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Volume Author/Editor: Leo Grebler, David M. Blank, and Louis Winnick

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Chapter Author: Leo Grebler, David M. Blank, Louis Winnick

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APPENDIX D

COMPARISON OF RESIDENTIAL CAPITAL FORMATION WITH RESIDENTIAL WEALTH ESTIMATES

THE cumulated annual estimates of capital formation presented in this study were derived by adding yearly capital increments (net) to the estimated value of residential capital existing in the initial year, 1890. Annual estimates of net capital formation were obtained by subtracting annual capital consumption (allowance for depreciation plus estimated value of demolished structures) from the annual gross capital increment. We attempted to check the reliability of our cumulated capital formation estimates by comparing them with the various existing estimates of residential wealth based on census data. The census estimates, of course, include the value of land, while our capital formation estimates do not. Our comparison procedure was designed to allow for this as well as for the differing price basis. The results of the comparison indicated that gross systematic errors in our estimates are unlikely.

The comparison was made, for convenience, by two procedures: (1) our own figures were adjusted to a base comparable to that of the census estimates, and (2) the census figures were adjusted to a base comparable to that of our estimates. Under the first procedure we converted our own annual estimates, which were in constant prices, to a price base reflecting market value in each year. To these estimates of market value of the structures we added estimated value of the land. Under the second procedure we converted the census figures to a constant price base and removed the land value component.

Neither comparison pointed to gross flaws in our own estimating procedure. For example, a continuing difference between the two series in the same direction and of increasing size would be an indication of systematic error. While considerable differences appear in many of the subperiods (Table D-5), they are in opposite directions and do not cumulate. For the six decades as a whole the net capital formation estimates in this volume fall 16 per cent short of the net capital formation implied in the census estimates, with most of the shortage occurring during the last decade. Considering the crudity of the test, a difference of this size is not necessarily evidence of any serious shortcoming in our net capital formation estimates.

Given the basic housekeeping expenditures series presented in this volume, five additional pieces of information were required before comparison with the census estimates:

1. For gross capital formation, a rough estimate (Table D-2) of

TABLE D-1

Cumulated Estimates of Nonfarm Residential Wealth, 1889-1953
(*dollars in millions*)

END OF YEAR	STRUCTURES		LAND		TOTAL RESIDENTIAL WEALTH IN CURRENT DOLLARS
	1929 Dollars	*Current Dollars*	*Proportion of Land to Total Value*	*Value of Land in Current Dollars*	
	(1)	(2)	(3)	(4)	(5)
1889	$22,050	$ 8,600	40.0%	$ 5,733	$14,333
1890[a]	22,918	8,984	40.0	5,989	14,973
1890	23,786	9,324	40.0	6,216	15,540
1891	25,087	9,508	39.6	6,234	15,742
1892	26,814	9,868	39.3	6,389	16,257
1893	28,024	10,285	38.9	6,548	16,833
1894	29,301	10,373	38.5	6,494	16,867
1895	30,816	10,755	38.2	6,648	17,403
1896	32,080	11,260	37.8	6,843	18,103
1897	33,459	11,510	37.4	6,877	18,387
1898	34,522	12,393	37.1	7,310	19,703
1899	35,525	13,677	36.7	7,930	21,607
1900	35,984	14,610	36.3	8,326	22,936
1901	36,892	14,794	36.0	8,322	23,116
1902	37,640	15,621	35.6	8,635	24,256
1903	38,418	16,520	35.2	8,974	25,494
1904	39,425	16,756	34.9	8,983	25,739
1905	41,385	18,416	34.5	9,702	28,118
1906	43,085	21,069	34.1	10,902	31,971
1907	44,378	22,677	33.8	11,578	34,255
1908	45,715	22,629	33.4	11,348	33,977
1909	47,406	24,367	33.0	12,002	36,369
1910	48,499	25,801	32.7	12,536	38,337
1911	49,539	26,008	32.3	12,409	38,417
1912	50,711	27,283	31.9	12,780	40,063
1913	51,927	26,950	31.6	12,451	39,401
1914	53,051	27,693	31.2	12,558	40,251
1915	54,306	29,054	30.8	12,932	41,986
1916	55,510	31,641	30.5	13,886	45,527
1917	55,613	37,038	30.1	15,949	52,987
1918	55,008	43,566	29.7	18,406	61,972
1919	55,317	50,947	29.4	21,216	72,163
1920	55,122	65,430	29.0	26,715	92,155
1921	55,976	53,401	28.6	21,390	74,791
1922	58,316	51,143	28.3	20,186	71,329
1923	61,245	60,204	27.9	23,297	83,501
1924	64,818	62,809	27.5	23,824	86,633

[a] June 1, 1890.

(continued on next page)

TABLE D-1 (continued)
(*dollars in millions*)

END OF YEAR	STRUCTURES		LAND		TOTAL RESIDENTIAL WEALTH IN CURRENT DOLLARS
	1929 Dollars	*Current Dollars*	*Proportion of Land to Total Value*	*Value of Land in Current Dollars*	
	(1)	(2)	(3)	(4)	(5)
1925	$68,715	$ 66,104	27.2%	$24,698	$ 90,802
1926	72,519	70,271	26.8	25,728	95,999
1927	75,939	72,598	26.4	26,041	98,639
1928	78,938	75,702	26.1	26,736	102,438
1929	80,563	80,563	25.7	27,866	108,429
1930	80,775	78,756	25.3	26,674	105,430
1931	80,724	72,571	25.0	24,190	96,761
1932	79,796	60,725	24.6	19,812	80,537
1933	78,685	59,958	24.2	19,142	79,100
1934	77,724	64,433	23.9	20,236	84,669
1935	77,273	62,205	23.5	19,109	81,314
1936	77,420	65,188	23.1	19,582	84,770
1937	77,692	72,797	22.8	21,500	94,297
1938	78,028	75,140	22.4	21,690	96,831
1939	79,006	77,426	22.0	21,838	99,264
1940	80,149	81,512	21.7	22,590	104,102
1941	81,535	89,362	21.3	24,186	113,548
1942	81,230	94,064	20.9	24,858	118,922
1943	80,219	97,225	20.6	25,225	122,450
1944	79,111	104,506	20.2	26,454	130,960
1945	78,178	110,153	19.8	27,195	137,348
1946	78,974	123,278	19.5	29,862	153,140
1947	80,556	152,412	19.1	35,984	188,396
1948	82,790	174,273	18.7	40,085	214,358
1949	84,951	173,555	18.3	38,875	212,430
1950	88,855	191,571	18.0	42,052	233,623
1951	91,575	212,454	17.6	45,379	257,833
1952	94,173	224,320	17.2	46,598	270,918
1953	96,933	234,966	16.9	47,785	282,751

Column	Source
1	Estimated by adding to the estimate for December 31, 1889, derived as described in this appendix, the annual estimates of net capital formation in constant dollars given in Table B-8.
2	Column 1 deflated by the construction cost index given in Table B-10, column 1.
3	Based on the estimates of Louis Winnick in "Wealth Estimates for Residential Real Estate," unpublished dissertation, Columbia University, 1953.
4	Difference between column 5 and column 2.
5	Column 2 divided by the complement of the ratios in column 3.

expenditures on additions and alterations for the years 1889-1920 was necessary, corresponding to the period covered by the new series on housekeeping expenditures. As in the case of the latter series, the new estimates of additions and alterations were substituted for the Department of Commerce series for the period 1915-1920. Because there was no other method, the estimates were made by graphic extrapolation. The Commerce estimates of additions and alterations for the years 1921-1950 were plotted against the Commerce housekeeping expenditures series for these years and the relation between the two series observed. Additions and alterations seem to parallel the movement in housekeeping construction expenditures but, for reasons discussed in Chapter III, have a smaller amplitude. These observed relationships were used as a guide for graphing expenditures for additions and alterations back to 1889 in relation to our own series on housekeeping expenditures.

Such a procedure is obviously crude. But even the undoubtedly wide margins of error that exist in the 1889-1920 portion of the series are likely to distort the estimates of gross and net capital formation less seriously than the complete omission of additions and alterations. These estimates should not be accepted for any but the roughest of uses. If, as we believe, the Commerce estimates of additions and alterations are typically understated, the indicated shortage in net capital formation as compared with census data might in large part be traceable to this item.

2. An adequate allowance for capital consumption was calculated. (This calculation is discussed in detail in Appendix E.) An annual depreciation rate of 2 per cent was applied to the cumulated value of residential structures at the end of each preceding year, and a half year's depreciation was charged against the current year's construction. An additional allowance for demolition was also made and added to the depreciation allowance to form total capital consumption.

3. Since the census-type estimates of residential wealth are expressed in current prices, a price index was needed to revalue our cumulated series. The Boeckh construction cost index extrapolated to 1889 was selected for this purpose. As the analysis of this index in Appendix C points out, the long-run conformity between the Boeckh index and indexes of market price is remarkably good, although there are a number of short-run differences of some significance for the current-price wealth totals in individual years. Adjustment of our wealth series to a current-price base permitted not only comparison with our benchmark wealth estimates, but also relationship to other current-dollar series, particularly the residential mortgage debt in Chapter XI.

4. A reasonable allowance for the underlying land was estimated.

TABLE D-2

Annual Estimates of Additions and Alterations, 1889-1920
(*millions of dollars*)

	Current Dollars	*1929 Dollars*		*Current Dollars*	*1929 Dollars*
1889	85	217	1905	110	247
1890	85	217	1906	111	227
1891	82	216	1907	111	217
1892	80	217	1908	114	230
1893	79	215	1909	118	230
1894	78	220	1910	112	211
1895	77	221	1911	109	208
1896	77	219	1912	108	201
1897	76	221	1913	106	204
1898	72	201	1914	106	203
1899	71	184	1915	108	202
1900	70	172	1916	116	204
1901	73	182	1917	110	165
1902	76	183	1918	90	114
1903	84	195	1919	140	152
1904	98	231	1920	140	118

Source: Current-dollar figures derived by graphic extrapolation as described in the text and adjusted to a 1929-dollar base by the construction cost index given in Table B-10, column 1.

Although some of the census-type wealth estimates were independently broken down into separate land and structure values and are so presented in Table D-3, these breakdowns are not based on direct evidence and result in land ratios implausible both in level and in trend. Existing estimates of structure values were, therefore, not considered sufficiently reliable to serve as a check on capital formation.

Many difficulties beset any effort to estimate land values. The land value sought here is site value free from those elements of capital formation, such as grading, landscaping, and paving, which are necessary to convert raw land into a site for a residential structure, since land development costs are included in construction expenditures. Data on land value of existing real estate include the value of such site improvements.

The procedure employed here, following the practice of other investigators, was to estimate the value of residential land by a ratio of the value of land under improved residential real estate to the total value of existing residential real estate. Other methods, such as multiplying aggregate residential land area by some unit price, i.e. value per square foot, are completely unfeasible in the absence of data on the measures involved. The chief drawback to basing land value estimates

on ratios is the implicit and far-from-tenable assumption that the value of residential sites will change each year, aside from a trend factor, in the same proportion as existing structure values change.

A sixty-year series of land ratios is presented in Table D-1. This series, which is more fully explained in an unpublished dissertation by Louis Winnick,[1] is based on FHA appraisal data and tax assessment data from a number of cities which permit the separation of residential from other real estate. These data do not extend back of the thirties but, together with a bench-mark estimate for the twenties and one for 1907, are sufficient to approximate both the level of the ratio and the direction of its trend. For the period between 1890 and 1953 the land ratio of existing residential real estate is estimated as having declined from 40 to 17 per cent, with the move to the suburbs accounting for most of this trend.[2]

Considerable extrapolation and interpolation were required in order to render the land ratios in the form of an annual series. No account was taken of the fact that the land value data are descriptive of improved rather than raw sites, even though an allowance for private site improvements is included in construction expenditures. A small downward adjustment in the land ratio series would therefore have been desirable but was dispensed with for lack of a basis other than guesswork for estimating its size. Crude as these estimates may be, they are considered more useful than those in existing wealth studies, which are based on even scantier data and, in some cases, even on pure assumption.

5. Initial residential wealth as of January 1, 1889, was estimated. Such an estimate can be derived in three ways: (1) by beginning the cumulation, as Goldsmith has done,[3] somewhere at the beginning of the nineteenth century, (2) by accepting Kuznets' estimate for 1890,[4] or (3) by forming an independent estimate on the basis of the 1890 census of mortgaged owner-occupied houses.

The first approach was rejected because aggregate residential construction data are virtually nonexistent for the period before 1889. An effort to build up such estimates is a hazardous undertaking and necessary only to a study employing original cost, linear depreciation,

[1] "Wealth Estimates for Residential Real Estate, 1890-1950," Columbia University, 1953.

[2] Bogue estimates that because of the automobile, the supply of residential land in standard metropolitan areas has increased ten times more rapidly than population over the past half century. Donald J. Bogue, *Needed Urban and Metropolitan Research*, published jointly by Miami and Chicago Universities, 1953, p. 39.

[3] Raymond W. Goldsmith, *A Study of Saving in the United States*, Princeton University Press, 1955, Vol. I, Tables R-27 and R-28.

[4] Simon Kuznets, *National Product since 1869*, National Bureau of Economic Research, 1946, pp. 201-202.

which is not the case here. Kuznets' estimating procedure obtains residential wealth indirectly as a residual and is therefore subject to a wide margin of error. The third method was adopted because, poor as it may be, it has at least the virtue of being directly tied to contemporary data for the initial period.

The mortgage census of 1890 gives $3,250 as the average value of an owner-occupied mortgaged house. Wickens had already estimated the total number of dwelling units standing in 1890; we derived an aggregate wealth estimate by estimating the average value of all dwelling units. In 1940 the ratio of the average value of a dwelling unit to the average value of an owner-occupied and mortgaged one- to four-family house was about 63 per cent. We assumed that the corresponding ratio for 1890 was somewhat lower, because at that time mortgaged homes were more concentrated in the higher value classes than in 1940. On this basis we estimated an average dwelling unit value of $1,800 for 1890, equal to about 55 per cent of the value of an owner-occupied mortgaged home, and multiplied by 8,319,000 nonfarm dwelling units (Table 15).

Total nonfarm residential wealth on June 1, 1890, was estimated at $14,974,000,000. This value, although derived with complete independence, agrees quite closely with Kuznets' estimate of $14,423,000,000 for the same date. In order to adjust the estimate from a June 1 to a January 1 basis, an allowance was made for a half year's capital formation and capital consumption, making the value of the opening inventory as of January 1, 1890, $14,333,000,000 in current prices, of which $8,600,000,000 or 60 per cent was estimated to be the value of residential structures. A similar extrapolation was made back to January 1, 1889, in order to estimate capital consumption during 1889.

Differences between Cumulated Wealth Estimates and Bench-Mark Estimates

The cumulated wealth estimates used in this volume can be checked against the various independent wealth estimates, one or more of which exist for each of the years 1890, 1900, 1912, 1922, 1930, 1938, 1940, and 1950. These census-type estimates divide themselves into two groups, according to the nature of the data and procedures employed in their derivation. One set of estimates is based upon real estate assessment data collected by government agencies. In this group are the estimates for 1890, 1900, and 1912 by Simon Kuznets and the estimates for 1922, 1930, and 1938 by Robert Doane. The second group of estimates is based upon values and rents of nonfarm housing reported by the census in 1930, 1940, and 1950. From 1930 census data a number of residential wealth estimates have been prepared, of which two, one

by Wickens and the other by Keller, are discussed here. In 1940 the Bureau of the Census made its own estimate of the value of the 1940 nonfarm inventory; a rough wealth estimate has also been prepared from 1950 census value and rent data. A summary of these census-type residential wealth estimates is presented in Table D-3. Census-type wealth estimates, it was pointed out, have only limited serviceability as a check on capital formation estimates. Since such estimates include the value of land as well as structures, comparisons were made only after our cumulated estimates were augmented by a land estimate. If the land value estimates are greatly in error, shortcomings in the capital formation estimates will be obscured. Although the land ratios are believed to be essentially accurate in trend and reasonably accurate in level, the error stemming from this source, while possibly not serious, nevertheless weakens the check.

Equally significant for the comparison and further reducing its usefulness are differences in coverage and in valuation base. Our estimates exclude certain types of marginal dwelling units (Appendix A), which the estimates based on assessment data presumably include and which are expressly counted in census wealth estimates. Our estimates do not cover the expenditures on public housing made in recent years, while this segment of residential wealth is included in the estimates based on Housing Census data. On the other hand, our estimates include nonresidential items, such as retail or office space, which may form part of a new residential structure. Those census data which report value on a dwelling unit rather than a structure basis exclude these nonresidential components; whether the residential wealth estimates based on assessment data include the nonresidential portions of residential real estate is not known. The likelihood, judging from New York City practice, is that they are included.

Related to the problem of coverage are the difficulties which arise because of inter-sector shifts in wealth. The transfer between two bench-mark dates of farmhouses into the nonfarm residential category, because of change in definition or actual change in use, will be reflected in a census estimate but not in our cumulated estimates, since, obviously, no capital formation has taken place. Conversely, when a residential structure is converted to nonresidential use, the transfer is not recorded in our estimates since there has been no capital consumption. The census-type wealth estimates will presumably register this wealth decrement. In the derivation of a residential wealth estimate from our capital formation data such wealth transfers should be recognized and a proper adjustment made. Unfortunately, there are few or no data, except for some items for recent years, describing such shifts in and out of the private residential wealth sector. It is certain that

transfers between farm and nonfarm use have added to residential wealth and it is very likely that shifts between residential and nonresidential use have subtracted from it, but the size of the net balance or even its sign is not known.

The second major factor which can account for differences between our estimates and the others lies in the method of valuation. Our estimates, valued on the basis of a construction cost index, are essentially depreciated replacement costs. The census-type estimates are intended to approximate market values. Thus (1) the wealth estimates based on assessment data make adjustments to a market basis by use of an equalization ratio, and (2) the estimates derived from census housing data are based on the personal estimates of home owners of the market value of their dwelling unit together with a transformation, in the case of tenant-occupied units, of reported rents into market values by use of a gross rent multiplier (Appendix I). Even if both the reproduction cost valuation and the market price valuation are derived from statistically valid data, substantial differences in wealth estimates may be apparent at any bench-mark year since year-to-year movements in the prices of housing inputs and in the prices of existing houses have been far from equal.

Discrepancies in the estimates due to valuation may be further increased when the shortcomings in market valuation are considered. Owners' estimates of market price probably have a tendency to lag behind actual market price, i.e. the market price that a well-constructed index of house prices would show. Their estimates of value seem to be influenced by the sales prices of the recent past as well as those of the present. Nor is it known to what extent owners tend to include separable household equipment in their estimates of value. Refrigerators, washing machines, porch and garden furniture, screens, etc., are often part of the sales package in a residential real estate transfer and are reflected in the sales price. None of this equipment is, of course, covered in capital formation estimates, although estimates of additions and alterations may inadvertently include it because they are based on family expenditure data taken from budget studies.

The wealth estimates obtained from assessment data and revalued to a market basis depend on the accuracy of the equalization ratio used. Available data on these ratios indicate considerable differences by type of property and location even within a single city; the derivation of a reliable country-wide ratio requires a major statistical effort beyond the scope of past attempts in this direction. Even a relatively small error in the market valuation of total real estate may lead to a large error in the estimate of residential real estate that is calculated as a residual.

A third cause of discrepancy between the two sets of estimates lies in the differences in dates. Our estimates are on a year-end basis, while the other estimates are variously dated at April 1, June 1, and December 31. On the whole, differences due to dating are probably minor, since our estimates can be adjusted by taking a pro rata share of the year's net capital formation.

In view of these differences in the two sets of wealth estimates, a discrepancy of 10 per cent at any check point seems well within the limits of tolerance, and would seem so even if one could attribute a high degree of accuracy to the census-type data. Such an assumption would be overly optimistic. As the footnotes to Table D-3 indicate, the residential wealth estimates by Kuznets and Doane, obtained as residual components of total taxable real estate, may be affected by all the errors made in estimating the total as well as each of the nonresidential components; their reliability leaves much to be desired. Even some of the census residential wealth estimates contain demonstrable errors for which adjustments have to be made.

Comparison of Our Estimates with Other Bench-Mark Estimates

For December 31, 1900, our estimates indicate a residential wealth total of $22.9 billion compared with Kuznets' June 1 estimate of $20.0 billion. Since there is a seven-month difference in dates in a year of rising construction costs, and since the 1890 initial estimate starts at a level $.6 billion higher than Kuznets', about half of the discrepancy is readily explainable. The remaining difference of $1.5 billion need not, it should be re-emphasized, imply an overstatement in our estimates, in view of the kinds of error to which Kuznets' estimates are vulnerable.

For 1912 the agreement is quite close. The $.9 billion difference between our estimate of $40.1 billion and Kuznets' estimate of $39.2 billion is completely reconcilable in view of the difference in dates as well as a minor rounding error.

At the next bench-mark date, 1922, our estimate of $71.3 billion is about 10 per cent higher than Doane's estimate of $65.0 billion. The difference at this date is undoubtedly accounted for in large part by valuation. Construction costs in the postwar period moved erratically, rising by 29 per cent between 1919 and 1920 and dropping by 25 per cent between 1920 and 1922 (Table B-10). Kuznets' (and Keller's) 1922 estimates, though in closer agreement with our estimates, were not used for comparison, since they are essentially derived from and dependent upon the 1930 census data discussed below. Nor is King's quite comparable 1922 estimate of $71.1 billion used,[5] since, like many

[5] Willford I. King, *The National Income and Its Purchasing Power*, National Bureau of Economic Research, 1930, p. 378.

other estimates omitted from this discussion, its basis seems unreliable.

For 1930, three estimates can be compared with our figures. Our estimate as of December 31, 1929, is $108.5 billion. The Wickens and Keller estimates based on the April 1, 1930, census are $122.6 and 99.0 billion respectively. Doane's 1930 estimate (precise date not stated) based on assessment data is $107.7 billion.

Doane's estimate, derived as a residual of total taxable real estate, is quite close to our estimate. The two census estimates, however, diverge not only in opposite directions from our estimates, but more strikingly from each other, despite the fact that they are based on a common source. The $23.6 billion difference between Keller and Wickens can be explained as follows: (1) The 1930 census reported the median value of an owner-occupied house and the median rent of tenant-occupied dwelling units. Keller accepted these medians as the equivalent of averages. Wickens was able to obtain average values and rents through a special census tabulation. The average value of an owner-occupied house in 1930, $5,833 proved to be 21 per cent higher than the median value of $4,828 used by Keller. Similarly, the average monthly rent of $30.34 was 8 per cent higher than the median rent. Differences between averages and medians account for about two-thirds of the total discrepancy. (2) Nearly all of the remaining difference is explained by Keller's omission of 1.5 million vacant and nonreporting dwelling units. (3) Keller uses a slightly lower gross rent multiplier than Wickens in deriving the value of the tenant-occupied inventory.

The $14.1 billion difference between our estimate and Wickens' remains to be explained. Wickens may have been led into an overstatement of residential wealth because of (1) an error in the census reports and (2) the use of an excessive gross rent multiplier in converting the average rent of tenant-occupied dwelling units into a value estimate.

There has been more than a little confusion in the interpretation of census data on owner-occupied houses as to whether the average values reported refer only to the dwelling unit occupied by the owner or to the entire structure. While the two values are identical in the case of single-family houses, the type of structure in which most owner-occupants reside, a large number of owner occupants are found in other types of structures. Although the proportions are not known for earlier years, the 1940 Census of Housing indicates that about 16 per cent of owner occupants reside in structures other than single-family houses and that the total number of dwelling units in owner-occupied structures is 22 per cent greater than the number actually occupied by owners. The average value of owner-occupied structures will there-

fore be higher than the average value of owner-occupied dwelling units.

Wickens, on the assurance of the Bureau of the Census, assumed the 1930 census reports represented dwelling unit rather than structure values, though the Bureau admitted that there had been confusion on this score on the part of some enumerators.[6] Internal evidence in the 1930 census data indicates that the error may have been more widespread than was originally believed. If the 1930 values had actually been dwelling unit values, the average value of all owner-occupied dwelling units should have been smaller than the average value of a single-family house. This relationship is confirmed by the 1940 census and by FHA appraisals, as well as by other sources. In 1940, for example, the median value of owner-occupied dwelling units in single-family houses was $2,996, compared with $2,671 for owner-occupied dwelling units in other than single-family houses. Average values would show an even greater difference.

TABLE D-3

Comparison of Cumulated and Bench-Mark Residential Wealth Estimates, Various Dates, 1890-1950

(*billions of current dollars*)

	CUMULATED WEALTH ESTIMATES[a]				BENCH-MARK WEALTH ESTIMATES		
DATE	*Structures*	*Land*	*Total*	DATE	*Structures*	*Land*	*Total*
June 1890	9.0	6.0	15.0	June 1890[b]	6.7	7.7	14.4
Dec. 1900	14.6	8.3	22.9	June 1900[b]	9.5	10.5	20.0
Dec. 1912	27.3	12.8	40.1	June 1912[b]	20.7	18.5	39.2
Dec. 1922	51.1	20.2	71.3	n.a. 1922[c]	30.0	34.9	65.0
				April 1930[d]	98.1	24.5	122.6
Dec. 1929	80.6	27.9	108.5	April 1930[e]	46.8	52.2	99.0
				n.a. 1930[c]	51.6	56.1	107.7
Dec. 1938	75.1	21.7	96.8	n.a. 1938[c]	44.0	48.0	92.0
Dec. 1939	77.4	21.8	99.2	April 1940[f]	–	–	87.4
Dec. 1949	173.6	38.9	212.5	April 1950[g]	–	–	260.0

n.a. = not available.

Note: June and April figures are for the first day of the month; December figures are for the last day of the month.

[a] From Table D-1.

[b] Simon Kuznets, *National Product since 1869*, National Bureau of Economic Research, 1946, pp. 201-207.

The estimates are derived by successively subtracting estimates of agricultural, mining, and manufacturing real estate from the total taxable real estate estimates made by the various wealth censuses. The residual, comprising other industrial (commercial) and residential real estate, is further subdivided by use of an estimated ratio of residential real estate to the combined residual. The separation of

(notes continued on next page)

[6] David L. Wickens, *Residential Real Estate*, National Bureau of Economic Research, 1941, p. 18.

Notes to Table D-3 (continued)

land and structures is performed by dividing each of the categories—total taxable, agricultural, mining, and manufacturing real estate—by estimated land ratios. Land and structures for the combined category, other industrial and residential, are then derived as residuals. The effect of this procedure is to assign to residential real estate the same land ratio as is assigned to other industrial, which is not in accord with available data.

[c] Robert R. Doane, *The Anatomy of Wealth*, Harper, 1940, pp. 213, 224, and 251. Doane's procedure is essentially similar to that used by Kuznets. Apparently as a result of a typographical error, a 1922 estimate of $67 billion is given on page 116. Subsequent discussion indicates that $65 billion is the total actually intended.

[d] David L. Wickens, *Residential Real Estate*, National Bureau of Economic Research, 1941, p. 3.

[e] E. A. Keller, *A Study of the Physical Assets, Sometimes Called Wealth, of the United States, 1922-1933*, University of Notre Dame Press, 1939, pp. 116-120.

[f] Housing—Special Reports, Bureau of the Census, Series H-1943, No. 1, September 11, 1943.

[g] Derived as follows from *Census of Housing 1950*, Preliminary Reports, Series HC-5, No. 1:

		(*billions*)
15.6 million owner-occupied dwelling units in one-family structures, average value $10,800	total value =	$168.5
17.1 million tenant-occupied dwelling units, estimated average value $3,900	total value[a] =	66.7
3.9 million owner-occupied dwelling units in other than one-family structures	estimated total value[b] =	15.2
2.8 million vacant and other dwelling units	estimated total value[c] =	9.6
	Total =	$260.0

[a] Average monthly rent of $39 multiplied by a factor of 100 (see Appendix I) to obtain average value.

[b] The number of such units represents the difference between all owner-occupied units and owner-occupied single family houses. The average value was assumed to be equal to the average value of a tenant-occupied unit, namely, $3,900.

[c] The total value of vacant and other dwelling units represents a rough estimate.

If, on the other hand, owner-occupied structure values had been in fact reported, the average value of all owner-occupied "dwelling units" would have been higher than the average value of owner-occupied single-family houses. In 1940 the average value of a mortgaged two- to four-family owner-occupied house was 42 per cent greater than that of a corresponding single-family house: $6,247 compared with $4,403.

Wickens' study, based on a special census tabulation of 139 nonfarm areas, presents average values for both owner-occupied single-family houses and all owner-occupied "dwelling units." In 107 cases or nearly 80 per cent of the total the "dwelling unit" values are higher than the average values of owner-occupied single-family houses. It seems quite likely, therefore, that structure values were reported in 1930. The resulting overstatement in Wickens' estimate is estimated to be about

10 per cent of the value of the owner-occupied inventory, or about $6 billion.

In deriving the value of tenant-occupied units, Wickens multiplied average annual rent by 11.9, based on the findings in *The Financial Survey of Urban Housing.*[7] Judging from the findings in Appendix I, a weighted gross rent multiplier in 1929 would appear to have a maximum value of 10. A 16 per cent reduction in the gross rent multiplier would reduce the value of the tenant-occupied inventory by about $9 billion.

A decrease of about $15 billion in Wickens' 1930 estimate would bring it close to both our estimate and Doane's estimate.

For 1938 (month unspecified) Doane's estimate of $92.0 billion is not more than 5 per cent lower than our estimate of $96.8 billion. More serious is the discrepancy between our $99.2 billion estimate and the estimate of $87.4 billion made by the Bureau of the Census for April 1, 1940. The discrepancy is even greater than it appears, since between 1930 and 1940 a small number of farms and public housing units and a considerable number of marginal units entered the housing inventory, as defined by the Bureau. In this case no significant part of the difference can be explained by errors in reporting, since the Bureau was quite explicit in reporting average values on a dwelling unit basis. Nor does its choice of a gross rent multiplier of 8.3 seem incorrect in the light of the discussion in Appendix I. A major part of the discrepancy is probably accounted for by the nature of the valuation. There is a strong presumption that owners' estimates of market value in 1940 lagged behind actual market values because of depression experience. In addition, there is some evidence that construction costs had made a better recovery by 1940 than had market prices. Whether these facts are enough to account for the differences between the two estimates cannot, however, be firmly established.

The last point of comparison is April 1, 1950. A rough estimate of the value of the housing inventory based on census data yields a total of $260 billion, while our estimate at the end of 1949 is only $212.5 billion. The divergence is sufficiently large to point toward a shortage in our capital formation estimates during this decade, much smaller, however, than indicated by the gross difference. Since the publication of the 1950 census results, most authorities have been persuaded that official construction estimates have failed to measure adequately the full volume of construction. The census reported a gross increase in the housing inventory of nearly 11 million units compared with 5.7 million new units recorded by the Bureau of Labor Statistics. Table D-4 shows how this difference has been officially reconciled.

[7] Dept. of Commerce, 1937.

TABLE D-4

Reconciliation of the Net Change in the Nonfarm Housing Inventory, 1940-1950, and New Construction as Reported by the Bureau of Labor Statistics

		Thousands of Dwelling Units
Net change in nonfarm housing inventory (census)		9,942
Estimated losses and abandonments		1,000
Total to be accounted for		10,942
1. Completions estimated from BLS reports	5,700	
2. Temporary public housing units	550	
3. Shift from farm to nonfarm status	1,250	
4. Net conversions	2,000	
5. Trailers	300	
6. One-room units, shacks, etc.	50	
7. Seasonal and similar units excluded from BLS coverage	350	
8. Underreporting by BLS	350	
9. Unaccounted for	392	
Total		10,942

Source: Preliminary report of an interdepartmental committee of federal agencies (to be published).

Capital formation as defined in our study is affected only by item 8, possibly part of item 9, and the probable understatement in additions and alterations in view of the large number of conversions (item 4). Thus in terms of construction expenditures the shortage in our data is on the order of 10 per cent.

The wealth total derived from the 1950 Housing Census reflects accretions to the housing stock that either do not represent capital formation (item 3 and part of item 4) or represent types of capital formation outside our coverage (items 2, 5, 6, and 7, and probably part of item 9). In addition, the value reported by home owners in 1950 was probably unaffected by the temporary interruption, during 1949, of the sustained and striking postwar rise in market prices. Since the sales prices of neighboring houses provide the basis of most home owners' value estimates, it is more likely that the evidence of value was drawn from the highly active market of 1947 and early 1948 than from the less active year preceding the census. The 6 per cent decline in the construction cost index which took place during 1949, on the other hand, is fully reflected in our estimate and represents the first decline in the current-price estimates since 1935.

The problems of dealing with owners' estimates of value can also be illustrated by the following: At the beginning of 1949 the Survey of

Consumer Finances reported the average value of an owner-occupied house, according to the owners' own estimates, as $9,100.[8] According to the 1950 census sample, the average value of owner-occupied detached single-family houses was $10,800, or nearly 19 per cent higher. Although these two averages are derived from somewhat different samples, this in itself is not likely to account for so large a discrepancy. While there are no firm data on the course of market prices of existing homes during the period between the Consumer Survey and the Housing Census, any upward change was probably insignificant. The additions to the housing inventory during this period could have acted only to reduce the average; the estimated average cost for new housekeeping dwelling units started in 1949—80 per cent of which were of the single-family type—could hardly have exceeded $8,300 including land.

The impression is left that the value estimates of the owners of residential real estate are not particularly reliable.

Comparison in Terms of Net Capital Formation

If differences of 10 per cent in comparative wealth data are considered within an acceptable margin of error, the census-based estimates become poor measures for testing capital formation over short periods. Because the increment to housing capital over a ten-year period is a relatively small fraction of total capital, small differences in stock estimates are compatible with large differences in net capital formation. The test is probably better for a twenty- or thirty-year period, but even then the interpretation of variances remains uncertain.

When two of the census-based estimates are adjusted (a $15 billion reduction in Wickens' estimates for 1930 for reasons discussed earlier and a $20 billion reduction in the estimates based on the 1950 census to allow for excess coverage) and the land components removed on the basis of the land ratios given in Table D-1, direct comparison can be made of net capital formation in constant prices.

Between June 1890 and April 1950 the increase in value (in constant prices) of residential structures implied in the bench-mark estimates amounts to $73.9 billion. Net capital formation, according to our estimates, totaled $62.0 billion between June 1, 1890, and the end of 1949, or about 16 per cent less. In most of the subperiods wider discrepancies appear, although in alternate directions. Thus in the first decade the $13.1 billion in net capital formation estimated in this study is about 40 per cent higher than the net capital formation implicit in the bench-mark census estimates. Between 1900 and 1912 the estimates

[8] *Federal Reserve Bulletin*, September 1949, p. 1045.

deviate in the opposite direction, $14.7 billion in our estimate compared with $18.3 billion. In the next period, 1912-1922, our estimate is more than double the amount of capital formation inferred from the bench-mark estimate, $7.6 billion compared with $3.6 billion. In the period December 31, 1890–December 31, 1922, as a whole, the years which are covered by the new estimates of construction expenditures, our estimate of net capital formation of $35.4 billion is 14 per cent higher than the estimate of $31.1 billion based on bench-mark data. In the period 1922-1930, compared with previous subperiod estimates, our $22.2 billion estimate falls about 17 per cent short of the bench-mark data. In the period 1890 to 1930 as a whole, because of compensatory subperiod discrepancies, the agreement is extremely close. The two sets of net capital formation estimates differ by less than 1 per cent.

During the two decades 1930 to 1950, differences become wide. Whereas the bench-mark estimates imply $10.4 billion of net disinvestment between 1930 and 1940, our estimates between comparable dates

TABLE D-5

Comparison of Cumulated Net Capital Formation Estimates with Net Capital Formation Derived from Bench-Mark Estimates, for Various Subperiods, 1890-1950

(*billions of 1929 dollars*)

Period	*Cumulated Estimates* (1)	*Period*	*Independent Wealth Estimates* (2)	*Net Differences* (1 − 2) (3)
June 1890–Dec. 1900	13.1	June 1890–June 1900	9.3	−3.8
Dec. 1900–Dec. 1912	14.7	June 1900–June 1912	18.3	−3.6
Dec. 1912–Dec. 1922	7.6	June 1912–n.a. 1922	3.5	−4.0
Dec. 1922–Dec. 1929	22.2	n.a. 1922–April 1930	26.8	−4.6
Dec. 1929–Dec. 1939	−1.6	April 1930–April 1940	−10.4	−8.8
Dec. 1939–Dec. 1949	5.9	April 1940–April 1950	26.4	−20.5
June 1890–Dec. 1922	35.4	June 1890–n.a. 1922	31.1	−4.3
June 1890–Dec. 1929	57.6	June 1890–April 1930	57.9	−.3
Dec. 1929–Dec. 1949	4.4	April 1930–April 1950	16.0	−11.6
June 1890–Dec. 1949	62.0	June 1890–April 1950	73.9	−11.9

n.a. = not available.

Note: June and April figures are for the first day of the month; December figures are for the last day of the month.

Column — Source

1 Table D-1, column 1.

2 The census-type wealth estimates shown in Table D-2, adjusted for overstatement in 1930 and 1950, were reduced to structure values by use of the land ratios shown in Table D-1 and deflated by the construction cost index shown in Table A-10, column 1. In the case of the 1930, 1940, and 1950 wealth estimates, land ratios and deflators for 1929, 1939, and 1949 were applied in order to obtain comparability with the land ratios and deflators used in the cumulated estimate at corresponding dates.

indicate a much smaller decrement, only $1.6 billion. In the next decade the comparison yields equally poor results. On the evidence of the two Housing Censuses, $26.4 billion of net capital was added to the residential sector, while the estimated capital formation amounts to only $6.0 billion between nearly equivalent dates. For both decades taken together, the census data imply $16.0 billion, and the data prepared for this study, $4.4 billion.

The shortage in net capital formation may of course be nothing more than an illusion, reflecting not deficiencies in the basic estimate of gross capital formation, but rather errors in the various adjustments applied to the bench-mark data. The excess in net capital formation for the early decades and the shortage in the latter decades are undoubtedly occasioned in part by any productivity bias inherent in the cost index (Appendix C). The bench-mark data may also reflect some amounts of consumer capital other than housing. Some of the shortage is unquestionably real, particularly for the past decade, when housekeeping residential construction expenditure estimates were somewhat incomplete and estimates of additions and alterations badly understated.