

NEW MEASURES OF VALUE OF NONFARM BUILDING FOR THE UNITED STATES, ANNUALLY 1850-1939*

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IN a preceding work, an effort was made to develop a new nation-wide series of the number of dwelling units erected annually in the United States since 1840.¹ This series contained revisions of the prevailing estimates for the decade levels of building between 1890 and 1940 and added a full half century to our statistical annals of residential building. The decade levels of the estimates up to 1910 were aligned to Census increments of housing stock and nonfarm labor force and were adjusted by rates of new residential building for these increments as found in the state of Ohio. In this paper, the same research effort is extended to estimation of the value of nonfarm building, both total and residential. The necessary preparatory data regarding the value of building in Ohio over the period 1837-1912 has been disclosed elsewhere.²

We seek, first, to establish a reliable and consistent set of decade aggregates of new nonfarm building for the six decades before 1910. For this purpose, we have available periodic Census returns on standing stocks closely related to new nonfarm building activity: (a) the so-called "true value" of nonfarm real estate, and

* The author is Professor of Economics at the University of Wisconsin-Milwaukee. This paper grew out of intensive research during the past four years into all phases of urban building cycles carried on with the aid of the National Bureau of Economic Research and particularly Dr. Moses Abramovitz. See progress reports on the inquiry in the Annual Reports of the National Bureau of Economic Research for 1962, pp. 48-51 for 1963, pp. 46-47, for 1965, pp. 53-54. An early version of this paper was presented to and discussed at the September 4 and 5, 1963 Conference on Research in Income and Wealth. The Conference discussion, particularly the challenging comments of Dr. Paul David of Stanford University, helped to direct attention to contentious issues.

¹ M. Gottlieb, *Estimates of Residential Building, United States 1840-1939*, (National Bureau of Economic Research, Technical Paper No. 17, 1964).

² See M. Gottlieb, "Building in Ohio Between 1840-1912," Conference on Research in Income and Wealth, Proceedings of Conference September 4 and 5, 1963, *Output Employment and Productivity in the United States After 1800* (National Bureau of Economic Research, to be published), 243-290.

(b) the nonfarm labor force. Periodic readings of the true value of real estate will obviously reflect intervening activity in building. These readings will also reflect shifts in urban site values, as gauged by speculative opinion, underlying land improvement, and utilities (roads, sidewalks, water, and sewage, etc.) which become reflected in private land values, and rates of wastage or deterioration of existing stocks. Moreover, true value will be variously gauged by analysts of different temperaments with access to different kinds of market information. True value measures of reality are thus treacherous. Increments from a historic succession of such measures should have an early unpredictable range of error.

We have known, however, from the work of Simon Kuznets, that the Censal surveys of "true value" can be utilized to shed light on building activities.³ These Censal surveys were themselves conducted in the later Census periods with awareness of the difficulty of evaluation. And it is proposed here to use them not in their vulnerable form but in the light of Ohio experience with these same Censal surveys and the independently determined Ohio measures of building activity. A particular Censal survey of market values may have badly misgauged market value or the scope of enumeration of property may have been altered, but if the survey did not utilize different standards of evaluation or enumeration in Ohio, the Ohio relationship between building and realty value will be affected and the necessary correction can be imparted to the national returns. We have

³ Simon Kuznets, *National Product Since 1869* (National Bureau of Economic Research, 1946), 202-215. See the further development of Kuznets' estimates in R. Goldsmith, "The Growth of Reproducible Wealth of the United States of America from 1805 to 1950," International Association for Research in Income and Wealth, *Income and Wealth Series*" (1952) 225ff and Appendix Tables. Goldsmith found it feasible to utilize the "true value" estimates of the 1850 Census as the basis for his 1850 wealth estimate (p. 317 and following) while Kuznets worked with the Census returns of 1880 and later.

TABLE 1. — STANDING STOCK WEALTH, OHIO, AND UNITED STATES, 1850–1912
 (in thousands)

		Ohio	U.S.
1850	Assessed value taxable real estate	\$337,521	\$3,899,226
	True value factor	116.33%	117.29%
	True value	392,639	4,573,403
	Farm value	313,599 ^a	3,271,575
	Nonfarm true value	79,040	1,301,827
	Raised to post-Civil War values ^b	110,411	1,818,522
1860	Assessed value taxable real estate		\$6,973,106
	True value factor		133.72%
	True value		9,324,437
	Farm value		6,645,045
	Nonfarm true value	155,674 ^c	2,679,392
	Raised to post-Civil War values ^b	217,462	3,742,843
1880	Assessed value taxable real estate	\$1,093,678	\$13,036,767
	True value factor	158.97% ^d	161.16 ^e
	True value	1,856,838	
	Farm value	1,162,694 ^c	10,197,097
	Nonfarm true value	694,144	11,127,143
1890	True value real estate ^h	\$2,530,255	\$39,544,544
	Farm value	1,050,032	13,279,253
	Nonfarm true value	1,480,223	26,265,291
1900	True value real estate ^h	\$2,918,961	\$52,537,628
	Farm value	1,036,615	16,614,647
	Nonfarm true value	1,882,346	35,923,081
1912	True value real estate ^h	\$5,173,708	\$110,676,333
	Farm value	1,773,218 ^f	37,306,000 ^g
	Nonfarm true value	3,400,490	73,370,333

SOURCES: U.S. Bureau of the Census, 13th Census *Agriculture, General Report* 83–91; Ohio wealth appraisals, tax reports; U.S. Bureau of the Census, *Wealth, Debt and Taxes* (1907, 1915).

^a The 1850 Census contained an apparently excessive account of farm value. A statewide 1846 appraisal, marked up by 1.04 to reflect growth to 1850, was used.

^b 1.392. See M. Gottlieb, "Building in Ohio Between 1840–1912," n. 24, cited in footnote 2.

^c Ohio appraised value nonfarm real estate.

^d see Gottlieb, "Building in Ohio Between 1840–1912," n. 19.

^e Adjusted on the basis of Ohio shift in valuation between 1870 and 1880.

^f 1910 value raised by nation-wide increase to 1912 (7.2%).

^g U.S. Bureau of the Census, *Historical Statistics of the United States, 1789–1945* (Washington, D.C., 1949) 95.

^h Plus value of tax-exempt property.

learned elsewhere that, particularly in the second half of the 19th century, trends and levels of urbanization, industrial mix, and levels of income in Ohio conformed closely to the national pattern.⁴

The relevant statistics of real estate value for Ohio and the nation are set forth in table 1. We leave out the wealth evaluation of 1870 taken near the high tide of the Civil War inflation when business and property values were still unsettled and, to varying degrees, adjusted either to a domestic paper currency or to a gold basis. The table commences with assessed values of taxable real estate as enumerated in the Census of local taxation. The coefficient of undervaluation was determined by the local agents of the Bureau of the Census after con-

sidering indications of the probable true value of all taxable property. From the Census of Agriculture we then obtained a "true value" which left a nonfarm true value raised by an adjustment factor to a post-Civil War level of values for the two pre-Civil War Censal years. Though the Censal measures after 1880 are more reliable and more inclusive, with the aid of the Ohio correction factors it is believed that the earlier returns can be used.

The second set of benchmark stocks which are related in stable and persistent ways to building activity is the shifting number of persons in the nonfarm labor force. The relevant statistics have already been developed and tested in our residential numbers projection and were there found to be quite serviceable.⁵

⁴ See Gottlieb, *Estimates of Residential Building, United States 1840–1939*, 18–31.

⁵ *Ibid.*, Table 10 and adjoining text.

The use of this projection base supposes that new members of the nonfarm labor force in Ohio were equipped at nationwide standards in their urban facilities, homes, and workshops. Since we have found elsewhere that levels of per capita realty value and nonfarm income in Ohio were somewhat lower than nation-wide levels — by as much as 15 per cent for 1850 and down to five to eight per cent in the 1900's — a correction factor has been applied to adjust Ohio levels of building to supposed national levels.⁶

Details of the calculation of an acceptable and consistent set of decade aggregates of new nonfarm building from 1850 to 1910 are set forth in table 2. The reported decade totals of new Ohio building (column 1) are drawn from another publication but are adjusted upward ten per cent to allow for a fully "true value" basis plus a minimal allowance of five per cent for site improvements and builder's profits. The Ohio wealth-new building ratios (column 7) oscillate with the rhythm of the Kuznets' wave process, suggesting that the surges of new building found in the 1860's, 1880's, and 1900's were associated with tendencies for buoyant realty values. Many questions of adequacy and interpretation are raised by the two projections but it is important to note that the two resulting sets of estimates are aligned in trend, and except for the last two decades, in overall level. No clear basis was found for preferring one set to the other in view of the manifest biases inherent in each. The two sets were accordingly averaged, where possible, in the hope that biases would be offset rather than cumulated. For the decades of the 1860's and 1870's, only the labor force projection was available and this seemed to allocate too much building to the 1870's and too little to the adjoining decades. Hence, we adjusted at this point "for fitting" by using the labor force projections for the two decades but raised the decades of the 1860's and 1880's and lowered the decade of the 1870's by ten per cent each. The resulting pattern of decade estimates (column 10) conforms generally to the pattern implicit in the Kuznets decade estimates and the Riggle-

man per capita building rates extended to the total urban population.⁷

Granted the pattern, there are grounds to be concerned about the level of the estimates. For the 40 years between 1870 and 1910 the Kuznets construction estimates, when broken down by an allocating formula, presuppose about 44 billion dollars of nonfarm building or 43 per cent more than our 40 year aggregate. Stocks of real wealth in improvements enumerated and appraised in 1912, if we accept the breakdown between land and improvements suggested by Kuznets, amounted in 1910 to some 30 billion dollars.⁸ Other responsible estimates for the value of nonfarm standing structures in 1910 exceed this estimate by some five billion dollars.⁹ Even modest allowances for depreciation on structure and for loss by demolition or disaster would suggest that our estimates involve serious understatement.

The hiatus between our estimates and the Kuznets totals may be due to lack of coverage in our series of alterations and additions and

⁷ For the sake of easy comparison I cite:

	(in billions of dollars)		
	New series	Kuznets' estimates	Riggleman urban extensions
1870's	2908	4748	2533
1880's	5138	8166	4348
1890's	7320	12000	6102
1900's	15322	19100	11187

For Kuznets' estimates, we used his decade aggregates for new construction in current dollars with quotas (averaging 59.2 per cent) for nonfarm building derived by Dr. Moses Abramovitz (National Bureau of Economic Research, O. P. 90, 1964) chap. 3, Appendix A, 224 and following; and Simon Kuznets, *Capital in the American Economy* (National Bureau of Economic Research, 1961) 524. The Riggleman urban extensions were computed by multiplying his per capita building permits in 1913 dollars by a linearly interpolated series of total urban population. The "new series" was presented in table 2.

⁸ Including improvements in nonfarm residential and exempt wealth, and improvements for manufacturing and "other industrial," categories, the total is \$34.5 billion at the end of 1912 or about \$30 billion in 1910. See *Historical Statistics of the United States, 1789-1945* (1949 ed.), 9.

⁹ See estimates of R. Goldsmith, "The Growth of Reproducible Wealth of the United States of America from 1805 to 1950," *Income and Wealth of the United States* (1952), 258ff and 306ff. In his *Study of Saving in the United States*, Goldsmith estimated that by the end of 1912 standing nonfarm structures were valued at current prices at \$56.9 billion (v.III, pp. 42-44) and, exclusive of value of improvements, for public utilities (as valued by Kuznets) at \$40 billion. Using substantially the same sources, W. I. King in 1915 added up these values to \$29.3 billion. See W. I. King, *The Wealth and Income of the People of the United States* (1915), 256 and 259.

⁶ Gottlieb, "Building in Ohio Between 1840-1912," Tables 5, 6.

TABLE 2. — PROJECTION OF NATION-WIDE BUILDING BY DECADES, 1850-1912

	Nonfarm Labor Force Projection ^c					Wealth Projection				
	Estimated Ohio nonfarm building (million \$) ^a	Ohio force increment ^b (000)	Ohio building per member increment ^b (1 + 2)	Nationwide force increment ^b (000)	Estimated nationwide building (million \$) (variant labor force) (3 X 4)	Ohio realty increment ^f (million \$)	New building per \$1,000 of realty	National realty increment ^f (million \$)	Estimated nat'l. bldg. (million \$) (variant wealth)	New estimate adjusted (average of columns 5 & 9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1850's	113.9	81.9	1390.7	1530.0	2440.1	107.1	1063.5	1924.3	2046.5	2243.3
1860's	108.9	106.6	1021.6	1525.4	1731.5	227.3	479.1	7384.3	3962.4	1904.7
1870's	146.9	152.4	963.9	3016.6	3230.8	249.4	589.0			2907.7
1880's	250.4	276.4	905.9	4491.5	4521.1	786.1	318.5	15138.2	4821.5	5138.4
1890's	337.0	258.7	1302.7	4521.7	6544.8	402.1	838.1	9657.8	8094.2	7319.5
1900's	689.4	368.3	1871.8	6892.8	13948.3	1578.1	594.4 ^d	37447.3	16694.6 ^e	15321.5
Total										
1870-1910	1423.7				28,245.1				31,591.5 ^e	30,687.1

^a Drawn from Gottlieb, "Building in Ohio Between 1840-1912," Table 7, col. 7, adjusted upwards by 15 per cent to allow for 100 per cent of market value, and an allowance of five per cent for site expenditure and builder's profit. The entry for 1850 was estimated by taking the total value of building for Ohio for the decade less the decade share for the 1860's used for farm purposes (12 per cent).
^b See Gottlieb, *Estimates of Residential Building, United States 1840-1930*, Table 10.
^c Adjusted upward for differential between Ohio and national per capita nonfarm wealth and income levels (see Gottlieb, "Building in Ohio Between 1840-1912" Tables 5 and 6) with division by .872 for the 1850's, .9 for 1860-90's, and .925 for the 1900's.
^d This multiplier was computed by adding to the decade total of Ohio new building for 1900-1909 the entries for building for 1910, 1911, and one-half of 1912 or a total of \$938.05 million.
^e For purposes of totalling, 1870-1880 was split in half.
^f See table 1.
^g Total for 12.5 half years reduced to the 1900-1909 level based on Shaw's finding that output of construction materials during 1910-1912 exceeded that of 1900-1909 on a yearly average basis by 25.7%.

also to a minimal allowance for site improvements. It may be expected that proper allowance for these would add a good ten per cent to our totals.¹⁰ There is also some possibility that our allocating formula assigns an excessive proportion of the estimates by Kuznets for gross new construction to the category of nonfarm building. The circumstance that the hiatus between our estimates and Kuznets' was not evenly distributed over time may be significant. For the first three decades, Kuznets' estimates were 62 per cent above ours; for the last decade only 25 per cent. In these early decades was the markup prescribed by Kuznets for transportation and dealer charges of construction materials too high? Were construction materials diverted to other uses? Was the allowance for value added excessive? In favor of the general level of our estimates is the fact that they link up with the Commerce series for aggregate building smoothly; that they are

aligned with the extension of the Riggleman rates of per capita building to total urban population; and that they provide the necessary coverage for nonurban and nonfarm building.¹¹ Unquestionably, the rate of growth of construction output as estimated by Kuznets, when put on a man-hour basis, was improbably high for the years between 1869 and 1900.¹²

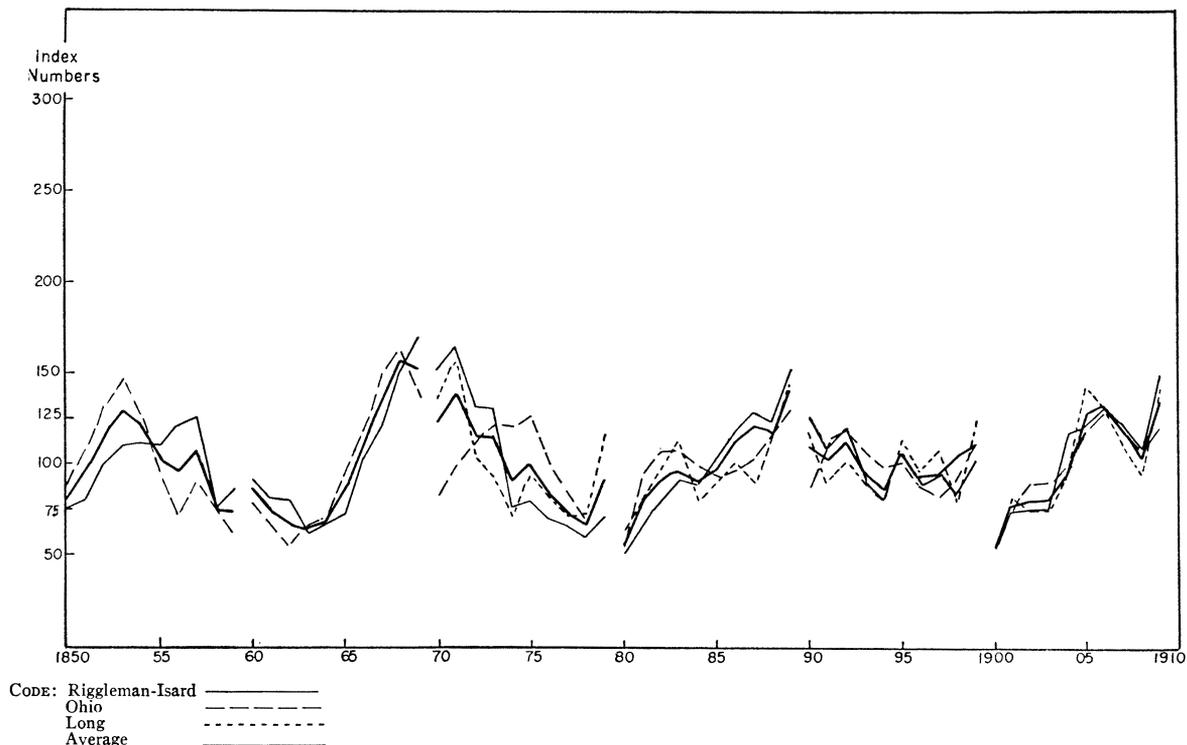
The distribution of our decade aggregates into individual years requires six sets of decade relatives showing the fluctuations of building throughout the decade. These decade relatives and their sources are graphed on chart 1. For the decades of the 1850's and 1860's, only the Ohio and Riggleman series of total building were available. For the four decades following

¹⁰ Considering the proportions of urban, as compared to nonfarm and nonurban, population growth and the much higher rates of per capita urban wealth, our estimates would seem compatible with the urban building permit rates disclosed by Riggleman. For the period 1890 to 1910 population growth in incorporated cities below 2,500 in size was only 18 per cent of growth in cities over 2,500, while our series provides for a 30 per cent share of nonfarm nonurban building.

¹² Thus Kendrick derives the following improbable table of indexes (1929 = 100) of construction output per man-hour for the Census years between 1869 and 1929: 37.3, 52.9, 68.3, 65.9, 100.4, 90.7, 100.0. J. W. Kendrick, *Productivity Trends in the United States* (National Bureau of Economic Research, 1961), Appendix E, p. 497ff.

¹⁰ Thus, for the three years 1954 to 1956, building permits issued under the headings "alteration and repair" accounted for some ten per cent of all building covered by permits. U.S. Department of Labor, *Trends in Building Permit Activity* (Bull. 1243, U.S. Government Printing Office), 40ff. This estimate is probably minimal. See M. Reid, "Capital Formation in Residential Real Estate," *Journal of Political Economy* (Apr. 1958), 135.

CHART 1. — DECADE INDEXES OF ANNUAL TOTAL BUILDING, RIGGLEMAN-ISARD, LONG 1850-1909
(each decade mean = 100)



SOURCE: C. D. Long, *Building Cycles and the Theory of Investment*, Appendix B; Riggelman-Isard, Colean-Newcomb, *Stabilizing Construction* (McGraw-Hill, 1952) Appendix N; Gottlieb, "Building in Ohio Between 1840-1912," Table 8. Indexes for 1860 deflated with a Riggelman cost of building index.

there was also available the Long series on total building value. While heavily weighted with Manhattan in the 1870's, the index gives added breadth to our base for yearly distribution. The selected sets of decade relatives — which conformed closely in pattern of movement — were averaged by decade through to 1909. It is hoped that future research will make it possible to expand the index base with one or more sets of index relatives reflecting building experience in regions, such as the Pacific Coast, Northwest, or Southeast, which are inadequately represented in our index measures.

From 1909 to 1915, we extend our last reported yearly total value with index relatives averaged from Riggelman and Isard, and Long. Our extrapolated terminal value for 1915 was within 5.5 per cent — and for the three years 1915 to 1917 was within 2.5 per cent — of the corresponding Commerce series values. Our values were reliably linked and from here on, at least for nonresidential building, the Com-

merce series, reduced to dollars of 1915 purchasing power were used in order to link up reliably with the post-Civil War level of values.

For residential building values, our procedure may follow more simple lines. We have already (in a previous publication) developed a series of estimates for the number of nonfarm, housekeeping, permanent dwelling units erected annually in the United States from 1840 to 1939.¹³ For the years 1850 to 1912, we have elsewhere developed an acceptable Ohio series for the average unit value of nonfarm dwellings which, with adjustments for our present purposes, may do service as a nation-wide series of unit value. We have argued elsewhere that this adjusted series is superior to the more narrowly based permit-derived series constructed by Grebler, Blank, and Winnick.¹⁴ The only

¹³ See Gottlieb, *Estimates of Residential Building, United States 1840-1939*, Table 15, Chart 21.

¹⁴ See Gottlieb, "Building in Ohio Between 1840-1912," Section 7, Chart 7.

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TABLE 3. — ANNUAL ESTIMATES OF VALUE, OF TOTAL, RESIDENTIAL AND
NONRESIDENTIAL NONFARM BUILDING FOR THE UNITED STATES, 1850-1939
(millions of dollars)

Value of Building				Value of Building			
Year	Total ^a	Residential ^b	Nonresidential ^c	Year	Total	Residential	Nonresidential
1850	184.7	82.4	102.3	1895	782.4	386.7	395.7
1851	212.8	96.2	116.6	1896	659.9	317.7	342.2
1852	257.7	107.4	150.3	1897	691.8	364.8	327.0
1853	290.0	118.8	171.2	1898	622.0	335.2	286.8
1854	270.9	124.0	146.9	1899	829.9	365.0	464.9
1855	233.1	124.6	108.5	1900	784.8	345.4	439.4
1856	216.5	122.7	93.8	1901	1,179.0	494.9	684.1
1857	241.6	129.8	111.8	1902	1,216.1	497.6	718.5
1858	168.3	94.8	73.5	1903	1,226.0	559.8	666.2
1859	167.1	87.2	79.9	1904	1,458.1	704.9	753.2
1860	163.0	75.4	87.6	1905	1,957.6	1,028.2	929.4
1861	140.0	64.0	76.0	1906	2,021.8	1,045.7	976.1
1862	128.8	75.3	53.5	1907	1,795.7	959.7	836.0
1863	122.7	78.9	43.8	1908	1,568.8	952.4	634.4
1864	130.7	67.5	63.2	1909	2,095.5	1,259.3	836.2
1865	161.6	82.7	78.9	1910	2,042.9	1,119.8	923.1
1866	220.7	110.1	110.6	1911	2,037.9	1,146.1	981.8
1867	272.6	134.1	138.5	1912	2,207.6	1,247.0	978.0
1868	315.0	169.5	145.5	1913	1,895.6	1,200.7	694.9
1869	309.8	173.3	136.5	1914	1,672.6	1,151.3	521.3
1870	359.6	164.4	195.2	1915	1,968.9	1,233.9	735
1871	407.2	191.7	215.5	1916	2,078.9	1,201.9	877
1872	336.0	170.9	165.1	1917	1,500.0	722.0	778
1873	334.8	186.0	148.8	1918	978.1	368.1	610
1874	259.0	143.7	115.3	1919	1,684.1	945.1	739
1875	292.5	155.6	136.9	1920	1,536.1	553.1	983
1876	242.1	123.8	118.3	1921	2,148.4	1,094.4	1,045
1877	213.0	125.7	87.3	1922	3,151.7	1,918.7	1,233
1878	196.0	98.4	97.6	1923	3,586.1	2,336.1	1,250
1879	266.6	108.8	157.8	1924	3,972.1	2,707.1	1,265
1880	330.4	148.3	182.1	1925	4,617.1	3,035.1	1,582
1881	410.5	215.0	195.5	1926	5,062.3	3,211.3	1,851
1882	473.3	226.9	246.4	1927	4,435.2	2,609.2	1,826
1883	494.1	259.9	234.2	1928	4,124.7	2,288.7	1,836
1884	463.7	283.3	180.4	1929	3,690.4	1,819.4	1,871
1885	493.6	319.0	174.6	1930	2,828.2	1,258.2	1,570
1886	572.1	326.9	245.2	1931	2,233.2	1,146.2	1,087
1887	615.9	377.3	238.6	1932	1,170.9	497.9	673
1888	605.8	387.1	218.7	1933	779.4	298.4	481
1889	729.1	480.9	248.2	1934	917.5	357.5	560
1890	810.9	384.7	426.2	1935	1,264.5	705.5	559
1891	765.5	354.9	410.6	1936	2,109.7	1,178.7	931
1892	825.6	460.5	365.1	1937	2,193.3	1,245.3	948
1893	702.1	327.5	374.6	1938	2,175.2	1,338.2	837
1894	629.5	330.8	298.7	1939	3,049.4	2,035.4	1,014

SOURCE: U.S. Departments of Labor and Commerce, *Construction Volume and Costs* (Washington, D.C.: U.S. Government Printing Office, 1954), 2, Table 2, and 42, Table 11.

^a Total building for the years 1850-1909 was determined by applying decade indexes, as explained in the text, to the average yearly decade value derived from table 2, column 10. Adjustments were made for only one transition year (1880) increased by \$50 million. From 1909 to 1915, the total was extended by an index of total building (see text). From 1915 onward the total was derived by addition of residential and nonresidential values. Values between 1865 and 1869 were raised by \$51 million to allow for rebuilding in the South arising out of damage during the Civil War. See M. Gottlieb, *Estimates of Residential Building, United States 1840-1939*, n. 61.

^b Residential values were derived by multiplying the schedule of per unit values (graphed in chart 2) by the number of units estimated in our series, Gottlieb, *Estimates of Residential Building, United States 1840-1939*, Table 15. From 1850 to 1912, unit values are an adjusted three-year moving average derived from Ohio unit values. From 1912 on, the values are the per unit dollar values of Grebler, Blank and Winnick, scaled to 1912 dollar values and linked to the Ohio values by a simple formula which distributed a 6.6 per cent reduction over the 1912-1919 period.

^c Nonresidential values for 1850 to 1914 are residual values and are derived by subtraction. From 1915 onward, total nonresidential building is in 1947-1949 dollars (converted to 1912 dollars by multiplying by .24915) for the following categories of buildings: total new private and public nonresidential building. Nonhousekeeping residential building in current dollars (reduced to dollars of 1915 cost levels by use of the Boehk index) was added since residential building before 1915 was adjusted to a housekeeping basis only.

remaining problem is the scope of adjustment and the form of technical linkage to be effected between the two series at or around 1912. The gap between the absolute levels of the two series of about 20 per cent is narrowed when we adjust the Ohio to the nation-wide level by the sliding scale (.872 to .925) and allow the minimal five per cent for site improvements and builders' profits. These adjustments were previously allowed for in our total building projection (see table 2). The permit series were given what appears to be a more liberal adjustment for undervaluation and site improvements and builders' profits (127.4 per cent). It may be, however, that the upward bias of the permit series due to a restricted sample and to the estimating procedures was more important. The latter hypothesis seemed more plausible and the series are linked by reducing the Grebler, Blank, and Winnick series to the 1910-1912 level. This reduction of 6.6 per cent is tapered off over the period 1912-1920 as the bias had been narrowing over time. The entire adjusted unit value series from 1850 to 1939 is shown in chart 2.

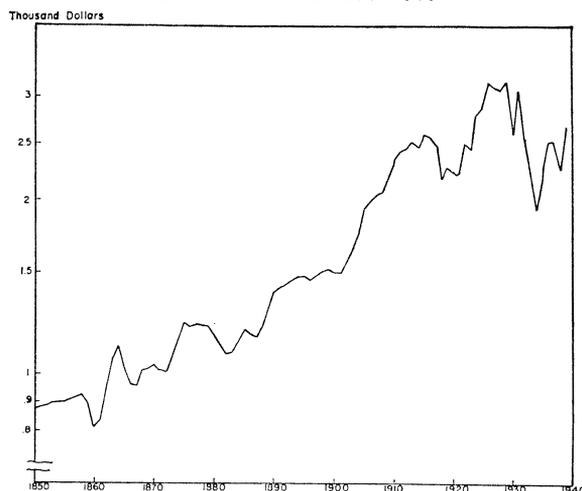
The new time series of nonfarm building (set forth in table 3 and in chart 3) should not be regarded as embodying an independent set

of measurements. The new series should, rather, be regarded only as a relatively consistent set of estimates intended to reconcile and link together a conglomeration of independent annual or decennial measurements and primary estimates of building activity or stocks of wealth produced by many collecting agencies both in the state of Ohio and nation-wide. Reconciliation at best is approximate and rests upon inferences from information which is often of uncertain quality or relate to relationships which are merely indicated but which cannot be conclusively proven. We can only link data of different character and scope by judgments which sometimes have a high margin of error.

Our estimates are believed most trustworthy with regard to secular drift and sequence of decadal levels. The play of annual figures around this drift reflects, essentially, the limited range of annual measurements and estimates available for our use. We were able to add to original measurements through the processing of the Ohio statistics. Unfortunately, annual patterns were influenced predominantly before the 1890's by a relatively small number of central cities. Amplitudes of movements tend to be somewhat higher than were probably realized over the nation. The pattern of movement of our annual estimates, particularly before 1890, tends to reflect patterns of central city behavior more than it should, tempered by the statewide experience of Ohio. It is a pity that data from other states and regions are not available to aid in the tempering process.

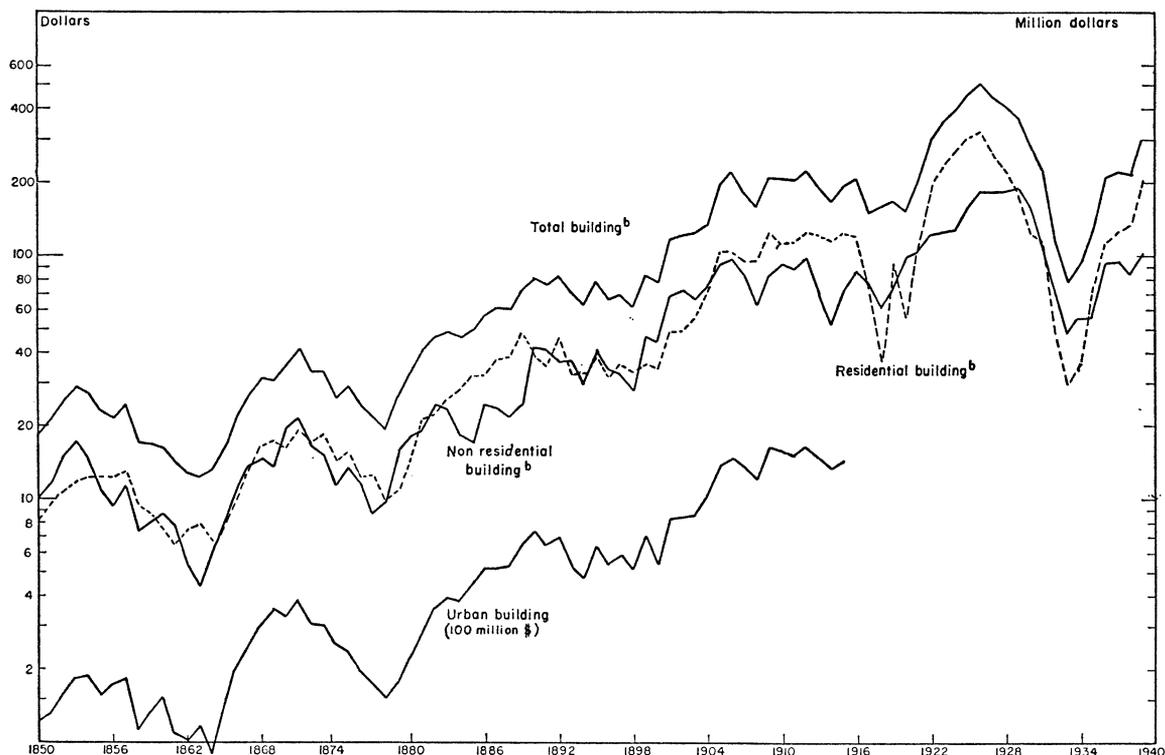
The volume of nonresidential building indicated by our series is compiled as a residual between 1850 and 1915 by merely subtracting our independently contrived estimates of residential building values from total building values. The series for this period serves primarily to exhibit estimating biases in the two primary series and, at best, indicates certain general tendencies of nonresidential building. The first two long wave movements of nonresidential building are shown to have fluctuated more violently than residential building. The major depression of the mid-eighties stands out strongly in the nonresidential series as does the building decline around 1906-1907. Since from 1915 onward our nonresidential series are

CHART 2. — NONFARM UNIT DWELLING VALUES
U.S. ANNUALLY 1850-1939



SOURCE: From 1858 to 1911 a three-year moving average of Ohio nonfarm state-wide unit values adjusted for a five per cent undervaluation and by a sliding scale (see p. 3 and table 2c of text); linked in 1912 to .934 of the Grebler-Blank-Winnick unit series in 1912 dollars and by a reducing formula to 1.00 of the Grebler-Blank-Winnick series by 1920. Grebler-Blank-Winnick, *Capital Formation in Residential Real Estate* (National Bureau of Economic Research, 1956) appendix J, 426.

CHART 3. — ESTIMATED DOLLAR VALUE, ALL BUILDING, RESIDENTIAL AND URBAN U.S., 1850–1939
(in 1912–1915 dollars) ^a



^a 1850–1862 raised to post-Civil War values; 1862–1912 in current dollars.
^b In ten million dollars.

the deflated Commerce estimates, the pattern of movement of the nonresidential series around the year where the two series are linked may be due to the statistical treatment of the data more than to building behavior. But even before 1915, and increasingly thereafter, nonresidential building ceases to synchronize closely

with residential building. The lags between turning points spread out. Thus, the sharp decline of residential building in the 1920's is tempered by maintenance of the flow of nonresidential building, and the peak of nonresidential building is three years after the dwelling peak of 1926.