to get distorted results, while if we exclude it our observations on expansions during upswings are confined to a single upswing. In view of these facts we do not attempt a detailed analysis of Wardwell's scheme, but merely compare reference-cycle patterns.

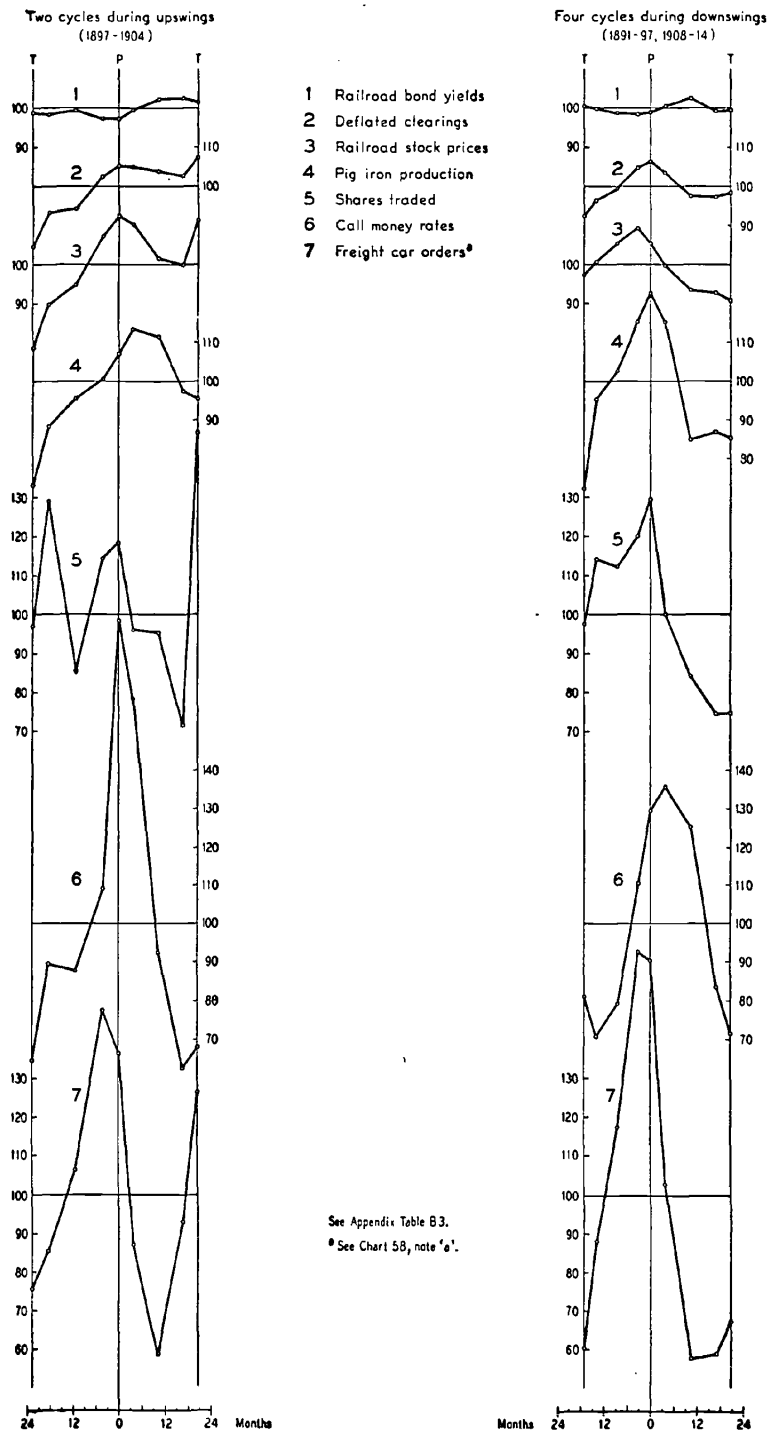
Chart 62 presents the average patterns of our series for the four business cycles during Wardwell's two downswings and for the two business cycles during one of his upswings.[10] We see that the average patterns differ

[9] Our monthly chronology discloses only three longer expansions: one during the Civil War, another following the great contraction of 1929–33, and the expansion in process since May 1938. Thus three of the four longest expansions since 1854 have been war expansions. See pp. 90-4.

[10] The chart omits the business cycles of 1904–08 and 1914–19 which overlap the upswing and downswing of the major cycles; since our rule is that the period matched with an upswing start and end with an expansion and the period matched with a downswing start and end with a contraction. This rule does not cover adequately the business cycle from the trough of June 1894 to the trough of June 1897. Since the annual troughs of this cycle are 1894 and 1896, and Wardwell's major-cycle trough comes in 1895, we have as much warrant for matching the cycle with the upswing as the downswing. By placing it in the downswing we adopt the arrangement that, on the whole, is most favorable to Wardwell's scheme.

CHART 62

Average Reference-cycle Patterns during the Upswings and Downswings of Wardwell's Major Cycles, 1891–1914
Seven American Series



See Appendix Table B3.

[a] See Chart 58, note 'a'.

as Wardwell's scheme leads us to expect. The contraction is longer relatively to the expansion during the downswing than during the upswing; it is also deeper in most instances. Consequently the patterns of the reference cycles during the downswing tilt upward slightly or not at all, while most patterns during the upswing have a sharp upward tilt. These differences seem instructive, but we have no good reason for believing that Wardwell's chronology, if extended by his methods, would confirm the traces of a cycle of cycles. We have found it impossible to date from Wardwell's records a representative trough before the peak of 1890, although eight of his ten American series go back to the 1870's or earlier. In any event, apart from the difference in tilt, Chart 62 shows a basic similarity in the relations among our test series—a similarity all the more remarkable because so few cycles are included in the averages.[11]

III Long Cycles Marked Off by Long Waves in Prices

We pass to Kondratieff's hypothesis, the most celebrated of the long-cycle 'theories'. For many years monetary writers have affirmed the existence of long waves in wholesale prices. The waves are supposed to last fifty to sixty years—a much longer period than is found in building construction, or in general economic activity according to Wardwell, Kuznets or Burns. The long waves in prices have usually been explained by accidental discoveries of gold deposits, improvements in gold refining, wars, and changes in the world's monetary systems. Kondratieff presents the more daring hypothesis that the long waves in wholesale prices are an organic part of a long cycle characteristic of capitalism.[12] Kondratieff's statistical investigations cover the leading industrial countries of the world; they are based mainly on value series, but include also small samples of physical volume series.

Table 165 shows the peaks and troughs of the long waves in wholesale prices in the United States, Great Britain, Germany and France.[13] Most of these dates fall within the turning zones of the long waves in the economic life of capitalist countries, as fixed by Kondratieff. Since 1790 there are only two complete long waves and an undetermined fraction of a third. Few series in our entire collection and none of the present sample go back so far. The longest series in our sample starts in 1857, while the monthly reference dates of business cycles in different countries start between

11 See below, Sec. VI.

12 N. D. Kondratieff, Die Langen Wellen der Konjunktur, *Archiv für Sozialwissenschaft und Sozialpolitik*, Dec. 1926. An abridged English translation of this article was published in the *Review of Economic Statistics*, Nov. 1935. See also Joseph A. Schumpeter, *Business Cycles*, Ch. IV-VII, and especially George Garvy, Kondratieff's Theory of Long Cycles, *Review of Economic Statistics*, Nov. 1943.

13 We deliberately follow convention as closely as possible in the dating—a matter to which we return later in this section.

TABLE 165

Peak and Trough Dates of Kondratieff's Long Waves and the Long Waves in Wholesale Prices of Four Countries

Nature of turn	Turns in Kondratieff's long waves	Turns in long waves of wholesale prices[a]			
		United States	Great Britain	Germany	France
Trough....	Late 1780's or early 1790's	1789	1789	1793[b]	....
Peak.....	1810–17	1814	1813	1808	1820[c]
Trough....	1844–51	1843	1849	1849	1851
Peak.....	1870–75	1864	1873	1873	1872–73
Trough....	1890–96	1896–97	1896	1895	1896
Peak.....	1914–20	1920	1920	1923	1926
Trough....	.....	1932[d]	1933[d]	1933[d]	1935[d]

[a] See Chart 65. Later in this section we comment on the tendency of this table to oversimplify the facts and to exaggerate similarities among the countries. In dating the peaks and troughs for each country we have relied on annual index numbers based on currency prices.

UNITED STATES: Based on the Warren-Pearson index from 1797 to 1889, and the Bureau of Labor Statistics index since 1890. George F. Warren and Frank A. Pearson, Wholesale Prices in the United States for 135 Years, 1797 to 1932 (Cornell University Agricultural Experiment Station, *Memoir 142*, Part I, Nov. 1932); also U. S. Bureau of Labor Statistics, *Bulletin 572* and later publications. The trough in 1843 is not confirmed by the familiar Aldrich index which shows a trough in 1849, but it is reasonably certain that the trough came in the earlier year. We date a trough in 1789; the trough in prices came that year in Boston, Philadelphia and Charleston, but apparently in 1791 in New York. See the evidence in *Memoir 142*, just cited, and in Arthur H. Cole, *Wholesale Commodity Prices in the United States, 1700–1861* (Harvard University Press, 1938).

GREAT BRITAIN: Based mainly (the exceptions are noted below) on Gayer's index of imported and domestic commodity prices before 1850, and on the Sauerbeck-Statist index since then. The former we owe to an unpublished manuscript by Arthur D. Gayer. For the latter, see *Journal of the Royal Statistical Society*, Vol. 49, p. 648; Vol. 84, p. 260; Vol. 103, p. 348. A peak seems to have come in 1813, although Jevons' index shows a peak in 1810 and Silberling's in 1814 (confirmed by Gayer's index of prices of imported commodities). Some uncertainty surrounds the trough we have dated in 1849. Both Gayer's and Silberling's indexes stop in 1850; the former shows a slight fall and the latter a rise from 1849 to 1850. Sauerbeck's index reached a trough in 1849, Jevons' in 1849–50. See *ibid.*, Vol. 28, pp. 314-5 and *Review of Economic Statistics*, Oct. 1923, Supplement 2, pp. 232-3, for the indexes by Jevons and Silberling, respectively. The trough in 1789 is dated from these indexes.

GERMANY: Alfred Jacobs and Hans Richter, Die Grosshandelspreise in Deutschland von 1792 bis 1934, *Sonderhefte des Instituts für Konjunkturforschung*, No. 37, pp. 82-3, and *Statistisches Jahrbuch für das Deutsche Reich*, 1938, pp. 320-1.

FRANCE: Statistique Générale, *Annuaire Statistique*, 1938, pp. 436*-7*.

[b] Uncertain. The index starts in 1792, stands at 79.8 in that year and 79.7 the following year (av. 1913 = 100).
[c] Uncertain. The index starts in 1820.
[d] Uncertain. Lowest points as of the time of writing.

1854 and 1879. Under the circumstances it is impossible at present to come to serious grips with the problem whether business cycles tend to move in cycles within Kondratieff's periods.

We may, however, examine a simpler question: namely, whether there is evidence that the business cycles occurring during the upswings of the long waves in commodity prices differ substantially from the business cycles during the downswings in prices. Charts 63 and 64 seem to settle this question fairly conclusively. The thing that stands out above everything else is that the relations among the cyclical patterns of the activities represented in our sample are broadly similar during the periods of upswing and downswing in commodity prices. If we drop the extreme cycle of 1927–33, the reference-cycle patterns of at least three series—deflated clearings, pig iron production, and railroad stock prices—are nearly indistinguishable during periods of upswing and downswing in prices. The only series in which the direction of the 'trend' of prices clearly makes a substantial difference is railroad bond yields. That result

is not surprising, since it has often been alleged that long-term interest rates are characterized by long waves that roughly parallel the long waves in wholesale prices.[14]

These critical facts suffice for our present purpose. It is of interest, however, to inquire how the cyclical measures of our series differ in detail during periods of opposite price trends. As in the case of the building hypothesis, we may expect (1) that expansions of specific cycles in individual economic activities will tend to be longer and more boisterous, and contractions shorter and milder, when the 'trend' of prices is upward than when it is downward; consequently, (2) that expansions relatively to whole cycles will be longer and the amplitude of rises relatively to full-cycle swings will be larger when the 'trend' of prices is upward than when it is downward. There are also some grounds for believing that "the depressed phases of business cycles are susceptible of greater prolongation than the prosperous phases." [15] Hence we may expect (3) that full cycles will be longer and their amplitudes perhaps larger during periods of declining than during periods of rising price 'trends'.

Table 166 shows that the first expectation is fulfilled in 17 out of 28 instances, the second in 21 out of 28, the third in 9 out of 14.[16] Clearly the averages in the table differ in most instances in the expected direction. But there are considerable differences both among the series and the cyclical measures. Railroad bond yields conform to expectations more consistently than any other series. Shares traded run counter to expectations almost as frequently as bond yields meet expectations. The amplitudes of specific cycles meet expectations less well than the durations —iron production, freight car orders and share trading being poor conformers. The ratios of expansions to full cycles, which are the most sensitive duration measures, meet expectations best of all. Sixteen of the 26 conforming comparisons for durations, but only 8 of the 21 conforming comparisons for amplitudes, yield variance ratios above unity. However, only 5 variance ratios in the table are 'significantly large' and all but one refer to bond yields.

Taken as a whole this evidence is slightly more favorable than the evidence supporting the building hypothesis. But it does not create a strong presumption that a causal relation exists between business cycles and the direction of price trends. For although the movements that conform to expectations preponderate over those that do not, this fact is neutralized by two others: the intercorrelation of the cyclical measures for

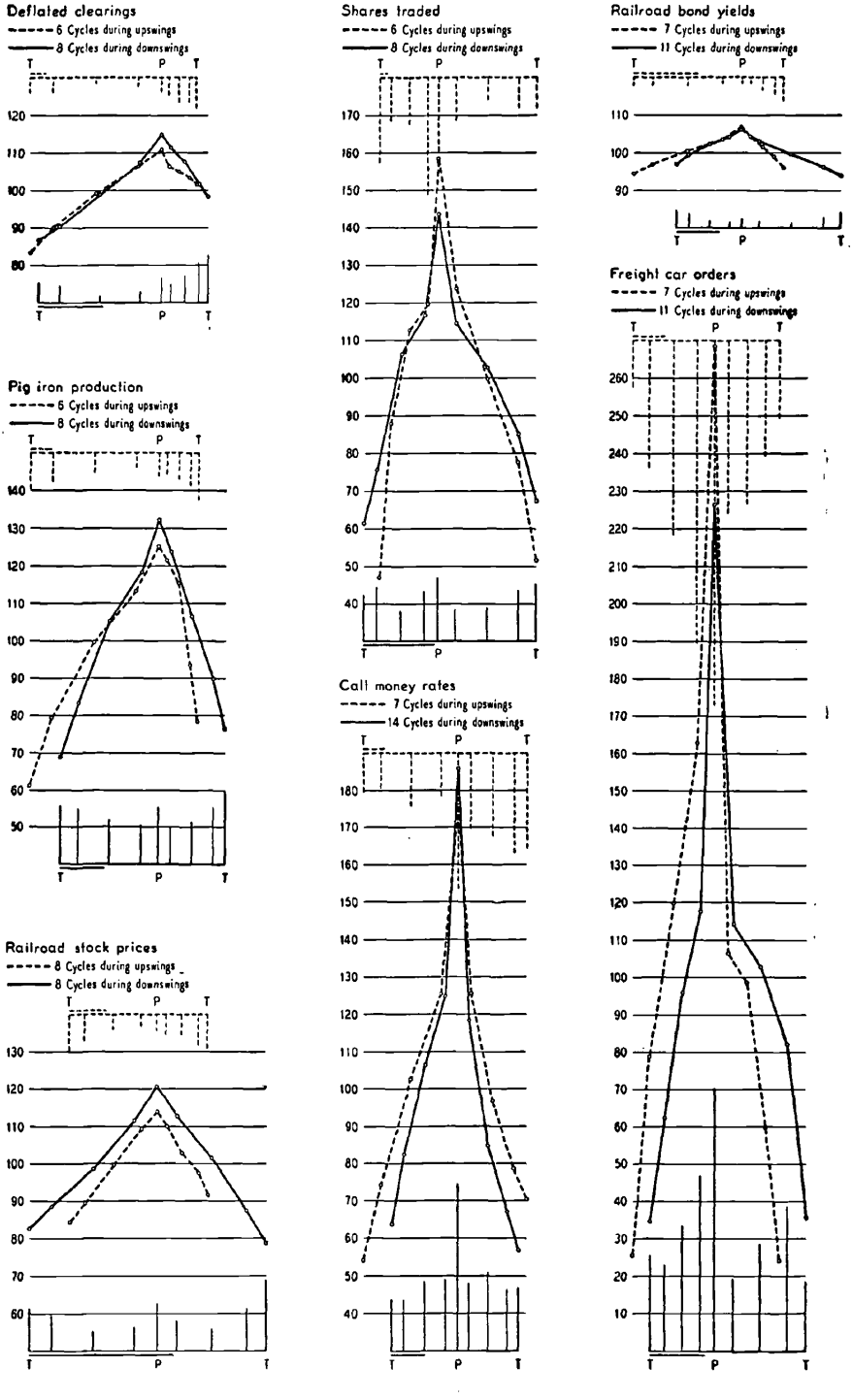
[14] For a trenchant analysis of this relation, see F. R. Macaulay, *Interest Rates, Bond Yields and Stock Prices*, Ch. VI.

[15] See Mitchell, *Business Cycles: The Problem and Its Setting*, pp. 411-2, 421.

[16] The table shows the ratio of expansions to full cycles marked off by peaks as well as by troughs. The extra computation eliminates the influence of the extreme contraction of 1929–33 and also serves as a check on the analysis for positive cycles; see above, note 4. The distribution of specific cycles between periods of rising and falling price 'trends' is shown in Appendix Table B6.

CHART 63

Average Specific-cycle Patterns during the Upswings and Downswings of Long Waves in Wholesale Prices
Seven American Series

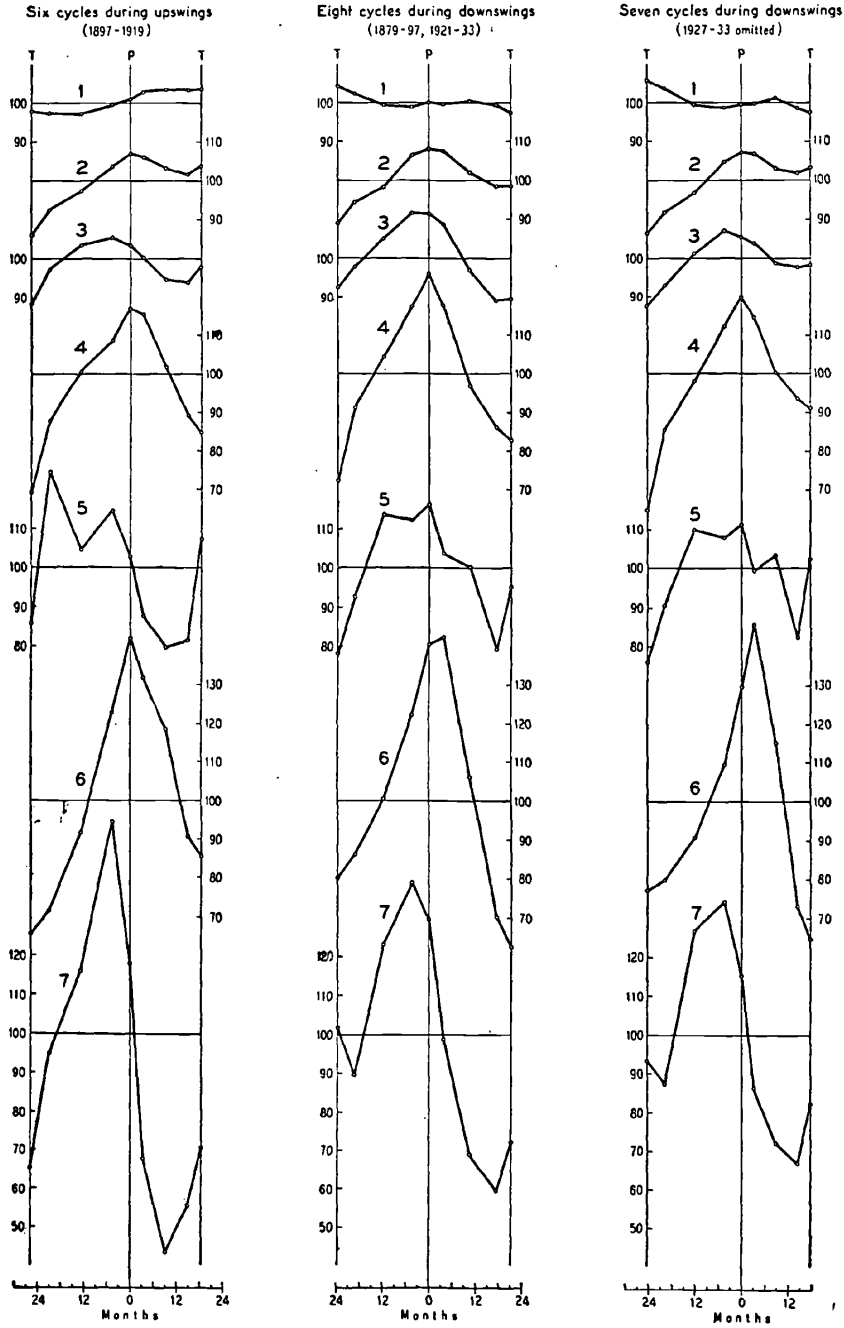


See Appendix Tables B1 and B6. For explanation of chart, see Ch. 5, Sec. VI.

CHART 64

Average Reference-cycle Patterns during the Upswings and Downswings of Long Waves in Wholesale Prices, 1879–1933
Seven American Series

1 Railroad bond yields
2 Deflated clearings
3 Railroad stock prices
4 Pig iron production
5 Shares traded
6 Call money rates
7 Freight car orders[a]



See Appendix Table 83.

[a] See Chart 58, note 'a'.

TABLE 166

Average Duration and Amplitude of Specific Cycles during the Upswings and Downswings of Long Waves in Wholesale Prices
Seven American Series

Series and phase of long waves in prices	Av. duration of specific cycles in months			Av. ratio of expansion to full cycles marked off by		Av. amplitude in specific-cycle relatives			Av. ratio of rise to total rise & fall of cycles marked off by	
	Expansion	Contraction	Full cycle	Troughs	Peaks	Rise	Fall	Rise & fall	Troughs	Peaks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
DEFLATED CLEARINGS										
Upswings	32	9	45	.79	.78	25	10	37	.74	.76
Downswings	33	13	45	.75	.75	28	16	45	.64	.68
Difference	−1	−4*	−1*	+.04*	+.03*	−3	−6*	−8*	+.10*	+.08*
PIG IRON PRODUCTION										
Upswings	32	11	45	.76	.74	61	47	111	.57	.59
Downswings	26	17	44	.60	.62	63	60	119	.56	.61
Difference	+6*	−6*	+1	+.16*	+.12*	−3	−13*	−8*	+.01*	−.02
FREIGHT CAR ORDERS										
Upswings	20	17	39	.54	.50	242	244	487	.50	.48
Downswings	17	24	41	.39	.42	192	193	382	.51	.54
Difference	+3*	−6*	−2*	+.15*	+.07*	+50*	+52	+105	−.01	−.06
RAILROAD STOCK PRICES										
Upswings	24	14	38	.61	.64	34	22	52	.55	.56
Downswings	34	27	64	.51	.51	38	39	80	.48	.53
Difference	−10	−13*	−25*	+.10*	+.14*	−4	−17*	−28*	+.07*	+.03*
SHARES TRADED										
Upswings	16	26	42	.38	.35	116	107	218	.50	.52
Downswings	20	26	46	.43	.42	82	83	158	.53	.53
Difference	−4	0	−4*	−.05	−.07	+34*	+24	+60	−.03	−.01
CALL MONEY RATES										
Upswings	23	18	44	.59	.57	107	106	227	.56	.56
Downswings	18	18	34	.50	.48	122	121	251	.49	.52
Difference	+6*	0	+10	+.09*	+.09*	−15	−15*	−24*	+.08*	+.05*
RAILROAD BOND YIELDS										
Upswings	28	14	40	.69	.66	14	12	24	.58	.61
Downswings	17	26	43	.44	.42	9	13	21	.41	.36
Difference	+11*	−12*	−3*	+.26*	+.24*	+5*	−2*	+2	+.17*	+.25*
	Ratio of variance between groups to variance within groups									
Deflated clearings	0.01	0.45	0.00†	0.44	0.30	0.15	0.84	0.51	0.84	1.03
Pig iron production	1.01	1.55	0.02	3.15	4.44	0.06	0.56	0.17	0.02	0.11
Freight car orders	0.40	1.65	0.09	2.81	0.81	0.89	0.76	0.79	0.07	0.51
Railroad stock prices	0.99	3.84	2.33	1.48	1.62	0.12	1.42	1.19	0.53	0.08
Shares traded	0.56	0.00‡	0.17	0.20	0.28	3.24	1.47	2.82	0.40	0.01
Call money rates	2.21	0.01	4.69♩	1.00	2.13	0.28	0.20	0.13	2.43	0.26
Railroad bond yields	3.79	4.43♩	0.18	8.08♩	9.77♪	1.86	0.17	0.22	2.85	6.75♩

The measures in col. (6) and (11) are made from cycles marked off by peaks; all others from cycles marked off by troughs. The analysis by peaks is confined to cycles within the outer boundaries of the cycles marked off by troughs. The measures for cyclical phases include some cycles not covered by the measures for full cycles; hence the discrepancies between the averages. For a full list of the cycles included in each group, see Appendix Table B6. The entries designated 'difference' are computed from averages carried to one more place than is shown in the table.

*Indicates that the difference accords with expectations stated in the text.
♩ Larger than the value that would be exceeded once in twenty times by chance.
♪ Larger than the value that would be exceeded once in a hundred times by chance.
† Smaller than the value that would be fallen short of once in twenty times by chance.
‡ Smaller than the value that would be fallen short of once in a hundred times by chance.

the several series and the unimpressive level of the variance ratios. One point, however, deserves further exploration; namely, there seems to be better evidence of association between price trends and specific cycles in the case of cyclical durations than in the case of amplitudes.

To push analysis of the amplitudes further we would have to enlarge considerably our sample of series—a step we cannot undertake at this time. But in the case of the durations we have at hand a simple and excellent check in the monthly measures of business cycles. In columns (2)-(6) of Table 167 these measures are set out for the United States and also our three foreign countries on the model of Table 166. The average durations of American business cycles meet in every instance the expectations that we set up, but the differences between periods of upswing and downswing

TABLE 167

Average Duration of Business Cycles during the Upswings and Downswings of Long Waves in Wholesale Prices
Four Countries

Country and phase of long waves in prices	Based on monthly reference dates					Based on annual reference dates				
	Av. duration of business cycles in months			Av. ratio of expansion to full cycles marked off by		Av. duration of business cycles in months			Av. ratio of expansion to full cycles marked off by	
	Expansion	Contraction	Full cycle	Troughs	Peaks	Expansion	Contraction	Full cycle	Troughs	Peaks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
UNITED STATES										
Upswings...	26	17	42	.59	.58	30	14	45	.66	.64
Downswings.	24	25	49	.53	.53	24	25	49	.52	.53
Difference....	+2*	−8*	−7*	+.07*	+.05*	+6*	−11*	−4*	+.14*	+.11*
GREAT BRITAIN										
Upswings...	38	17	56	.70	.68	42	16	58	.71	.69
Downswings.	30	38	64	.44	.45	34	26	58	.58	.62
Difference....	+8*	−21*	−8*	+.26*	+.22*	+8*	−10*	0	+.13*	+.07*
GERMANY										
Upswings...	40	18	58	.68	.65	39	15	57	.70	.66
Downswings.	32	42	74	.46	.60	39	43	75	.54	.55
Difference....	+8*	−24*	−17*	+.22*	+.06*	0	−28*	−18*	+.16*	+.10*
FRANCE										
Upswings...	31	15	49	.66	.63	35	15	53	.67	.63
Downswings.	30	34	70	.46	.54	43	31	77	.57	.57
Difference....	0	−19*	−22*	+.20*	+.09*	−8	−16*	−24*	+.10*	+.06*
Ratio of variance between groups to variance within groups										
United States.	0.20	1.86	0.67	0.86	0.53	1.21	4.55♩	0.28	5.15♩	2.68
Great Britain.	0.66	5.91♩	0.45	9.09♩	9.48♩	1.32	3.57	0.00†	5.21♩	1.42
Germany.....	0.69	7.63♩	1.15	11.10♩	0.17	0.00§	10.70♪	1.42	6.11♩	0.69
France.....	0.00†	6.06♩	2.51	5.08♩	0.64	0.50	8.21♩	3.59	1.11	0.26

Derived from Table 16; the annual reference dates are for calendar years. For a full list of the cycles included in each country and group, see Appendix Table B7; for other explanations, see note to Table 166.

*Indicates that the difference accords with expectations stated in the text.
♩Larger than the value that would be exceeded once in twenty times by chance.
♪Larger than the value that would be exceeded once in a hundred times by chance.
†Smaller than the value that would be fallen short of once in twenty times by chance.
§Smaller than the value that would be fallen short of once in a thousand times by chance.

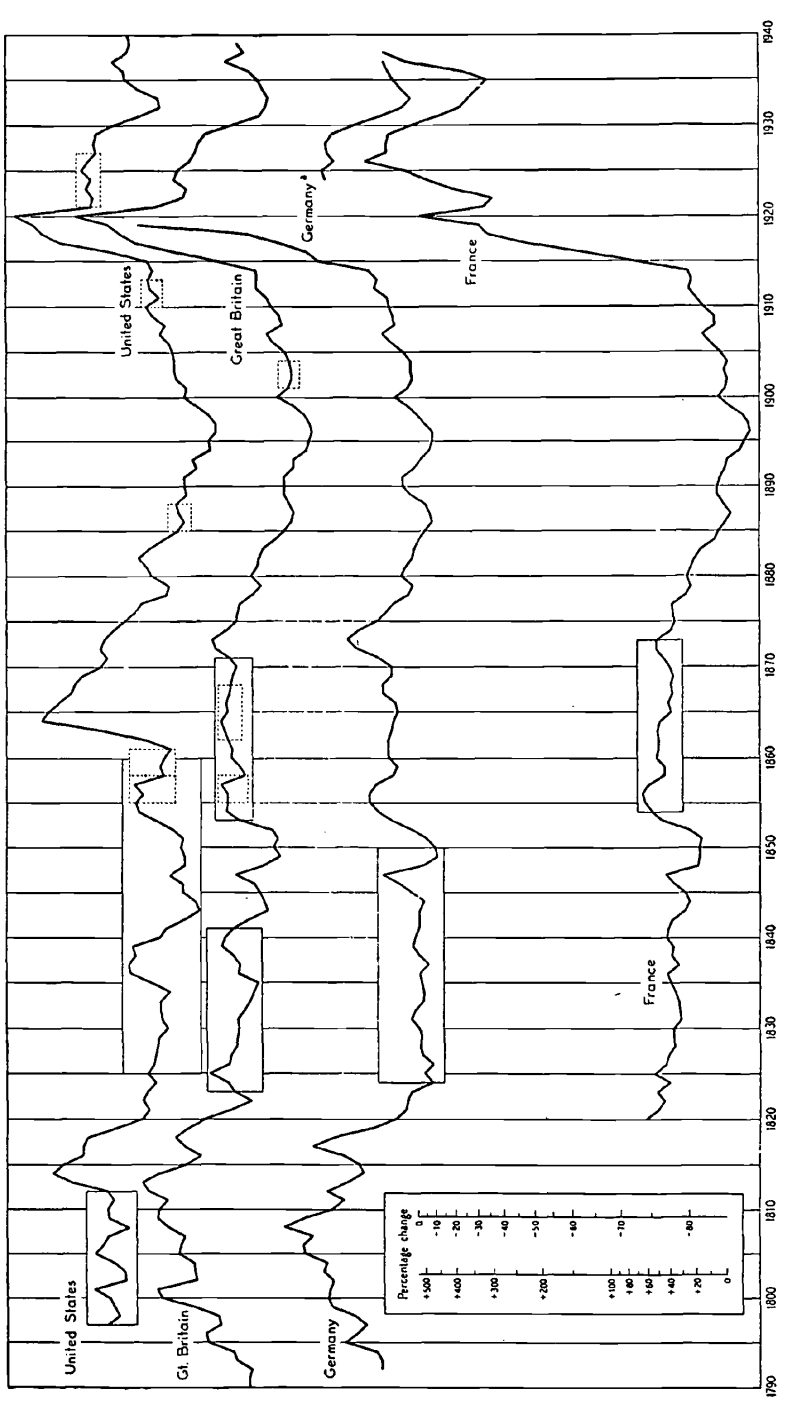
in prices are not statistically significant. Although these results confirm the specific-cycle measures, they appear in a new light when put side by side with other evidence. In practically every instance the foreign monthly measures differ between periods of rising and falling price 'trends' in the expected direction. In each foreign country the durations of business-cycle contractions during periods of rising price trends differ 'significantly' from the durations during periods of falling price trends. Even in the United States the variance ratio for business-cycle contractions, while not 'significantly large', exceeds unity. Further, the analysis based upon annual reference dates, which give coarser measures but cover more business cycles, yields a 'significantly large' variance ratio for business-cycle contractions in the United States, though not in Great Britain. Allowing as best we can for the interrelation of business cycles in our four countries, we judge that the evidence in hand supports the common opinion that there is a real relation between the direction of the trend in wholesale prices and business-cycle contractions: the contractions tend to be long or short according as the trend of prices is falling or rising, and this relation seems to hold for the duration of contractions relatively to full cycles as well as for their absolute duration.[17] At the same time the differences between the variance ratios for business cycles marked off by troughs and by peaks shout warnings that the relation between the direction of price trends and the relative duration of business-cycle phases is heavily overlaid by other factors.

We are unable at this time to undertake a causal analysis of this relation, but it is important to point out that the statistical devices we have used may not be well suited to such an undertaking. Our statistical analysis is built around the abstraction of a 'long-term' price trend, a procedure imposed by the hypothesis we are testing. We say that 'the' trend of prices was upward in the United States from 1897 to 1920, downward from 1920 to 1932, and so on; in other words, the 'trends' that concern us are the movements from trough to peak and from peak to trough of the alleged long waves in wholesale prices. But whether the chain of causation runs from the trend of prices to business cycles, the other way around, or is more complex than either statement implies, it seems plain that the trend of prices that is chiefly relevant to a given business cycle is the 'short-term' trend during that cycle, not the 'long-term' trend. There would be no difficulty if the 'short-term' trend invariably agreed in direction with the 'long-term' trend; but there is no such invariable rule (see Chart 65). For example, we treat 1843–64 and 1897–1920 as periods of rising prices in the United States, but the 'short-term' trend of prices was declining during the business cycles of 1855–58 and 1858–61, and was virtually horizontal during the 1910–13 cycle. We treat 1864–97 and 1920–32 as periods of falling prices, but the 'short-term' trend of prices

[17] Cf. Mitchell, *ibid.*, pp. 410-11.

CHART 65

Indexes of Wholesale Prices, Four Countries, 1790–1940



Some periods are boxed in to aid the reader in following the text.
For sources of data, see Table 165, note 'a'.

* Indexes for 1920–23, years of great inflation, are much too high to fit on the chart.

was virtually horizontal during the cycle of 1885–88 and the two cycles from 1921 to 1927. In Great Britain we consider the 'trend' of prices as rising from 1849 to 1873 and from 1896 to 1920, but the 'short-term' trend was not rising in the cycle of 1855–58, or in the cycles of 1862–68 and 1901–04.[18]

One more point may be noted. The chronology of 'long waves' in wholesale prices in Table 165 is an abstraction not only in the sense just indicated, but in the additional sense that back of the 1870's the long waves are partly an optical illusion. Our table shows a trough in Germany in 1849, which confirms the entries for the other countries. But Chart 65 shows that the index of wholesale prices of the *Institut für Konjunkturforschung* was almost as low in 1824 and 1826 as in 1849–50; the 'trend' during the intervening period, if any, sloped gently upward. In France we list a peak in 1872–73 that matches the peaks in other European countries. But the index of the *Statistique Générale* was higher in 1854–57 than in 1872–73; from 1854 to 1873 prices were high or falling, definitely not rising. In the United States the long waves in wholesale prices are also to some extent illusory. High rather than rising prices prevailed from 1797 to 1812. Again, if we concentrate on the period from about 1825 to 1860 and disregard the preceding and following years, we might describe prices as moving along a horizontal trend. The long waves are clearest in Great Britain; yet one who did not already know these waves in advance might conclude that the trend of prices was not falling from 1823 to 1841, or rising during 1853–71.

IV Long Cycles as Triplets of Business Cycles

Schumpeter claims that "industrial history" establishes Kondratieff long waves, that each 'Kondratieff cycle' contains six 'Juglar' cycles "of from nine to ten years' duration" and that "every Juglar so far observed . . . is readily . . . divisible into three cycles of a period of roughly forty months". But he adds that Juglar cycles are "less clearly marked" in time series than Kondratieff cycles; while the forty-month cycle, "as well as the others, is more clearly marked in this country than in any other and notably more marked than in England".[19] For our purposes the new

[18] The periods cited are based on our annual reference dates.

[19] Joseph A. Schumpeter, The Analysis of Economic Change, *Review of Economic Statistics*, May 1935, p. 8. Similar statements appear in his *Business Cycles*, though the fuller exposition is less rigid. For example, Schumpeter warns the reader that "there is no rational justification . . . for assuming that the integral number of Kitchins in a Juglar or of Juglars in a Kondratieff should always be the same". He states that "it is possible to count off, historically as well as statistically, six Juglars to a Kondratieff and three Kitchins to a Juglar—not as an average but in every individual case"; but qualifies this claim with the proviso "barring very few cases in which difficulties arise". The Kitchin cycles, Schumpeter explains, are mostly "somewhat less than 40 months": they are "fluctuations, shorter than those of the Juglar group, but which we nevertheless believe to be of similar nature and which we think to be tolerably represented by a typical duration somewhat exceeding three years". See Vol. I, pp. 161-74, especially pp. 173-4.

TABLE 168

Frequency Distribution of Durations of Business Cycles
Four Countries

Duration in months	United States 1854–1933		Great Britain 1854–1932		France 1865–1932		Germany 1879–1932	
	No. of observations	Per cent	No. of observations	Per cent	No. of observations	Per cent	No. of observations	Per cent
16– 22	1	2.6	1	3.4	..	....	..	....
23– 29	1	2.6	4	13.8	5	17.2	1	5.3
30– 36	11	28.2	2	6.9	2	6.9	2	10.5
37– 43	11	28.2	2	6.9	5	17.2	1	5.3
44– 50	4	10.3	3	10.3	4	13.8	4	21.1
51– 57	4	10.3	3	10.3	4	13.8	1	5.3
58– 64	2	5.1	2	6.9	2	6.9	2	10.5
65– 71	1	2.6	4	13.8	2	6.9	2	10.5
72– 78	2	5.1	1	3.4	..	....	1	5.3
79– 85	..	....	2	6.9	..	....	1	5.3
86– 92	..	....	..	....	2	6.9	1	5.3
93– 99	1	2.6	1	3.4	1	3.4	1	5.3
100–106	1	2.6	1	3.4	..	....	1	5.3
107–113	..	....	..	....	2	6.9	..	....
114–120	..	....	1	3.4	..	....	..	....
121–127	..	....	1	3.4	..	....	1	5.3
128–134	..	....	..	....	..	....	..	....
135–141	..	....	1	3.4	..	....	..	....
Total[a]....	39	100.0	29	100.0	29	100.0	19	100.0

Derived from the monthly reference dates in Table 16. Observations include business cycles marked off by both troughs and peaks.

[a] The percentages in this line are rounded to 100.0.

TABLE 169

Relations in Time between Business Cycles and Schumpeter's 'Juglar Cycles'
United States, 1848–1932

JUGLAR CYCLES MARKED OFF BY TROUGHS			JUGLAR CYCLES MARKED OFF BY PEAKS		
Dates assigned by Schumpeter[a]	Corresponding period in our reference chronology[b]	No. of business cycles during this period	Dates assigned by Schumpeter[a]	Corresponding period in our reference chronology[c]	No. of business cycles during this period
1848–1858	1848–1858	2			
1858–1866	1858–1867	2			
1866–1876	1867–1878	2	1872–1881	1873–1882	1
1876–1885	1878–1885	1	1881–1891	1882–1890	2
1885–1895	1885–1894	3	1891–1900	1890–1899	3
1895–1904	1894–1904	3	1900–1909	1899–1910	3
1904–1914	1904–1914	3			
1914–1922	1914–1921	2			
1922–1932	1921–1932	3			

[a] Derived from his *Business Cycles*, Vol. I, pp. 396-7, 426-7, and Vol. II, pp. 786-9, 907. But see note 22. The peaks of several Juglar cycles were not dated by Schumpeter because of the dominance of 'external factors'; hence the smaller number of Juglar cycles marked off by peaks.

We might have matched the period 1885–96 with the Juglar of 1885–95 and 1896–1904 with the Juglar of 1895–1904. But this arrangement is less favorable to Schumpeter's scheme of 3 Kitchins per Juglar, since it assigns 4 business cycles to the Juglar of 1885–95 and 2 to the Juglar of 1895–1904.

[b] Begins and ends with a trough; see the calendar-year dates in Table 16.

[c] Begins and ends with a peak; see the calendar-year dates in Table 16.

question raised by this three-cycle scheme is whether business cycles tend to move cyclically during the periods of 'Juglar cycles'.

Our reference dates confirm Schumpeter's statement that the forty-month cycle is more clearly marked in the United States than in other countries. But even in the United States only about 28 per cent of our measures of business cycles since 1854 fall between 37 and 43 months (Table 168).[20] No arrangement of our monthly measures in groups of three consecutive cycles will produce an approximation to 'Juglar cycles' of from nine to ten years.[21] For example, if we start in 1854 and mark the cycles off by troughs, the durations of the groups of three run, successively, 156, 209, 109, 122, 124, 115 and 166 months; while if we start in 1857 and mark the cycles off by peaks, the durations run 144, 213, 105, 137, 135 and 98 months. Table 169 shows that if we insist upon getting rough groupings approximating nine to ten years, we must disregard a part of the historical record, or take at times three, at times two, and at times only one business cycle as corresponding to a 'Juglar cycle'.[22]

We may, of course, interpret 'Juglar cycles' as triplets of business cycles irrespective of duration. On this interpretation we can examine our cyclical measures to see if triplets of business cycles constitute higher units. Chart 66 shows average patterns of the reference cycles of our seven series grouped according as they come first, second or third in successive triplets of American business cycles from 1879 to 1933. Since fifteen business cycles span this period, the third cycle of the last triplet reaches a terminal trough in March 1933. We find no substantial differences in cyclical behavior on the present classification. The second contraction of the triplets seems on the average to be milder and briefer than either the first or the third, but the measures for single cycles fail to bear out the averages. A grouping of business cycles according to their position within triplets seems to be equivalent to a random grouping.

20 Cf. Mitchell, *Business Cycles: The Problem and Its Setting*, pp. 339-43, 386-407, 416-24. Note, however, that the duration of the nine American business cycles from 1885 to 1914 ranged from 35 to 46 months (Table 16). It seems that this, in the main, is the core of experience on which the widely held notion of a forty-month cycle rests.

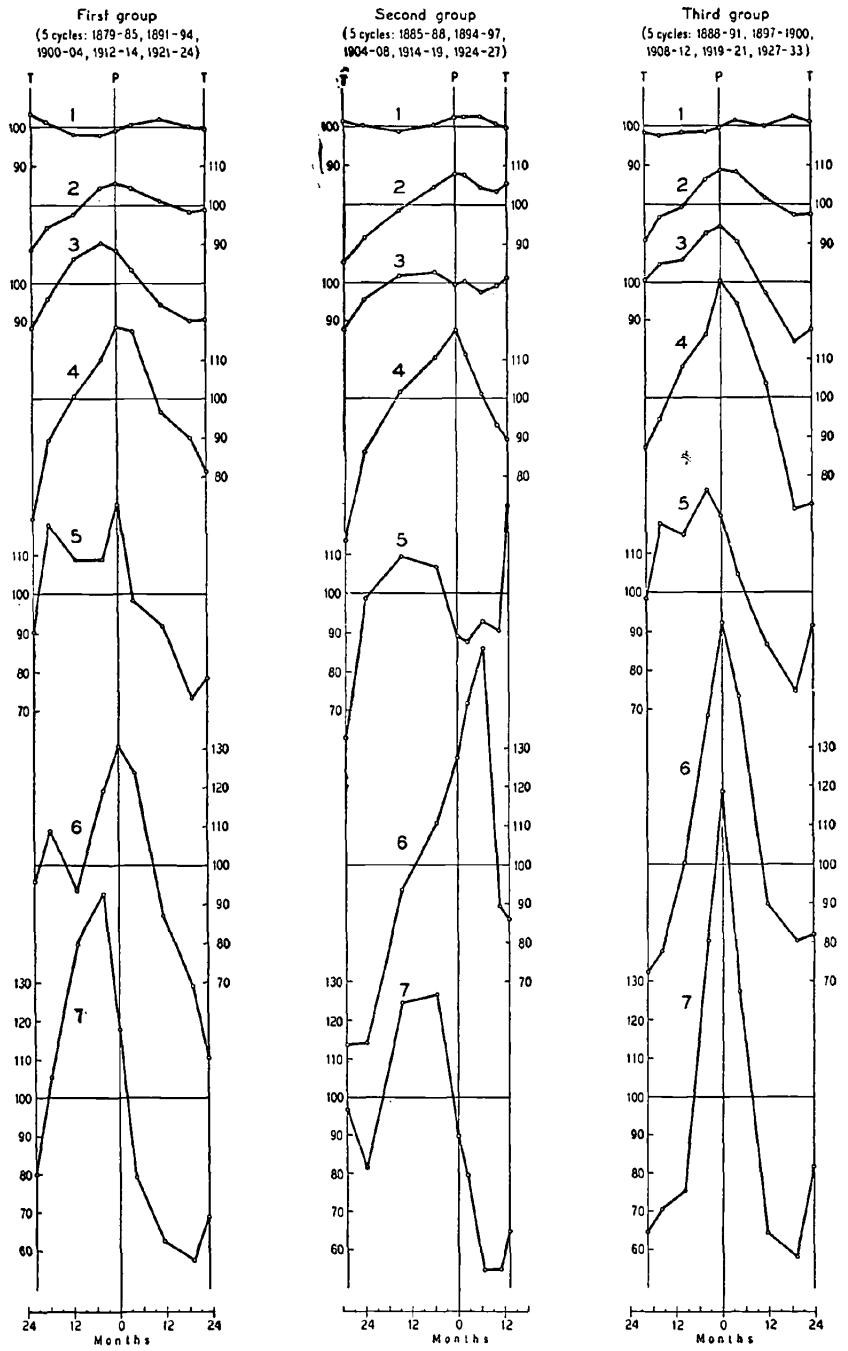
21 Although Juglar called his great work *Des Crises Commerciales et de Leur Retour Périodique*, he did not claim a high degree of regularity for the duration of his cycles. His list of crisis dates during the nineteenth century in France, England and the United States shows crises at widely varying intervals. In England, for example, Juglar listed 14 crises from 1803 to 1882; their successive intervals are 7, 5, 3, 8, 4, 7, 2, 8, 10, 7, 2, 7 and 9 years, and the average interval is about 6 years. See his second edition (Librairie Guillaumin, Paris, 1889), p. 256; also, pp. 162-8, and Part II, History of Crises, *passim*.

22 It should be noted that the dates of successive Juglars in Table 169, which we attribute to Schumpeter, are not true cyclical units in his sense. In Schumpeter's words: a cycle starts "with the neighborhood of equilibrium preceding prosperity" and ends "with the neighborhood of equilibrium following revival. The count from trough to trough or from peak to peak is . . . never theoretically correct. . . . Revival is the last and not the first phase of a cycle. If we count from troughs we cut off this phase from the cycle to which it belongs and add it on to a cycle to which it does not belong." (See his *Business Cycles*, Vol. I, p. 156 and Ch. V.)

CHART 66

Average Patterns of Reference Cycles Occupying First, Second or Third Place within Successive Triplets of Cycles, 1879–1933
Seven American Series

1 Railroad bond yields
2 Deflated clearings
3 Railroad stock prices
4 Pig iron production
5 Shares traded
6 Call money rates
7 Freight car orders*



See Appendix Table B3.

* See Chart 58, note 'a'.

This experiment, however, does not bear crucially on Schumpeter's theory that 'Juglar cycles' are higher units of cyclical fluctuations. For our business and specific cycles are not strict equivalents of what Schumpeter calls Kitchin cycles. We do not recognize a cycle unless a fluctuation appears in the data, while Schumpeter regards Kitchin and even Juglar cycles as rhythmic tendencies that may or may not be directly observable in the data. There is therefore no contradiction when Schumpeter testifies to three Kitchins within a Juglar and we find only one or two business cycles. But, if 'Juglar cycles' really are higher cyclical units, we should find that the first specific or business cycle within a Juglar differs significantly from the last specific or business cycle; that is, if both the Juglar and the shorter cycles are marked off by troughs, the rise of the first specific or business cycle should be larger and the fall smaller than the corresponding movement of the last cycle, or at least the rise relatively to the fall should be larger in the first cycle than in the last. Similar expectations may be entertained, though with less confidence, in regard to the durations of the cyclical phases. To test these expectations,[23] it is necessary to disregard the few instances where a single specific or business cycle is roughly coterminous with a Juglar cycle, and to group the others according to their place within the alleged Juglars. We have put the cycles at the beginning of the Juglars in one class, the cycles at the end in another class, and then compared the two classes.[24] The results of this experiment are shown in Table 170 and Charts 67-68.

These charts resemble earlier exhibits in demonstrating considerable similarity between the cyclical patterns of different series in the first group and the cyclical patterns in the second group. But now striking differences also appear in the tilts of the two groups of patterns, the duration of their phases of expansion and contraction, and their amplitudes of rise and fall —differences that, on the whole, seem very favorable to the hypothesis that business cycles vary rhythmically within the periods separating Juglar troughs. Table 170 strengthens this impression. Most differences between the cycles with which the Juglars begin and the cycles with which they end are in the direction to be expected on the present hypothesis, many are substantial, and a goodly number are statistically significant. Clearly, the evidence is better that business cycles vary substantially within periods of Juglar cycles than that they do so within the long-cycle periods suggested by the other hypotheses that we have so far reviewed.

[23] There are several difficulties in making a statistical test. (1) Schumpeter regards cycles as rhythmic tendencies not necessarily observable in the data. (2) He considers the Juglars, as well as the other cycles, as units bounded by 'neighborhoods of equilibrium', not by their turning points. (3) He assumes that when a Juglar reaches a peak a Kitchin reaches a trough, and that at the time of a Juglar trough the Kitchin is at its peak. Our tests blink (as they virtually must if they are to be made at all) these difficulties. They are also confined to intervals separated by troughs; though a full test would require analysis also by peaks, since theoretical expectations might not be met in the former and yet fully met in the latter.

[24] Intervening cycles, if any, were disregarded: see Appendix Table B8.

TABLE 170

Average Duration and Amplitude of Specific Cycles in Seven Series and Average Duration of Business Cycles Occupying First or Last Place within Schumpeter's 'Juglar Cycles' in the United States

Series and place of cycles within Juglars	Av. duration of specific or business cycles in months		Av. ratio of expansion to full cycle	Av. amplitude in specific-cycle relatives		Av. ratio of rise to total rise & fall
	Expansion	Contraction		Rise	Fall	
DEFLATED CLEARINGS						
First	34	6	.85	34	10	.76
Last	32	18	.62	17	20	.49
Difference	+3*	−12*	+.22*	+17*	−10*	+.28*
PIG IRON PRODUCTION						
First	34	9	.78	79	50	.62
Last	21	21	.52	46	82	.38
Difference	+13*	−12*	+.26*	+33*	−32*	+.24*
FREIGHT CAR ORDERS						
First	20	17	.51	179	160	.55
Last	18	27	.40	196	217	.47
Difference	+2*	−10*	+.10*	−16	−57*	+.08*
RAILROAD STOCK PRICES						
First	17	15	.49	24	22	.52
Last	31	25	.54	43	48	.44
Difference	−14	−10*	−.05	−19	−26*	+.08*
SHARES TRADED						
First	14	20	.40	86	73	.53
Last	16	36	.28	122	136	.47
Difference	−3	−16*	+.12*	−37	−62*	+.07*
CALL MONEY RATES						
First	26	13	.66	126	110	.54
Last	15	24	.38	89	115	.44
Difference	+12*	−11*	+.28*	+38*	−5*	+.11*
RAILROAD BOND YIELDS						
First	16	27	.41	6	12	.37
Last	28	21	.55	14	12	.53
Difference	−12	+6	−.14	−8	−1*	−.16
BUSINESS CYCLES						
First	25	13	.65	...	...	...
Last	24	30	.44	...	...	...
Difference	+2*	−17*	+.21*	...	...	...
	Ratio of variance between groups to variance within groups					
Deflated clearings	0.09	6.04 ♩	11.25 ♪	4.94	1.52	10.41 ♪
Pig iron production	4.76	2.98	5.19	14.61 ♪	2.78	20.00 ♪
Freight car orders	0.15	2.83	1.04	0.19	1.61	3.79
Railroad stock prices	2.13	4.75	0.24	1.49	1.79	0.70
Shares traded	0.13	14.78 ♪	1.03	2.30	20.23 ♪	2.76
Call money rates	9.07 ♪	7.77 ♩	14.87 ♪	1.79	0.02	4.46
Railroad bond yields	3.12	0.71	1.59	3.67	0.03	1.81
Business cycles	0.07	6.98 ♩	9.19 ♪	...	...	...

All measures are made from specific or business cycles marked off by troughs. The measures for business cycles are derived from the monthly reference dates in Table 16. For a full list of the cycles included in each group, see Appendix Table B8. The entries designated 'difference' are computed from averages carried to one more place than is shown in the table.

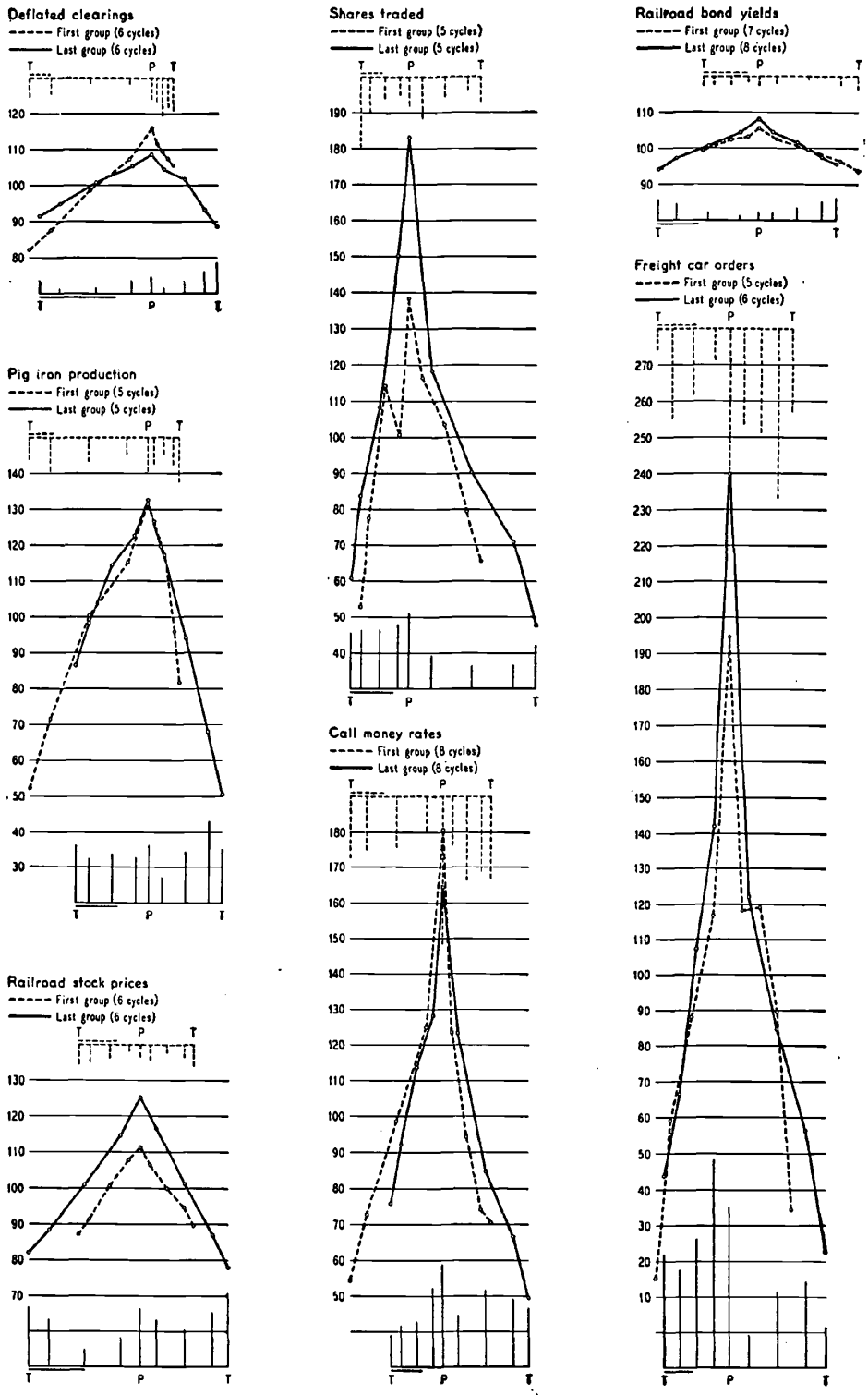
*Indicates that the difference accords with expectations stated in the text.

♩ Larger than the value that would be exceeded once in twenty times by chance.

♪ Larger than the value that would be exceeded once in a hundred times by chance.

CHART 67

Average Patterns of Specific Cycles Occupying First or Last Place within Schumpeter's 'Juglar Cycles' Seven American Series

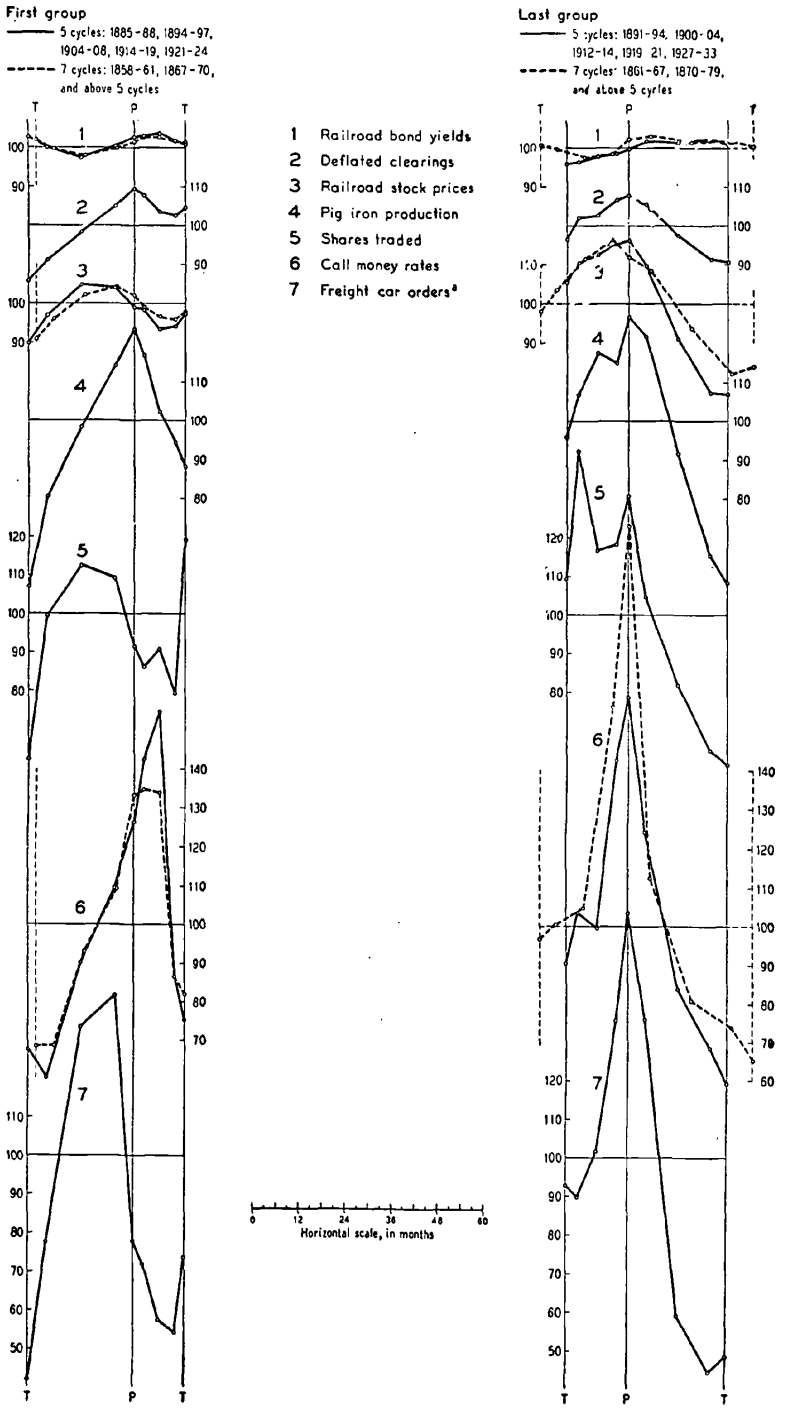


Horizontal scale, in months 0 12 24 36 48 60

See Appendix Tables B1 and B8. For explanation of chart, see Ch. 5, Sec. VI.

CHART 68

Average Patterns of Reference Cycles Occupying First or Last Place within Schumpeter's 'Juglar Cycles' Seven American Series



See Appendix Table 83.

[a] See Chart 58, note 'a'.

May we conclude, therefore, that the 'Juglar cycles' listed by Schumpeter are higher cyclical units, that is, genuine cycles of cycles? It is important to notice, first of all, that the trough dates of the Juglar cycles correspond roughly to the trough dates of severe business depressions. The only clear exception, at least since the 1870's, is the Juglar trough in 1904.[25] So far as Juglar troughs mark off intervals between severe business depressions, it is only natural that substantial differences should appear between the business or specific cycles occupying opposite ends of the Juglars. If the business cycles characterized by long and violent depressions were singled out explicitly, they would of necessity differ materially from the other and milder cycles. Such a classification would demonstrate that some business cycles are in fact milder than others, not that the periods between the troughs of severe depressions are long cycles. Of course, if some internal regularity characterized the business cycles coming within periods separated by troughs of severe depressions, the hypothesis of a cycle of cycles would have surer footing. But the most striking of the internal regularities suggested by Schumpeter—the presence of three Kitchins within a Juglar and the nine to ten year duration of the Juglars—we are unable to confirm at this time. Table 169 shows one American business cycle that is roughly coterminous with a Juglar cycle. There are several instances of this sort in our foreign countries.[26] And the effort to fit our reference dates of business cycles into Schumpeter's chronology of Juglars yields periods that vary from 6.2 to 11.5 years,[27] although most Juglar cycles on this artificial basis do come out close to nine or ten years.

In view of these doubts, we cannot accept Schumpeter's chronological scheme as a solid basis for differentiating among specific or business cycles at this stage of our investigation. But we regard Schumpeter's scheme as a valuable suggestion for future research, and in Section VI say a little about the behavior of business cycles classified explicitly according to their position within periods separating severe business depressions.

V Long Cycles Marked Off by Booms

Kitchin's scheme of economic fluctuations is similar to Schumpeter's. What he calls fundamental movements, major cycles and minor cycles correspond fairly closely to what Schumpeter calls Kondratieff, Juglar

25 The business-cycle contraction of 1902–04, at least on the physical side of economic activity, is one of the mildest on record, definitely not a severe contraction. See at this point Schumpeter's remarks on the 1907–08 contraction (*Business Cycles*, Vol. I, pp. 424-8); also Sec. VI, below.

26 True, the long business cycles may be divisible into so-called Kitchin cycles, but that is a hypothesis of rather uncertain standing. See in this connection the comments on Table 171, below; also Ch. 4, Sec. VI.

27 March 1879–May 1885 is at one extreme, Sept. 1921–March 1933 at the other.

and Kitchin cycles. However, Kitchin's 'major cycles' differ sufficiently from Schumpeter's 'Juglar cycles' to warrant separate notice. According to Schumpeter three 'forty-month' cycles constitute a Juglar cycle. According to Kitchin, major cycles "are merely aggregates, usually of two" and sometimes of three 'minor cycles' lasting forty months on the average. The 'limit' of each major cycle, he explains, is "distinguished by a maximum of exceptional height, by a high bank rate, and sometimes by a panic". He presents his findings for bank clearings, prices of commodities at wholesale, and short-term interest rates by months in Great Britain and the United States; and states that they are supported by a wide range of data, chiefly annual, for other economic factors.[28]

TABLE 171

Number of Minor or Business Cycles within Kitchin's Major Cycles United States, 1873–1920 and Great Britain, 1848–1921

UNITED STATES			GREAT BRITAIN		
Dates of Kitchin's major cycles[a]	No. of minor cycles found by Kitchin[b]	No. of business cycles shown by our reference dates[c]	Dates of Kitchin's major cycles[a]	No. of minor cycles found by Kitchin[b]	No. of business cycles shown by our reference dates[c]
...	..	..	1848–1858	(3)	2
...	..	..	1858–1866	(3)	2
...	..	..	1866–1874	(2)	1
1873–1883	(3)	1	1874–1882	(3)	1
1883–1893	(3)	3	1882–1891	(2)	1
1893–1900	2	2	1891–1900	3	1
1900–1908	2	2	1900–1907	2	2
1908–1913	2	2	1907–1913	2	1
1913–1920	2	2	1913–1921	2	2

[a] From peak to peak. Kitchin expressed his 'maxima' in hundredths of a year; we round them to the nearest year.
[b] Kitchin presents a chronology of minor cycles since 1890 only. The numbers in parentheses are inferred from his general scheme; see his paper, *loc. cit.*, especially p. 14.
[c] Derived from Table 16.

Table 171 presents Kitchin's chronology of major cycles; it runs solely by peaks since Kitchin found the troughs "often rather indefinite" and therefore did not attempt to date them. We compare in the table the number of business cycles that we find during the period of each major cycle with the number of minor cycles—which term Kitchin uses interchangeably with business cycles—assigned by him to the same periods. There are numerous disagreements: in five instances in Great Britain and one in the United States, the business cycles shown by our reference dates correspond to Kitchin's major cycles, not to his minor cycles. We believe that the wide discrepancies in the two chronologies are due not so much to different senses in which Kitchin and we speak of business cycles, but principally to differences in the materials used to identify business cycles.

[28] Joseph Kitchin, Cycles and Trends in Economic Factors, *Review of Economic Statistics*, Jan. 1923, pp. 10-16.

Our chronology of business cycles is based on an extensive range of economic activities; we believe that Kitchin's is dominated by financial processes. Series such as bank clearings, interest rates, and security prices sometimes experience contraction when most business activities are not shrinking, or expansion when most activities are declining.[29] That happens more often in foreign countries than in the United States, but even in the United States we not infrequently find 'extra' cycles in financial series during long business cycles. If this explanation of the disagreements is valid, we must reject Kitchin's hypothesis concerning the relation of business to major cycles.

We might reformulate Kitchin's hypothesis and say that major cycles are coterminous with business cycles at certain times, and include two, three or perhaps more business cycles at other times. So modified the hypothesis may warrant exploration—but not for our present purpose, since it no longer provides a framework for investigating whether business cycles tend to vary cyclically. Another way out is to restrict Kitchin's hypothesis to the United States, and this seems reasonable in view of the evidence. Although Kitchin's and our lists of business cycles are irreconcilable for Great Britain, they differ for the United States only in the period 1873–83 and it is not impossible that we have overlooked some cyclical movements during these years.[30] On this interpretation it is of interest to see whether American business cycles have varied systematically within Kitchin's major-cycle periods since 1883. Kitchin's major cycle from 1883 to 1893 includes three business cycles; the next four major cycles include two business cycles each. If we disregard the middle business cycle within the major cycle of 1883–93, we have two business cycles for each major cycle, and so can determine whether a substantial difference exists between the business cycles that come first and those that come last within the major cycles. Our sample series can be readily treated on a similar basis, since each except railroad bond yields shows specific cycles that correspond closely to business cycles over the entire period from 1883 to 1920.[31]

We follow this plan in Charts 69-70 and Table 172. These exhibits show cyclical movements on an inverted basis, a procedure forced upon us by the fact that Kitchin dates his major cycles by booms. Apart from this technical shift, the charts are similar to those previously presented and repeat the story told in preceding sections. The thing that stands out is that the relations among the patterns of the several series are basically

[29] This statement does not apply to wholesale prices which weigh heavily in Kitchin's analysis; but in this instance, if not also in others, Kitchin seems to have been betrayed by his pattern sense. See the chart on pp. 12-13 of the article just cited.

[30] Cf. Ch. 4, Sec. VI.

[31] We omit bond yields in analyzing specific cycles, but not reference cycles. Appendix Table B8 shows how the cycles in each series are classified. Note that the series on freight car orders is troublesome at one or two points.

TABLE 172

Average Duration and Amplitude of Specific Cycles in Six Series and Average Duration of Business Cycles Occupying First or Last Place within Kitchin's Major Cycles, United States, 1883–1920

Series and place of cycles within Kitchin's major cycles	Av. duration of specific or business cycles in months			Av. ratio of expansion to full cycle	Av. amplitude in specific-cycle relatives			Av. ratio of rise to total fall & rise
	Contraction	Expansion	Full cycle		Fall	Rise	Fall & rise	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEFLATED CLEARINGS								
First	12	33	44	.76	16	32	47	.68
Last	7	28	36	.79	5	21	27	.79
Difference	+4*	+4	+8	−.03*	+10*	+10	+20	−.10*
PIG IRON PRODUCTION								
First	16	32	48	.67	44	73	117	.64
Last	9	26	36	.70	41	57	98	.57
Difference	+7*	+5	+12	−.03*	+3*	+16	+19	+.08
FREIGHT CAR ORDERS								
First	27	23	50	.47	193	158	350	.47
Last[a]	15	20	35	.55	308	184	493	.48
Difference	+12*	+2	+14	−.09*	−116	−26*	−142	−.02*
RAILROAD STOCK PRICES								
First	27	19	45	.46	28	29	57	.49
Last	11	27	39	.69	21	26	47	.49
Difference	+15*	−9*	+7	−.23*	+7*	+3	+9	0
SHARES TRADED								
First	32	12	44	.27	88	104	193	.49
Last	24	14	39	.36	82	127	210	.60
Difference	+8*	−2*	+6	−.08*	+6*	−23*	−17	−.11*
CALL MONEY RATES								
First	21	25	46	.57	174	148	322	.48
Last	15	21	35	.58	109	133	242	.58
Difference	+6*	+5	+11	−.01*	+64*	+15	+79	−.10*
BUSINESS CYCLES								
First	22	25	47	.53	...	...	...	...
Last	17	20	36	.54	...	...	...	...
Difference	+5*	+5	+10	0	...	...	...	...
	Ratio of variance between groups to variance within groups							
Deflated clearings	1.31	0.48	0.87	0.27	5.29	2.45	6.95J	1.71
Pig iron production	3.62	0.54	2.00	0.10	0.11	1.87	1.04	1.69
Freight car orders	3.81	0.12	2.17	0.50	0.41	0.64	0.54	0.02
Railroad stock prices	3.91	1.86	0.53	3.50	0.83	0.06	0.64	0.00§
Shares traded	1.75	0.25	0.57	1.02	0.06	0.28	0.12	0.75
Call money rates	1.07	0.64	1.12	0.03	1.71	0.18	1.37	1.29
Business cycles	0.91	0.64	1.18	0.00†	...	...	...	...

All measures are made from specific or business cycles marked off by peaks. The measures for business cycles are determined from the monthly reference dates in Table 16. For a full list of the cycles included in each group, see Appendix Table B8. The entries designated 'difference' are computed from averages carried to one more place than is shown in the table.

[a] If the highly exceptional cycle from 1918 to 1920 (see Ch. 12, Sec. III) is dropped, the averages of the successive amplitude measures are 131, 175, 306, .56.

* Indicates that the difference accords with expectations stated in the text; no definite expectations are advanced for col. (4) and (8).

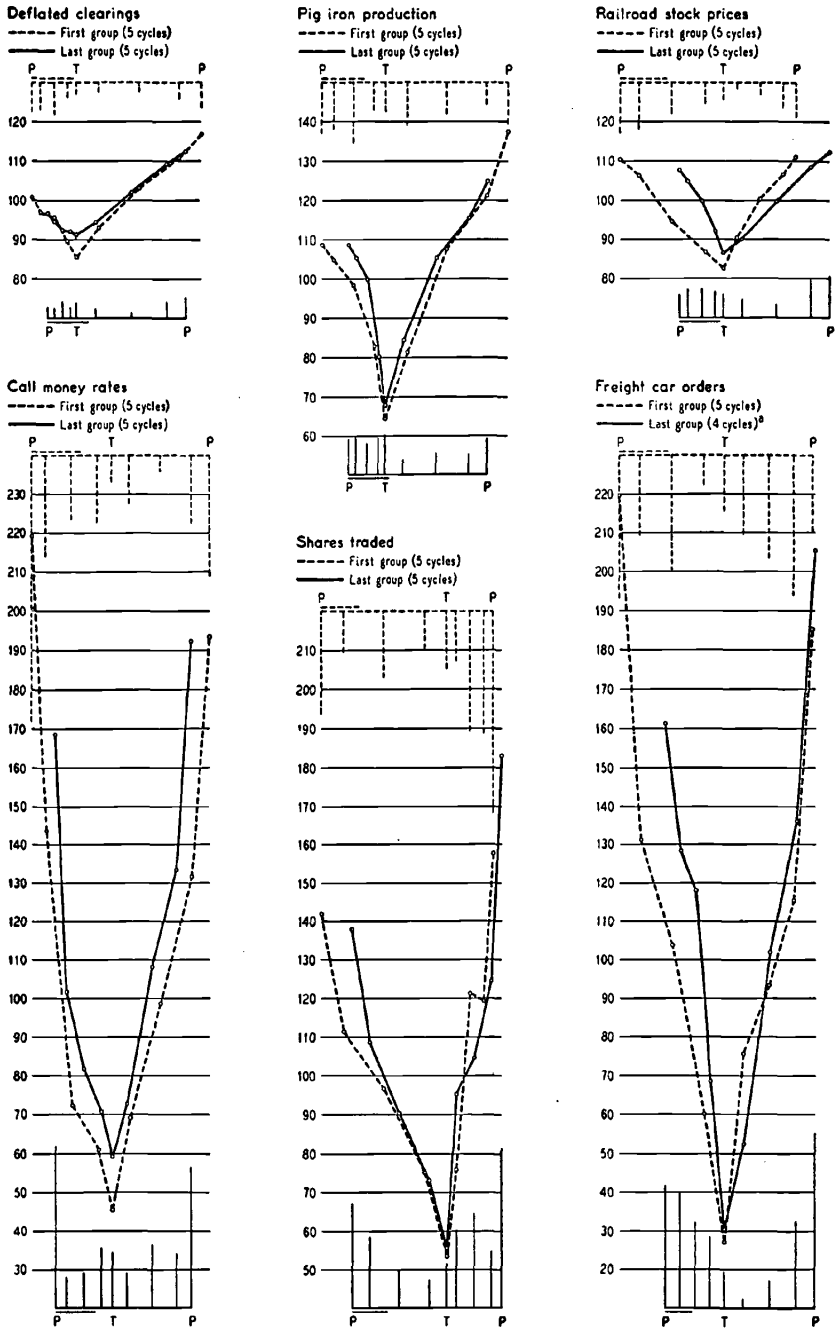
J Larger than the value that would be exceeded once in twenty times by chance.

† Smaller than the value that would be fallen short of once in twenty times by chance.

§ Smaller than the value that would be fallen short of once in a thousand times by chance.

CHART 69

Average Patterns of Specific Cycles Occupying First or Last Place within Kitchin's Major Cycles from 1883 to 1920
Six American Series
(Patterns made on inverted basis)



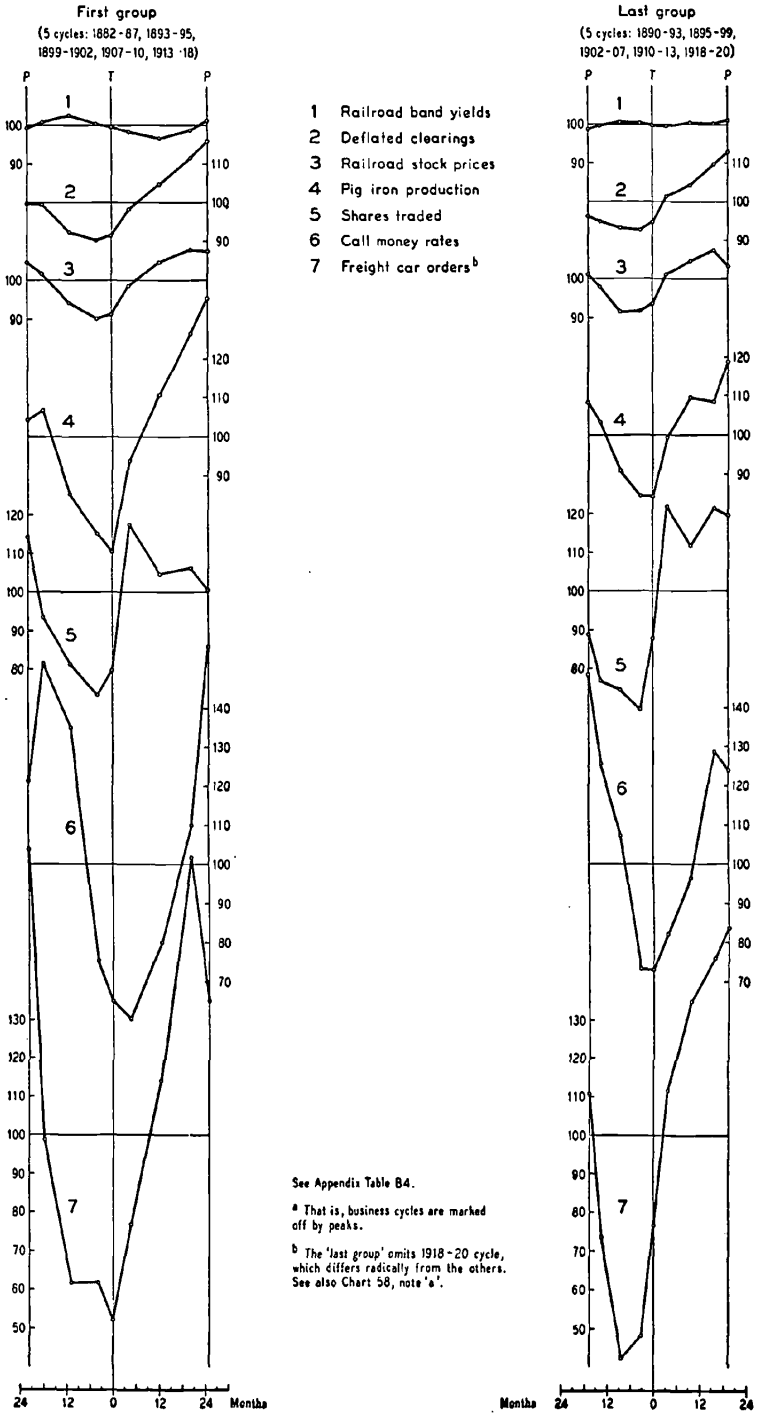
See Appendix Tables B2 and B8. For explanation of chart, see Ch. 5, Sec. VI.

*1918–20 cycle omitted because it differs radically from the others.

CHART 70

Average Patterns of Reference Cycles Occupying First or Last Place within Kitchin's Major Cycles from 1883 to 1920 Seven American Series

(Patterns made on inverted basis [a])



See Appendix Table B4.

[a] That is, business cycles are marked off by peaks.

[b] The 'last group' omits 1918-20 cycle, which differs radically from the others. See also Chart 58, note 'a'.

the same in each group of cycles.[32] One point that may arrest attention is that the business cycles occupying the first place within the major-cycle periods are longer on the average than the business cycles occupying the last place. But the averages represent their arrays badly: the first business cycle is longer than the last in two and shorter in three of the major-cycle periods.

Table 172 analyzes in detail the present classification. If the 'limit' of each major cycle is "distinguished by a maximum of exceptional height", we should find that the ratio of the rise to the full-cycle amplitude is smaller in the first than in the last specific cycle within the major cycles; also, perhaps, that the rise of the first specific cycle is smaller and the fall larger than the corresponding movement of the last specific cycle. Similar expectations may be advanced for the durations of expansions and contractions of the specific cycles.[33] We find that the amplitudes meet expectations in eleven out of eighteen instances; however, in only four of these eleven instances is the variance ratio above unity and in no instance is it statistically significant. Our expectations concerning durations of cyclical phases meet a better fate when we examine specific cycles, but collapse when we turn to business cycles. Nor does the table bring out anything concerning full cycles that warrants particular notice.[34] On the present evidence it seems that there are no substantial differences between business cycles according to their position within Kitchin's major cycles, and that such differences as do exist may well result from chance variations.

As stated before, our principal concern in this chapter is whether business cycles undergo substantial cyclical variations within the periods suggested by certain outstanding hypotheses of long cycles, not whether long cycles are genuine phenomena. We may, however, observe in passing that short-term interest rates, which play a critically important part in Kitchin's scheme, do not fit very closely his chronology of 'major crises' in the United States. In call money rates the supposedly 'minor' peaks of 1887 and 1890 are higher than the 'major' peak of 1893, the 'minor' peak of 1902 is above the 'major' peak of 1899, and the 'minor' peak of 1918 is above the 'major' peak of 1912. In commercial paper rates (a series not included in our sample) the 'minor' peak of 1887 is higher than the 'major' peak of 1883, and the 'major' peak of 1900 is below the 'minor' peaks of 1896, 1898 and 1903. These facts seem to discredit what little support Kitchin's hypothesis derives from the amplitude comparisons of interest rates in the preceding charts and table.

32 For the cycle-by-cycle measures, see Appendix Tables B2 and B4.

33 Kitchin asserts merely that there is a "tendency for minima to be nearer to the lower of two succeeding maxima". His 'ideal curve' of business cycles is drawn on this plan. Note also that according to this 'ideal curve' the rise of the first cycle *is* smaller and the fall larger than the corresponding movement of the last cycle. See Kitchin's article, *op. cit.*, pp. 12-13, 15.

34 In every series specific cycles average longer in the first group than in the last. But the differences between the averages are no more dependable for specific cycles than for business cycles.

VI Long Cycles Marked Off by Severe Depressions

Kitchin's adventure suggests another way of marking off major cycles. The economic development of modern nations has been characterized by a rising secular trend, the peak of each cycle in industrial activity being almost invariably higher than the preceding peak. Cyclical troughs show less uniformity in this respect. In deflated clearings, for example, the trough is lower in November 1884 than January 1882, in August 1893 than March 1891, in November 1914 than October 1910, and in March 1933 than September 1923. But every peak in clearings is higher than its predecessor during the period we analyze, except the peaks of June 1883 and October 1895. Prior to 1920 every cyclical peak in pig iron production tops the preceding peak, but three troughs reach lower than preceding troughs. In view of these facts it should be easier to mark off provisional 'major cycles' by severe depressions [35] in industrial activity than by 'booms'. It is also a more promising method if there is any substance in Schumpeter's scheme of Juglars or in the common opinion that violent depressions are due to the partial character of the liquidations effected during preceding contractions.[36]

American businessmen of today will readily agree that the depressions of 1920–21 and 1929–33 were exceptionally severe; their fathers held the same opinion about the depressions of 1907–08, 1893–94 and 1873–79. On the whole, the leading indexes of business conditions in the United States confirm these ratings.[37] If we judge by Dorothy Thomas' index of business conditions [38] in 1855–1914 and other statistical indicators in later years, the American list of very severe depressions seems to fit also British experience since the 1870's. We dare not carry the list of severe depressions further at present, because we lack confidence in indexes of business for these two countries before 1870 or for other countries before 1914. We regard even the present list as highly tentative.[39]

35 In general, contraction is a less ambiguous term than depression. But for our present purpose, depression is the better term, since we wish to emphasize the 'low level' of industrial activity reached at the end of contraction, rather than the degree of contraction. In an economy in which each cyclical peak is invariably, or almost invariably, higher than the preceding peak, a severe contraction is almost sure to end in severe depression and a mild contraction in a mild depression. Of course, if a cyclical peak is lower than its predecessor, a mild contraction might easily end in what we should have to describe as a severe depression of industry.

36 It may be recalled that the troughs of Wardwell's 'major cycles' are also supposed to be coincident with troughs of severe depressions. See above, Sec. II.

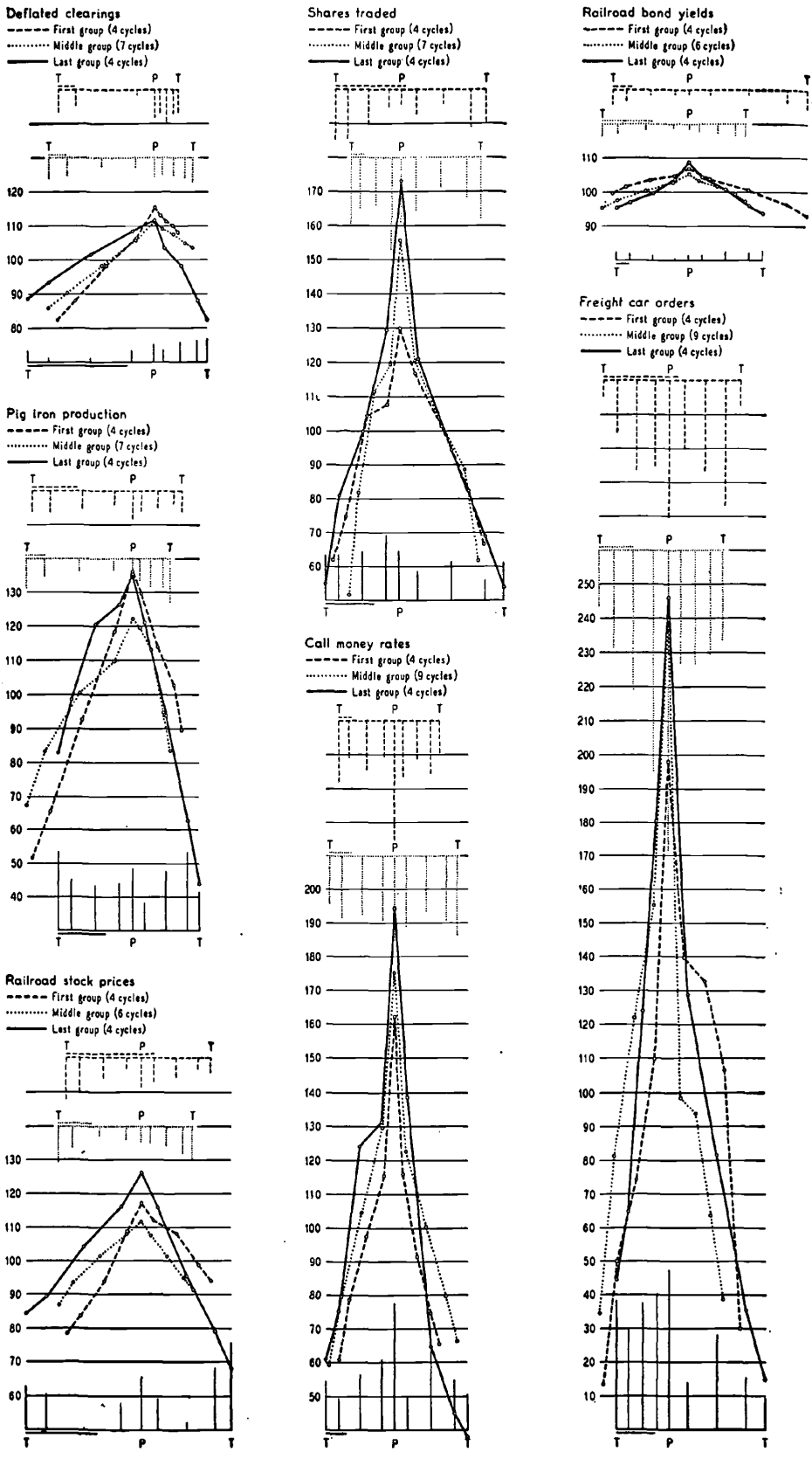
37 We ranked the amplitudes of the cyclical contractions from 1879 to 1933 in the indexes of business conditions compiled by Leonard P. Ayres, Warren M. Persons, and the American Telephone and Telegraph Company, then averaged the ranks, and adjusted the rank of the cyclical contraction in 1873–78 shown by Ayres' index (the only one available for this contraction) to the average ranks after 1878. The highest five average ranks correspond to the severe depressions just named. See Table 156, which however is restricted to 1879–1933; see also note 35.

38 An Index of British Business Cycles, *Journal of the American Statistical Association*, March 1925.

39 See below, pp. 462, 464.

CHART 71

Average Patterns of Specific Cycles Occupying First, Middle or Last Place within Periods Marked off by Troughs of Severe Depressions, 1879–1933
Seven American Series

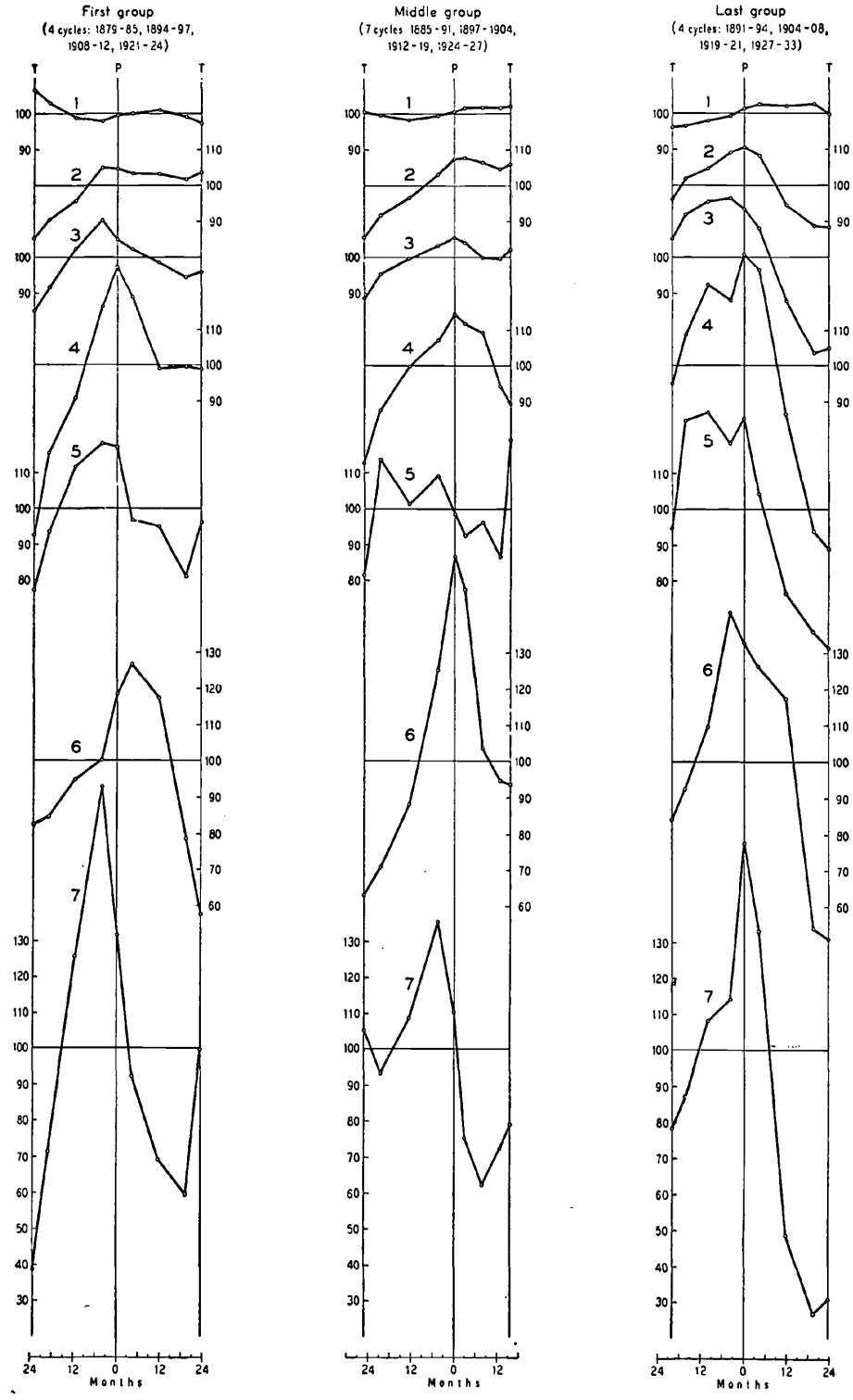


See comment on three horizontal lines in note to Chart 26; for other explanations, Ch. 5, Sec. VI. See also Appendix Tables B1 and B8.

CHART 72

Average Patterns of Reference Cycles Occupying First, Middle or Last Place within Periods Marked off by Troughs of Severe Depressions, 1879–1933
Seven American Series

1 Railroad bond yields
2 Deflated clearings
3 Railroad stock prices
4 Pig iron production
5 Shares traded
6 Call money rates
7 Freight car orders[a]



See Appendix Table B3.

[a] See Chart 58, note 'a'.

The above depression dates mark off four 'major cycles' between 1879 and 1933. According to our American reference dates, their minima came in March 1879, June 1894, June 1908, September 1921 and March 1933; according to the British reference dates, in June 1879, February 1895, November 1908, June 1921 and August 1932. The durations of the successive periods are approximately 15, 14, 13 and 12 years in the United States and 16, 14, 13 and 11 years in Great Britain. If we mark off the 'major cycles' by peaks preceding the severe depressions, the durations are about 19, 14, 13 and 9 years in the United States and 18, 17, 13 and 9 years in Great Britain. These periods include successively 4, 4, 4 and 3 business cycles in the United States and 2, 3, 3 and 3 business cycles in Great Britain. All this suggests a fair degree of uniformity, and gives point to an inquiry whether business cycles have varied cyclically during periods marked off by severe depressions.

Our first task is to distribute business cycles in the United States according to their position within these periods. Since the number of business cycles in these periods is sometimes three and sometimes four, we are forced to make somewhat arbitrary groupings. The 'first' group includes the business cycles, marked off by troughs, just following each severe depression; the 'last' group includes the business cycles within which the severe depressions fall; the remaining business cycles are thrown together in a 'middle' group. We have fitted the specific cycles into the periods of the major cycles, not into the distribution of business cycles within these periods. Thus we put in the 'first' group the specific cycles just following each severe depression, in the 'last' group the specific cycles that cover the severe depression, and in the 'middle' group all intervening cycles—of which there are usually two, occasionally none, and in one instance as many as four. Full details for each series are presented in Appendix Table B8.

Charts 71 and 72 show average patterns of the specific and reference cycles of our seven series distributed on the above plan. The charts suggest that this classification represents a fundamental line of cleavage. The vigor of the expansions in the 'first' group of cycles and the severity of the contractions in the 'last' group are arresting features. But there are no striking differences in the cyclical durations. Moreover, the relations among the cyclical patterns of our series are so similar from one group of cycles to another that it appears that the differences among the business cycles are merely differences of intensity, not differences of kind.[40]

Table 173 presents measures of the average amplitude of the three groups of specific cycles. In every series the average fall of the specific cycles is largest in the last group, as is also the joint rise and fall. Almost invariably the average ratio of rise to the joint rise and fall, in column (5), is lower in the last group than in the first or middle group of cycles. Well

[40] Cf. our *Bulletin 61*, pp. 19-20.

TABLE 173*

Average Amplitude of Specific Cycles Occupying First, Middle or Last Place within Periods Marked Off by Severe Depressions from 1873 to 1933

Seven American Series

Series and order of cycles between severe depressions (1)	Average amplitude in specific-cycle relatives			Average ratio of rise to total rise & fall of cycles marked off by	
	Rise (2)	Fall (3)	Rise & fall (4)	Troughs (5)	Peaks (6)
DEFLATED CLEARINGS					
First	33	7	40	.80	.55
Middle	26	8	33	.71	.76
Last	23	29	52	.46	.80
PIG IRON PRODUCTION					
First	85	46	131	.65	.56
Middle	55	38	93	.59	.64
Last	52	92	144	.38	.57
FREIGHT CAR ORDERS					
First	185	168	353	.53	.61
Middle	205	201	406	.52	.55
Last	202	231	433	.46	.41
RAILROAD STOCK PRICES					
First	39	23	62	.60	.49
Middle	25	21	46	.50	.50
Last	42	58	100	.42	.58
SHARES TRADED					
First	68	63	132	.51	.30
Middle	104	94	198	.53	.59
Last	118	119	237	.50	.66
CALL MONEY RATES					
First	101	97	198	.49	.24
Middle	116	109	225	.53	.55
Last	134	156	290	.45	.66
RAILROAD BOND YIELDS					
First	7	14	21	.39	.29
Middle	10	8	18	.53	.48
Last	14	15	29	.47	.65
	Ratio of variance among groups to variance within groups				
Deflated clearings	0.54	7.43‡	1.23	5.17‡	3.96
Pig iron production	6.01‡	6.56‡	4.70‡	7.64‡	0.75
Freight car orders	0.04†	0.24	0.11	1.11	1.56
Railroad stock prices	0.59	2.01	1.27	0.86	0.18
Shares traded	2.00	2.59	2.73	0.12	4.31‡
Call money rates	0.35	1.49	0.91	0.69	11.53‡
Railroad bond yields	1.47	1.91	3.22	0.44	2.88

The measures in col. (2)-(5) are made from specific cycles marked off by troughs and distributed according to their position within periods separated by the trough dates of severe depressions. The measures in col. (6) are made from cycles marked off by peaks and distributed according to their position within periods separated by the beginning dates of severe depressions. The former cover the period from about 1879 to 1933, the latter from about 1873 (or somewhat later) to 1929. The classification of cycles is shown in full in Appendix Table B8.

‡Larger than the value that would be exceeded once in twenty times by chance.
‡Larger than the value that would be exceeded once in a hundred times by chance.
‡Larger than the value that would be exceeded once in a thousand times by chance.
†Smaller than the value that would be fallen short of once in twenty times by chance.

over half of the variance ratios in columns (2)-(5) exceed unity, and as many as six are statistically significant. Of course, these systematic differences among the amplitudes in our several groups are natural concomitants of the scheme of classification, especially in iron production and clearings, which count heavily in the index numbers we have used to rate business depressions.[41] Column (6), however, stands on a different footing. If specific cycles are taken on an inverted basis and arranged according to their position within periods marked off by the *beginning* dates of severe depressions, there is no longer an inherent tendency for the ratio of the rise to the full-cycle amplitude to vary according to the position of the cycles within these periods. The high variance ratios in this column cannot be regarded as inevitable concomitants of our scheme of classification, and they direct attention to one provocative feature of the evidence.

This feature is that the series representing industrial activity seem to behave in a different way within the provisional long-cycle periods than do the series representing interest rates and speculation. While the average rise is largest in the first and smallest in the last group of specific cycles in both iron production and deflated clearings, it is smallest in the first and largest in the last group in bond yields, call money rates, and shares traded. In the last group of cycles the average rise is nearly the same as the average fall in shares traded and bond yields, not much smaller in call money rates, but considerably smaller in iron production. These differences suggest a hypothesis along the following lines. After a severe depression industrial activity rebounds sharply, but speculation does not. The following contraction in business is mild, which leads people to be less cautious. Consequently, in the next two or three cycles, while the cyclical advances become progressively smaller in industrial activity, they become progressively larger in speculative activity. Finally, the speculative boom collapses and a drastic liquidation follows, which ends this cycle of cycles and brings us back to the starting point. This hypothesis will repay exploration and may turn out to have substance; but what the cycle-by-cycle measures in Table 174 show is that the rises and falls of different activities do not follow invariably the above or any other simple pattern.[42] The picture appears to be one of partial cumulation of successive cycles; but the relations are not sufficiently regular in the records before us to justify us in regarding the business cycles separated by severe depressions as subdivisions of long cycles.

41 The 'significant' variance ratios do not necessarily mean that all three groups of cycles are strongly differentiated: in pig iron production the variance ratio for the rise reflects mainly the difference between the first group of cycles and the others, while the variance ratio for the fall reflects mainly the difference between the last group of cycles and the others.

42 The table shows, besides our standard measures of amplitude, the rise expressed as a percentage of the standing at the trough and the decline expressed as a percentage of the standing at the peak. These measures are perhaps simpler to interpret when successive cycles are being compared. They can be derived readily from columns (2)-(4) of our standard Table S2 (see p. 133).

TABLE 174

Amplitude of Specific Cycles Occupying Successive Places within Periods Bounded by Troughs of Severe Depressions, 1879–1933

Four American Series

Series and period[a] between severe depressions	First specific cycle[b]		Second specific cycle		Third specific cycle		Last specific cycle[c]	
	Rise	Fall	Rise	Fall	Rise	Fall	Rise	Fall
Amplitude expressed as percentage of monthly average during the cycle								
Pig iron production								
1879–1894	64	25	65	26	50	47	45	64
1894–1908	87	61	76	30	49	50	74	63
1908–1921	79	42	45	57	62	40	41	91
1921–1933	108	59	36	19	...	...	50	149
Deflated clearings								
1879–1894	52	13	37	6	28	8	17	26
1894–1908	22	10	36	6	21	6	27	25
1908–1921	31	3	11	12	40	5	12	11
1921–1933	19	6	...	...	...	...	...	55
Call money rates								
1879–1894	124	166	174	156	142	143	160	192
1894–1908	199	171	151	129	149	173	211	211
1908–1921	87	61	84	102	120	31	61	77
1921–1933	33	75	66	27	...	...	102	146
Shares traded								
1879–1894	103	62	62	83	51	38	94	115
1894–1908	62	68	129	108	182	176	113	85
1908–1921	45	79	71	110	129	84	144	135
1921–1933	63	46	102	58	...	...	121	141
Amplitude expressed as percentage of standing at beginning of the phase[d]								
Pig iron production								
1879–1894	115	21	97	19	68	38	67	56
1894–1908	169	44	145	24	71	42	144	50
1908–1921	131	30	54	44	118	35	45	70
1921–1933	278	40	50	17	...	...	41	86
Deflated clearings								
1879–1894	79	11	46	6	33	7	19	24
1894–1908	25	9	44	5	25	6	32	23
1908–1921	39	3	12	11	52	4	13	10
1921–1933	21	5	...	...	...	...	...	44
Call money rates								
1879–1894	174	85	449	73	304	76	256	86
1894–1908	580	73	286	63	248	83	669	87
1908–1921	171	44	118	66	274	19	80	56
1921–1933	36	60	132	23	...	...	139	83
Shares traded								
1879–1894	324	46	84	61	74	31	118	66
1894–1908	85	51	440	68	518	81	348	59
1908–1921	55	62	89	73	554	55	251	67
1921–1933	102	36	196	38	...	...	238	82

[a] The periods refer to groups of business cycles and hence are identical for each series; the corresponding specific-cycle periods differ somewhat.

[b] Two specific cycles in deflated clearings and three in call money rates occupy approximately the same period as the business cycle from 1879 to 1885. To simplify comparisons we ignore here (but not in Tables 173 and 175) the 'extra' cyclical movements; that is, the trough-peak-trough dates in clearings are taken as March 1878, June 1883 and Nov. 1884, and in call money rates Sept. 1878, Feb. 1881 and Jan. 1885.

[c] That is, the fourth cycle in each of the first three periods, but the third cycle in the fourth and last period. During 1921–33 clearings show only two specific cycles; the expansion of the second cycle is omitted, since it runs from 1923 to 1929.

[d] The standings include as a rule the 3 months centered on the month of turn, but in a few instances they include 1 or 2 months only. See Appendix Table B1.

Table 175 seems to support this judgment. Cyclical durations played no part in dating the periods we are investigating and therefore provide an independent test of the hypothesis that business and specific cycles vary cyclically within these periods. We find that the differences between the first and last groups are, on the whole, in the same direction as those between the first and last groups within 'Juglar cycles', but they are less impressive. Few variance ratios exceed unity, and not one in the table is 'significantly large'. There is a rough suggestion that the durations of British business cycles may have varied according to their position within periods separated by severe depressions, but little or no evidence that the durations of American business cycles have done so.

It is important to bear in mind that our ratings of business depressions are surrounded by uncertainty, and that for this reason, if for no other, it is desirable to suspend judgment concerning the nature of the periods marked off by severe depressions. The indexes of business conditions on which we have relied are made from slender samples in the early years. Another and more vital difficulty is that the cyclical depressions of experience do not group themselves readily into mild and severe types.[43] The contraction of 1882–85 has no place in our list of the severest five depressions in the United States between 1873 and 1933. It would have a place if we included the severest six depressions. It would have a place even in a list of five, replacing the contraction of 1907–08, if we made our selection according to Persons' index of 'production and trade' or according to Eckler's ratings,[44] instead of according to the combined indications of the three indexes of business that we have used. But if the contraction of 1882–85 is placed on the list of severe depressions, we get one severe depression succeeding another, and the neat distribution of business cycles that we have been elaborating is disrupted at the start. This would happen automatically if business depressions were rated according to their duration and amplitude, instead of their amplitude alone—as we have done. For when the cyclical contractions from 1879 to 1933 in our three indexes are ranked on the joint criterion,[45] all three agree that the contraction from 1882 to 1885 was only less severe than the contraction of 1929–33. And if we look beyond 1933, even the simple amplitude criterion proves embarrassing since the contraction of 1937–38 in the United States was apparently even severer than that of 1920–21; so that

[43] Cf. Mitchell, *Business Cycles: The Problem and Its Setting*, pp. 350-2.

[44] See his paper, A Measure of the Severity of Depressions, 1873-1932, *Review of Economic Statistics*, May 15, 1933.

[45] The troughs of Schumpeter's Juglars (since the 1870's and barring the trough in 1904) seem to be troughs of severe depressions on the joint criterion. Note the application of this criterion in Table 53.

But as note 19 in Ch. 6 implies, the joint criterion is inadequate so far as it ignores cyclical patterns. The contraction of 1882 to 1885 was very mild in the early stages; if we allowed for its peculiar pattern, it would not rank as high in a list of severe depressions as it does when the ranks are determined on the basis merely of duration and amplitude.

TABLE 175

Average Duration of Specific Cycles in Seven American Series and of American and British Business Cycles Occupying First, Middle or Last Place within Periods Marked Off by Severe Depressions from 1873 to 1933

Series and order of cycles between severe depressions (1)	Average duration of specific or business cycles in months: Expansion (2)	Contraction (3)	Full cycle (4)	Average ratio of expansion to full cycles marked off by: Troughs (5)	Peaks (6)
DEFLATED CLEARINGS					
First	29	7	36	.80	.78
Middle	32	11	43	.73	.73
Last	38	16	54	.71	.82
PIG IRON PRODUCTION					
First	30	15	45	.67	.68
Middle	32	11	43	.74	.71
Last	22	20	42	.54	.65
FREIGHT CAR ORDERS					
First	20	21	40	.46	.39
Middle	20	16	36	.52	.51
Last	16	28	44	.36	.46
RAILROAD STOCK PRICES					
First	22	21	43	.51	.39
Middle	25	15	40	.62	.57
Last	35	27	62	.53	.70
SHARES TRADED					
First	20	25	45	.43	.31
Middle	15	24	39	.40	.37
Last	22	31	53	.40	.50
CALL MONEY RATES					
First	16	14	30	.54	.48
Middle	19	19	38	.49	.52
Last	20	22	42	.46	.56
RAILROAD BOND YIELDS					
First	23	35	58	.38	.41
Middle	26	17	42	.62	.52
Last	21	22	43	.48	.60
BUSINESS CYCLES, U. S.					
First	23	24	47	.50	.49
Middle	25	16	41	.61	.54
Last	20	24	44	.46	.59
BUSINESS CYCLES, G. B.					
First	49	24	74	.67	.59
Middle	26	14	40	.58	.52
Last	26	30	56	.44	.55
	Ratio of variance between groups to variance within groups				
Deflated clearings	0.36	0.88	0.72	0.44	1.20
Pig iron production	0.99	0.96	0.04†	1.89	0.30
Freight car orders	0.20	2.28	0.28	0.94	0.72
Railroad stock prices	0.55	0.99	0.92	0.69	2.60
Shares traded	0.55	0.49	0.86	0.04†	0.79
Call money rates	0.16	1.07	2.25	0.15	0.26
Railroad bond yields	0.10	2.32	1.89	1.19	0.79
Business cycles, U. S.	0.40	1.24	0.29	1.19	0.72
Business cycles, G. B.	2.32	1.32	1.94	1.32	0.12

The measures for business cycles are derived from the monthly reference dates in Table 16. For further explanations, see note to Table 173.

†Smaller than the value that would be fallen short of once in twenty times by chance.

once again we get one severe depression following upon another. These difficulties are not necessarily fatal to the chronological scheme we have tested, for it may be better to select severe depressions from small clusters of cycles than from an array covering all cycles. But the difficulties we have recited at least invite caution. It is wiser to wait until the researches now in process yield authentic ratings of business depressions before expending much effort in elaborating the hypothesis that the periods separating severe depressions are genuine cyclical units.

VII Conclusions and Plans for Later Work

From the tests in this chapter we cannot draw any far-reaching conclusions. In the first place, we have analyzed only a small sample of time series and tested only a few hypotheses. In the second place, our technical methods are rough. We have made no allowance for substantial leads or lags that might possibly characterize cyclical variations in the specific cycles of different activities; our probability tests are approximate at best; and our techniques are insensitive to the possible coexistence of several cyclical swings, each with a different period, in business cycles. In view of these limitations we are in no position to say whether business cycles have or have not varied cyclically.

But that basic problem is also beyond the scope of this chapter. Our analysis was designed to determine whether there is any clear presumption for the belief that business and specific cycles have varied substantially according to their position within the long cycles dated by different investigators, rather than whether business cycles are grouped into genuine higher units. We have not found substantial variations within the alleged long cycles, except in the so-called 'Juglar cycles' and the periods explicitly marked off by dates of severe depressions. Even in these periods the systematic variations between business cycles in the different groups that we distinguished seem less impressive than their common features, the systematic differences found in the averages do not invariably mark each of the alleged long cycles, and their dates are surrounded by uncertainties independent of our results. We therefore conclude that strong reasons do not now exist for organizing cyclical measures on the assumption that business cycles have varied cyclically within the periods suggested by any of the hypotheses of long cycles that we have noted. Both the studies in this chapter and our general knowledge of economic time series suggest that if cyclical changes have occurred in business cycles, they cannot have been so pronounced and dominating as to jeopardize the value of the approximate descriptions of cyclical behavior afforded by our over-all averages.

There is a sharp contrast between chronologies of business cycles and chronologies of long cycles. In Chapter 4, Section VI we found that statis-

tical investigators, even when they have used widely different samples of time series and different techniques of measurement, have drawn up similar chronologies of business cycles. That result would be unlikely if business cycles failed to leave a clear imprint on statistical records of important economic activities. Since statistical investigators of long cycles, as we have seen in this chapter, reach widely divergent results, it seems reasonable to infer that cycles in general business activity of a higher order than business cycles are probably far from being a clear or pronounced feature of economic development.

These preliminary conclusions must suffice for the present. At a later time they will be tested thoroughly. As already stated, one of the main problems to be explored in the concluding volume of this series is whether business cycles have been subject to secular, structural or cyclical changes as well as to the haphazard changes that everyone recognizes. When we undertake that task we shall probably find that we need new cyclical measures as well as additional time series. Such things are learned best in working on a problem intensively, but it is also desirable in the course of current work to assemble materials that seem likely to facilitate later studies. In the preceding chapter we explained how we modify our standard technique to take account of secular changes in cyclical behavior that are prominent in some series. We shall now add a few illustrations of how we provide materials concerning cyclical changes in cyclical behavior.

In passing from one economic factor to another, we make an effort to note long cycles whenever they appear clearly in the raw data of individual series. We mark off these cycles, and measure their duration and amplitude, in the same manner as the specific cycles. We also set out their relation in time to the shorter cycles in which our interest centers, and contrast the behavior of specific cycles during the rise and fall of the long cycles. Tables 161-163 illustrate some of these steps. We have analyzed on this general plan railroad stock prices and number of shares traded, two series in our present sample; also the American series on real estate trading, immigration, and numerous series on building construction. All these activities show specific cycles bunched in long cycles averaging fifteen to twenty years, though the timing of the long cycles differs from series to series. In prices of commodities at wholesale and long-term interest rates we find much longer and seemingly more doubtful major cycles. We have not attempted to measure the major cycles in these series, but have found it instructive to take separate averages of their specific and reference cycles for periods of rising and falling 'trends', as well as averages in which the rising and falling 'trends' are allowed to neutralize each other. Whether or not these materials will put us on the path of true cyclical changes in business cycles, they are sure to help us understand better than we do now why no two business cycles in actual life have ever run exactly the same course.