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

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Volume Publisher: NBER

Volume ISBN: 0-87014-404-9

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

Publication Date: 1964

Chapter Title: Long Swings in Construction Viewed as Fluctuations in Rates of Growth

Chapter Author: Moses Abramovitz

Chapter URL: http://www.nber.org/chapters/c1807

Chapter pages in book: (p. 99 - 122)

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Long Swings in Construction Viewed as Fluctuations in Rates of Growth

Since it seems impossible to resolve completely the uncertainties regarding long swings in construction in the sense of protracted fluctuations in the level of construction, we go on to consider such swings as alternations between acceleration and retardation in growth. A variety of evidence has already been amassed supporting the view that there was, indeed, a succession of long swings in this weaker sense. First, the doubts entertained about the existence of a succession of upsurges interrupted by protracted downswings at fifteen-to twenty-five-year intervals are doubts concerning the occurrence of significantly large declines in the absolute level of activity. To entertain such doubts, however, implies that the statistics suggest some notable change between the rates of growth in the periods before the occurrence of doubtful peaks and those in the periods which follow. This applies both to indexes of aggregate construction and to estimates of the individual branches taken separately. Secondly, the regular and marked differences between the character of specific-cycle expansions and contractions when classified by phase of long swing implies that, at a minimum, there were differences between rates of growth during the long upswings of individual series and those during their long downswings. Again this was true of the measures of aggregate construction as well as of indexes for the several branches. Finally, the very high indexes of conformity to reference long swings suggest that there was a widely shared tendency for construction in its various branches to join in common wave-like movements which must, therefore, have amounted to waves in aggregate construction activity. If there is legitimate doubt about the recurrence of actual declines in aggregate construction activity, the conformity measures for full swings clearly imply long swings in its rate of growth in which virtually every important branch of the industry regularly participated. We turn now to some direct observations of fluctuations in growth rates.

We begin by identifying the peaks and troughs of long swings in the rates of growth per annum of our thirty-eight series. The growth rates in question are calculated between the average standings of each series in successive short reference cycles.[1] First, rates of growth per annum were computed between reference cycles running from trough to trough, then between cycles running from peak to peak. The resulting figures were then intermingled to obtain a continuous series of growth rates between the average standings of construction in successive overlapping pairs of reference cycles. The procedure is intended to produce growth rates from which the influence of ordinary business cycles has been eliminated in whole or in good part, since the values between which growth rates are computed are themselves the average standings of a series over entire business-cycle periods. The values obtained are centered at the middle of the intervals between the midpoints of the reference-cycle periods from which the given growth rates are computed.

The series of growth rates fluctuate in well-defined long waves of wide amplitude. A chronology of turning points in such waves for the thirty-eight series (Table 14) displays closely clustered major peaks and troughs, clusters which include the turning points in the rates of growth of individual branches in total urban building and in aggregate construction. The clusters correspond one for one with those that appear in Tables 4 and 5, although the turns in growth rates, of course, consistently precede those in the level of construction. In contrast with the chronology of turns in the level of construction, the chronology of long-swing turns in growth rates displays virtually no blanks, that is, there were almost no skipped cycles. It is true that a number of series failed to display retardation during the World War II period and that merchant shipbuilding skipped the wave of the 1920's and 1930's. Only

[1] The growth rate is computed as the difference between two successive trough-to-trough cycle standings (see Chapter 2) divided by the number of years between the midpoints of the two trough-to-trough periods, the difference being expressed as a percentage of the average of the two cycle standings compared.

TABLE 14

CHRONOLOGY OF PEAKS AND TROUGHS OF LONG SWINGS IN RATES OF CHANGE PER ANNUM OF CONSTRUCTION, 1858-1950[a]

Series	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak
A. Aggregate Construction												
1. Gross new construction in current prices, Kuznets			1874.25[d]	1889.75[b]	1893.75	1900	1913.5	1923[b]	1930.25	1938.5[c]	1943.25[c]	1948.25
2. Gross new construction in 1929 prices, Kuznets			1874.25[d]	1889.75[b]	1893.75	1900	1914.5	1921.25	1930.25	1938.5[c]	1943.25[c]	1948.25
3. Index of the value of construction in current prices, NBER				1881	1893.75	1904	1913.5[d]					
4. Index of the value of construction in constant prices, NBER				1884	1893.75	1904	1913.5[d]					
5. Index of the physical volume of construction, NBER		1866.25	1874.25	1884	1892.25	1903	1913.5[b,d]					
6. Total construction in current prices, Commerce-Labor								1923	1930.25	-	-	1948.25
7. New construction in current prices, Commerce-Labor								1923	1930.25	1938.5[c]	1943.25[c]	1948.25
8. New construction in 1947-49 prices, Commerce-Labor								1921.25	1930.25	1938.5[c]	1943.25[c]	1948.25
B. Total Urban Building												
9. Riggleman's value of permits per capita in current prices	1858	1866.25	1874.25	1884	1892.25	1903	1913.5	1920.25				
10. Riggleman's index adjusted for trend	1858	1866.25	1874.25	1884	1892.25	1903	1917.25	1920.25				
11. Riggleman-Isard index of value of permits	1858	1866.25	1874.25	1884	1892.25	1903	1913.5	1920.25				
12. Long's index of the value of all permits			1874.25[d]	1881	1891	1903[b]	1913.5[b]	1920.25				
13. Long's index of the number of all permits		1866.25	1874.25	1884	1892.25	1904	1914.5	1921.25				
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb			1874.25[d]	1881	1896.5[b]	1903	1913.5[b]	1920.25				

(continued)

TABLE 14 (continued)

Series	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak
B. Total Urban Building (cont.)												
15. Colean-Newcomb index of the value of new building in current prices	1858	1864.25	1874.25	1884	1892.25	1903	1911	1923[b]	1930.25	1938.5[c]	1943.25[c]	
16. Colean-Newcomb index of the value of new building in constant prices	1858	1866.25	1874.25	1888	1896.5	1903	1913.5[b]	1921.25				
C. Nonfarm Residential Building												
17. Long's index of the value of residential permits			1874.25[d]	1881	1891	1904[b]	1913.5	1920.25				
18. Long's index of the number of residential permits	1861.75	1866.25	1874.25	1884	1899	1904	1914.5	1921.25				
19. Expenditures for new dwelling units in current prices, Blank					1892.25[d]	1904	1914.5	1921.25	1930.25	-	-	1948.25
20. Expenditures for new dwelling units in 1929 prices, Blank					1899[b]	1904	1917.25	1921.25	1930.25	1938.5[c]	1943.25[c]	1948.25
21. Number of dwelling units started, Blank					1892.25[d]	1904[b]	1917.25	1921.25	1930.25	-	-	1944.75
21a. Production of housekeeping dwelling units, Gottlieb	1858	1866.25	1874.25	1884	1889.75	1903	1917.25	1921.25	1927.5			
D. Private Nonresidential Building												
22. Long's index of the value of nonresidential permits			1874.25[d]	1888	1896.5	1900	1913.5[b]	1918.25				
23. Long's index of the number of nonresidential permits	1860[d]	1864.25	1874.25	1886.5	1896.5	1903	1913.5[b]	1918.25				
24. New private nonresidential construction in current prices, Commerce-Labor							1921.25	1924	1932.25	-	-	1944.75[e]
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor							1921.25	1924	1932.25	-	-	1944.75[e]

(continued)

TABLE 14 (concluded)

Series	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak	Trough	Peak
E. Farm Construction												
26. New farm construction in 1947-49 prices, Commerce-Labor							1920.25[d]	1926	1930.25	-	-	1944.75
F. Transportation and Other Public Utilities Construction												
27. Rail consumption		1866.25	1874.25	1886.5	1892.25	1899	1914.5[b]	1923	1930.25			
28. Increase in wire mileage, Western Union Telegraph Co.[f]				1886[b]	1889.25	1899.5		1920.25	1930.25[b]			
29. Increase in wire mileage, all telephone systems						1896.5	1917.25[b]	1920.25	1932.25	-	-	1944.75
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer				1891[b]	1893.75	1899	1914.5	1921.25	1932.25	-	-	1944.75[d]
31. Gross capital expenditures in current prices, all regulated industries, Ulmer				1891[b]	1893.75	1899	1913.5	1921.25	1932.25	-	-	1944.75[d]
32. New private public utilities construction in 1947-49 prices, Commerce-Labor								1921.25	1932.25	-	-	1944.75
33. New private public utilities construction in current prices, Commerce-Labor								1923	1932.25	-	-	1944.75
G. Shipbuilding												
34. Tonnage of merchant vessels built in the U.S.[f]	1857.5	1861.25	1883.5	1887.5	1891.75	1896	1920.75[b,c]	-	-	1938.5[c]	1944.75[c,d]	
H. Public Construction												
35. Long's index of the value of public building permits			1874.25[d]	1884	1893.75	1903[b]	1917.25[b]	1920.25				
36. New public construction in current prices, Commerce-Labor								1924	1932.25	1936.75[c]	1943.25[c]	1948.25
37. New public construction in 1947-49 prices, Commerce-Labor								1924	1932.25	1936.75[c]	1943.25[c]	1949.5

NOTES TO TABLE 14

Source: Appendix A, Part I, Table A-3.
Note: Blank space indicates data not available. Dash indicates cycle skipped.

[a]Since the rates of change upon which these turning points are based are calculated from the average standings of the series during periods identified by the NBER as bounded by the trough or peak years of business cycles, the rates of change refer to the midpoints between the business cycle periods so marked off. These midpoints often fall in years centered at dates other than the normal June 30. This is denoted by decimals following the year, e.g., 1896: year centered at June 30; 1896.5: year centered at December 31; 1896.25: year centered at September 30; 1896.75: year centered at March 31, 1897.

[b]An extra, less prominent, movement intervenes between the term marked and the one preceding. These extra movements, by series number, are:

1. Peak 1884, trough 1886.5; peak 1917.25[c], trough 1920.25[c].
2. Peak 1884, trough 1886.5.
5. Trough 1907.75, peak 1910.
12. Peak 1893.75, trough 1896.5; trough 1906.75, peak 1910.
14. Trough 1891, peak 1893.75; trough 1906.75, peak 1910.
15. Peak 1917.25[c], trough 1920.25[c].
16. Trough 1906.75, peak 1910.
17. Peak 1893.75, trough 1899.
20. Trough 1892.25[d], peak 1893.75.
21. Peak 1895.25, trough 1899.
22. Trough 1906.75, peak 1910.
23. Trough 1906.75, peak 1910.
27. Trough 1906.75, peak 1910.
28. Peak 1877.25, trough 1883.5; trough 1921.25, peak 1926.
29. Trough 1907.75, peak 1911. (This was a fairly strong movement, about as pronounced as the following retardation, but somewhat shorter.)
30. Peak 1877.75[d], trough 1884.
31. Peak 1881, trough 1884.
34. Trough 1909.5, peak 1916.75[c].
35. Peak 1896.5, trough 1899; trough 1906.75, peak 1910.

[c]Peaks and troughs of major wartime contractions.

[d]Tentative turning point marked at beginning and end of a series.

[e]A very mild fluctuation in this series took place after 1944, with a trough in 1949.5 and a peak in 1952.75.

[f]First segment is given in fiscal years. Fiscal-year dates have been adjusted to a calendar-year basis. Thus, a turning point falling in fiscal-year 1905 is shown in the table as 1904.5, that is, centered on December 31, 1904. Similarly, a turning point falling in fiscal-year 1895.5 is shown in the table as 1895, that is, centered on June 30, 1895; and so on.

this single series, however, had turning points whose timing was to any marked degree different from those of the bulk of construction. As might be expected in series of rates of change, there are a number of shorter and milder movements, which are identified in the notes to Table 14. These extra movements, however, rarely display amplitudes of the same magnitude as those of the waves recognized in the chronology.

All these observations run to the conclusion that the several doubts that were entertained concerning the existence of an unbroken succession of long swings in the level of aggregate construction and its major branches disappear when the long waves are viewed as fluctuations in growth rates. Charts 4 to 6 provide a visual impression of the character of these waves as they appear in the same group of fifteen long series[2] whose levels were depicted in Charts 1 to 3. The charts make it quite clear that long wave-like movements appear in growth rates, that the swings in the various sectors run together and are reflected in clear swings of wide amplitude in the various aggregates. The charts also show the extra swings in the series and confirm our assertion that these were, with some few exceptions, milder movements constituting minor interruptions to the long upswings and downswings of the rates of growth.

The waves in the growth rates of the various sectors were so clearly congruent that formal measures of association or conformity appeared to be superfluous. Definite measures of the duration and amplitude of the long-swing movements should, however, be provided. Table 15 contains measures of the average duration of long swings in growth rates for the long series whose movements are shown in Charts 4 to 6. The significant figures are those in columns (2) to (4), since they are based on the turning points of the major movements recognized in the chronologies of Table 14. Columns (6) to (8) provide similar measures, including movements classed here as extra cycles. Because the latter are in most cases too mild to be recognized as long swings, the figures are included only to record the full results of the work.

[2]We refer to fifteen series although the charts may, at first glance, appear to show only twelve. This happens because in three cases, series that stopped in 1914 or 1933 were extended by more current series that start later but continue to recent years.

CHART 4

Aggregate Construction: Rates of Change Per Annum Between Average Reference-Cycle Standings, 1860-1954

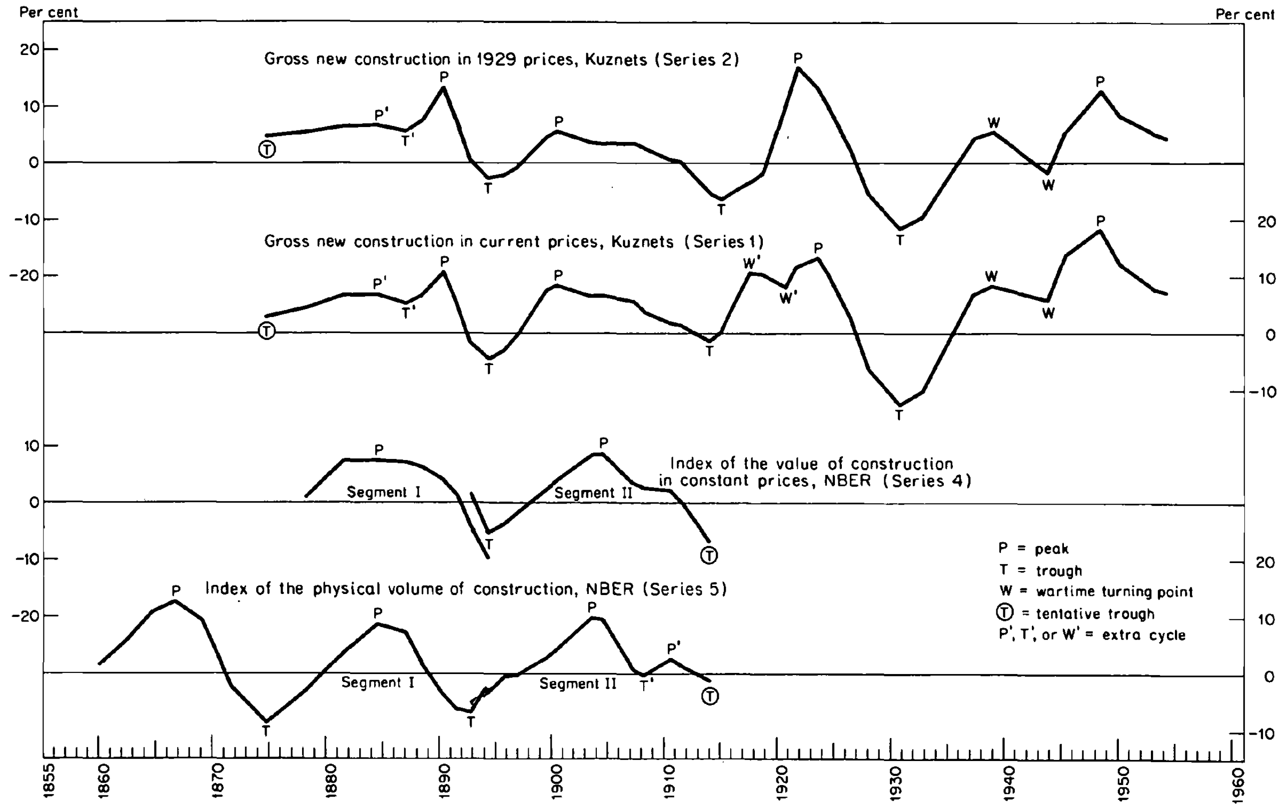
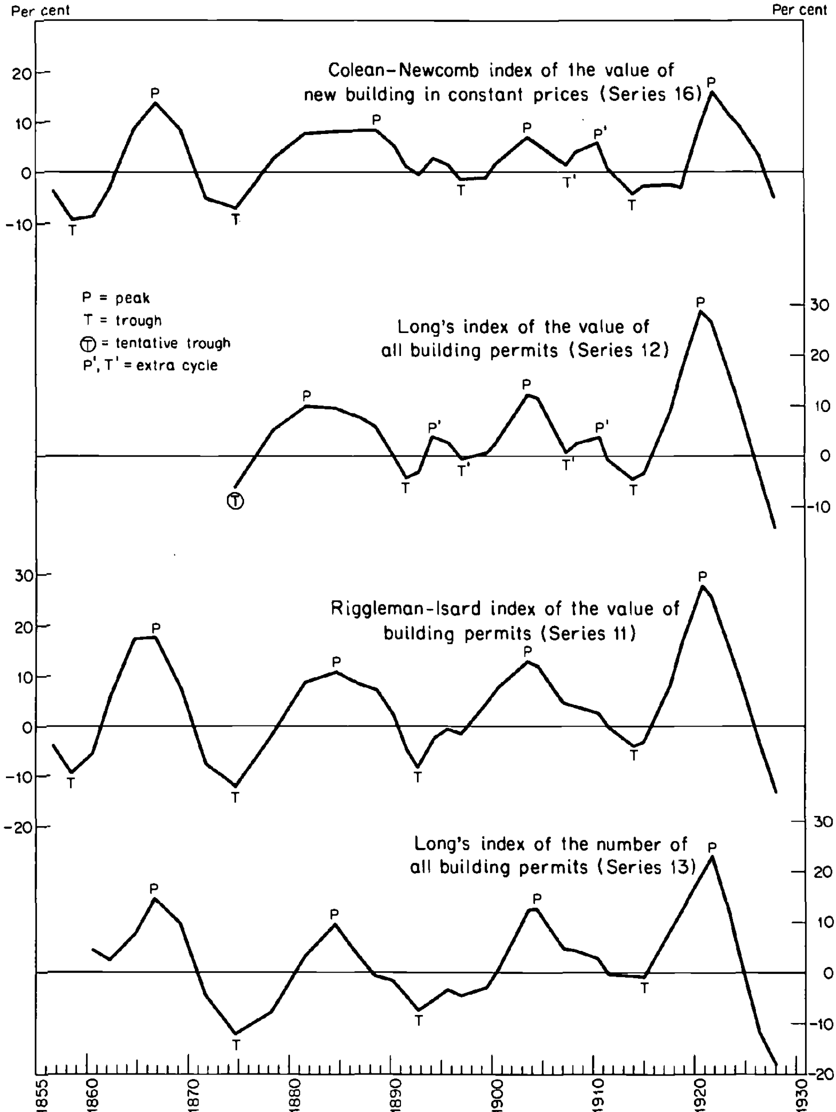


CHART 5

Total Urban Building: Rates of Change Per Annum Between Average Reference-Cycle Standings, 1856-1927



The interesting feature of the table does not lie in the durations of the full long swings. Since, as has already been shown, the long swings in growth rates correspond one for one to those in the levels of construction activity, it follows that the average durations of the former will be very similar to those of the latter. They do indeed fall within the same fifteen- to twenty-five-year range, their exact length depending chiefly on the period covered by the series. For upswings and downswings taken separately, however, the duration of movements in growth rates turns out to be quite different from that in the level of construction. When dealing with swings in the level of construction, we showed that the durations of the long upswings in aggregate construction were much longer than those of the downswings. In the case of long swings in growth rates, however, the differences between the average durations of upswings and downswings are small and may well not be significant. It may be supposed that this difference between long swings in growth rates and levels of construction is, in part, a reflection of a difference in trend factors. The primary trend of the level of construction in its various branches has been upward; the primary trend in the *rates of growth* of construction has been virtually horizontal. Further, there were occasions when the level of activity in one branch or another of construction continued to rise, although other branches experienced a long downswing in their level. This must have stretched out the upswings in the level of aggregate construction at the expense of the downswings. In the rates of growth there are no significant instances in which a downswing was wholly skipped by an important branch of the industry.

It seems likely, however, that these considerations are not really the matters of primary importance. There are two possibilities. The relative brevity of upswings in rates of growth (compared with upswings in the level) of activity may be connected with limitations on the growth of construction capacity. For example, as the construction industry emerges from a generally depressed state, its rate of advance may be very rapid during a period of recovery in which unemployed labor is being reabsorbed and underutilized capital is being employed more intensively. Thereafter, though activity continues to grow, it must do so at a retarded rate, its growth depending on the speed with which additional manpower can be attracted from other industries and outfitted wih an enlarged and improved stock of equipment and tools.

CHART 6

Major Sectors of Construction: Rates of Change Per Annum Between Average Reference-Cycle Standings, 1856-1954

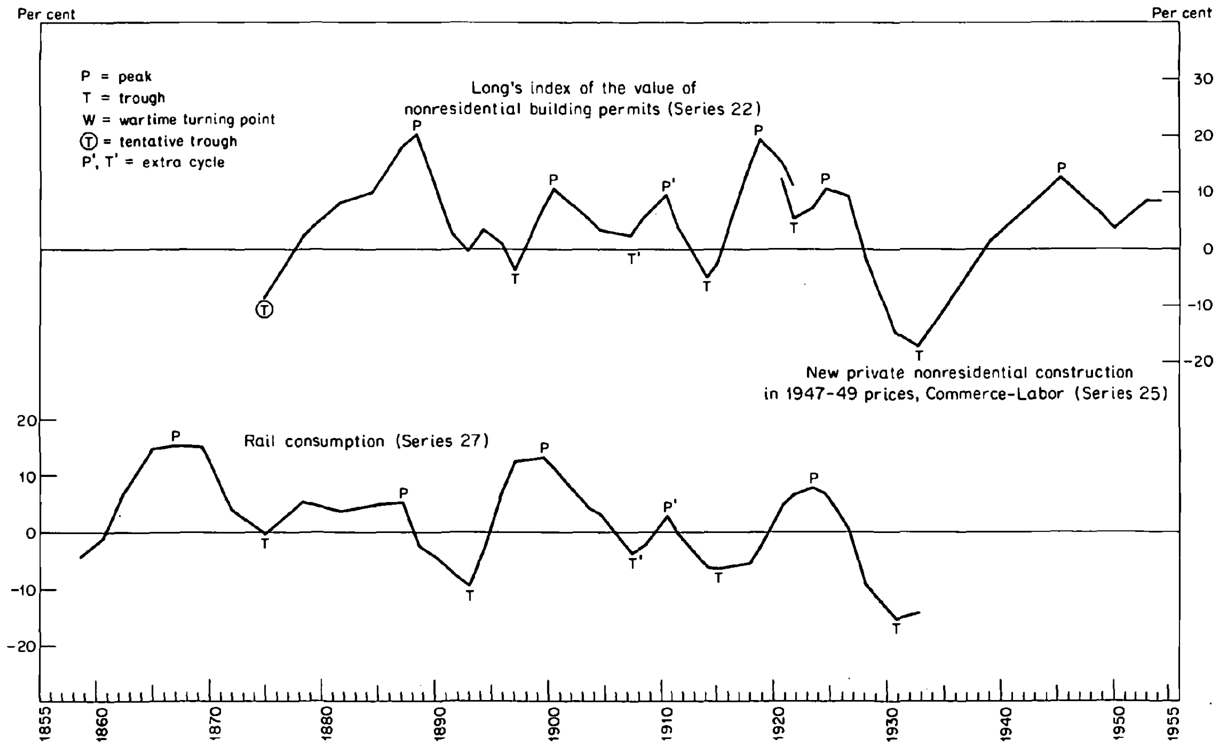


CHART 6 (concluded)

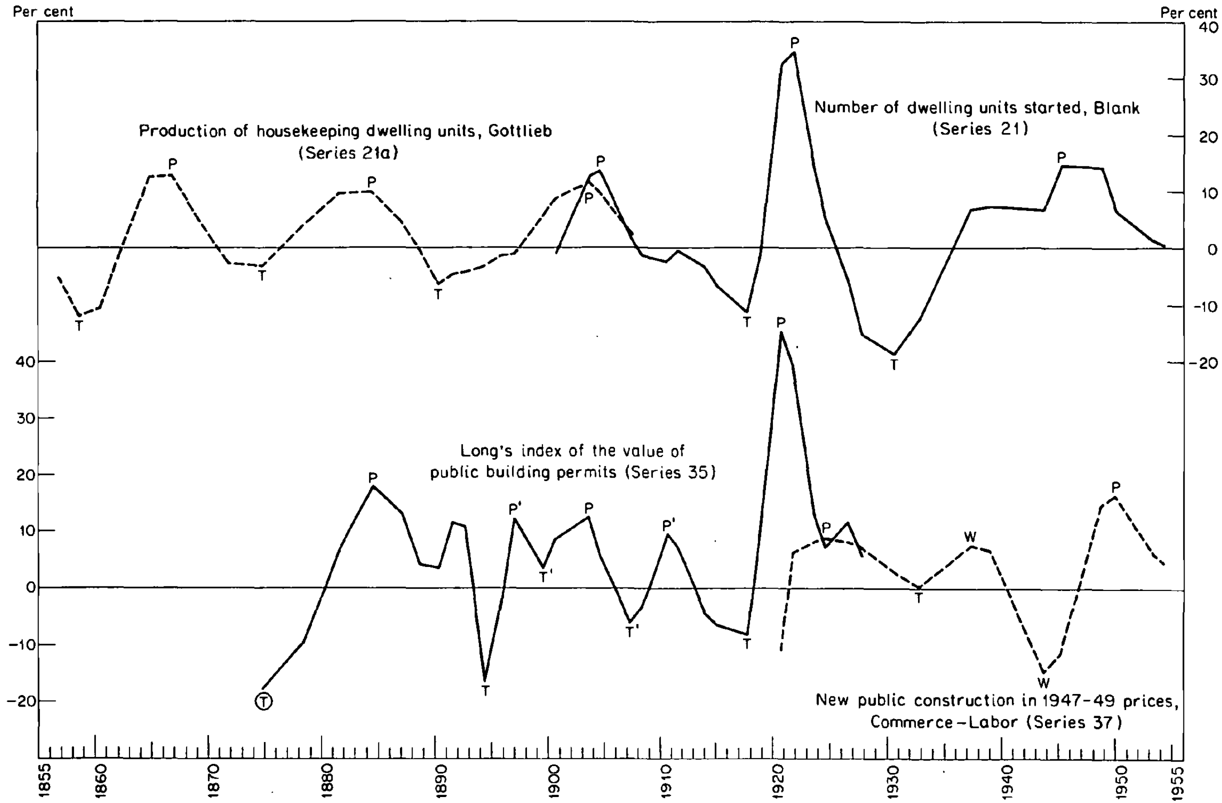


TABLE 15

AVERAGE DURATION OF LONG SWINGS IN RATES OF CHANGE PER ANNUM OF FIFTEEN SELECTED CONSTRUCTION SERIES, 1858-1950
(duration in years)

Series	Period	SWINGS RECOGNIZED IN TABLE 14: Number of Swings (1)	Average Duration: Up-swings (2)	Average Duration: Down-swings (3)	Average Duration: Full Cycles (4)	MEASURES INCLUDING EXTRA CYCLES: Number of Swings (5)	Average Duration: Up-swings (6)	Average Duration: Down-swings (7)	Average Duration: Full Cycles (8)
A. Aggregate Construction									
1. Gross new construction in current prices, Kuznets	1874.25-1948.25	4.5	8.90	7.38	16.28	6.5	5.57	5.83	11.40
2. Gross new construction in 1929 prices, Kuznets	1874.25-1948.25	4.5	8.35	8.06	16.41	5.5	6.54	6.95	13.49
4. Index of the value of construction in constant prices, NBER	1844-1913.5	1.5	10.25	9.62	19.87				
5. Index of the physical volume of construction, NBER	1866.25-1913.5	2.5	10.25	8.92	19.17	3.5	7.58	6.12	13.70
B. Total Urban Building									
11. Riggleman-Isard index of value of permits	1858-1920.25	3.5	8.88	8.92	17.80				
12. Long's index of the value of all permits	1874.25-1920.25	2.5	8.50	10.25	18.75	4.5	5.20	5.00	10.20
13. Long's index of the number of all permits	1866.25-1921.25	3	9.42	8.92	18.34				
16. Colean-Newcomb index of the value of new building in constant prices	1858-1921.25	3.5	8.81	9.00	17.81	4.5	7.70	5.94	13.64
C. Nonfarm Residential Building									
21. Number of dwelling units started, Blank	1892.25-1944.75	2.5	10.08	11.12	21.20	3.5	6.62	8.67	15.29
21a. Production of housekeeping dwelling units, Gottlieb	1858-1927.5	4	8.81	8.56	17.37				

(continued)

TABLE 15 (concluded)

		SWINGS RECOGNIZED IN TABLE 14				MEASURES INCLUDING EXTRA CYCLES			
			Average Duration				Average Duration		
Series	Period	Number of Swings (1)	Up-swings (2)	Down-swings (3)	Full Cycles (4)	Number of Swings (5)	Up-swings (6)	Down-swings (7)	Full Cycles (8)
D. Private Nonresidential Building									
22. Long's index of the value of nonresidential permits	1874.25-1918.25	2.5	7.33	11.00	18.33	3.5	6.31	6.25	12.56
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	1921.25-1944.75	1.5	7.62	8.25	15.87				
F. Transportation and Other Public Utilities Construction									
27. Rail consumption	1866.25-1930.25	3.5	9.17	9.12	18.29	4.5	7.69	6.65	14.34
H. Public Construction									
35. Long's index of the value of public building permits	1874.25-1920.25	2.5	7.33	12.00	19.33	4.5	4.55	5.81	10.36
37. New public construction in 1947-49 prices, Commerce-Labor	1924-1949.5	2	5.38	7.38	12.76				

Alternatively—or additionally—as suggested in Chapter 1,[3] the waves of construction activity and capital formation may themselves be connected both as cause and consequence, with upswings in the rate of growth of income and of population that are not much, if at all, longer than the downswings; and these factors may be reflected in the relatively early peaks in the rate of growth of construction. These larger subjects clearly need to be pursued, but they are beyond the scope of the present paper.

The data in Table 16 provide more definite information about the size of the swings in rates of growth in construction. In this instance amplitude is measured as the difference in the number of percentage points between the rate of growth per annum at the peaks of long swings and that at the troughs. The table shows the average amplitudes for upswings and downswings of the fifteen long series included in Table 15 and in the charts of this paper. The more significant figures are those in columns (3) and (4) which are averages of measures for swings corresponding to those identified in the chronologies of Table 14. Columns (7) and (8) provide averages for swings including the milder and shorter extra cycles, but these are of lesser significance. To afford some standard against which to compare fluctuations in growth rates, column (9) provides rough measures of the long-term rate of growth for most of the series.[4]

The amplitudes of long swings in the rates of growth of construction have manifestly been very wide. In the case of Kuznets' estimates in 1929 prices, for example, the smallest long-swing movement whose turning points can be definitely established[5] involves a rise of nine percentage points. The average rise or fall of the series was approxi-

[3]See also my "The Nature and Significance of Kuznets Cycles" (2), pp. 238 ff.; and my Statement (1), pp. 428-431.

[4]The long-term rate of growth was measured by first taking an average of the standings of a series at the first long-swing peak and trough (or trough and peak) in the *level* of the smoothed data of a series, and then a similar average of the standings of the series at the last two long-swing turning points in its smoothed data (cf. Table 5). The rate of growth per annum was then computed between these two averages. This measure was not computed for four series, either because their two initial or two terminal turning points occurred at such widely separated dates that this procedure seemed inappropriate, or because the series, being broken into segments, did not afford a continuous run of values for a sufficiently long period.

[5]We disregard the initial rise in the series and begin with the tentative trough in 1875.

TABLE 16

AVERAGE AMPLITUDE OF LONG UPSWINGS AND DOWNSWINGS IN RATES OF CHANGE PER ANNUM OF FIFTEEN SELECTED CONSTRUCTION SERIES, 1858-1950

Series	SWINGS RECOGNIZED IN TABLE 14				MEASURES INCLUDING EXTRA CYCLES				Long-Term Rate of Growth Per Annum (per cent) (9)
	Number of		Amplitude of		Number of		Amplitude of		
	Up-swings (1)	Down-swings (2)	Up-swings (per cent) (3)	Down-swings (per cent) (4)	Up-swings (5)	Down-swings (6)	Up-swings (per cent) (7)	Down-swings (per cent) (8)	
A. Aggregate Construction									
1. Gross new construction in current prices, Kuznets	5	4	13.70	-13.33	7	6	10.37	-9.57	4.79
2. Gross new construction in 1929 prices, Kuznets	5	4	14.07	-15.61	6	5	11.91	-12.70	1.65
4. Index of the value of construction in constant prices, NBER	1	2	13.63	-16.05					a
5. Index of the physical volume of construction, NBER	2	3	16.12	-16.04	3	4	11.52	-12.61	a
B. Total Urban Building									
11. Riggleman-Isard index of value of permits	4	3	25.47	-21.79					4.03
12. Long's index of the value of all permits	3	2	21.53	-15.12	5	4	14.21	-9.18	5.01
13. Long's index of the number of all permits	3	3	21.54	-18.78					1.59
16. Colean-Newcomb index of the value of new building in constant prices	4	3	16.41	-13.59	5	4	13.96	-11.23	2.59
C. Nonfarm Residential Building									
21. Number of dwelling units started, Blank	3	2	32.44	-39.22	4	3	24.74	-26.71	1.90
21a. Production of housekeeping dwelling units, Gottlieb	4	4	23.68	-24.30					2.74

(continued)

TABLE 16 (concluded)

Series	SWINGS RECOGNIZED IN TABLE 14				MEASURES INCLUDING EXTRA CYCLES				Long-Term Rate of Growth Per Annum (per cent)
	Number of		Amplitude of		Number of		Amplitude of		
	Up-swings	Down-swings	Up-swings (per cent)	Down-swings (per cent)	Up-swings	Down-swings	Up-swings (per cent)	Down-swings (per cent)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
D. Private Nonresidential Building									
22. Long's index of the value of nonresidential permits	3	2	22.46	-19.68	4	3	18.66	-15.55	6.46
25. New private nonresidential construction in 1947-49 prices, Commerce-Labor	2	1	17.74	-27.72					a
F. Transportation and Other Public Utilities Construction									
27. Rail consumption	3	4	14.04	-18.30	4	5	12.24	-16.01	1.48
H. Public Construction									
35. Long's index of the value of public building permits	3	2	39.38	-27.52	5	4	28.35	-19.66	4.75
37. New public construction in 1947-49 prices, Commerce-Labor	2	2	19.56	-15.46					a

[a] Not available; see accompanying text, footnote 4.

mately fourteen percentage points, a figure which may be compared with the long-term rate of growth of the series of under 2 per cent per annum. Long-swing changes in the rate of growth of several of the branches of construction appear to have been much larger whether we look directly at the average differences between rates of growth at their peak and trough levels or compare these with long-term growth rates.

The measures of Table 16 are, in a sense, measures of relative acceleration and retardation. They state that the rate of growth is construction at the troughs of long swings was typically far below its rate of growth at peaks. And since the rates of change have been measured from smoothed data, it may be said that these large changes in rates of growth were, to some degree, independent of changes which occur in the course of ordinary business cycles. For some purposes, however, it is important to know not only that rates of growth at long-swing troughs were far below those at peaks, but also that there were protracted periods when the rate of growth was, in some relevant sense, very low.

The standard chosen here is a rate of growth of 2 per cent per annum, and Table 17 shows how long were the intervals (on two important occasions) during which rates of growth did not exceed that rate. The 2 per cent growth rate was chosen because it appears that, in view of the rates of growth of our labor force, of our capital stock, and of our productivity, it has required growth in the quantity of output at a rate somewhere between 3 and 4 per cent per annum to permit each year's accretion to our productive capacity to be utilized. Growth proceeding at lower rates for any considerable period of time implies an accumulation of idle resources which is wasteful in itself, which discourages further investment, and which is, therefore, likely to produce a serious depression. When the output of any important branch of the economy, such as construction, falls much below the required rate of growth, there are serious direct effects on the economy's over-all rate of growth. And since construction activity itself generates income, a slow rate of growth in construction tends to retard the growth of demand for the output of other sectors of the economy. On both counts, therefore, a growth rate of 2 per cent or less in construction may be considered to have seriously prejudiced the ability of the economy to grow at a rate rapid enough to absorb fully the annual increments to our supplies of labor and capital.

TABLE 17

INTERVALS IN WHICH RATE OF CHANGE PER ANNUM WAS 2 PER CENT OR LESS DURING TWO PERIODS OF RETARDATION AND DECLINE, 1890'S AND PRE-WORLD WAR I

Series	The 1890's			Pre-World War I		
	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals
A. Aggregate Construction						
1. Gross new construction in current prices, Kuznets	1892-1897	1891-1896	1891-1897	1907-1909	1911-1915	{1908.5-1909.5 1911.5-1912.5
2. Gross new construction in 1929 prices, Kuznets	1892-1897	1891-1899	1892.5-1898	1909-1916	1908-1915	1908.5-1912.5
3. Index of the value of construction in current prices, NBER[a]	1892-1897 1892-1897	1891-1898 1891-1898	1891-1895 1892.5-1898	1912-1916	1911-1915	1911.5-1912.5
4. Index of the value of construction in constant prices, NBER[a]	1892-1897 1892-1899	1891-1898 1891-1900	1891-1895 1892.5-1898	1906-1916	1911-1915	1911.5-1912.5
5. Index of the physical volume of construction, NBER[a]	1887-1897 1892-1897	1888-1894 1891-1896	1888.5-1895 1891-1898	1906-1912	1911-1914	{1906-1908.5 1911.5-1912.5
B. Total Urban Building						
9. Riggleman's value of permits per capita in current prices	1890-1897	1891-1900	1889.5-1898	1906-1916	1911-1914	{1906-1908.5 1909.5-1912.5
10. Riggleman's index adjusted for trend	1890-1901	{1891-1894 1896-1900	1889.5-1901	{1903-1908 1905-1916	1911-1914	{1905-1908.5 1909.5-1912.5

(continued)

TABLE 17 (continued)

Series	The 1890's: Specific-Cycle Peaks	The 1890's: Specific-Cycle Troughs	The 1890's: Reference-Cycle Intervals	Pre-World War I: Specific-Cycle Peaks	Pre-World War I: Specific-Cycle Troughs	Pre-World War I: Reference-Cycle Intervals
B. Total Urban Building (continued)						
11. Riggleman-Isard index of value of permits	1890-1897	1891-1894 1896-1900	1899.5-1898	1909-1916	1911-1914	1909.5-1912.5
12. Long's index of the value of all permits	1890-1892 1895-1897 1899-1901	1891-1894 1896-1900	1889.5-1893.5 1895-1898	1905-1916	1911-1914	1906-1908.5 1911.5-1912.5
13. Long's index of the number of all permits	1886-1901	1888-1894 1896-1900	1886.5-1901	1906-1912		1911.5-1912.5
14. Long's index of the value of all permits, as adjusted by Colean and Newcomb	1890-1892 1895-1899	1891-1900	1889.5-1893.5 1895-1898	1912-1916	1903-1908	1911.5-1912.5
15. Colean-Newcomb index of the value of new building in current prices	1891-1898	1894-1899	1891-1893.5 1895-1898		1907-1914	1911.5-1912.5
16. Colean-Newcomb index of the value of new building in constant prices	1891-1898	1893-1899	1891-1893.5 1895-1901	1912-1916	1907-1914	1911.5-1912.5
C. Nonfarm Residential Building						
17. Long's index of the value of residential permits	1886-1892 1895-1897 1899-1901	1884-1894 1896-1902	1886.5-1893.5 1895-1901	1905-1912	1911-1914	1906-1908.5 1909.5-1912.5
18. Long's index of the number of residential permits	1889-1901	1888-1894 1896-1900	1888.5-1901	1909-1916	1908-1913	1909.5-1912.5
19. Expenditures for new dwelling units in current prices, Blank	1889-1901	1891-1900	1891-1901	1909-1912	1908-1911	1908.5-1911.5

(continued)

TABLE 17 (continued)

Series	The 1890's			Pre-World War I		
	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals
C. Nonfarm Residential Building (continued)						
20. Expenditures for new dwelling units in 1929 prices, Blank	1892-1901	1891-1893 1896-1900	1891-1893.5 1895-1901	1905-1913	1907-1911	1906-1911.5
21. Number of dwelling units started, Blank	1892-1901	1891-1900	1891-1901	1905-1916	1908-1910	1906-1911.5
21a. Production of housekeeping dwelling units, Gottlieb	1889-1899	1888-1900	1888.5-1898	1905-1912	1908-1911	1908.5-1912.5
D. Private nonresidential building						
22. Long's index of the value of nonresidential permits	1890-1893 1896-1899	1891-1898	1891-1893.5 1895-1898	1902-1906 1912-1916	1904-1908	1911.5-1912.5
23. Long's index of the number of nonresidential permits	1889-1899	1888-1900	1888.5-1898			1911.5-1912.5
F. Transportation and Other Public Utilities Construction						
27. Rail consumption	1887-1895	1888-1894	1886.5-1895	1906-1913	1904-1908 1911-1914	1905-1908.5 1911.5-1912.5
28. Increase in wire mileage, Western Union Telegraph Co.	1888-1896	1890-1895	1888.5-1895.5	1906-1914	1900-1909	1902.5-1909.5 1911.5-1913
29. Increase in wire mileage, all telephone systems				1907-1910	1903-1909 1911-1915	1906-1909.5
30. Gross capital expenditures in 1929 prices, all regulated industries, Ulmer		1889-1896	1892.5-1897	1910-1912	1911-1915	1911.5-1912.5

(continued)

TABLE 17 (concluded)

Series	The 1890's			Pre-World War I		
	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals	Specific-Cycle Peaks	Specific-Cycle Troughs	Reference-Cycle Intervals
F. Transportation and Other Public Utilities Construction (continued)						
31. Gross capital expenditures in current prices, all regulated industries, Ulmer		1889-1896	1892.5-1895	1910-1912	1911-1915	1911.5-1912.5
G. Shipbuilding						
34. Tonnage of merchant vessels built in the U.S.	1891-1893	1892-1895	1891-1895	1908-1913	1905-1915	1906-1912.5
H. Public Construction						
35. Long's index of the value of public building permits	1893-1895	1891-1898	1892.5-1895	{1904-1907 {1911-1915	{1906-1909 {1914-1916	{1905-1908.5 {1911.5-1912.5

Note: Periods bracketed indicate that the retardation was broken by an interval of more rapid growth.

[a]Periods indicated by the data in Segment I of the series are shown in the upper row; by Segment II, in the lower row (see Source Notes in Appendix A, Part II, for composition of the segments).

Since almost all construction figures actually declined for an extended period during the 1870's and again from the middle or late 1920's to the early or middle 1930's, attention is concentrated on the two other periods, when the occurrence of a low-rate of growth in construction activity is more uncertain, that is, the 1890's and the years just before and after 1910. For each of these periods we ask how long were the intervals during which rates of growth did not exceed 2 per cent per annum. Such intervals are identified by three different tests: (1) according to the rate of growth between the successive peaks of specific cycles; (2) according to the rate of growth between the successive troughs of specific cycles; and (3) according to the rate of growth per annum between the average standing of a series in successive reference cycles, that is, according to the rates of growth in the smoothed data. Each of these measures is a somewhat different, though complementary, way of measuring the growth of construction activity corrected for business cycles. Since the measures for the second period are complicated by the entrance of the United States into the war in 1917, movements ending in specific-cycle peaks or troughs occurring after 1916 have been arbitrarily disregarded, as have been rates of change involving average standings during reference cycles covering years after 1916. Unfortunately, the midpoint of the last reference cycle that could then be used fell at the end of 1912 (the date called 1912.5). As a result, the third test is of very limited use in the period before World War I.

The data in the table make it amply apparent that the rates of growth of construction during the 1890's and before World War I, if they did not actually become negative, fell to very low levels for protracted periods. Thus, in the 1890's, the growth rate of aggregate construction between successive specific-cycle peaks was 2 per cent or less for five years according to Kuznets' estimates in 1929 prices. Between troughs, the interval of slow growth was eight years. Judged by growth between average standings in successive reference cycles, the interval was 5.5 years. The intervals of slow growth (or decline) according to the other indexes of aggregate construction were as long or longer. By one of them, it was as long as ten years. Representative periods of slow growth in the indexes representing major branches of construction were at least as long, indeed, in many cases longer. Only shipbuilding failed to meet the test for as many as five years by one criterion or another.

With one possible exception of major importance, the records indicate that the period before World War I was also a time when the growth of construction in its various branches became very slow for a long period, if, indeed, there was not an actual long-swing decline. The possible exception is private nonresidential building. Apparently, there was no extended period of slow growth in the number of nonresidential permits issued, according to Long's index.[6] His index of value of permits, however, grew slowly between successive peaks for two four-year periods, with a period of more rapid growth intervening. Between troughs it grew slowly for a period of four years. This showing is all the more noteworthy because Long's figures are an index of value in current prices. Deflated, the index would have risen more slowly. Growth in aggregate construction, by any of the available indexes, was slow for impressively long periods; and the same was true in total urban building and in residential building. The figures for transportation and other public utilities do not reveal the situation adequately because the series failed to reach specific-cycle peaks in the years just before the United States entered the war. Thus Ulmer's series of expenditures by private public utilities in constant prices reached a peak value in 1910 which was not again exceeded until 1923.

We may conclude that according to the records of construction activity, there was a succession of long swings in the rate of growth of aggregate construction. These swings were shared by all the major branches of construction. The amplitudes of the movements were very wide. In the downswing phases, rates of growth either became very low or else actually negative for protracted periods. This conclusion is, in a sense, no more than provisional because the records relied on here are faulty in many respects. Nevertheless, the many indexes reviewed and the several measures employed reinforce each other and create a strong presumption that the interpretation placed on the figures is valid.

[6]The figures for value of public building permits are only a seemingly doubtful case. By these tests, the longest period of slow growth in Long's index of public building was one of four years between peaks from 1911 to 1915. These tests, however, fail to do justice to the record. The index reached a peak value of 30 in 1904, a figure not exceeded in any later year until 1921. There was, however, a lower peak in 1907 (index = 25); and growth between that year and 1911 (index = 29) exceeded 2 per cent per annum.