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CHAPTER 7

Long Cycles

THROUGHOUT our description of the secular behavior of capital formation it was necessary to take frequent note of the giant, recurring swings which characterize these series. A meaningful definition of longer-term drift required some systematic method for penetrating—or seeing beyond—the short-term fluctuations. The use of nine-year moving averages removed in considerable measure the evidence of business cycles and "random" movements. In output this was generally sufficient, for in these series there is no pronounced evidence of long cycles.[1] Nor do clearly perceptible fluctuations of this nature appear in the annual increments in output. But in capital formation substantial swings, of considerable magnitude as well as duration, remained. For this reason special precautions were necessary in order to avoid a distorted picture of the secular trend. Either changes were measured from peak to peak or from trough to trough of the long cycles, or mathematical curves were fitted which generally pierced their midpoints, or—at a minimum—mental, informal account was taken of their behavior in comparing sequences of decade or nine-year averages. This requirement compels us to turn—at least briefly—to a description of the long cycles themselves, bearing in mind that such phenomena lie at the borderline of our central interest and that our data are but imperfectly suited to their analysis.

The Measurement of Long Cycles

Visually, the long cycles in the capital formation of all regulated industries are most clearly depicted in the center and lower panels of Chart 1. A first glance might suggest that little question could arise concerning their definition and measurement, given the magnitude of the towering waves under review. But this is true only in part. It makes considerable difference, for example, whether we focus attention upon the annual data or on the nine-year moving averages. The difference occurs primarily in the period from the 1870's through the 1890's. In the annual data, two substantial cycles appear with peaks in 1881 and 1893, and troughs in 1875, 1885, and 1896. It should be noted that the first of these is roughly coincident

[1] This is not to say that there is no evidence *at all* of long cycles in either output or changes in output. The point is that in these cases long cycles are not distinctly apparent in the raw data—either annual or nine-year moving averages. On the other hand, they are unmistakably present in the corresponding series for capital formation. However, if tested for *conformity* to long cycles, the output series would on this basis yield positive results.

with one of the more severe business cycles dated in the National Bureau of Economic Research chronology.[2] In the nine-year moving averages these two cycles are considerably smoothed, and it is possible to discern an underlying wave of greater duration than either, moving from a trough in 1876 to a peak at about 1891 and to a terminal trough in 1898. Aside from this, the difference in the timing of cycles in the annual data and in the nine-year moving averages are minor. Yet the exception is most significant. Whether to date two cycles or one during the years from the 1870's to the 1890's cannot be decided on purely empirical grounds.

The fundamental question on which a decision must turn concerns the very meaning of long cycles. Do they reflect the play of forces which extend *beyond* the range of ordinary business cycles, and comprise a distinctive causal nexus of their own? Were we able to identify such forces, we would possess a reliable guide for the statistical definition of these fluctuations. Or are long cycles *illusory*, in the sense that they reflect only the more or less chance juxtaposition of major and minor business cycles? Consistent with the latter thesis is the fact that each long cycle downturn is coincident with a major business depression. On the other hand, this is no more than would be expected if we were to assume that long cycles were an economic as well as a statistical reality. For a long cycle downturn would be *conducive* to major depressions.

These are questions which we may raise, but not answer, in the present brief survey. The final section of this chapter is designed to cast a modest light on some of the problems which arise in this connection. In the meantime we shall give principal attention to the hypothesis that long cycles are authentic reflections of forces extending *beyond* the duration of business cycles. Our decision is prompted primarily by the desire to make possible comparison with other studies conducted on a similar assumption. As in these other studies, we work with the nine-year moving averages, for these smooth out business cycle movements with reasonable effectiveness. But the underlying question, itself, we leave open. Measurements of long cycles based on nine-year moving averages are given for all regulated industries and, insofar as they occur, in each of the individual components in Tables 33 through 37. We also present measurements based on the annual data in Tables 38 through 43. But note that in the latter set a cogent question can be raised concerning *what* is being measured. For in the annual data business cycles, even the fairly small ones appear. We have felt that no

[2] Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (National Bureau of Economic Research, 1946), p. 78.

service would be performed, in the present connection, by dating all of these. Hence, we have concentrated simply on the *largest* waves which stand out rather clearly in the data. Such measurements provide some comparison with those based on the nine-year moving averages. But since the fluctuations marked off include at least one ordinary business cycle, they can be called *long* cycles only loosely.

The Pattern of Long Cycles

We direct attention first to Table 33, which summarizes the characteristics of long cycles as they appear in the nine-year moving averages of the gross capital formation, in constant dollars, of all regulated industries in the aggregate. Since the fluctuations appear much the same in net and gross investment, we have confined analysis to the latter.

The peaks and troughs presented in the first three columns are the successive high and low points as they appear in the nine-year moving averages. Though particular years are cited, they should be interpreted as designating the general neighborhood of a *period of years* in which long cycles change direction. This interpretation follows from our tentatively adopted concept of long cycles as recurrent patterns of economic events lasting longer than business cycles. It also results from the observation that if we had used seven-year or eleven-year moving averages (either of which would have smoothed the business cycles), our turning points would have been altered somewhat.

Columns 4 through 6 of the table present the duration of the expansions, contractions, and of the total cycles in the gross capital formation of the regulated industries. Measured in the nine-year moving averages, they vary from 17 to 22 years and average a little less than 20. Expansions are regularly longer than contractions, averaging 12 years as against 8. There is a suggestion, too, of a progressive decline over time in the length of the total cycles, but as the remaining columns of the table show, this was coupled with a sharp advance in amplitude.

The data appearing in columns 7 through 9 of Table 33 represent investment at the initial trough, peak, and terminal trough of each of the cycles. In the lower panel of the table these figures are given in millions of 1929 dollars. In the upper panel they are given in the form of relatives—the value at each turning point being expressed as a percentage of the average annual investment during the full course of the cycle in which it falls. The measures of amplitude in columns 10 and 11 are derived from the three previous columns by subtraction.

TABLE 33

All Regulated Industries: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Nine-Year Moving Averages

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1876	1891	1898	15	7	22	61	122	116	61	6	67	4.1	0.9	3.0
1898	1910	1918	12	8	20	55	130	87	75	43	118	6.2	5.4	5.9
1918	1927	1935	9	8	17	72	134	62	62	72	134	6.9	9.0	7.9
1935	1946[a]		11	–	–	70	146	–	76	–	–	6.9	–	–
	Average		12	8	20	64	133	88	68	40	107	6.0	5.1	5.6
						IN MILLIONS OF 1929 DOLLARS								
1876	1891	1898	15	7	22	464	930	884	466	46	512	31.0	6.6	23.3
1898	1910	1918	12	8	20	884	2,113	1,415	1,229	698	1,927	102.4	87.2	96.4
1918	1927	1935	9	8	17	1,415	2,619	1,214	1,204	1,405	2,609	133.8	175.6	153.5
1935	1946[a]		11	–	–	1,214	2,542	–	1,328	–	–	120.7	–	–
	Average		12	8	20	994	2,051	1,171	1,057	716	1,683	97.0	89.8	91.1

[a] Terminal date of series rather than peak.

Source: Appendix Table K–2.

Thus the magnitude of the long cycles is evident here even more distinctly than in the chart. The extent of the movement in full, including rise and fall together, was equivalent on the average to more than 100 per cent of the average annual investment during a long cycle. As might be anticipated in a series in which the secular movement is upward, expansions exceed contractions with the former amounting on the average to nearly 70 per cent and the latter to 40 per cent. The *pace* of the movement was also greater during expansions, as shown in the columns giving amplitude per year. However, it is in keeping with the *declining* secular rate of increase in the capital formation of the regulated industries that contractions have grown progressively over time on both an absolute and relative basis. The amplitude of expansions, on the other hand, showed only a faint tendency to increase. Accordingly, the two movements were of almost equal magnitude in the most recent periods. Moreover, the amplitude of the whole cycle—rise and fall together—advanced sharply and steadily over the eighty-year period, from 67 per cent of the average annual investment in the 1876–98 cycle, to 118 per cent in 1898–1918, and to 134 per cent in the cycle which lasted from 1918 to 1935. These swings are measured from trough to trough. When taken from peak to peak the trend is about equally pronounced. Amplitudes advanced from 81 per cent in the first cycle lasting from 1891 through 1910, to 105 per cent in the second and to 148 per cent in the third. Of course, since our record covers only three and one-half cycles, conclusions concerning secular trends in their behavior must be tentative at most. In the evaluation of these secular changes, however, some further progress may be achieved through a comparative analysis of the individual components of the regulated industries.

A glance at Charts 4 through 9 will verify that swings of the kind described for the aggregate of the regulated industries do not appear, or are but indistinctly traced, in the capital formation of local bus lines or of street and electric railways. But they are clearly evident in the other components at least for a part, if not the whole, of the period of record. For these, descriptive analyses were prepared similar to the analysis compiled for the long cycles in the total. They are presented in Tables 34 through 43.

One important difference among these components lies in their reaction to the first of the cycles which appeared in the aggregate. It seems that this movement, beginning with the trough in 1876 and moving on to a peak in 1891 and to the terminal trough of 1898, is skipped, or is only partially reflected, in all of the components except railroads. It is primarily for this reason, of course, that this

TABLE 34

Steam Railroads: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Nine-Year Moving Averages

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1876	1890	1899	14	9	23	73	127	60	54	67	121	3.9	7.4	5.3
1899	1910	1918	11	8	19	42	141	73	99	68	167	9.0	8.5	8.8
1918	1926	1935	8	9	17	88	134	50	46	84	130	5.8	9.3	7.6
1935	1946[a]	–	11	–	–	68	127	–	59	–	–	5.4	–	–
	Average		11	9	20	68	132	61	64	73	139	6.0	8.4	7.2
						IN MILLIONS OF 1929 DOLLARS								
1876	1890	1899	14	9	23	377	652	309	275	343	618	19.6	38.1	26.9
1899	1910	1918	11	8	19	309	1,038	539	729	499	1,228	66.3	62.4	64.6
1918	1926	1935	8	9	17	539	824	305	285	519	804	35.6	57.7	47.3
1935	1946[a]		11	–	–	305	572		267	–	–	24.3		
	Average		11	9	20	383	772	384	389	454	883	36.4	52.7	46.3

[a] Terminal date of series rather than peak.

Source: Appendix Table K-2.

TABLE 35

Electric Light and Power: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Nine-Year Moving Averages

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
	1910[a]	1917	–	7	–	–	110	76	–	34	–	–	4.9	–
1917	1927	1936	10	9	19	52	151	59	99	92	191	9.9	10.2	10.1
1936	1946[b]		10	–	–	72	149	–	77	–	–	7.7		
	Average		10	8	19	62	137	68	88	63	191	8.8	7.6	10.1
						IN MILLIONS OF 1929 DOLLARS								
	1910[a]	1917	–	7	–	–	356	247	–	109	–	–	15.6	–
1917	1927	1936	10	9	19	247	713	279	466	434	900	46.6	48.2	47.4
1936	1946[b]		10	–	–	279	575	–	296	–	–	29.6		
	Average		10	8	19	263	548	263	381	272	900	38.1	31.9	47.4

[a] Since the nine-year moving averages of gross capital expenditures show a steady rise through 1910, the long cycle analysis begins with this year.

[b] Terminal date of series rather than peak.

Source: Table K–2.

TABLE 36

Telephones: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Nine-Year Moving Averages

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
	1908[a]	1917	–	9	–	–	108	99	–	9	–	–	1.0	–
1917	1927	1936	10	9	19	55	142	74	87	68	155	8.7	7.6	8.2
1936	1946[b]		10	–	–	60	155	–	95	–	–	9.5	–	–
	Average		10	9	19	58	135	86	91	38	155	9.1	4.3	8.2
						IN MILLIONS OF 1929 DOLLARS								
	1908[a]	1917	–	9	–	–	161	147	–	14	–	–	1.6	–
1917	1927	1936	10	9	19	147	376	196	229	180	409	22.9	20.0	21.5
1936	1946[b]		10	–	–	196	510	–	314	–	–	31.4	–	–
	Average		10	9	19	172	349	172	272	97	409	27.2	10.8	21.5

[a] Since the nine-year moving averages of gross capital expenditures show a steady rise through 1908, the long cycle analysis begins with this year.

[b] Terminal date of series rather than peak.

Source: Appendix Table K-2.

TABLE 37

All Other Utilities: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Nine-Year Moving Averages

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1898[a]	1913	1918	15	5	20	43	138	124	95	14	109	6.3	2.8	5.5
1918	1927	1935	9	8	17	72	129	70	57	59	116	6.3	7.4	6.8
1935	1946[b]		11	–	–	64	162	–	98	–	–	8.9	–	–
	Average		12	6	18	60	143	97	83	36	112	7.2	5.1	6.2
						IN MILLIONS OF 1929 DOLLARS								
1898[a]	1913	1918	15	5	20	116	371	333	255	38	293	17.0	7.6	14.7
1918	1927	1935	9	8	17	333	599	323	266	276	542	29.6	34.5	31.9
1935	1946[b]		11	–	–	323	816	–	493	–	–	44.8	–	–
	Average		12	6	18	257	595	328	338	157	418	30.5	21.0	23.3

[a] Since the nine-year moving averages of gross capital expenditures do not show any cyclical behavior prior to this year, the analysis begins with the cycle of 1898–1918.

[b] Terminal date of series rather than peak.

Source: Appendix Table K–2.

TABLE 38

All Regulated Industries: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1875	1881	1885	6	4	10	46	192	74	146	118	264	24.3	29.5	26.4
1885	1893	1896	8	3	11	51	174	69	123	105	228	15.4	35.0	20.7
1896	1910	1919	14	9	23	38	155	68	117	87	204	8.4	9.7	8.9
1919	1929	1933	10	4	14	49	141	29	92	112	204	9.2	28.0	14.6
1933	1948[a]		15	–	–	35	228	–	193	–	–	12.9	–	–
	Average		10.6	5.0	14.5	44	178	60	134	106	225	14.0	25.6	17.7
						IN MILLIONS OF 1929 DOLLARS								
1875	1881	1885	6	4	10	270	1,138	440	868	698	1,566	144.7	174.5	156.6
1885	1893	1896	8	3	11	440	1,498	592	1,058	906	1,964	132.3	302.0	178.5
1896	1910	1919	14	9	23	592	2,389	1,048	1,797	1,341	3,138	128.4	149.0	136.4
1919	1929	1933	10	4	14	1,048	2,999	618	1,951	2,381	4,332	195.1	595.3	309.4
1933	1948[a]		15	–	–	618	4,062		3,444	–	–	229.6		
	Average		10.6	5.0	14.5	594	2,417	675	1,824	1,332	2,750	166.0	305.2	195.2

[a] Tentative peak.

Source: Appendix Table B–1.

TABLE 39

Steam Railroads: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1875	1881	1885	6	4	10	43	199	70	156	129	285	26.0	32.2	28.5
1885	1893	1896	8	3	11	61	186	21	125	165	290	15.6	55.0	26.4
1896	1910	1919	14	9	23	18	182	52	164	130	294	11.7	14.4	12.8
1919	1923	1933	4	10	14	52	156	21	104	135	239	26.0	13.5	17.0
1933	1949[a]		16	–	–	30	173	–	143	–	–	8.9		
	Average		9.6	6.5	14.5	41	179	41	139	140	279	17.7	28.8	21.1
						IN MILLIONS OF 1929 DOLLARS								
1875	1881	1885	6	4	10	211	982	347	771	635	1,406	128.5	158.8	140.6
1885	1893	1896	8	3	11	347	1,064	122	717	942	1,659	89.6	314.0	150.8
1896	1910	1919	14	9	23	122	1,216	345	1,094	871	1,965	78.1	96.8	85.4
1919	1923	1933	4	10	14	345	1,035	140	690	895	1,585	172.5	89.5	113.2
1933	1949[a]		16	–	–	140	799	–	659	–	–	41.2		
	Average		9.6	6.5	14.5	233	1,020	238	787	836	1,623	102.0	164.7	122.4

[a] Tentative peak.

Source: Appendix Table C-1.

TABLE 40

Electric Light and Power: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
	1912[a]	1918	–	6	–	–	164	41	–	123	–	–	20.5	–
1918	1924	1934	6	10	16	25	161	28	136	133	269	22.7	13.3	16.8
1934	1949[b]		15	–	–	33	242	–	209	–	–	13.9	–	–
	Average		10	8	16	29	189	34	172	128	269	18.3	16.9	16.8
						IN MILLIONS OF 1929 DOLLARS								
	1912[a]	1918	–	6	–	–	493.9	124.0	–	369.9	–	–	61.6	–
1918	1924	1934	6	10	16	124.0	812.7	143.0	688.7	669.7	1,358.4	114.8	67.0	84.9
1934	1949[b]		15	–	–	143.0	1,060.7	–	917.7	–	–	61.2	–	–
	Average		10	8	16	134	789.1	134	803.2	519.8	1,358.4	88.0	64.3	84.9

[a] Since this industry shows a steady growth in capital formation up to 1912, the long cycle analysis begins with this year, which represents the first peak.

[b] Tentative peak.

Source: Appendix Table D-1.

TABLE 41

Telephones: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

Dates of Long Cycles: Trough (1)	Peak (2)	Trough (3)	Duration (Years): Rise (4)	Fall (5)	Total (6)	Long Cycle Values at: Initial Trough (7)	Peak (8)	Terminal Trough (9)	Amplitude of: Rise (10)	Fall (11)	Rise and Fall (12)	Amplitude (per Year) of: Rise (13)	Fall (14)	Rise and Fall (15)
						IN RELATIVES								
	1906[a]	1909	–	3	–	–	142	65	–	77	–	–	25.7	–
1909	1917	1919	8	2	10	74	127	87	53	40	93	6.6	20.0	9.3
1919	1929	1933	10	4	14	42	184	35	142	149	291	14.2	37.2	20.8
1933	1948[b]		15	–	–	31	300	–	269	–	–	17.9	–	–
	Average		11	3	12	49	188	62	155	89	192	12.9	27.6	15.0
						IN MILLIONS OF 1929 DOLLARS								
	1906[a]	1909	–	3	–	–	237.8	107.9	–	129.9	–	–	43.3	–
1909	1917	1919	8	2	10	107.9	185.0	127.2	77.1	57.8	134.9	9.6	28.9	13.5
1919	1929	1933	10	4	14	127.2	556.8	106.1	429.6	450.7	880.3	43.0	112.7	62.9
1933	1948[b]		15	–	–	106.1	1,012.5	–	906.4	–	–	60.4	–	–
	Average		11	3	12	113.7	498.0	113.7	471.0	212.8	507.6	37.7	61.6	38.2

[a] Since this industry shows steady growth in capital formation up to 1906, the long cycle analysis begins with this year.

[b] Tentative peak.

Source: Appendix Table E–1.

TABLE 42

Street and Electric Railways: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
IN RELATIVES														
	1907[a]	1919	–	12	–	–	205	40	–	165	–	–	13.8	–
1919	1923	1933	4	10	14	71	144	32	73	112	185	18.2	11.2	13.2
1933	1939	1950[b]	6	11	17	80	192	7	112	185	297	18.7	16.8	17.5
	Average		5	11	16	76	180	26	92	154	241	18.4	13.9	15.4
IN MILLIONS OF 1929 DOLLARS														
	1907[a]	1919	–	12	–	–	355.6	69.3	–	286.3	–	–	23.9	–
1919	1923	1933	4	10	14	69.3	140.1	31.1	70.8	109.0	179.8	17.7	10.9	12.8
1933	1939	1950[b]	6	11	17	31.1	74.6	2.8	43.5	71.8	115.3	7.2	6.5	6.8
	Average		5	11	16	50.2	190.1	34.4	57.2	155.7	147.6	12.4	13.8	9.8

[a] Since this industry shows steady growth in capital formation up to 1907, the long cycle analysis begins with this year.

[b] Terminal date of series rather than trough.

Source: Appendix Table H-1.

TABLE 43

All Other Utilities: Dates, Duration, and Amplitude of Long Cycles in Gross Capital Formation, Based on Annual Data

DATES OF LONG CYCLES			DURATION (YEARS)			LONG CYCLE VALUES AT:			AMPLITUDE OF:			AMPLITUDE (PER YEAR) OF:		
Trough (1)	*Peak* (2)	*Trough* (3)	*Rise* (4)	*Fall* (5)	*Total* (6)	*Initial Trough* (7)	*Peak* (8)	*Terminal Trough* (9)	*Rise* (10)	*Fall* (11)	*Rise and Fall* (12)	*Rise* (13)	*Fall* (14)	*Rise and Fall* (15)
						IN RELATIVES								
1875	1881	1885	6	4	10	59	189	57	130	132	262	21.8	33.2	26.4
1885	1893	1896	8	3	11	39	189	80	150	109	259	18.6	36.0	23.4
1896	1912	1921	16	9	25	31	164	95	133	69	202	8.3	7.7	8.1
1921	1929	1933	8	4	12	48	145	34	97	111	208	12.1	27.8	17.3
1933	1950[a]		17	-	-	29	222	-	193	-	-	11.4	-	-
	Average		11	5	14	41	182	66	141	105	233	14.4	26.2	18.8
						IN MILLIONS OF 1929 DOLLARS								
1875	1881	1885	6	4	10	40	129	39	89	90	179	14.8	22.5	17.9
1885	1893	1896	8	3	11	39	190	81	151	109	260	18.9	36.3	23.6
1896	1912	1921	16	9	25	81	434	250	353	184	537	22.1	20.4	21.5
1921	1929	1933	8	4	12	250	756	177	506	579	1,085	63.3	144.8	90.4
1933	1950[a]		17	-	-	177	1,341	-	1,164	-	-	68.5	-	-
	Average		11	5	14	117	570	137	453	240	515	37.5	56.0	38.4

[a] Terminal date of series rather than peak.

Source: Appendix Table H-1.

initial swing is only dimly traced in the aggregate. Even in railroads it is the weakest of the long cycles, and its configuration—as noted above—is obscured by a succession of two larger-than-average business cycles. Its failure to appear in the telephone and electric light and power components is thus more understandable. These industries, a mere decade old or less, were in the flush of their early expansion when the peak of the initial long cycle in railroads was reached. The vacuum effect—described in Chapter 5—was at the height of its force. The flow of investment was further reinforced by the temporarily rising capital-product ratio characteristic of the gestation period. Hence, the weakest of long cycle downturns, that running from 1891 to 1898, left no perceptible imprint upon the pace of their expansion.

It will be noted in the tabular summaries (derived from nine-year moving averages) that turning point dates for the initial cycle are also omitted for the all other group. In the *annual* data two cycles appear before 1898, similar in timing to the subcycles in railroads, but very much weaker. In the nine-year moving averages they are completely ironed out. In the analysis of the all other group, however, a number of difficulties intrude. To be sure, within the component were two industries—gas utilities and pipelines—which were in a relatively early stage of vigorous expansion. Like telephones and electric light and power, their activity may not have reflected in any pronounced way the downturn of 1891–98. But most important is the fact that the method of estimation employed for the all other group in the earlier years resulted in smoothing the series artificially.[3] Hence, though adequate for the analysis of long-term trends, this series is insufficiently sensitive in this period to provide a reliable indication of the component's cyclical response. Although capital formation in the all other group actually rose during the 1891–98 contraction, it is of some interest that the pace of its advance was retarded during that time. From 1876 to 1891 the annual rate of gross capital formation advanced by 3.0 million 1929 dollars per year; during the 1891–98 period the annual rate of increase dropped to 2.3 million.

All of the other long cycles which are so pronounced in the aggregate of the regulated industries appear as well in each of the components barring, of course, local bus lines and street railways. The turning points occur at about the same time in every case, differing by a year at the most, except for the 1910 peak. Here there was somewhat greater variation, with the turn coming in 1910 in the railroads and in electric light and power, in 1908 in telephones,

[3] See Appendix H.

and in 1913 in the all other group. But even these discrepancies barely rate as significant, given the crudeness of most of our annual data prior to World War I, the use of nine-year moving averages, and the broad interpretation suggested above for the dating of long cycles in general.

There are, however, some significant differences in the amplitude of movement among the several components. It will be noted from the descriptive tables that expansions averaged 88 per cent in the capital formation of electric light and power and 91 per cent in telephones, but only 64 per cent in railroads. Contractions averaged 38 per cent in telephones, 63 per cent in electric light and power, and 73 per cent in railroads. If we recall the ratings given to these industries with respect to the model pattern of growth in Chapter 3, it will be noted that the amplitude of contractions varies directly, and the amplitude of expansion varies inversely, with the degree of maturity. This conclusion is in part confirmed by examination of the behavior of long cycles in the capital formation of railroads, telephones, and electric light and power considered individually. In each case contractions tend to deepen over time, as Tables 34, 35, and 36 show, while except for telephones, expansions tend to diminish.

Thus from both chronological and cross section study the following pattern emerges. In an industry's earlier days long cycles are barely evident in the progress of investment, if they appear at all. Later, the broad, vigorous expansion is interrupted by modest contractions. Gradually, the contractions deepen while expansions tend to grow weaker. It is through this process of cyclical behavior that the sharp upward slope of the secular growth trend slowly diminishes, and—in some cases—ultimately yields to descension. In this respect the secular role of long cycles is similar to that of business cycles,[4] though on a scale of magnified dimensions.

With the above in mind, we may return briefly to the two series in which long cycles were not distinctly apparent. Local bus lines were in the early stage of expansion at the time of the downturn beginning in 1927. That this contraction—the only one in the recorded history of this component—was omitted, is therefore fully in keeping with the general pattern described above. The street and electric railways component, on the other hand, is a special case.

It began as a virtually new industry in the 1880's. Like that of telephones and electric light and power, its early period of growth was not appreciably deterred by the long cycle contraction of 1891–98. As in the case of the other components, too, its capital formation

[4] Burns and Mitchell, *op. cit.*, pp. 412–416.

was finally enveloped in the sharp contraction of 1910–18, though in street railways the downturn started earlier (with the brisk business cycle dip of 1907). At that point, paths diverged. Under the impact of the vigorous competition of motor vehicles, extensive periods of sharply rising investment were out of the question for street railways. Capital formation moved in a precipitous, overshadowing decline, which was still in progress in 1950.

Even so, in the annual data of this series (see Chart 7) there is evidence of a response to long cycle fluctuations which is too faint to appear in the nine-year moving averages. The trough of 1919 was followed by an advance to 1923, then a drop to 1933, followed once again by expansion. All advances were weak and contractions powerful. The last expansion, beginning in 1933, was in fact cut off abortively six years later. Investment in street railways thus represents an illustration at the extreme of the general secular pattern of long cycle behavior. Expansions so swiftly lost their force, and contractions so rapidly gained power, that the evidence of long swings was all but submerged almost immediately after the industry's early period of growth under the impetus of the vacuum effect. By the end of the 1930's, long cycles in this series had apparently disappeared entirely.

It will be recalled that in the capital formation of regulated industries in the aggregate there was no apparent tendency for the amplitude of expansions to diminish over time, as we might expect in conformity with the general pattern. Instead, both contractions and expansions deepened progressively, though the increase in the latter was clearly more modest and less regular. Accordingly, the magnitude of long cycles as a whole was substantially augmented over time. This result is explained in some measure by the constant influx of new industries into the over-all composite. The expansion from 1898 to 1910 was reinforced by the sharply growing electric light and power, telephone, and electric railway components, none of which was significant in the previous expansion from 1876 to 1891. The expansion from 1918 through 1927 was bolstered by the development of an additional set of new industries including trucking, local bus lines, radio communication, and petroleum pipelines. Finally, television and air transportation helped to support the expansion which began in 1935 and continued to the very end of our period of study. Obviously, however, new industries alone are not sufficient to account for the unprecedented vigor of the latter advance. Investment in *all* components in this period mounted very sharply, and in some, such as telephones, pipelines, trucking and gas, the extent of the rise reached record levels. Indeed the magnitude of the fluctuations in the post-World War I period in general would remain something of a puzzle, even after allowing for the effects of the wars and the influence of maturation, unless our framework were broadened to permit a comparison with related movements in other segments of the economy.

Comparison with Other Economic Segments

In Table 44 are listed the dates of turning points of long cycles defined in nine-year moving averages of the gross national product,

TABLE 44

Long Cycle Turning Points in Selected Series

(all value series in 1929 dollars)

	Trough	*Peak*	*Trough*	*Peak*	*Trough*	*Peak*	*Trough*
Gross national product	1873	1883	1892	1905	1911	1926	1934
Gross construction	1873	1891	1897	1909	1917	1926	1935
Additions to population	1874	1884	1898	1910	1919	1924	1935
Number of dwelling units started		1889	1899	1909	1916	1925	1934
Expenditures on dwelling units		1891	1900	1909	1917	1925	1934
Capital formation of all regulated industries:							
Gross	1876	1891	1898	1910	1918	1927	1935
Net	1876	1890	1898	1909	1918	1926	1935

Source: Gross national product, gross construction, and additions to population, from Simon Kuznets, "Swings in the Rate of Secular Growth" (Work Memorandum No. 37, mimeographed, National Bureau of Economic Research, March 1952), Table 6. Dwelling units started and expenditures on dwelling units, from Leo Grebler, David M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate: Trends and Prospects* (Princeton University Press for National Bureau of Economic Research, 1956), Table 4.

As originally presented by Kuznets, nine-year moving averages in the additions to population were dated "by the last year rather than the midyear of the period on the ground that they are cumulative totals whose impact does not become effective until the addition is in fact made." In this table they are midyear, to conform with the dating of all the other series.

gross construction, annual additions to the population, and of two measures of residential building. For comparison the turning points for gross and net capital formation by the regulated industries are also given. The dates of the first three series in the table were taken from a study by Kuznets,[5] those on residential building from a

[5] Simon Kuznets, "Swings in the Rate of Secular Growth," (Work Memorandum No. 37, mimeographed, National Bureau of Economic Research, March 1952). His method for determining turning points for the gross national product and for gross construction differ from that employed for all the other series included in Table 44. Both the gross national product and gross construction are characterized by pronounced upward secular trends.

recent monograph by Grebler, Blank, and Winnick.[6] All of the value series employed were in 1929 dollars. The close relationship between the timing of long cycles in all of the series represented in the table, except the gross national product, is striking. Long swings occur almost simultaneously in gross construction, in additions to population, in residential building, and in the capital formation of the regulated industries. Only one important discrepancy is to be noted—that in the first peak, which occurs in 1884 in the population series and from five to seven years later in the others.

The agreement between swings in gross construction on the one side, and in residential building and regulated industry investment on the other, of course, is a near statistical necessity. For the first series is composed in large part of the second and a considerable portion of the third. Nevertheless, the series on residential building, on population increments, and on capital formation of the regulated industries are, from a statistical point of view, entirely independent. The regularity of agreement in the timing of long cycles in these cases suggests a significant causal nexus. Their behavior reflects either some common generator of their movements, or a direct interaction among the represented activities themselves.

Long cycles in the gross national product (and of course in all of its important components, except for construction[7]) are, for only part of the period, synchronous with those observed in the other segments of Table 44. And it should be noted that the cycles in the gross national product represent fluctuations in the *rate of growth* of this series,[8] rather than in its absolute values. Only the cyclical movements (consisting of two expansions and a contraction) in the post-World War I years are distinctly marked in the absolute figures. And it is only during this period that long swings are synchronous in the over-all level of business activity and in the regulated industries and residential building. This coincidence in the later years must have contributed in substantial measure to the power of the two postwar expansions, as well as to the unusual severity of the intervening contraction from the mid-1920's to the mid-1930's. For in these years the movements were mutually reinforcing.

Peaks and troughs were determined by plotting the nine-year moving averages on semilogarithmic scales and recording turns whenever the *slope* of the series "became significantly steeper or flatter." Thus turning points represent highs and lows in the *rate* of growth. In all of the other series of Table 44, peaks and troughs represent *absolute* highs and lows.

[6] Leo Grebler, David M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate: Trends and Prospects* (Princeton University Press for National Bureau of Economic Research, 1956), Table 4.

[7] See Kuznets, *op. cit.*, Table 6.

[8] See footnote 5, this chapter.

It is more difficult to interpret behavior in the years before World War I. Then the swings in the gross national product were quite different from those in all the other series of Table 44. It is possible that they were therefore mutually offsetting, and in this sense served as moderators. Nevertheless, the cycles which reached their peak about 1910 in the regulated industries and in residential building were very substantial. Throughout the pre-World War I period, furthermore, the long cycles in the gross national product appeared only in relative rates of growth, the absolute trend in the nine-year moving averages having been constantly upward. At the same time, of course, there were important shorter-term cycles in the Gross National Product, obscured by nine-year moving averages, which may have affected—and been affected by—the long swings in the other segments. Within the framework of the present study, it is not possible to explore these relationships. Some observations which bear upon the general problem, however, are given in the following section.

Some Theoretical Considerations

Though a full inquiry into the nature of long cycles would extend our analysis well beyond its intended purview, a few observations are ventured here concerning the relevance of some of our findings to the problem of causation. Hypotheses advanced in the past which are *directly* relevant to some or all of the regulated industries are limited to the theories of Einarsen and Isard[9] on reinvestment and transport-building cycles, respectively. We turn to these first, and later suggest other avenues of investigation which may—in the light of the facts adduced earlier in this chapter—prove fruitful.

The theory of reinvestment cycles observes that if a bulge in capital formation is at any time induced by a business boom or a war, or for whatever reason, replacement requirements at subsequent dates will tend to generate similar expansions. If all capital goods had the *same* life span, and if replacement decisions were based on purely *mechanical* considerations, subsequent cycles would duplicate the initial one exactly, and the duration from peak to peak would depend solely upon the durability of capital—except insofar as

[9] Johan Einarsen, *Reinvestment Cycles and Their Manifestation in the Norwegian Shipping Industry* (Oslo, University of Economics, 1938); "Reinvestment Cycles," *Review of Economic Statistics*, February 1938; and "Replacement in the Shipping Industry," *Review of Economic Statistics*, November 1946. See also J. S. Bain, "The Relations of the Economic Life of Equipment to Reinvestment Cycles," *Review of Economic Statistics*, November 1946.

Walter Isard, "A Neglected Cycle: The Transport-Building Cycle," *Review of Economic Statistics*, November 1942; "Transport Development and Building Cycles," *Quarterly Journal of Economics*, November 1942, and "The Transport-Building Cycle in Urban Development: Chicago," *Review of Economic Statistics*, November 1943.

booms, depressions, wars, and other "external" factors intruded. Although it is conceded that such ideal conditions are *never* satisfied, the existence of perceptible reinvestment cycles in practice must rest at least upon their rough approximation. In the regulated industries, in particular, we would expect (1) a considerable degree of concentration about some average life span among the different types of plant and equipment, and (2) some agreement between this average life span of capital and the observed duration of cycles. Neither of these conditions holds.

The fluctuations under review in the regulated industries lasted approximately twenty years and were about the same in all components. But the average life of capital varied widely among components, and in every case substantially exceeded the length of the cycle. The average life of capital in the railroads was fifty-eight years, in electric light and power thirty-seven, and in telephones twenty-eight.[10] Available information suggests also a considerable amount of variation within components. In railroads the life of equipment varied from twenty-five to forty years, while roadway items in general lasted two or three times as long.[11] In electric utilities the average life of equipment by type varied from twelve to seventy-five years, in telephones about the same, in gas utilities from eight to one hundred years. Utility structures varied in life from twenty to more than a hundred years.[12] There appears to be little ground for supposing that long swings in the capital formation of the regulated industries—at least in the United States—reflect in any considerable measure the periodic impulses associated with reinvestment cycles.

The facts at hand are similarly unfavorable to the transport-building cycle hypothesis formulated by Isard. These fluctuations are presumed to emanate from fundamental alterations in the mode of transportation, and because of their power and multifarious repercussions, are supposed to induce corresponding swings in housing and in the general level of business activity. A number of the preceding findings conflict with this hypothesis—at least as it may be employed to explain the fluctuations which have been called long cycles in this study. And it was so used by Isard.

In the first place, insofar as there are long swings in the general level of business activity, these appear to have run *counter* to long

[10] See Appendixes C, D, and E.

[11] K. T. Healy, "Regularization of Capital Investment in Railroads," in *Regularization of Business Investment* (Princeton University Press for National Bureau of Economic Research, Special Conference Series 4, 1954), pp. 162–195. See also Appendix A.

[12] Eli Winston Clemens, *Economics and Public Utilities* (Appleton-Century-Crofts, 1950), p. 198.

swings in the transportation and other regulated industries before World War I, and to have been synchronous with them later. The connection between the two, therefore, may not be the simple, straightforward cause-and-effect one supposed above. Second—and more important—it seems impossible to provide an explanation for each of the three and one-half swings during the 1870–1950 period in terms of specific transportation innovations. The only new development of major consequence along these lines in the years between 1870 and World War I was electric railways. But investment in this segment did not become significant until *after* the expansion period of our first cycle (from 1876 to 1891) had completely run its course. Indeed the rise in electric railway investment progressed most vigorously during the following contraction phase (from 1891 to 1898) and ended somewhere in the middle of the expansion phase of the second cycle (from 1898 to 1910).[13]

The only other major innovations of the same character in our period of study were the automobile and the airplane. But the start of the post-World War I long cycle expansion may be explained by a variety of factors—not the least of which was the huge accumulation of deferred investment requirements in all of the regulated industries during the war. The end of this expansion came along before any tentative termination date we might fix for the long-run growth of motor vehicle transportation, or even for the increments in its growth. Quantitative considerations alone preclude attributing the 1935–46 expansion to the development of air transportation. It would thus seem abundantly clear that the birth and growth of the different modes of transportation—important as they are—cannot be used to explain the appearance of the twenty-year cycles described in this chapter. Indeed if such innovations did generate cycles, it would appear that they must have been fluctuations of much greater duration than those now under consideration. Of course, it may be said that transportation *by nature* tends to expand in spurts, and that this in turn generates corresponding movements in other branches of economic activity, perhaps with substantial lags. So general a statement would not conflict with the facts. But it would leave still unexplained the heart of the problem: i.e. the particular factors which give rise to long swings in capital formation in transportation.

Both of the theories described above assumed that the swings in the capital formation of the regulated industries were *internally* generated—that is, due essentially to events within this segment of the economy itself. There remains the possibility that they reflect—

[13] The peak in the investment of street and electric railways occurred in 1903 in the nine-year moving averages, and in 1907 in the annual figures.

in whole or in part—events *outside* the segment. It would not conflict with the facts nor with considerations of plausibility, for example, to suppose that cycles in residential building induce those which have appeared in electric utilities, telephones, transportation, and the other regulated industries. There would remain the task, then, of explaining how residential building cycles arise. Of course, much attention has been given to this problem in the past—and much knowledge won,[14] though it cannot be said that a fully satisfactory explanation has yet been provided for the length of building cycles.[15]

It may be that the solution to this problem, and others, will be found in further investigations along lines recently charted by Kuznets. He suggests that the cycles in the capital formation of the regulated industries along with those in residential building may represent a joint reaction to the long swings in population increments. The latter in turn may mirror, with a lag, the long cycles in the aggregate (and per-capita) national income. As he puts it:

"One may argue that upswings in increase of product per capita, indicative of expansions in the rate of growth of economic welfare per head, induced greater inflow of people from abroad—if perhaps with a minor lag. The latter, as they cumulated, tended to prolong the upswing and downswing in the rate of growth of residential and related construction beyond the dates of the crests and troughs in the rate of growth of total and per capita national product. A contributory factor to the disparity in timing may have been the inability of the economy to generate capital resources needed in any combination of upswing in the rate of growth of flow of consumers and producers durables with that in the rate of growth of construction. When immigration ceased to be an important factor, and when limitations on the country's productive capacity ceased to be serious, swings in the rate of growth of construction, of other components of national product, and of national product itself, began to coincide. The implication of this shift for the accentuation of the amplitude of the swings in the rate of growth of national product, and for that matter, of the shorter fluctuations associated with business cycles is patent."[16]

Nevertheless, as may be expected, it is possible to raise questions

[14] Among the most illuminating investigations into underlying causal factors are those of Arthur F. Burns, "Long Cycles in Residential Construction," in *Economic Essays in Honor of Wesley Clair Mitchell* (Columbia University Press, 1935).

[15] Perhaps the most interesting econometric study of residential building cycles is J. B. D. Derksen's "Long Cycles in Residential Building: An Explanation" (*Econometrica*, April 1940). Derksen's effort to illuminate the duration of building cycles resulted in a model which yielded a cycle of twelve years. This, of course, conflicts with observed fluctuations of nearly twice that length.

[16] Kuznets, *op. cit.*, pp. 43–46.

concerning this (still developing) hypothesis to which answers are not at once apparent. In the years before World War I, swings in population increments largely ran counter to those in the rate of growth of the gross national product. How under these circumstances, we may inquire, were additions to population in this period translated into greater effective *monetary demand* for the services they were supposed to stimulate? And if demand itself moved in long cycles, we are justified in asking why the *output* of the regulated industries or output increments, did not reflect these swings more distinctly. Indeed, the need for further exploration is fully acknowledged by Kuznets, who writes:

"Yet, plausible as these relations seem, they require more exploration. Can we assume that variations in the *rate of increase* of product per worker, given the generally higher level of income in this country, necessarily affect the flow of immigrants? To what extent can we claim that such variations in the rate of growth of product per worker influenced people abroad, and what was the mechanism of this influence? Was it the assistance of foreign born already here that induced relations or friends to come, or was it some effective grapevine of letters and reports? Was there any connection between the rapidity of growth in this country and a similar course in countries of would-be immigrants, so that dislocation of industrialization widened the source of emigration in agreement with the timing of the fluctuations in the rate of growth here? Furthermore, can we assume that the newly arrived immigrants, with their relatively low purchasing power, had a truly major effect on residential construction? Were the swings in residential construction perhaps associated with those in the number of native born of native parentage—touched upon below? Alternatively, were the residential construction swings delayed beyond those in product per worker because, particularly in pre-World War I days, the economy did not have the capacity to accelerate the rates of growth of both consumer goods and some capital equipment *and* also of residential construction, so that construction swings had to wait until the limited capacity permitted an upswing? This argument might explain why the swings in residential construction lagged behind those in national product before World War I and coincided with them in post-World War I days.

"These questions should not be interpreted to mean that the association suggested . . . is necessarily illusory. They are rather intended to indicate both that the mechanism of these long swings is complex and that their further exploration promises to shed light on the past behavior of this country's economy—and perhaps also of other economies. The only hypothesis urged here is that immigration, arrivals and departures may have played a significant part in this mechanism."[17]

One additional avenue of investigation is suggested by the facts outlined in the two preceding sections. It concerns the possibility that the long swings in the investment of the regulated industries—and in that of residential building, too—are the result of the peculiar reaction of these industries, given their inherent characteristics, to ordinary business cycles. That both segments are *predisposed* to fluctuations of exceptional length (though not necessarily of twenty years) is well known. The details of financing and of capital budgeting are time-consuming and cumbersome.[18] Facilities are characterized by a high degree of indivisibility and exceptional durability. The planning horizon in the regulated industries is unusually distant.[19] The construction process itself is typically protracted, requiring in some cases as much as three years for completion.[20] And of course, once begun, such projects are not lightly abandoned in half-finished stages. Compounding these factors is an *institutional* tendency toward "lumpiness" in investment, even when the capital units are technically divisible. Thus freight cars are usually ordered and purchased in large quantities at a time, since frequent reconsideration of such decisions would be wasteful and troublesome. As explained by Hultgren: "If borrowing were necessary, underwriters and investors would not welcome a multiplicity of equipment trust issues, each secured by a small block of rolling stock. No one railroad typically buys cars in driblets; or at any rate small repetitive purchases can hardly account for any large part of total orders. On the contrary, orders for hundreds of thousands of freight cars, depending on the size of the road, are often placed at one time."[21]

All this lends to the regulated industries a high degree of inflexibility, a momentum which promotes continued movement in the same direction and discourages swift reversals. For reasons which are not entirely the same, residential building possesses a similar

[17] Simon Kuznets and Ernest Rubin, *Immigration and the Foreign Born* (National Bureau of Economic Research, Occasional Paper 46, 1954), pp. 33–34.

[18] See Edward W. Morehouse, "Regularization of Business Investment in the Electric Utility Industry," and K. T. Healy, "Regularization of Capital Investment in Railroads," in *Regularization of Business Investment* (Princeton University Press for National Bureau of Economic Research, 1954).

[19] See, for example, Michael Gort, "The Planning of Investment: A Study of Capital Budgeting in the Electric Power Industry," *Journal of Business*, April 1951.

[20] Morehouse, *op. cit.*, p. 220.

[21] Thor Hultgren, *American Transportation in Prosperity and Depression* (National Bureau of Economic Research, 1948), p. 167.

characteristic.[22] In these considerations there is the suggestion that an investment expansion, once under-way, will not be significantly deterred by a short and mild business cycle contraction. It is not without significance in this connection that *major* business depressions are roughly coincident with each of the long cycle downturns recorded in the capital formation of the regulated industries and of residential building. They were the contractions of 1873–79, 1893–94, 1907–08, and 1929–33—four of the six most severe depressions in United States history as ranked by the National Bureau of Economic Research.[23] A fifth—the decline of 1882–85—also powerfully depressed the capital flow, as Charts 1, and 4 through 9 show. The sixth—the downturn of 1920–21—is only faintly reflected; but this contraction occurred in the very early stage of a long cycle upswing and was itself short-lived and followed by brisk recovery.

Now a long cycle expansion period is one in which investment proceeds at a rate much faster than that warranted over the long run by fundamental growth factors. And the longer it proceeds, the more vulnerable it becomes to general business setbacks. It is possible that even before signs of a general depression appear, the pace of capital formation in one of the regulated industries or in residential building may be slackened, and this in itself may contribute to the onset of a general business decline. But however started, a business depression of major proportions is likely to depress the capital flow significantly in *all* the regulated industries and in residential building. With the one exception noted, it always has. And if the preceding expansion period has been protracted, the downturn may disclose a disparity of alarming proportions between existing capacity and the probable output requirements of the immediate future, which had been obscured by both the euphoria of the previous boom and the extensive period existing between the start of an investment project and its completion. Hence, given the high durability of capital in these segments of the economy, the contraction is likely to be an extended one, and to end only when long-term growth factors have once again brought demand abreast of the capacity to produce. As for long swings in population increments, they likewise may be explained in terms of major depressions. For it is these depressions, with their dramatic characteristics, which are widely reported and can be depended upon to retard for some time the influx of immigrants as well as the birth rate at home. And until the regulated industries and residential building were

[22] Burns, *op. cit.*, and Asher Achinstein, *Introduction to Business Cycles* (Crowell, 1950), Chapter 27.

[23] Burns and Mitchell, *op. cit.*, pp. 455–464.

once again revived, vigorous expansions in business activity would remain unlikely.

The exploration of such relationships, however, requires a framework different from that employed in the descriptive half of this chapter. Annual data would, at a minimum, be essential and, for some of the problems involved, monthly figures might well be found necessary. Such an investigation is precluded here by both the deficiencies of the materials at hand, and the major interest of the present study.