Volume Title: Evidences of Long Swings in Aggregate Construction Since the Civil War

Volume Author/Editor: Moses Abramovitz

Volume Publisher: NBER

Volume ISBN: 0-87014-404-9

Volume URL: http://www.nber.org/books/abra64-1

Publication Date: 1964

Chapter Title: Duration and Amplitude of Long Swings in Construction Compared with Those of Specific Cycles

Chapter Author: Moses Abramovitz

Chapter URL: http://www.nber.org/chapters/c1804

Chapter pages in book: (p. 39 - 71)

5

Duration and Amplitude of Long Swings in Construction Compared with Those of Specific Cycles

The measures presented in this chapter are intended to bear on the question whether the long swings we have identified are significant in the sense that they can be clearly differentiated from the shorter fluctuations that also mark construction series. If the long swings have been marked off in a meaningful way, they should turn out to be distinctly longer in duration and wider in amplitude than the shorter movements that run through them.

The shorter movements in the construction series are, on the whole, those associated with business cycles. They correspond to what the National Bureau refers to as "specific cycles," fluctuations defined as "wave-like movements, the duration of which is of the same order as that of business cycles," or ". . . recurrent sequences of expansion, recession, contraction, and revival, lasting more than one year but not more than ten or twelve years."[1] Just as long swings have been marked off in the various construction series, so have specific cycles been marked off. The actual identification of specific cycles gives little or no trouble. National Bureau practice in dealing with annual data such as these series is to recognize virtually every reversal of direction, however mild, as a specific-cycle movement; and the practice has been followed in this study.

To begin with, Table 6 sets forth the average duration of the long swings in each series as measured by the chronology based on annual

[1] Burns and Mitchell, *Measuring Business Cycles* (8), pp. 11 and 24.

TABLE 6

AVERAGE DURATION OF SPECIFIC CYCLES AND LONG SWINGS IN CONSTRUCTION, 1858-1959

Series	Specific Cycles: Period	Specific Cycles: No. of Cycles	Specific Cycles: Avg. Duration (yrs.) Expansion	Specific Cycles: Avg. Duration (yrs.) Contraction	Specific Cycles: Avg. Duration (yrs.) Full Cycle	Long Swings: Period	Long Swings: No. of Cycles	Long Swings: Avg. Duration (yrs.) Expansion	Long Swings: Avg. Duration (yrs.) Contraction	Long Swings: Avg. Duration (yrs.) Full Cycle	Ratio of Long Swings to Specific Cycles: Expansions	Ratio of Long Swings to Specific Cycles: Contractions	Ratio of Long Swings to Specific Cycles: Full Cycle
A. Aggregate Construction													
1. Gross new construction in current prices, Kuznets	1871-1959	16.5	3.4	1.9	5.3	1873-1959	5	13.2	4.0	17.2	3.9	2.1	3.2
2. Gross new construction in 1929 prices, Kuznets[a]	1871-1959	19.5	2.7	1.8	4.5	1892-1959	4	11.0	5.8	16.8	4.1	3.2	3.7
3. Index of the value of construction in current prices, NBER	1871-1918	11.5	2.1	2.0	4.1	1871-1918	2.5	14.0	6.3	20.3	6.7	3.2	5.0
4. Index of the value of construction in constant prices, NBER	1871-1918	13.5	1.7	1.8	3.5	1871-1918	2.5	14.0	6.3	20.3	8.2	3.5	5.8
5. Index of the physical volume of construction, NBER	1861-1918	14	2.3	1.8	4.1	1861-1918	3	13.0	6.0	19.0	5.7	3.3	4.6
6. Total construction in current prices, Commerce-Labor	1915-1959	4.5	6.2	2.5	8.7	1915-1959	2.5	11.0	4.0	15.0	1.8	1.6	1.7
7. New construction in current prices, Commerce-Labor	1915-1959	3.5	8.5	3.3	11.8	1915-1959	2.5	11.7	4.5	16.2	1.4	1.4	1.4
8. New construction in 1947-49 prices, Commerce-Labor	1916-1959	6	5.0	2.2	7.2	1920-1959	2.5	10.3	4.0	14.3	2.1	1.8	2.0
B. Total Urban Building													
9. Riggleman's value of permits per capita in current prices	1862-1933	16	2.2	2.2	4.4	1862-1933	4	9.2	8.5	17.7	4.2	3.9	4.0
10. Riggleman's index adjusted for trend	1862-1933	16	2.1	2.3	4.4	1864-1933	4	8.9	8.5	17.4	4.2	3.7	4.0
11. Riggleman-Isard index of value of permits	1862-1933	15	2.5	2.2	4.7	1862-1933	4	11.0	6.8	17.8	4.4	3.1	3.8
12. Long's index of the value of all permits[a]	1869-1933	16.5	1.9	2.0	3.9	1871-1933	2.5	22.5	5.7	28.2	11.8	2.8	7.2

(continued)

TABLE 6 (continued)

Series	Period	SPECIFIC CYCLES				LONG SWINGS					Ratio of Long Swings to Specific Cycles		
		No. of Cycles	Avg. Duration (yrs.)			Period	No. of Cycles	Avg. Duration (yrs.)					
			Expansion	Contraction	Full Cycle			Expansion	Contraction	Full Cycle	Expansions	Contractions	Full Cycle
13. Long's index of the number of all permits	1858-1934	17	2.3	2.2	4.5	1858-1934	4	10.5	8.5	19.0	4.6	3.9	4.2
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb[a]	1869-1933	13.5	2.6	2.1	4.7	1871-1933	2.5	23.0	5.3	28.3	8.8	2.5	6.0
15. Colean-Newcomb index of the value of new building in current prices[a]	1862-1944	10	5.5	2.7	8.2	1862-1944	3	22.0	5.3	27.3	4.0	2.0	3.3
16. Colean-Newcomb index of the value of new building in constant prices[a]	1863-1933	10	4.3	2.7	7.0	1863-1933	3	16.3	7.0	23.3	3.8	2.6	3.3
C. Nonfarm Residential Building													
17. Long's index of the value of residential permits	1869-1936	19	1.7	1.8	3.5	1871-1934	3.5	6.3	11.0	17.3	3.7	6.1	4.9
18. Long's index of the number of residential permits	1858-1934	17	2.1	2.4	4.5	1858-1934	4	9.5	9.5	19.0	4.5	4.0	4.2
19. Expenditures for new dwelling units in current prices, Blank	1889-1959	16	2.5	1.9	4.4	1889-1959	4	10.0	7.5	17.5	4.0	3.9	4.0
20. Expenditures for new dwelling units in 1929 prices, Blank	1891-1959	13.5	2.7	2.3	5.0	1892-1959	4	8.8	8.0	16.8	3.3	3.5	3.4
21. Number of dwelling units started, Blank	1891-1959	14.5	2.6	2.1	4.7	1892-1959	4	8.8	8.0	16.8	3.4	3.8	3.6
21a. Production of housekeeping dwelling units, Gottlieb	1862-1933	16	2.1	2.4	4.5	1864-1933	4	9.5	7.8	17.3	4.5	3.2	3.8
D. Private Nonresidential Building													
22. Long's index of the value of nonresidential permits[a]	1869-1933	16.5	2.3	1.6	3.9	1869-1933	2.5	21.0	7.3	28.3	9.1	4.6	7.3

(continued)

TABLE 6 (continued)

Series	Specific Cycles: Period	Specific Cycles: No. of Cycles	Specific Cycles: Avg. Duration (yrs.): Expansion	Specific Cycles: Avg. Duration (yrs.): Contraction	Specific Cycles: Avg. Duration (yrs.): Full Cycle	Long Swings: Period	Long Swings: No. of Cycles	Long Swings: Avg. Duration (yrs.): Expansion	Long Swings: Avg. Duration (yrs.): Contraction	Long Swings: Avg. Duration (yrs.): Full Cycle	Ratio of Long Swings to Specific Cycles: Expansions	Ratio of Long Swings to Specific Cycles: Contractions	Ratio of Long Swings to Specific Cycles: Full Cycle
23. Long's index of the number of nonresidential permits[a]	1861-1933	13	3.1	2.5	5.6	1861-1933	3	14.7	9.3	24.0	4.7	3.7	4.3
24. New private nonresidential construction in current prices, Commerce-Labor	1915-1958	10	2.9	1.4	4.3	1915-1957	2.5	12.0	3.0	15.0	4.1	2.1	3.5
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	1916-1957	9	3.0	1.6	4.6	1918-1957	2.5	11.0	3.0	14.0	3.7	1.9	3.0
E. Farm Construction													
26. New farm construction in 1947-49 prices, Commerce-Labor	1917-1958	8.5	2.4	2.4	4.8	1919-1958	3.5	7.3	4.2	11.5	3.0	1.8	2.4
F. Transportation and Other Public Utilities Construction													
27. Rail consumption[b]	1862-1938	19	2.4	1.6	4.0	1862-1933	5	7.0	7.2	14.2	2.9	4.5	3.6
28. Increase in wire mileage, Western Union Telegraph Co.[b]	1868-1941	21	1.9	1.6	3.5	1874-1931	4.5	7.2	5.7	12.9	3.8	3.6	3.7
29. Increase in wire mileage, all telephone systems[a]	1883-1957	13	3.8	1.8	5.6	1886-1957	3.5	15.8	2.7	18.5	4.2	1.5	3.3
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer[b]	1871-1948	14	3.3	2.2	5.5	1871-1943	5.5	9.2	4.3	13.5	2.8	2.0	2.5
31. Gross capital expenditures in current prices, all regulated industries, Ulmer[b]	1871-1948	15	2.9	2.2	5.1	1871-1943	5.5	9.8	3.8	13.6	3.4	1.7	2.7
32. New private public utilities construction in 1947-49 prices, Commerce-Labor	1916-1957	9	2.9	1.7	4.6	1921-1957	2.5	10.3	2.5	12.8	3.6	1.5	2.8

(continued)

TABLE 6 (continued)

Series	SPECIFIC CYCLES					LONG SWINGS					Ratio of Long Swings to Specific Cycles		
			Avg. Duration (yrs.)					Avg. Duration (yrs.)					
	Period	No. of Cycles	Expansion	Contraction	Full Cycle	Period	No. of Cycles	Expansion	Contraction	Full Cycle	Expansions	Contractions	Full Cycle
33. New private public utilities construction in current prices, Commerce-Labor	1915-1957	8.5	3.2	1.6	4.8	1915-1957	2.5	12.0	3.0	15.0	3.8	1.9	3.1
G. Shipbuilding													
34. Tonnage of merchant vessels built in the U.S.	1859-1950	17	2.5	2.9	5.4	1859-1943	4.5	7.2	12.0	19.2	2.9	4.1	3.6
H. Public Construction													
35. Long's index of the value of public building permits[b]	1870-1933	18.5	1.7	1.7	3.4	1870-1933	4.5	8.2	6.0	14.2	4.8	3.5	4.2
36. New public construction in current prices, Commerce-Labor	1916-1959	6.5	4.4	2.0	6.4	1920-1959	2.5	10.7	3.5	14.2	2.4	1.8	2.2
37. New public construction in 1947-49 prices, Commerce-Labor	1916-1959	7.5	3.9	1.7	5.6	1920-1959	2.5	11.0	3.0	14.0	2.8	1.8	2.5
ALTERNATIVE MEASURES EXCLUDING EXTREMELY LONG UPSWINGS													
12. Long's index of the value of all permits	1869-1933	16.5	1.9	2.0	3.9	1871-78, 1916-33	1.5	7.0	5.7	12.7	3.7	2.8	3.3
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	1869-1933	13.5	2.6	2.1	4.7	1871-77, 1916-33	1.5	7.0	5.3	12.3	2.7	2.5	2.6
15. Colean-Newcomb index of the value of new building in current prices	1862-1944	10	5.5	2.7	8.2	1862-78, 1927-44	2.5	8.5	5.3	13.8	1.5	2.0	1.7
16. Colean-Newcomb index of the value of new building in constant prices	1863-1933	10	4.3	2.7	7.0	1863-77, 1912-33	2.5	7.0	7.0	14.0	1.6	2.6	2.0

(continued)

TABLE 6 (concluded)

		SPECIFIC CYCLES				LONG SWINGS					Ratio of Long Swings to Specific Cycles		
			Avg. Duration (yrs.)					Avg. Duration (yrs.)					
Series	Period	No. of Cycles	Expansion	Contraction	Full Cycle	Period	No. of Cycles	Expansion	Contraction	Full Cycle	Expansions	Contractions	Full Cycle
22. Long's index of the value of nonresidential permits	1869-1933	16.5	2.3	1.6	3.9	1869-77, 1912-33	1.5	7.0	7.3	14.3	3.0	4.6	3.7
23. Long's index of the number of nonresidential permits	1861-1933	13	3.1	2.5	5.6	1861-1900, 1924-33	2.5	10.0	9.3	19.3	3.2	3.7	3.4
29. Increase in wire mileage, all telephone systems	1883-1957	13	3.8	1.8	5.6	1917-1957	3	10.7	2.7	13.4	2.8	1.5	2.4

[a]Alternative measures, excluding extremely long upswings, are shown at the end of the table. (No alternative measures are necessary for Series 2 because the skipped cycle occurs at the beginning of that series.) See Table 4 and accompanying text for explanation and periods of skipped cycles.

[b]The measures for long swings reflect an extra cycle, as identified in Table 4, note e.

data, the average duration of the specific cycles, and the ratio of the former to the latter. The measures presented include swings bounded by wartime peaks and troughs and also the few extra long swings identified in the footnotes to Table 4.

The result which stands out clearly is that these long swings are, on the average, distinctly longer than movements associated with business cycles. The average duration of long swings in the various series representing aggregate construction lies between fourteen and twenty years. We compare these figures first with the average duration of general business cycles as identified in the National Bureau chronology, rather than with the specific cycles in the same series (see Chapter 3 above). By this standard, even the shortest of these average long-swing durations is equal to almost four normal business cycles, while the longest spans five normal business cycles. The average long-swing expansions in series representing aggregate construction vary from ten to fourteen years and so are 4.0 to 5.6 times as long as a general business-cycle expansion of average duration. Similarly, the average long-swing contractions are between four and six years long and so are 2.5 to 3.7 times as long as a business-cycle contraction of average length.

The variation among series in the average duration of long swings, and, consequently, in the ratio of average long-swing duration to the average duration of business cycles, has little to do with differences in the behavior of these different series. A glance at the chronologies in Table 4 shows that, with minor differences in the dates of turning points, the same swings are recognized in all the aggregate series that cover the same period. Thus the variation in long-swing durations among these series reflects almost entirely a difference in the duration of long swings in different periods. The Commerce-Labor series, which cover only the period since World War I, have the shortest average durations—fourteen to sixteen years; the NBER indexes, which cover only the period ending with World War I, have the longest—nineteen to twenty years; while the Kuznets estimates, which span both periods, have average durations of intermediate length. Taking the period since the Civil War as a whole, this chronology suggests that, for aggregate construction, the average duration of long swings was approximately seventeen years. Thus, what emerges once more is that the long swings recognized here in aggregate construction correspond to the swings earlier made familiar by indexes of residential or total urban building.

The relatively short duration of the long swings in construction since World War I need not indicate any real change in their character. The catastrophic nature of the Great Depression and the subsequent recovery, which fixed the bounds of the first swing after World War I, are unparalleled in American history; and the next swing, beginning about 1933, was interrupted by the events of World War II. Finally, it is too early to say how long the upswing in building, which began with the return of peace, will last. It has already lasted some fifteen or sixteen years, and there is as yet no clear indication of a long-swing decline in the absolute level of construction activity, although growth has become very slow.

Ratios of the average duration of long swings in the various indexes of aggregate construction compared with that of their specific cycles indicate again that the long swings marked off are distinctly longer than the short movements associated with business cycles. The variation among these ratios, however, is greater than among ratios of long-swing average duration in different series compared with the average duration of general business cycles. There are several reasons. First, there is some variation in the duration of shorter business cycles among the periods covered by the several series. Secondly, the specific cycles of individual series do not correspond perfectly in time with general business cycles. And thirdly, even if the correspondence between monthly indexes of construction activity and the consensus of monthly series on which the business-cycle chronology is based were perfect, annual data of construction will display such correspondence imperfectly. For annual data constitute a kind of smoothing of monthly data. As a result, specific cycles which would appear in the monthly data are not infrequently obliterated; or, more rarely, extra cycles are inserted. In any event, the timing of turning points is altered; so synchronous turns in monthly data may sometimes appear as leads or lags in annual data. Consequently, compared with business-cycle durations that are portrayed by more frequently reported series, specific cycles in annual data tend to be somewhat longer and to display more variation about their normal duration.[2]

Most of the observations that have already been made abcut the

[2]On the effect on business-cycle measures of the time unit in which data are reported, see Burns and Mitchell, *Measuring Business Cycles* (8), Chapter 6.

duration of long swings in aggregate construction and about the comparisons between such duration and the length of business cycles and specific cycles apply also to total urban building and to the major sectors of construction. There is, however, something to add. Some of the series representing total urban building (Series 12, 14, 15, 16) and private nonresidential building (Series 22 and 23) have long-swing expansions and full long swings that are of very long average duration. The reason is that in certain periods when most construction series experienced a long-swing decline in their absolute level, both in annual and smoothed data, these series did not. They "skipped" a long-swing decline, in some cases, two long-swing declines. As a result, the chronologies for these series include some extremely long expansions and full cycles. These extremely long movements, however, are not properly long swings at all. Any reasonable upper limit on the duration of long swings would exclude them from the reckoning. Moreover, although the series in question did not display long-swing declines in their absolute levels during certain periods, they did, nevertheless, share in the long-swing declines of other series in the sense that their growth slowed down (see Chapter 8). On this ground, too, the inclusion of the extremely long movements representing skipped declines exaggerates the true duration of long swings. If the periods involving skipped cycles are eliminated from the account, the duration of the remainder of the movements corresponds to that in aggregate construction and in the bulk of the other series, as an inspection of Table 4 indicates. Alternative duration measures, which eliminate the extremely long movements caused by skipped declines, are provided in the last section of Table 6 for those series in which such movements occurred.

In the figures before us, the durations of the long upswings are, for the most part, much longer than those of the downswings. Presumably, a portion of the difference reflects the predominantly upward trend of building, a trend not eliminated in most of these series. The substantial influence of trend on the relative durations of upswings and downswings is, indeed, suggested by some of the series which appear in trend-adjusted and unadjusted form. Thus, the duration of long upswings in Isard's modification of Riggleman's index (Series 11) is about 60 per cent longer than that of downswings. The difference is greatly reduced in Riggleman's index on a per capita basis (Series 9), and it almost disappears when the per capita index is adjusted to eliminate its time trend (Series 10). Trend may not, however, be the whole story, and the matter needs further study.

The duration table is of some help in gaining a better understanding of the problem. Depending on the period covered by the various indexes, the average durations of upswings in aggregate construction are between two and three times as long as those of downswings. The indexes in the various branches of construction tend to reveal no such large differences, with the exception of certain Commerce-Labor series, and series which skipped some downswings altogether. Such behavior in the latter involved anomalously long upswings which distort the averages—distortions which we try to correct by providing alternative measures at the end of the table. It remains true, however, that if a branch of construction skips a long-swing decline in which other branches share, its continued rise tends to prolong the upswing of aggregate construction. Since no important branch ever skipped an upsurge of activity, the upswings in the aggregate are prolonged at the expense of the downswings.

Our observations about the difference between the durations of long swings and specific cycles in construction have so far been based on average behavior. Inspecting the relation between the durations of long swings and specific cycles for each long swing taken separately, we would find that, in nearly all cases, long-swing expansions were much longer than the specific cycles contained in them. This, however, is not invariably true for long downswings. In a fair number of cases, we have recognized as long downswings movements uninterrupted—at least in annual data—by expansions, however short. These declines, therefore, also constitute specific-cycle contractions. Such cases of correspondence occur with some frequency in the 1870's and in the period following 1925, ending in the Great Depression. In both cases, the downswings in construction were especially severe. Hence, it is not surprising that annual data reveal no interruption in the downward movement. In both cases, too, the downswings were long compared with ordinary business-cycle contractions. Compared with their average duration of nineteen to twenty months, the contractions of the 1870's were six to nine years long; and those following 1925 were four to eight years long. There may be some question whether downswings so protracted may be considered specific-cycle contractions. There is no doubt that they are long downswings.

The next questions are how wide were the amplitudes of the long swings in construction and how does the size of the long upswings and downswings compare with the size of specific-cycle expansions and contractions. The answers to these questions are interesting in two ways. They tell us whether the long fluctuations were vigorous or mild compared with the more familiar short ones. And this information provides another test of the reality of the long swings identified in this chronology. Given the uneven quality of the data, confidence in the dating of the long downswings is greater if the size of these movements is large, relative to the specific-cycle contractions of the same periods, than if it is small.

The measures of amplitude for both specific cycles and long swings are computed in the manner normally used by the National Bureau in its business-cycle studies.[3] For specific cycles identified in annual data, the measure of amplitude for expansion is obtained by finding the difference between the standing of a series in a year identified as a specific-cycle peak and its standing at the preceding trough. This difference is then expressed as a relative to the "cycle base," that is, the average standing of the series in all the years included in the trough-to-trough cycle of which the expansion is one phase.[4] The amplitudes of specific-cycle contractions are found by taking the difference between the standings of a series at specific-cycle troughs and at previous peaks and expressing the result as a relative to the corresponding cycle base. Amplitudes of contraction necessarily have negative signs. Full-cycle amplitudes are obtained by finding the algebraic difference between amplitudes of expansions and succeeding contractions.[5] Amplitudes per annum are also computed for expansions, contractions, and full-cycles by dividing the measures of total amplitude by the number of years in the phase or full cycle. The amplitude measures for long swings are exactly analogous, except that now the peak and trough standings refer to standings in the peak or trough years of long swings and the cycle

[3]See *ibid.*, Chapter 5.

[4]To avoid the downward bias in the cycle base that occurs because a trough-to-trough cycle contains two troughs but only one peak, the standings in the trough years are given half weight.

[5]If a series begins with a contraction or ends with an expansion, the same procedures are followed except that the amplitude of the movement is expressed as a relative to an inverted, that is, a peak-to-peak cycle base.

TABLE 7

AVERAGE AMPLITUDE OF SPECIFIC CYCLES AND LONG SWINGS IN CONSTRUCTION, 1858-1959
(amplitudes in per cent)

		SPECIFIC CYCLES					
		Total Amplitude			Amplitude Per Annum		
Series	No. of Cycles[a]	Exp.	Contr.	Full Cycle	Exp.	Contr.	Full Cycle
A. Aggregate Construction							
1. Gross new construction in current prices, Kuznets	16.5	44.3	-21.9	66.2	14.0	-10.9	12.9
2. Gross new construction in 1929 prices, Kuznets[b]	19.5	30.8	-18.2	49.0	13.1	-8.9	11.4
3. Index of the value of construction in current prices, NBER	11.5	28.8	-27.9	56.7	13.6	-11.6	12.6
4. Index of the value of construction in constant prices, NBER	13.5	21.9	-24.4	46.3	12.0	-11.8	11.9
5. Index of the physical volume of construction, NBER	14	32.4	-24.7	57.1	14.1	-14.6	14.3
6. Total construction in current prices, Commerce-Labor	4.5	73.1	-36.6	111.7	12.5	-13.8	12.9
7. New construction in current prices, Commerce-Labor	3.5	112.6	-77.3	189.9	13.6	-28.9	17.9
8. New construction in 1947-49 prices, Commerce-Labor	6	54.2	-35.3	89.5	10.5	-13.7	11.5
B. Total Urban Building							
9. Riggleman's value of permits per capita in current prices	16	38.4	-38.1	76.5	17.8	-17.6	17.7
10. Riggleman's index adjusted for trend	16	34.4	-37.7	72.1	20.8	-18.0	19.3
11. Riggleman-Isard index of value of permits	15	45.8	-38.4	84.2	18.6	-16.2	17.5
12. Long's index of the value of all permits[b]	16.5	40.1	-40.9	81.0	22.5	-20.1	21.3
13. Long's index of the number of all permits	17	40.3	-38.5	78.8	19.8	-19.1	19.5
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb[b]	13.5	47.8	-46.0	93.8	20.9	-21.3	21.1
15. Colean-Newcomb index of the value of new building in current prices[b]	10	65.2	-42.7	107.9	10.6	-16.3	12.5
16. Colean-Newcomb index of the value of new building in constant prices[b]	10	42.6	-29.2	71.8	9.8	-9.3	9.6
C. Nonfarm Residential Building							
17. Long's index of the value of residential permits	19	53.3	-47.3	100.6	33.0	-26.8	29.8
18. Long's index of the number of residential permits	17	48.0	-47.3	95.3	24.9	-22.5	23.6
19. Expenditures for new dwelling units in current prices, Blank	16	55.4	-39.4	94.8	23.4	-18.5	21.3
20. Expenditures for new dwelling units in 1929 prices, Blank	13.5	57.2	-52.4	109.6	21.9	-21.6	21.8
21. Number of dwelling units started, Blank	14.5	51.5	-47.1	98.6	21.2	-24.3	22.6
21a. Production of housekeeping dwelling units, Gottlieb	16	38.4	-33.7	72.1	20.1	-15.0	17.4
D. Private Nonresidential Building							
22. Long's index of the value of nonresidential permits[b]	16.5	56.0	-49.4	105.4	25.3	-34.6	29.1
23. Long's index of the number of nonresidential permits[b]	13	49.0	-38.9	87.9	20.4	-18.3	19.5
24. New private nonresidential construction in current prices, Commerce-Labor	10	70.1	-39.6	109.7	25.2	-23.5	24.6

(continued)

TABLE 7 (continued)

Series	No. of Cycles[a]	Total Amplitude Exp.	Total Amplitude Contr.	Total Amplitude Full Cycle	Amplitude Per Annum Exp.	Amplitude Per Annum Contr.	Amplitude Per Annum Full Cycle
	SPECIFIC CYCLES						
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	9	59.4	-43.9	103.3	19.8	-25.4	21.7
E. Farm Construction							
26. New farm construction in 1947-49 prices, Commerce-Labor	8.5	43.8	-36.8	80.6	16.5	-14.4	15.4
F. Transportation and Other Public Utilities Construction							
27. Rail consumption[c]	19	50.0	-46.7	96.7	23.6	-30.3	26.3
28. Increase in wire mileage, Western Union Telegraph Co.[c,d]	21	43.6	-42.4	86.0	33.5	-24.9	29.6
29. Increase in wire mileage, all telephone systems[b,d]	13	4,156	-1,905	6,061	1,015	-820	952
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer[c]	14	61.7	-51.5	113.2	18.2	-19.9	18.9
31. Gross capital expenditures in current prices, all regulated industries, Ulmer[c]	15	65.8	-48.0	113.8	21.9	-19.0	20.6
32. New private public utilities construction in 1947-49 prices, Commerce-Labor	9	38.4	-29.1	67.5	10.9	-14.3	12.2
33. New private public utilities construction in current prices, Commerce-Labor	8.5	49.8	-30.4	80.2	15.3	-15.2	15.3
G. Shipbuilding							
34. Tonnage of merchant vessels built in the U.S.	17	96.0	-95.7	191.7	36.0	-38.7	37.4
H. Public Construction							
35. Long's index of the value of public building permits[c]	18.5	59.6	-59.0	118.6	37.0	-40.2	38.6
36. New public construction in current prices, Commerce-Labor	6.5	80.0	-49.3	129.3	25.7	-18.5	23.4
37. New public construction in 1947-49 prices, Commerce-Labor	7.5	66.5	-50.9	117.4	23.3	-22.7	23.1
	ALTERNATIVE MEASURES EXCLUDING EXTREMELY LONG UPSWINGS						
12. Long's index of the value of all permits	16.5	40.1	-40.9	81.0	22.5	-20.1	21.3
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	13.5	47.8	-46.0	93.8	20.9	-21.3	21.1
15. Colean-Newcomb index of the value of new building in current prices	10	65.2	-42.7	107.9	10.6	-16.3	12.5
16. Colean-Newcomb index of the value of new building in constant prices	10	42.6	-29.2	71.8	9.8	-9.3	9.6
22. Long's index of the value of nonresidential permits	16.5	56.0	-49.4	105.4	25.3	-34.6	29.1
23. Long's index of the number of nonresidential permits	13	49.0	-38.9	87.9	20.4	-18.3	19.5
29. Increase in wire mileage, all telephone systems[d]	13	4,156	-1,905	6,061	1,015	-820	952

(continued)

TABLE 7 (continued)

Series	No. of Cycles[a]	LONG SWINGS: Total Amplitude: Exp.	Total Amplitude: Contr.	Total Amplitude: Full Cycle	Amplitude Per Annum: Exp.	Amplitude Per Annum: Contr.	Amplitude Per Annum: Full Cycle
A. Aggregate Construction							
1. Gross new construction in current prices, Kuznets	5	125.8	-67.0	192.8	10.2	-21.6	12.9
2. Gross new construction in 1929 prices, Kuznets[b]	4	91.1	-67.6	158.7	9.3	-18.4	12.4
3. Index of the value of construction in current prices, NBER	2.5	102.8	-67.4	170.2	7.4	-10.3	8.3
4. Index of the value of construction in constant prices, NBER	2.5	92.8	-71.3	164.1	6.6	-11.1	8.0
5. Index of the physical volume of construction, NBER	3	92.9	-66.8	159.7	8.4	-15.8	10.7
6. Total construction in current prices, Commerce-Labor	2.5	114.1	-83.9	198.0	10.6	-25.6	14.6
7. New construction in current prices, Commerce-Labor	2.5	143.2	-117.2	260.4	12.7	-37.4	19.6
8. New construction in 1947-49 prices, Commerce-Labor	2.5	103.1	-100.8	203.9	10.5	-34.1	17.1
B. Total Urban Building							
9. Riggleman's value of permits per capita in current prices	4	108.8	-106.7	215.5	12.6	-13.0	12.8
10. Riggleman's index adjusted for trend	4	100.8	-106.6	207.4	12.4	-12.8	12.6
11. Riggleman-Isard index of value of permits	4	124.8	-105.2	230.0	13.1	-21.2	16.2
12. Long's index of the value of all permits[b]	2.5	164.4	-114.2	278.6	13.9	-30.8	17.3
13. Long's index of the number of all permits	4	116.9	-115.8	232.7	13.1	-19.6	16.0
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb[b]	2.5	170.0	-110.3	280.3	13.4	-30.3	16.6
15. Colean-Newcomb index of the value of new building in current prices[b]	3	189.8	-157.3	347.1	12.5	-37.4	17.3
16. Colean-Newcomb index of the value of new building in constant prices[b]	3	104.7	-80.2	184.9	9.7	-11.9	10.4
C. Nonfarm Residential Building							
17. Long's index of the value of residential permits	3.5	136.6	-123.0	259.6	25.0	-13.0	17.4
18. Long's index of the number of residential permits	4	137.4	-141.3	278.7	15.5	-15.2	15.4
19. Expenditures for new dwelling units in current prices, Blank	4	162.4	-121.1	283.5	17.0	-24.0	20.0
20. Expenditures for new dwelling units in 1929 prices, Blank	4	143.1	-125.1	268.2	17.7	-22.8	20.1
21. Number of dwelling units started, Blank	4	134.4	-118.8	253.2	17.0	-21.3	19.0
21a. Production of housekeeping dwelling units, Gottlieb	4	107.3	-93.0	200.3	12.4	-11.8	12.1
D. Private Nonresidential Building							
22. Long's index of the value of nonresidential permits[b]	2.5	181.0	-110.5	291.5	13.3	-15.6	13.9
23. Long's index of the number of nonresidential permits[b]	3	155.6	-137.6	293.2	10.8	-15.6	12.7
24. New private nonresidential construction in current prices, Commerce-Labor	2.5	171.6	-154.3	325.9	14.8	-58.8	23.6

(continued)

TABLE 7 (continued)

Series	No. of Cycles[a]	LONG SWINGS Total Amplitude Exp.	Contr.	Full Cycle	Amplitude Per Annum Exp.	Contr.	Full Cycle
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	2.5	127.2	-134.6	261.8	11.6	-52.1	20.3
E. Farm Construction							
26. New farm construction in 1947-49 prices, Commerce-Labor	3.5	90.4	-78.3	168.7	11.8	-23.5	16.1
F. Transportation and Other Public Utilities Construction							
27. Rail consumption[c]	5	108.0	-96.4	204.4	21.0	-15.4	18.2
28. Increase in wire mileage, Western Union Telegraph Co.[c,d]	4.5	147.2	-129.1	276.3	21.7	-22.4	22.0
29. Increase in wire mileage, all telephone systems[b,d]	3.5	11522	-5601	17123	938	-2133	1112
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer[c]	5.5	116.8	-105.4	222.2	14.1	-28.8	18.8
31. Gross capital expenditures in current prices, all regulated industries, Ulmer[c]	5.5	125.4	-106.5	231.9	15.0	-29.1	18.9
32. New private public utilities construction in 1947-49 prices, Commerce-Labor	2.5	91.9	-82.6	174.5	9.2	-32.2	13.7
33. New private public utilities construction in current prices, Commerce-Labor	2.5	125.1	-90.9	216.0	10.7	-29.0	14.4
G. Shipbuilding							
34. Tonnage of merchant vessels built in the U.S.	4.5	411.5	-214.0	625.5	60.6	-21.4	36.1
H. Public Construction							
35. Long's index of the value of public building permits[c]	4.5	143.1	-145.7	288.8	19.0	-28.6	23.1
36. New public construction in current prices, Commerce-Labor	2.5	153.0	-134.0	287.0	14.9	-35.9	20.1
37. New public construction in 1947-49 prices, Commerce-Labor	2.5	137.5	-132.3	269.8	13.3	-40.1	19.0
		ALTERNATIVE MEASURES EXCLUDING EXTREMELY LONG UPSWINGS					
12. Long's index of the value of all permits	1.5	164.7	-111.2	275.9	23.5	-19.6	21.7
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	1.5	154.7	-107.4	262.1	22.1	-19.8	21.1
15. Colean-Newcomb index of the value of new building in current prices	2.5	133.3	-117.7	251.0	15.6	-30.8	21.4
16. Colean-Newcomb index of the value of new building in constant prices	2.5	87.6	-73.8	161.4	12.5	-11.1	11.8
22. Long's index of the value of nonresidential permits	1.5	141.7	-120.4	262.1	20.3	-15.6	17.9
23. Long's index of the number of nonresidential permits	2.5	117.8	-112.4	230.2	11.4	-12.8	12.1
29. Increase in wire mileage, all telephone systems[d]	3	14458	-5601	20059	1222	-2133	1406

(continued)

TABLE 7 (continued)

Series	RATIO OF LONG SWINGS TO SPECIFIC CYCLES					
	Total Amplitude			Amplitude Per Annum		
	Exp.	Contr.	Full Cycle	Exp.	Contr.	Full Cycle
A. Aggregate Construction						
1. Gross new construction in current prices, Kuznets	2.8	3.1	2.9	0.7	2.0	1.0
2. Gross new construction in 1929 prices, Kuznets[b]	3.0	3.7	3.2	0.7	2.1	1.1
3. Index of the value of construction in current prices, NBER	3.6	2.4	3.0	0.5	0.9	0.7
4. Index of the value of construction in constant prices, NBER	4.2	2.9	3.5	0.6	0.9	0.7
5. Index of the physical volume of construction, NBER	2.9	2.7	2.8	0.6	1.1	0.7
6. Total construction in current prices, Commerce-Labor	1.6	2.2	1.8	0.8	1.9	1.1
7. New construction in current prices, Commerce-Labor	1.3	1.5	1.4	0.9	1.3	1.1
8. New construction in 1947-49 prices, Commerce-Labor	1.9	2.9	2.3	1.0	2.5	1.5
B. Total Urban Building						
9. Riggleman's value of permits per capita in current prices	2.8	2.8	2.8	0.7	0.7	0.7
10. Riggleman's index adjusted for trend	2.9	2.8	2.9	0.6	0.7	0.7
11. Riggleman-Isard index of value of permits	2.7	2.7	2.7	0.7	1.3	0.9
12. Long's index of the value of all permits[b]	4.1	2.8	3.4	0.6	1.5	0.8
13. Long's index of the number of all permits	2.9	3.0	3.0	0.7	1.0	0.8
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb[b]	3.6	2.4	3.0	0.6	1.4	0.8
15. Colean-Newcomb index of the value of new building in current prices[b]	2.9	3.7	3.2	1.2	2.3	1.4
16. Colean-Newcomb index of the value of new building in constant prices[b]	2.5	2.7	2.6	1.0	1.3	1.1
C. Nonfarm Residential Building						
17. Long's index of the value of residential permits	2.6	2.6	2.6	0.8	0.5	0.6
18. Long's index of the number of residential permits	2.9	3.0	2.9	0.6	0.7	0.7
19. Expenditures for new dwelling units in current prices, Blank	2.9	3.1	3.0	0.7	1.3	0.9
20. Expenditures for new dwelling units in 1929 prices, Blank	2.5	2.4	2.4	0.8	1.1	0.9
21. Number of dwelling units started, Blank	2.6	2.5	2.6	0.8	0.9	0.8
21a. Production of housekeeping dwelling units, Gottlieb	2.8	2.8	2.8	0.6	0.8	0.7
D. Private Nonresidential Building						
22. Long's index of the value of nonresidential permits[b]	3.2	2.2	2.8	0.5	0.5	0.5
23. Long's index of the number of nonresidential permits[b]	3.2	3.5	3.3	0.5	0.9	0.7
24. New private nonresidential construction in current prices, Commerce-Labor	2.4	3.9	3.0	0.6	2.5	1.0

(continued)

TABLE 7 (concluded)

Series	RATIO OF LONG SWINGS TO SPECIFIC CYCLES: Total Amplitude: Exp.	Total Amplitude: Contr.	Total Amplitude: Full Cycle	Amplitude Per Annum: Exp.	Amplitude Per Annum: Contr.	Amplitude Per Annum: Full Cycle
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	2.1	3.1	2.5	0.6	2.1	0.9
E. Farm Construction						
26. New farm construction in 1947-49 prices, Commerce-Labor	2.1	2.1	2.1	0.7	1.6	1.0
F. Transportation and Other Public Utilities Construction						
27. Rail consumption[c]	2.2	2.1	2.1	0.9	0.5	0.7
28. Increase in wire mileage, Western Union Telegraph Co.[c]	3.4	3.0	3.2	0.6	0.9	0.7
29. Increase in wire mileage, all telephone systems[b]	2.8	2.9	2.8	0.9	2.6	1.2
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer[c]	1.9	2.0	2.0	0.8	1.4	1.0
31. Gross capital expenditures in current prices, all regulated industries, Ulmer[c]	1.9	2.2	2.0	0.7	1.5	0.9
32. New private public utilities construction in 1947-49 prices, Commerce-Labor	2.4	2.8	2.6	0.8	2.3	1.1
33. New private public utilities construction in current prices, Commerce-Labor	2.5	3.0	2.7	0.7	1.9	0.9
G. Shipbuilding						
34. Tonnage of merchant vessels built in the U.S.	4.3	2.2	3.3	1.7	0.6	1.0
H. Public Construction						
35. Long's index of the value of public building permits[c]	2.4	2.5	2.4	0.5	0.7	0.6
36. New public construction in current prices, Commerce-Labor	1.9	2.7	2.2	0.6	1.9	0.9
37. New public construction in 1947-49 prices, Commerce-Labor	2.1	2.6	2.3	0.6	1.8	0.8
ALTERNATIVE MEASURES EXCLUDING EXTREMELY LONG UPSWINGS						
12. Long's index of the value of all permits	4.1	2.7	3.4	1.0	1.0	1.0
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	3.2	2.3	2.8	1.1	0.9	1.0
15. Colean-Newcomb index of the value of new building in current prices	2.0	2.8	2.3	1.5	1.9	1.7
16. Colean-Newcomb index of the value of new building in constant prices	2.1	2.5	2.2	1.3	1.2	1.2
22. Long's index of the value of nonresidential permits	2.5	2.4	2.5	0.8	0.5	0.6
23. Long's index of the number of nonresidential permits	2.4	2.9	2.6	0.6	0.7	0.6
29. Increase in wire mileage, all telephone systems	3.5	2.9	3.3	1.2	2.6	1.5

NOTES TO TABLE 7

[a]For periods covered see Table 6.

[b]Alternative measures, excluding extremely long upswings, are shown at the end of the Table. (See note a to Table 6 in regard to Series 2.) See Table 4 and accompanying text for explanations and periods of skipped cycles.

[c]The measures for long swings reflect an extra cycle, as identified in Table 4, note e.

[d]Amplitudes were computed in absolute units, not in percentages.

bases are the average standings of the series in all the years of an entire long swing.

We begin with a very general summary of these amplitude measures. Table 7 presents averages of the long-swing and specific-cycle amplitude measures computed for each series and ratios of the long-swing to the specific-cycle average amplitudes.[6] The measures of Table 7 are based throughout on the original annual data. They suggest that long swings in construction were, on the average, extremely large movements. Judged by the behavior of the series representing aggregate construction, an average long upswing involved a rise equal in magnitude to the average level of construction, that is, the level of construction much more than doubled between trough and peak. Similarly, an average long downswing involved a decline equivalent to two-thirds the average level of activity. The violence of movement in the various individual sectors was still more marked. In any event, the long swings were typically much larger movements than were specific cycles. Indeed, whether it is expansions, contractions, or full cycles that are examined, with very few exceptions, the average amplitudes of long swings were between two and four times as large as the specific-cycle movements in the same series. There were, in fact, only two series among the thirty-eight in which the average amplitude of long swings as a whole was less than twice as large as the comparable average for specific-cycle movements. Upswings of long waves were at least twice as large on the average as specific-cycle expansions in all but six series and average long downswings were at least twice as large as average specific-cycle contractions in all but one series.

This striking general observation, however, applies only to the total amplitudes of long swings, not to the amplitudes per annum which measure the speed of rise or fall. With regard to the pace of long swings

[6]In the last section of the table, alternative measures are presented for a few series in order to eliminate from these averages the very long movements that occur when long downswings are skipped.

and specific cycles the results are quite different. Amplitudes per annum of long upswings were, as a rule, considerably milder than those of specific-cycle expansions. The relatively low amplitudes per annum of long upswings in part reflect the fact that such upswings uniformly consist of a series of specific-cycle expansions interrupted by specific-cycle contractions. The total rise of a series during a long upswing is equal to the cumulative rise of the series during the specific-cycle expansions occurring during the long upswing minus the cumulative decline during the specific-cycle contractions in the same period. Thus, the total rise of a series during a long upswing is bound to be smaller than its cumulative rise during the specific-cycle expansions of the same period. Moreover, a long upswing, since it also includes specific-cycle contractions, must be longer than the sum of years included in the specific cycle expansions during the same long upswing. Hence, it is necessarily true that the rate of rise per annum during any given long upswing must be smaller than the average rate of rise during the specific-cycle expansions which it comprehends. The same must, therefore, be true for the average rate of rise of all long upswings compared with that of specific-cycle expansions occurring during the rising phases of long swings. When, however, the average rise per annum during long upswings is compared with the average rise per annum during *all* specific-cycle expansions, including those that occur during the falling phases of long swings, there is a countervailing consideration. As will be shown, the amplitudes per annum of specific-cycle expansions that occur during long downswings are lower than those that occur during upswings. Specific-cycle expansions during falling phases of long swings are, however, fewer and shorter than expansions during rising phases. These considerations suggest, therefore, that, while the average amplitudes per annum of specific-cycle expansions are very likely to be larger than those of long upswings, it is not necessarily true; and, in fact, there are exceptions to the rule.

When we turn to long downswings, the results are again different. For the various series representing aggregate construction and for most sectoral series, the average amplitudes per annum of long downswings were as large as, and often much larger than, the average amplitudes per annum of specific-cycle contractions. In principle, the same considerations advanced above to explain the pace of long upswings relative to that of specific-cycle expansions apply also to the pace of long downswings relative to that of specific-cycle contractions. In fact, however, long downswings were less frequently interrupted by short expansions. A considerable number of long downswings consisted of a single very large and protracted specific-cycle contraction. One reason that long downswings were less frequently interrupted by short contrary movements than were long upswings is, no doubt, that the downswings were shorter. Reversals due to essentially fortuitous circumstances, therefore, had less chance to occur. Whether it was also true that long downswings were also inherently more violent than long upswings and so smothered the potential effects of contrary influences is uncertain. If it were so, one might expect to find that the amplitudes per annum of specific-cycle contractions occurring during long downswings were regularly much larger than those of specific-cycle expansions occuring during long upswings. This, however, is not the case, as an inspection of Table 11, below, will reveal.

Nevertheless, there is a striking difference between the amplitudes per annum of long swings identified here and those of specific cycles. The amplitudes per annum of long downswings are regularly and significantly larger than those of long upswings. There is, however, no such distinct and regular difference between the speeds of expansion and contraction in the specific cycles which are associated with the shorter business cycles. This is clearly brought out by comparing average measures of amplitudes per annum in long and specific cycles for series representing aggregate construction, for those in each sector, and for all series combined (Table 8). The measures for individual series in Table 7 confirm the regularity of this difference.

These observations about total amplitude and amplitude per annum of long swings and about the difference between the pace of long upswings and downswings are striking as far as they go. In certain respects, however, they are subject to qualification. In particular, the figures in Table 7 which suggest that the total amplitudes of long swings have been two to four times as great as those of specific cycles clearly overstate the case. Since the long swings whose amplitudes are measured in Table 7 were marked off on the basis of annual data, they are bounded by specific-cycle troughs and peaks. The rise and fall of long swings as measured in this table are, therefore, exaggerated to some degree because they contain elements which may be properly attributed to the specific-cycle expansions or contractions which con-

TABLE 8

AVERAGE AMPLITUDE PER ANNUM OF SPECIFIC CYCLES AND LONG SWINGS IN SECTORS OF CONSTRUCTION, 1858-1959

		AMPLITUDE PER ANNUM (PER CENT)					
		Specific Cycles			Long Swings		
Series	Number of Series	Expansion	Contraction	Full Cycle	Expansion	Contraction	Full Cycle
A. Aggregate construction	8	12.9	-14.3	13.2	9.5	-21.8	13.0
B. Total urban building	8	17.6	-17.2	17.3	12.6	-22.1	14.9
C. Nonfarm residential building	6	24.1	-21.5	22.8	17.4	-18.0	17.3
D. Private nonresidential building	4	22.7	-25.4	23.7	12.6	-35.5	17.6
E. Farm construction	1	16.5	-14.4	15.4	11.8	-23.5	16.1
F. Transportation and other public utilities construction[a]	5	18.0	-19.7	18.7	14.0	-26.9	16.8
G. Shipbuilding	1	36.0	-38.7	37.4	60.6	-21.4	36.1
H. Public construction	3	28.7	-27.1	28.4	15.7	-34.9	20.7
Total[a]	36	19.7	-19.9	19.6[b]	14.5	-24.6	16.5

Source: Table 7.

[a]Excludes Series 28 and 29 because amplitudes were computed in absolute units, not in percentages.

[b]Amplitude for full cycle falls outside limits of measures for expansion and contraction because of use of unweighted averages.

stitute their termini. To gain an idea of the degree to which the specific cycles themselves contributed to the size of long-swing movements, we have made a second set of measures of long-swing amplitudes, this time based on smoothed data, that is, on the average standings of these series during successive overlapping business cycles. The chronology of long-swing peaks and troughs underlying this calculation was shown in Table 5. The average amplitudes of the series based on smoothed data are shown in Table 9, where they are compared with amplitude measures based on annual data for comparable long-swing movements in the same series.[7]

[7]Amplitude measures based on smoothed data are calculated in exactly the same way as those based on annual data. We have, however, employed the same cycle bases previously computed for measures based on annual data in order to express the absolute changes as relatives of the average standings of series during long swings. This procedure simplified the calculations and should make little or no difference in the results. The amplitude measures based on annual data in Table 9 are not in every case identical with those in Table 7, since only averages of those phases or cycles that were matched by similar movements in the smoothed data were included. Differences arose chiefly because a number of movements at the beginning or end of the annual series were based on "tentative" peaks or troughs. Some of these have been eliminated from the present table because the series in question was not long enough to establish a comparable turning point in the smoothed data. In some other cases, comparable measures for smoothed and annual data could not be contrived without considerable recomputation. When such recomputation would have provided measures for but a single cycle, we have omitted the comparisons. This was the case with Series 6 and 24.

TABLE 9

EFFECT OF SMOOTHING ON AMPLITUDE OF LONG SWINGS IN CONSTRUCTION, 1858-1959

Series	Period of Annual Data (1)	No. of Cycles (2)	AVERAGE AMPLITUDE (PER CENT) Based on Annual Data Expansion (3)	Based on Annual Data Contraction (4)	Based on Annual Data Full Cycle (5)	Based on Smoothed Data Expansion (6)	Based on Smoothed Data Contraction (7)	Based on Smoothed Data Full Cycle (8)	Ratio of Smoothed to Annual Data (per cent) Expansion (9)	Ratio Contraction (10)	Ratio Full Cycle (11)
A. Aggregate Construction											
1. Gross new construction in current prices, Kuznets	1892-1959	4	128.2	-74.1	202.3	88.0	-26.4	114.4	68.6	35.6	56.5
2. Gross new construction in 1929 prices, Kuznets	1892-1959	4	91.1	-67.6	158.7	58.2	-30.4	88.6	63.9	45.0	55.8
3. Index of the value of construction in current prices, NBER	1878-1912	1.5	102.8	-28.9	131.7	78.0	-12.5	90.5	75.9	43.3	68.7
4. Index of the value of construction in constant prices, NBER	1878-1912	1.5	92.8	-31.9	124.7	69.0	-14.3	83.3	74.4	44.8	66.8
5. Index of the physical volume of construction, NBER	1861-1916	2.5	92.9	-72.0	164.9	68.0	-48.4	116.4	73.2	67.2	70.6
6. Total construction in current prices,[a] Commerce-Labor											
7. New construction in current prices, Commerce-Labor	1926-1959	2	158.0	-117.2	275.2	91.0	-44.8	135.8	57.6	38.2	49.3
8. New construction in 1947-49 prices, Commerce-Labor	1920-1959	2.5	103.1	-100.8	203.9	63.0	-41.8	104.8	61.1	41.5	51.4
B. Total Urban Building											
9. Riggleman's value of permits per capita in current prices	1862-1925	3.5	108.8	-89.7	198.5	79.2	-50.4	129.6	72.8	56.2	65.3
10. Riggleman's index adjusted for trend	1864-1925	3.5	100.8	-91.1	191.9	63.8	-55.1	118.9	63.3	60.5	62.0
11. Riggleman-Isard index of value of permits	1862-1925	3.5	124.8	-88.2	213.0	98.0	-44.6	142.6	78.5	50.6	66.9
12. Long's index of the value of all permits	1871-1925	2	164.4	-87.0	251.4	131.3	-23.5	154.8	79.9	27.0	61.6
13. Long's index of the number of all permits	1858-1925	3.5	116.9	-100.0	216.9	84.2	-52.3	136.5	72.0	52.3	62.9

(continued)

TABLE 9 (continued)

Series	Period of Annual Data (1)	No. of Cycles (2)	AVERAGE AMPLITUDE (PER CENT): Based on Annual Data: Expansion (3)	Contraction (4)	Full Cycle (5)	Based on Smoothed Data: Expansion (6)	Contraction (7)	Full Cycle (8)	Ratio of Smoothed to Annual Data (per cent): Expansion (9)	Contraction (10)	Full Cycle (11)
B. Total Urban Building (concluded)											
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	1871–1925	2	170.0	-84.4	254.4	137.8	-25.0	162.8	81.1	29.6	64.0
15. Colean-Newcomb index of the value of new building in current prices	1862–1933	2	211.2	-178.6	389.8	195.4	-126.2	321.6	92.5	70.7	82.5
16. Colean-Newcomb index of the value of new building in constant prices	1863–1927	2.5	104.7	-72.4	177.1	86.7	-44.6	131.3	82.8	61.6	74.1
C. Nonfarm Residential Building											
17. Long's index of the value of residential permits	1871–1925	3	136.6	-98.5	235.1	97.1	-34.2	131.3	71.1	34.7	55.8
18. Long's index of the number of residential permits	1858–1925	3.5	137.4	-119.9	257.3	97.6	-68.2	165.8	71.0	56.9	64.4
19. Expenditures for new dwelling units in current prices, Blank	1900–1959	3.5	162.4	-144.6	307.0	102.3	-53.8	156.1	63.0	37.2	50.8
20. Expenditures for new dwelling units in 1929 prices, Blank	1892–1959	4	143.1	-125.1	268.2	85.3	-61.2	146.5	59.6	48.9	54.6
21. Number of dwelling units started, Blank	1892–1959	4	134.4	-118.8	253.2	79.6	-53.7	133.3	59.2	45.2	52.6
21a. Production of housekeeping dwelling units, Gottlieb	1864–1933	4	107.3	-93.0	200.3	80.7	-53.6	134.3	75.2	57.6	67.0
D. Private Nonresidential Building											
22. Long's index of the value of nonresidential permits	1869–1925	2	181.0	-88.9	269.9	150.4	-27.2	177.6	83.1	30.6	65.8
23. Long's index of the number of nonresidential permits	1861–1924	2.5	155.6	-103.4	259.0	116.6	-65.6	182.2	74.9	63.4	70.3
24. New private nonresidential construction in current prices, Commerce-Labor[a]											
25. New private nonresidential construction in 1947–49 prices, Commerce-Labor	1918–1933	1	104.7	-121.5	226.2	82.1	-104.4	186.5	78.4	85.9	82.4

(continued)

TABLE 9 (concluded)

Series	Period of Annual Data (1)	No. of Cycles (2)	AVERAGE AMPLITUDE (PER CENT): Based on Annual Data: Expansion (3)	Based on Annual Data: Contraction (4)	Based on Annual Data: Full Cycle (5)	Based on Smoothed Data: Expansion (6)	Based on Smoothed Data: Contraction (7)	Based on Smoothed Data: Full Cycle (8)	Ratio of Smoothed to Annual Data (per cent): Expansion (9)	Contraction (10)	Full Cycle (11)
E. Farm Construction											
26. New farm construction in 1947-49 prices, Commerce-Labor	1919-1932	1.5	41.2	-104.1	145.3	13.5	-68.0	81.5	32.8	65.3	56.1
F. Transportation and Other Public Utilities Construction											
27. Rail Consumption	1862-1933	4	116.2	-102.2	218.4	73.6	-51.8	125.4	63.3	50.7	57.4
28. Increase in wire mileage, Western Union Telegraph Co.[b]	1888-1931	2.5	209.5	-182.0	391.5	79.6	-70.5	150.1	38.0	38.7	38.3
29. Increase in wire mileage, all telephone systems[b]	1886-1933	2	4,754	-5,101	9,855	3,369	-2,968	6,337	70.9	58.2	64.3
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer	1875-1933	3	125.2	-107.5	232.7	91.8	-74.7	166.5	73.3	69.5	71.6
31. Gross capital expenditures in current prices, all regulated industries, Ulmer	1876-1933	3	133.6	-106.9	240.5	99.0	-64.0	163.0	74.1	59.9	67.8
32. New private public utilities construction in 1947-49 prices, Commerce-Labor	1921-1933	1	87.5	-108.4	195.9	70.7	-80.9	151.6	80.8	74.6	77.4
33. New private public utilities construction in current prices, Commerce-Labor	1915-1933	1	103.0	-131.8	234.8	73.6	-98.8	172.4	71.5	75.0	73.4
G. Shipbuilding											
34. Tonnage of merchant vessels built in the U.S.	1859-1943	4.5	411.5	-214.0	625.5	208.1	-150.7	358.8	50.6	70.4	57.4
H. Public Construction											
35. Long's index of the value of public building permits	1870-1929	3	167.6	-166.0	333.6	112.4	-79.4	191.8	67.1	47.8	57.5
36. New public construction in current prices, Commerce-Labor	1920-1959	2.5	153.0	-134.0	287.0	76.9	-29.7	106.6	50.3	22.2	37.1
37. New public construction in 1947-49 prices, Commerce-Labor	1942-1959	1	113.6	-179.8	293.4	82.5	-65.3	147.8	72.6	36.3	50.4

[a]Measures for Series 6 and 24 were omitted (see note 7 in this chapter).

[b]Amplitudes were computed in absolute units, not in percentages.

It appears that amplitudes of long swings measured in smoothed data are, indeed, considerably smaller than they are when measured from annual data. Attending only to full-cycle measures, and looking only at the series representing aggregate construction, it appears they were only about one-half as large. The reductions were somewhat larger for downswings than for upswings. Since, on the basis of annual data (Table 7) the amplitudes of long swings were observed to be between two and four times as large as those of specific cycles, it might be said, very roughly, that—after eliminating crudely the influences connected with business cycles and with those random factors that cancel out in periods covered by business cycles—the amplitude of long swings has been at least of the same order of magnitude as that of specific cycles, or larger; perhaps twice as large by some measures of total construction.

It is, perhaps, more interesting to interpret Table 9 somewhat differently. In a rough way, the smoothed data may be regarded as values from which the influence of ordinary business cycles has been eliminated. On this basis, and having regard only to full-cycle measures, we may say that about one-half (or slightly more) of the amplitude of long swings was contributed by influences which operated over periods longer than business cycles, while the other half (or somewhat less) was attributable to influences which canceled out in averages struck over periods bounded by business-cycle turning points. So far as these averages for full cycles can take us, we may infer that there were, indeed, long swings which can be significantly differentiated from business cycles.

This statement holds up well when the measures for long-swing expansions and contractions are taken separately. It is, indeed, true that the ratios of the average amplitudes of long swings based on the smoothed data to those based on annual data run somewhat lower for contractions than for full cycles—just as they run higher for expansions. Nevertheless, even for contractions it appears that a substantial share of the average long-swing declines, both in measures of aggregate construction and in most indexes for major sectors, persists even after smoothing to eliminate the influence of shorter cycles.

So far as average measures of amplitude go, therefore, the evidence supports the conclusion that, since the Civil War, both aggregate construction and its major segments have moved in a succession of long swings consisting of great upswings followed by smaller declines in the absolute level of activity. Averages, however, are not adequate for the purpose. A glance back at Charts 1 to 3 suggests that, while the successive long upswings were huge upsurges of unmistakable character, perhaps only the long downswing from the 1920's to the 1930's was a decline of comparable size and clarity. By comparson, the declines in the 1890's and before World War I were notably mild; and even the movements in the 1870's were less severe. To establish the existence of a succession of long downswings in the absolute level of construction, figures like those in Table 9 should be inspected for the successive long contractions taken separately.

That is the purpose of Table 10. It omits measures for the long downswing which began in the latter half of the 1920's and stretched into the early and middle 1930's because there can be no serious doubt about the size and protracted duration of that long decline in aggregate construction and its major sectors. The table contains measures for fewer series than Table 9 because the several Commerce-Labor series do not begin until 1915, just before the United States' entrance into World War I, and thus provide little useful evidence about a possible long-swing decline in the 1910's.

The data in Table 10 cast a certain shadow of doubt upon the suggestions ventured earlier that there were long-swing declines in the absolute level of construction in all the major sectors, as well as in aggregate construction, in the 1890's and the 1910's. Indeed, it raises some question even about the 1870's. We look first at the measures for the 1890's and 1910's. In certain sectors, such declines were clearly marked in both decades. That was true of urban residential building, of railroad and other public utility construction, and of public building, at least as measured by Long's index. In these sectors, the long-swing declines identified in the annual data were large even after allowing for the special effects of World War I. Similarly, the long-swing declines in the smoothed data were substantial; so the movements cannot be attributed to business-cycle contractions alone. We should remember, however, that Long's index of public building, being an index of the value of urban building permits, does not adequately reflect building by the federal government, a sector of increasing importance, in which activity presumably increased during the war as a consequence of military demands.

TABLE 10

EFFECT OF SMOOTHING ON AMPLITUDE OF LONG DOWNSWINGS IN CONSTRUCTION: INDIVIDUAL DOWNSWINGS, 1870-1920
(per cent)

Series	DOWNSWING OF THE 1870's			DOWNSWING OF THE 1890's			DOWNSWING OF THE 1910's		
	Amplitude of Decline		Ratio: Smoothed to Annual	Amplitude of Decline		Ratio: Smoothed to Annual	Amplitude of Decline		Ratio: Smoothed to Annual
	Annual Data	Smoothed Data		Annual Data	Smoothed Data		Annual Data	Smoothed Data	
A. Aggregate Construction									
1. Gross new construction in current prices, Kuznets	15.1			26.9	10.5	39.0	43.3	8.0	18.5
2. Gross new construction in 1929 prices, Kuznets				25.7	8.2	31.8	49.6	33.0	66.5
3. Index of the value of construction in current prices, NBER	116.2			28.9	12.5	43.3	57.1		
4. Index of the value of construction in constant prices, NBER	97.6			31.9	14.3	44.8	84.4		
5. Index of the physical volume of construction, NBER	96.7	65.6	67.8	47.2	31.2	66.1	56.6[a]		
B. Total Urban Building									
9. Riggleman's value of permits per capita in current prices	108.5	70.8	65.3	75.2	49.8	66.2	85.5	30.5	35.7
10. Riggleman's index adjusted for trend	80.0	44.1	55.1	81.9	48.9	59.7	111.5	72.3	64.8
11. Riggleman-Isard index of value of permits	129.4	86.7	67.0	52.7	28.9	54.8	82.6[a]	18.2[a]	22.0[a]
12. Long's index of the value of all permits	43.7	18.0	41.2				130.4[a]	29.0[a]	22.2[a]
13. Long's index of the number of all permits	150.0	103.1	68.7	73.4	46.4	63.2	76.7[a]	7.4[a]	9.6[a]
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	41.6	17.3	41.6				127.1[a]	32.8[a]	25.8[a]
15. Colean-Newcomb index of the value of new building in current prices	117.3	75.4	64.3						
16. Colean-Newcomb index of the value of new building in constant prices	94.4	51.2	54.2				50.5	37.9	75.0

(continued)

TABLE 10 (continued)

Series	DOWNSWING OF THE 1870's: Amplitude of Decline: Annual Data	DOWNSWING OF THE 1870's: Amplitude of Decline: Smoothed Data	DOWNSWING OF THE 1870's: Ratio: Smoothed to Annual	DOWNSWING OF THE 1890's: Amplitude of Decline: Annual Data	DOWNSWING OF THE 1890's: Amplitude of Decline: Smoothed Data	DOWNSWING OF THE 1890's: Ratio: Smoothed to Annual	DOWNSWING OF THE 1910's: Amplitude of Decline: Annual Data	DOWNSWING OF THE 1910's: Amplitude of Decline: Smoothed Data	DOWNSWING OF THE 1910's: Ratio: Smoothed to Annual
C. Nonfarm Residential Building									
17. Long's index of the value of residential permits	95.3	34.1	35.8	72.0	35.5	49.3	128.3	32.9	25.6
18. Long's index of the number of residential permits	152.0	88.6	58.3	92.7	68.5	73.9	114.9	47.5	41.3
19. Expenditures for new dwelling units in current prices, Blank				50.4			92.8[a]	10.9[a]	11.7[a]
20. Expenditures for new dwelling units in 1929 prices, Blank				61.3	28.3	46.2	111.1	62.8	56.5
21. Number of dwelling units started, Blank				68.4	29.7	43.4	104.0	55.3	53.2
21a. Production of housekeeping dwelling units, Gottlieb	66.7	21.8	32.7	56.6	36.9	65.2	102.7[a]	49.1[a]	47.8[a]
D. Private Nonresidential Building									
22. Long's index of the value of nonresidential permits	51.1	17.6	34.4				126.7[a]	36.8[a]	29.0[a]
23. Long's index of the number of nonresidential permits	149.3	96.8	64.8	57.5	34.5	60.0			
F. Transportation and Other Public Utilities Construction									
27. Rail consumption	95.9	24.7	25.8	90.2	39.0	43.2	89.9	49.4	54.9
28. Increase in wire mileage, Western Union Telegraph Co.[b]	17.5			79.8	31.8	39.8	316.0	92.8	29.4
29. Increase in wire mileage, all telephone systems[b]							2,194[a]	857[a]	39.1[a]
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer				123.6	76.9	62.2	87.0	73.5	84.5
31. Gross capital expenditures in current prices, all regulated industries, Ulmer				117.8	75.1	63.8	74.4	30.3	40.7

(continued)

TABLE 10 (concluded)

Series	DOWNSWING OF THE 1870's			DOWNSWING OF THE 1890's			DOWNSWING OF THE 1910's		
	Amplitude of Decline		Ratio:	Amplitude of Decline		Ratio:	Amplitude of Decline		Ratio:
	Annual Data	Smoothed Data	Smoothed to Annual	Annual Data	Smoothed Data	Smoothed to Annual	Annual Data	Smoothed Data	Smoothed to Annual
G. Shipbuilding									
34. Tonnage of merchant vessels built in the U.S.	121.8	71.7	58.9	121.5	76.7	63.1	113.3	44.9	39.6
H. Public Construction									
35. Long's index of the value of public building permits	247.2	136.7	55.3	156.1	53.8	34.5	94.7	47.8	50.5

Note: Blank space indicates no downswing during given period or data not available.

[a]Includes wartime contraction.

[b]Amplitudes were computed in absolute units, not in percentages.

In at least one important sector, private nonresidential building, the data speak less clearly. In the 1890's, Long's index of the number of nonresidential permits declines substantially, but his index of the value of such permits does not. In the 1910's, neither of these indexes suggests a long-swing decline (apart from a wartime decline in the value index).

As a consequence of the doubtful behavior of nonresidential building in these decades and presumably also because the other sectors did not begin and end their declines synchronously, the various indexes of total urban building present a mixed picture. The Riggleman indexes in their original form declined substantially in both periods. The Isard adjustment of Riggleman (to reflect population growth), however, declined significantly only in the 1890's. Long's index of the number of building permits of all kinds declined markedly in the 1890's, but his index of value did not, and neither Long index displayed a marked long-swing decline in the 1910's, apart from a wartime decline in value. Similarly, the various indexes computed by Colean and Newcomb, by reweighting and smoothing the components of Long's index of value, display no significant long-swing decline in either period (as indicated by the blank spaces in Table 10) apart from the post-1910 decline of their index in constant prices.[8]

Finally, with respect to the indexes of aggregate construction, the evidence consistently suggests that, while there were long-swing declines, they were very mild. Keeping in mind that the declines in the smoothed data were small, that the various indexes all have serious faults, and that some portion of the indicated declines after 1910 was due to the war,[9] one must conclude that the evidence for long-swing declines in the absolute level of aggregate construction activity during these decades is weak.

The record of the 1870's is at first blush a good deal clearer. Superficially, both the annual and the smoothed data show pronounced

[8]From 1915 on, this index depends on the Commerce-Labor estimates of aggregate construction.

[9]The net impact of the war, it should be remembered, is not entirely clear. It depressed some areas of building—residential, transport, public utility, state and local government—but it enormously stimulated other kinds of building by the federal government and by defense industries. This, no doubt, helps explain why some measures of private nonresidential building rose rapidly during the war.

long-swing declines in all the major sectors. Moreover, these falls were sufficiently congruent to cause substantial long downswings in the indexes of total urban building and in the NBER indexes of total construction, which combine urban, residential, and nonresidential building with railroad construction. There are, however, two difficulties in arriving at clear-cut conclusions about the extent of the decline in construction in this decade. First, while the indexes for the major sectors are consistent in suggesting profound long-swing declines, imperfections in the data leave us uncertain whether the various indexes measure the size of the declines accurately. The Long and Riggleman indexes of residential, nonresidential, and total urban building in this period all depend on permit data for a relatively few large cities. They may, therefore, overstate the size of the downswing, since they neglect the newer and smaller urban centers which may have been growing more rapidly. These defects also qualify, though to a lesser degree, the reliability of the NBER indexes of aggregate construction into which the Riggleman index enters as a principal component. It should be remembered, however, that among the series which decline markedly during the seventies are Riggleman's index, as adjusted by Isard to reflect the population growth of the cities in the Riggleman sample (Series 11), and the Isard adjustment of Riggleman as smoothed by Colean and Newcomb to eliminate undue fluctuation (Series 15 and 16).

A second element of doubt about the behavior of construction in the seventies arises because the Kuznets estimates of aggregate construction, in smoothed form, fail to exhibit a long-swing decline in this period. Indeed, there is no evidence of a long-swing decline even in Kuznets' annual estimates in constant prices, while his annual estimates in current dollars fall only some 15 per cent from 1873 to 1878. The force of these doubts, as already said, is qualified because Kuznets' figures rest on Census benchmarks which may overstate the decadal rise in the consumption of construction materials by 10 to 20 per cent and also because his intercensal interpolators in this period are weak.[10] Nevertheless, the showing of Kuznets' figures casts suspicion on the reality of a long-swing decline in the absolute level of construction in the 1870's.

In this situation, it is useful to introduce certain new evidence,

[10]See Appendix A, Part III.

parts of which are either not yet available in published form or which were not yet available in a form convenient for inclusion in the tables. Manuel Gottlieb has recently made a complete compilation of the number and assessed value of all new buildings in Ohio from 1858 to 1914. As part of this work, he has combined his count of the number of dwelling units built in Ohio with the Long and Riggleman indexes of urban building, after making careful adjustments of decade-to-decade changes in building based on Census and other benchmarks. The results of this work appear in our tables as Series 21a. This series in annual form declined 67 per cent between 1871 and 1878. Smoothed by the computation of average reference-cycle standings, the decline during the seventies was 22 per cent.

The Ohio figures for dwelling units taken alone display a marked long swing, beginning with a great surge from the early 1860's and culminating in a sharp slump in the 1870's. Gottlieb[11] has divided the data into two categories which behaved as follows:

Dwelling Units

	Urban			*Nonurban*			*Total*		
		Number	Per Cent Change		Number	Per Cent Change		Number	Per Cent Change
Trough	1862	1306		1864	3537		1862	4958	
Peak	1874	4318	+231	1873	13242	+274	1874	14975	+202
Trough	1878	1874	− 57	1878	6534	− 51	1878	8408	− 43

In addition to these indications for dwelling units, the assessed value of all newly built industrial buildings in Ohio climbed to a peak in 1872 and then, with one interruption in 1876-77, declined over 80 per cent to a trough in 1878. Similarly, the assessed value of new commercial buildings reached a peak in 1869 and declined over 65 per cent to a trough in 1878. No doubt some portion of these very large declines may be attributed to a readjustment in the assessed values of comparable structures. However, since an index of building costs in this period declined only some 35 per cent (from 1869 to 1878) and since appraised values are likely to move more sluggishly than building costs themselves, a substantial decline in nonresidential as well as residential buiding is indicated for Ohio sometime during the decade. Since the Ohio data comprise a complete count of new buildings in nonurban

[11] Gottlieb, *Estimates of Residential Building* (20).

as well as urban areas—in cities and towns of all sizes—one may regard these data as substantial new support for the view that there was a protracted and significant decline in the level of total construction in the 1870's. Even so, one cannot take the question to be wholly settled.

Subject to this statement, then, the evidence may be summarized by the observation that measures of amplitude generally support the view that there was a succession of long swings in aggregate construction activity widely shared by the major branches of construction. Certainly the upswing phases of the long swings identified in these chronologies represented great surges of activity which were very large compared with business-cycle expansions. This was also true of the downswings in certain sectors, notably railroad and urban residential construction. The indications are less consistent for nonresidential building in the 1890's and 1910's; and the long-swing declines in these decades, if they occurred, were presumably mild. These mild long downswings, which conceivably were no more than sharp retardations, taken together with a certain lack of congruence in the movements of the various sectors, throw reasonable doubt on the occurrence of actual long-swing declines in the absolute level of aggregate construction activity during the 1890's and 1910's. The figures do actually decline, but the declines in the smoothed figures were small. In view of weaknesses in the data and allowing for the impact of the war, one may well question whether total activity fell off at all apart from contractions associated with ordinary business cycles. Aside from these doubts, however, the tables so far leave unscarred the view that a succession of long swings occurred in the weaker sense, that is, construction activity rose in a series of surges interrupted by periods of slower growth. For even if the mild declines in aggregate construction activity which the figures display were really rises, it seems right to suppose they were small increases, not large ones.