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Chapter Author: David M. Blank

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4. COMPARISON OF NEW FINDINGS AND EARLIER ESTIMATES

THERE ARE relatively few existing series describing the course of housekeeping residential construction during the years prior to the initial dates of the official series, and none describing the behavior of nonhousekeeping residential construction.¹ Several of the existing series are derived by highly indirect techniques and the remainder are based on very limited data. The series developed for this study, on the other hand, are based on building permit data from a new and more comprehensive sample of cities than has hitherto been available and are derived by the use of more refined and elaborate expansion techniques. To highlight the essential differences between the new findings and the earlier estimates which have heretofore been considered as defining the movement and levels of aggregate residential construction, the earlier series and those presented in this paper are compared in this section.

Dwelling Unit Estimates

In Table 6 and Chart G, three important *annual* series on the number of dwelling units started in the period 1900-19 are compared with the new series; and in Table 7 Wickens' *decade* totals are compared with the new estimates.

Colean's annual dwelling unit estimates are based essentially on an annual distribution of Wickens' decade totals by the movement of Chawner's annual series and, therefore, are subject to the same deficiencies as those series.² In addition, Colean made several arbitrary adjustments in the resulting series to bring the "trend" in the second half of the 1910-19 decade into conformity with the data for 1920-29 and to correct the pre-1915 data for what he considered undercounting of rural nonfarm units in the estimates for those years. However, he does not present any evidence to support the allegation that there is an implicit underestimate of rural units in the basic series.

¹ See Section 5 for a comparison of the preliminary estimates derived in this study with the official estimates of the Bureau of Labor Statistics and the Department of Commerce. For the 1920-29 decade, the preliminary estimates of housekeeping dwelling unit starts total about 7 per cent higher than the official estimates; both series show a peak in 1925. The preliminary estimates of expenditures for housekeeping dwelling units are about 13 per cent lower than the official estimates for the half-decade 1915-19, and about 1 per cent higher for the decade 1920-29. The movements of the two series are similar except for a decline in the preliminary estimates of expenditures in 1920, a decline which is not found in the official series, and for a difference between the two series of one year in the mid-1920 peak in expenditures. The preliminary estimates of expenditures for nonhousekeeping residential facilities agree exactly with the official estimates for 1915-16, but lie considerably below them for the 1917-29 period, except for 1929. A peak in 1926 is found in both series.

The final estimates employed in this study and presented in Tables 16, 18, and 20 of Appendix A consist of new estimates through 1920 for dwelling units started and expenditures for such units and new estimates through 1914 for expenditures for nonhousekeeping residential facilities. For the post-1920 and post-1914 periods, the official BLS and Commerce estimates are accepted.

² Miles L. Colean, *American Housing* (Twentieth Century Fund, 1944), p. 363.

Table 6
ANNUAL ESTIMATES OF THE NUMBER OF NEW PRIVATE PERMANENT
NONFARM HOUSEKEEPING DWELLING UNITS STARTED, 1900-1919
(in thousands)

	NEW SERIES ^a	COLEAN ^b	CHAWNER ^c	BUREAU OF LABOR STATISTICS ^d
1900	189	204	240	
1901	275	303	340	
1902	240	327	360	
1903	253	411	400	
1904	315	416	440	
1905	507	459	480	
1906	487	464	480	
1907	432	433	440	
1908	416	438	440	
1909	492	573	580	
	3,606	4,028	4,200	
1910	387	505	500	475
1911	395	501	480	480
1912	426	476	520	490
1913	421	435	460	455
1914	421	414	440	445
1915	433	414	440	475
1916	437	394	420	480
1917	240	277	300	230
1918	118	174	200	120
1919	315	405	460	330
	3,593	3,995	4,220	3,980

^a New estimates described in this study.

^b Miles L. Colean, *American Housing* (Twentieth Century Fund, 1944), p. 364.

^c Lowell J. Chawner, *Residential Building* (National Resources Committee, 1939), p. 13.

^d *The Construction Industry in the United States*, Bureau of Labor Statistics, *Bulletin No. 786* (1944), p. 35.

Chawner's data for 1900-19 are composed of two separately derived series.³ He obtained one, covering the years 1915-19, by extrapolating back his own estimates of nonfarm dwelling units started for the 1920's by the year-to-year movement in the F. W. Dodge Co. data on residential floor space for which contracts were awarded in 27 states.⁴ The Dodge data were adjusted to allow "for the year-to-year changes in the Southern and Western States (not covered in the Dodge figures) as measured by building permits deflated for changes in building-construction cost." Chawner's estimates for the 1920's were based on the published BLS building permit data used by Wickens in deriving his estimates for this decade.

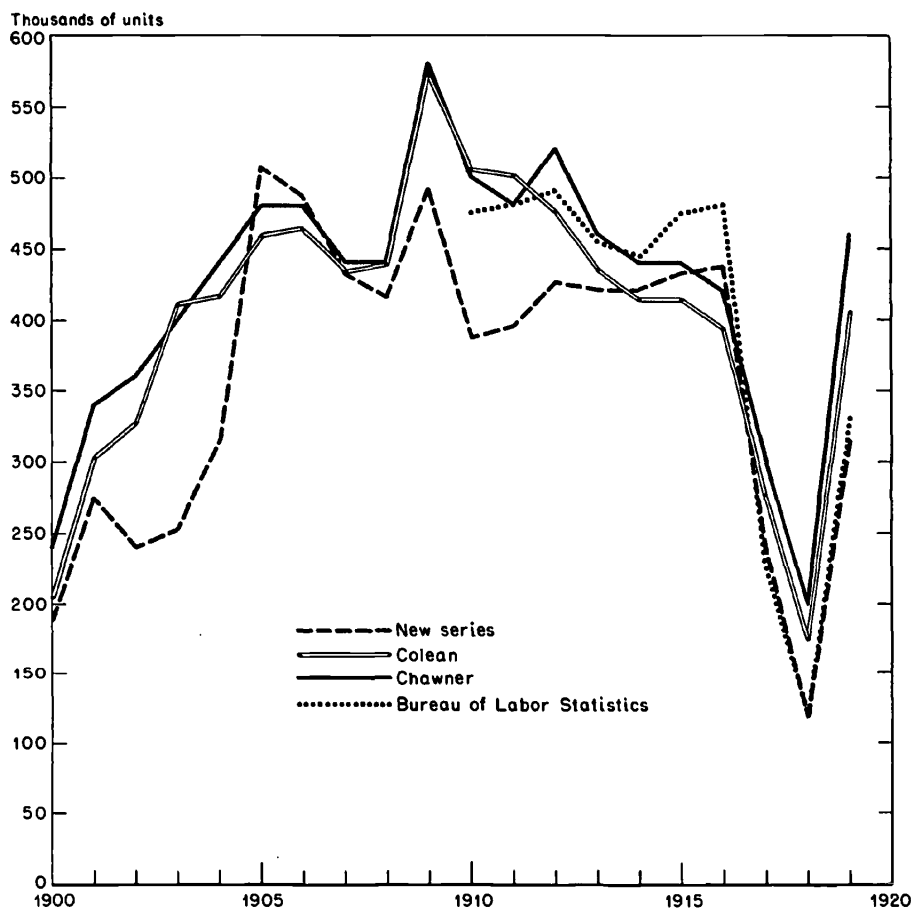
For the years 1900-14, Chawner secured estimates by extrapolating back his 1915 estimate by an index of real expenditures on residential construction. To obtain this index, he first derived an index of the dollar value of residential construction from permit data for some 24 to 40 cities; he then deflated this

³ Lowell J. Chawner, *Construction Activity in the United States, 1915-37* (Department of Commerce, 1938), p. 41, and *Residential Building* (National Resources Committee, 1939), p. 13.

⁴ It is not clear whether Chawner extrapolated his dwelling unit estimate for 1920 or the average number of units for the entire decade or a portion thereof.

Chart G

ANNUAL ESTIMATES OF THE NUMBER OF NEW PRIVATE PERMANENT
NONFARM HOUSEKEEPING DWELLING UNITS STARTED, 1900-1919



Source: Table 6.

index by the American Appraisal Co. construction cost index for wood-frame construction. It was this deflated index of expenditures that he used to extrapolate his 1915 estimate of nonfarm dwelling units started in order to obtain a dwelling unit series back to 1900.

The use of an expenditure series in constant dollars to measure changes in the volume of dwelling unit starts can lead to erroneous conclusions. Even if the small sample available to Chawner and any question as to the accuracy of the cost index used are waived, the average real expenditure per dwelling unit is subject to both long-term and cyclical movements. Some indication of the variation over the last sixty years in this measure is presented in Section 2, above.

The BLS estimates for the 1910-19 decade are based on a portion of the permit data used in the present study but are derived by a much less refined estimating procedure. This procedure first involved estimates of the annual

volume of starts for each year, 1910-20, in the BLS 257-city sample for which data are available for the 1920-29 decade and which provided the basis for Wickens' annual estimates. The 257 cities were classified by region and city size class in 1921, and then the building in each cell was estimated for each year back to 1910 by successively applying year-to-year percentage changes for identical cities in each cell to the estimate for the second of each pair of years. The number of cities in the sample decreased each year back to 1910, when it amounted to 132.

While these procedures are similar, in some respects, to those used in deriving the urban series described in the present study, the expansion to nonfarm totals by BLS is quite different. According to Wickens' estimates, the 257 cities accounted for about half of all nonfarm dwelling units started in 1921; consequently, BLS doubled the annual volume of starts ascribed to the 257 cities back to 1910 to obtain nonfarm totals. These totals were accepted for the years 1910-19, and Wickens' figure for 1920 was allowed to stand.

The procedure underlying Wickens' decade estimates essentially involved a calculation of the increase in families (occupied dwelling units) between censal dates and an adjustment of these increments for changes in vacancies, demolitions, and conversions, to yield decade estimates of the number of new nonfarm dwelling units built. Errors in any of these adjustments directly affect the dwelling unit estimates which are computed as residuals.

Table 7

DECADE ESTIMATES OF THE NUMBER OF NEW PRIVATE PERMANENT
NONFARM HOUSEKEEPING DWELLING UNITS STARTED, 1890-1919
(in thousands)

DECADE	NEW SERIES ^a	WICKENS ^b	RATIO OF COL. 2 TO COL. 1
	(1)	(2)	
1890-1899	2,941	2,417	.822
1900-1909	3,606	3,952	1.096
1910-1919	3,593	3,890	1.083

^a New estimates described in this study.

^b David L. Wickens, *Residential Real Estate* (National Bureau of Economic Research, 1941), p. 54.

The conformity of the Colean and Chawner series between 1900 and 1919 is very close, of course, since the latter series was largely used by Colean as a means of obtaining an annual distribution of Wickens' decade figures. There are some important divergences in short-term movements between these two series and that developed for this study. In particular, the new series suggests that the number of housekeeping dwelling units started reached a peak somewhat earlier (1905) than was indicated by the Colean and Chawner series (1909).

Except for 1905-06 and 1914-16, the new estimates are lower than the other two series. The level of the Colean series is determined by the level of Wickens' decade estimates, whose validity will be discussed below. The differ-

ences in levels between the Chawner series and the new series can be ascribed to two factors. As described above, Chawner derived estimates of dwelling units started during the period 1900-14 by extrapolating back his 1915 value by an index of real expenditures on residential construction.⁵ But as shown in Section 2, the average real construction expenditure per dwelling unit fell between 1900 and 1915. Thus, the use as an extrapolator of an index of deflated expenditures, which erroneously assumes a constant real construction expenditure per unit over time, results in an increasing overestimate of dwelling units started as one goes back in time. A major portion of the discrepancy between Chawner's pre-1915 estimates and the new estimates are accounted for by this bias in Chawner's extrapolating series. For the 1915-19 period, the differences are largely a result of Chawner's use of F. W. Dodge Company data on contracts awarded as an extrapolator.

For the years 1910-16, the estimates derived in this study are below the BLS estimates, which are based on permit data; but for 1917-20 they agree quite closely with the BLS series. For the decade as a whole, the new estimates are 387,000 below the corresponding BLS estimates.

The new series for this decade is based on a broader sample than that used for the BLS estimates, including, particularly, a considerably larger number of small cities. In addition, the expansion to nonfarm totals is based on population growth relationships for the decade in question, rather than on a relationship in the following decade, which is the case in the BLS expansion. According to evidence cited in Section 5, the decade increase in urban population was a larger proportion of the decade increase in total nonfarm population in the 1910-19 decade than in the 1920-29 decade. Accordingly, an expansion of urban estimates in the 1910-19 decade based on relationships in the 1920's results in an overestimate of nonfarm starts. This overestimate alone probably accounts for about half of the discrepancy between the BLS decade totals of starts and those presented in this paper.

It is difficult to judge the accuracy of Wickens' data or to identify the sources of error in his estimates. In particular, there is no way of verifying or correcting in any incontrovertible form his admittedly crude estimates for vacancies, demolitions, and conversions. Thus, it is impossible to determine what portion of the differences between Wickens' decade estimates and the new series, described in this study, is a result of errors in Wickens' estimates and what portion, of errors in the new series. Some brief observations can be made, however, to indicate possible sources of error in Wickens' estimates, whose elimination would tend to bring his estimates in closer accord with the new series. It seems likely that the rejection of Census data on the number of farm families in 1900 and the use of improbable levels of vacancies in 1890 and 1900 led Wickens to a decade estimate which was too low by an amount

⁵ Chawner's 1915 estimate is 440,000 units; the estimate prepared for this study is 433,000. See Table 6.

approximating the difference between the two series for this decade. For the 1910-19 decade, the use of a conversion estimate which apparently was too low may have resulted in an overestimate by Wickens of dwelling unit starts by an amount not very different from the discrepancy in this decade.⁶ For the 1900-09 decade, the net result of the rejection of Census farm family data for 1900 and 1910, the use of a low vacancy ratio for 1900, and a possibly low conversion estimate for the decade probably led Wickens to overestimate the volume of starts. While there may be offsetting or cumulative errors in other elements of Wickens' procedures for all three decades, it would be foolhardy even to hazard a guess as to their magnitude or direction. The conclusion seems to be that Wickens' figures can be reconciled with the new estimates, but only on the crudest of bases because of the inability to test the assumptions employed by Wickens. Certainly a close examination of Wickens' data yields no firm evidence of any major error in the new series.

In general, the new estimates of nonfarm housekeeping dwelling units started indicate a somewhat higher level of starts during the 1890-99 decade and a somewhat lower level during the next two decades than had heretofore been accepted. However, the total number of starts over the first two decades, which encompass a complete cycle beginning in 1892, is largely unchanged. Further, the extension of the new series to years before 1900 makes it possible to date the trough in aggregate nonfarm dwelling unit starts around 1900.

Table 8

ANNUAL ESTIMATES OF EXPENDITURES FOR NEW PRIVATE PERMANENT
NONFARM HOUSEKEEPING DWELLING UNITS, 1900-1914
(in millions of dollars)

	NEW SERIES ^a	CHAWNER ^b		NEW SERIES ^a	CHAWNER ^b
1900	\$433	\$350	1910	\$1,028	\$1,150
1901	610	470	1911	1,000	1,010
1902	572	560	1912	1,113	1,160
1903	607	620	1913	1,108	1,110
1904	690	700	1914	1,081	1,010
1905	1,154	880		\$5,330	\$5,440
1906	1,170	990			
1907	1,037	980			
1908	1,034	920			
1909	1,272	1,130			
	\$8,579	\$7,600			

^a New estimates described in this study.

^b Lowell J. Chawner, *Residential Building* (National Resources Committee, 1939), p. 13.

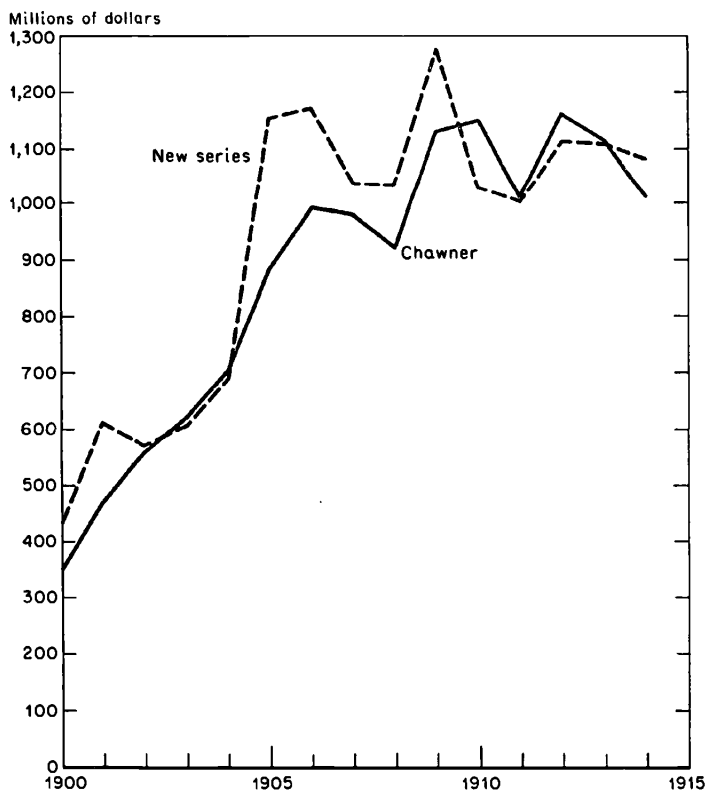
⁶ Wickens' conversion estimate is based on an estimate for the 1920's and a simple backward extrapolation on the basis of population. Other more recent estimates of conversions in the 1920's indicate a likelihood of a conversion level about four times that assumed by Wickens. If Wickens' estimates for the 1910-19 decade are similarly multiplied by four, the resulting estimate of the volume of starts would be 309,000 less than the present Wickens estimate and 12,000 below the new estimate. Further, Census data on the average number of nonfarm households per structure, a partial measure of conversions, shows a significant increase between 1910 and 1920, indicating a relatively high level of conversions during this decade. The high level of conversions was probably associated with World War I income increases and housing shortages, if recent experience is any guide.

Estimates of Expenditures for Housekeeping Dwelling Units

Chawner's series on residential construction expenditures (Table 8) is the only published series covering the pre-1915 period.⁷ While no description of the derivation of these estimates for the years 1900-14 can be found in the text discussion surrounding the table in which the series is presented or in the notes to the table itself,⁸ it is clear that Chawner used essentially the same data and procedures in developing this series which he used in deriving his dwelling unit estimates for the same years. As described earlier, the data consisted of total residential permit valuations for some 24 to 40 cities for the years 1900-15. These data were converted to link relative form and used to extrapolate back to 1900 Chawner's previously calculated 1915 estimates of construction expenditures.

Chart H

ANNUAL ESTIMATES OF EXPENDITURES FOR NEW PRIVATE PERMANENT NONFARM HOUSEKEEPING DWELLING UNITS, 1900-1914



Source: Table 8.

⁷ Raymond Goldsmith, in his "Study of Saving in the United States from 1897 to 1949," which will be published shortly, presents data on residential construction volume for years prior to 1914. For the bulk of the period in question his estimates were derived from Colean's annual dwelling unit estimates and the average values per dwelling unit implicit in Chawner's dwelling unit and expenditure series, plus an adjustment intended to correspond to the recent Commerce revision of their expenditure data. An analysis of Goldsmith's series and a comparison with the new estimates must await the final printed version of this series.

⁸ Chawner, *Residential Building*, p. 13.

Although both Chawner's series and the new series developed in this study show the same general growth over the 1900-14 period (Chart H), there are important discrepancies between the two series in year-to-year changes. In particular, the new estimates indicate a 1909 peak, contrasted with the 1912 peak indicated by Chawner's series. The validity of the 1909 peak is supported by the similar timing of the chain index of the permit value of urban housekeeping dwelling units derived directly from the sample data employed in this study.⁹ This index, computed in the same manner as Chawner's, is based on three to five times as many cities.

The new series is significantly higher than Chawner's estimates for most of the 1900-1909 decade (13 per cent for the decade as a whole), but the two series are at approximately the same level for the years 1910-14. For the 15-year period 1900-14 the new series indicates that expenditures for housekeeping residential construction were about 6.7 per cent higher than had been estimated by Chawner. In part this is a result of the upward adjustment of permit valuation to account for preliminary costs and builders' profits, which was made in the new estimates but not by Chawner. A portion of the discrepancy may be due to the linking procedure used by Chawner. The remainder may be due simply to biases resulting from the narrow coverage of the data underlying the Chawner series.

⁹ See Section 5, Table 11, below.