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Estimation of Decade Totals, 1890-1940

The first stage of the present research involves determination of a valid set of decade totals of nonfarm permanent residential housekeeping units constructed during the five decades following 1890. It begins with an appraisal of the relative adequacy of the decade estimates implicit in the BLS-NBER series, which begins with 1889. These decade estimates are the outgrowth of an extended series of studies in which data on building permits collected by permit-issuing municipalities were utilized. Two major undertakings sponsored by the National Bureau of Economic Research played an important role in the development of the series.¹² The decade estimates concerned are set forth in line 5 of Table 1. Elsewhere the table lists other sets of estimates related to housing construction. For the five decades following 1890, the total housing unit starts in the BLS-NBER series is 19,904,000 units.

For three reasons, this fifty-year total must be regarded as involving serious underestimation. First, Table 1 shows that the gross increases in nonfarm households and nonfarm stocks of dwelling units (lines 8, 9) recorded over the period 1890-1940 (19,952,000 and 20,179,000 units, respectively) are practically the same as in starts. This result is surely self-contradictory. It implies that permanent housekeeping units built were only as many as new households formed or the net dwelling stock increase between 1890-1940. No allowance is made for residential building which would permit more vacancies, would reduce household "sharing," or would replace loss in fires, disasters, or through voluntary demolitions.

¹² See Wickens, *Residential Real Estate*; L. Grebler, D. Blank and L. Winnick, *Capital Formation in Residential Real Estate: Trends and Prospects*, Princeton for NBER, 1956 (hereafter cited as GBW).

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TABLE 1
 DECADE ESTIMATES, RESIDENTIAL UNITS BUILT, UNITED STATES, 1860-1940
 (thousands)

	1860's	1870's	1880's	1890's	1900's	1910's	1920's	1930's	1890-1940 Total
1. Blank, original estimates				2,940	3,610	3,590	7,497	2,650	20,287
2. Chawner, estimates					4,200	4,220	6,764		
3. Wickens, estimates				2,417	3,952	3,890	7,035		
4. BLS estimates, 1953						3,980	7,035	2,734	
5. Official BLS-NBER estimates				2,940	3,606	3,590	7,034	2,734	19,904
6. Survivors, 1940 vintage report			1,492	2,804	4,796	5,009	7,253	4,086	23,948
7. Official as per cent of vintage (line 5/line 6)				104.8	75.2	71.7	97.0	66.9	
8. Nonfarm household increments				2,351	3,858	3,469	5,700	4,574	19,952
9. Net increase, nonfarm dwelling stock				2,270	3,736	3,579	6,580	4,014	20,179
10. Census increments, occupied dwellings, adjusted for vacancy and shrinkage									
11. Wickens, estimated increment, private nonfarm families	974	1,112	2,482	2,021	3,409				
12. Ohio multiplier, nonfarm occupied dwelling increment	1,151	1,404	2,560	2,494	3,951				
13. Ohio multiplier, nonfarm labor force increment	938	1,221	2,553	2,411	4,318				
14. Decade estimates, new	1,061	1,333	2,597	2,491	4,200	4,220	7,497	4,019	22,427

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SOURCE, BY LINE

1. Blank, *The Volume of Residential Construction*, pp. 11, 59.
2. Chawner, *Residential Building*, p. 13.
3. Wickens, *Residential Real Estate*, p. 54.
4. *Construction During Five Decades*, Dept. of Labor, Bull. 1146, 1953, p. 3.
5. *Non-Farm Housing Starts 1889-1958*, Dept. of Labor, Bull. 1260, 1959, p. 15.
6. *Sixteenth Census of the United States, 1940, Housing*, Bureau of the Census, Vol. III, Part 1 (1943), Table A-1, p. 9 (except for exclusion of three months of 1940 as disclosed in the report in same series *Housing*, 1945, p. 3).
8. Grebler, Blank, and Winnick, *Capital Formation in Residential Real Estate*, p. 82.
9. *Ibid.*, p. 86.
10. See Table 13.
11. Wickens, *Residential Real Estate*, p. 55.
- 12 to 14. See Table 12 for 1860-1900 and Section 2, below, for later decades.

The starts total thus presupposes an implausible deterioration in housing standards over the fifty-year period.¹³

Second, critical scrutiny of later bench-mark studies indicates that, around the fourth decade of this century, our established permit-derived residential building statistics have tended to understatement ranging up to 20 per cent.¹⁴ It is reasonable to hold that this tendency to understatement did not begin abruptly in 1940. Third, concrete indications of understatement are offered by the findings of the vintage statistics of the 1940 and 1950 Censuses. Owners, managers of residential buildings, or

¹³ Though the tables were presented in GBW and commented on extensively, the issue of the consistency between cumulated starts and stock aggregates was bypassed. It was explicitly recognized that between 1890 and 1930, before the tendency to convert had allegedly grown strong, new calculated starts only slightly exceeded growth in households and dwelling stock (GBW, p. 88). The slight excess (of 988,000 units of housing stock) "reflects the net effects of demolitions, conversions and other changes in the housing stock" (p. 88). As Margaret Reid has pointed out, ". . . there will be a tendency to overestimate the number of conversions or to underestimate the number of demolitions in order to account for the net change in number of non-farm dwellings indicated by decennial censuses" (Reid, "Capital Formation," n. 23).

¹⁴ Between 1930 and 1956, BLS estimates of housing starts "probably accounted . . . for between 70-80 per cent . . ." of the reported net change in units standing after liberal allowances for conversions and demolitions" (Grebler and S. Maisel, "Determinants of Residential Construction," mimeographed memo for Commission on Money and Credit, Oct. 1959, IV-17).

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knowledgeable neighbors were requested in the 1940 Census to disclose the year built of the original structure in which the surveyed residential units were located. The returns were presented by years for the first decade, by five-year intervals for the second decade, and thereafter by decade totals back to 1859. Vintage information was obtained for 92 per cent of the surveyed residential units.

Collecting decade totals for dwelling units for which year-built information was furnished, the vintage record (line 6, Table 1) as of the 1940 census enumerated 23,948,000 dwelling units in the 1940 stock as located in surviving structures originally erected after 1890. This total cannot be compared, without adjustment, with the 19,904,000 units estimated in the BLS-NBER series. Vintage attributions represent standing stock and thus include converted units, units transferred from the farm sector to the nonfarm and nonpermanent dwellings excluded from the starts category. The vintage attributions likewise do not include units built between 1890 and 1939 but destroyed or demolished, or for which a vintage report was not filed. Specified estimates under these headings are given in Table 2.

TABLE 2

1940 CENSUS VINTAGE REPORT ON
DWELLING UNITS BUILT, 1890-1940
(thousands)

Number nonfarm housing units originally constructed, 1890-1940 (unadjusted 1940 Census report)	23,948
1. Minus number of converted units included	2,436
2. Minus number of nonpermanent ineligible units included	147
3. Minus farm units transferred to nonfarm stock	150
4. Plus units built between 1890 and 1940 and destroyed or demolished	1,000
5. Plus units built after 1890 and not reporting vintage	1,805
Total adjusted	24,020

NOTE: For detailed explanation of the five adjustments, see the Appendix.

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The largest task of estimation involved the breakdown of converted units, numbering 3.18 million, and nonreporting units, numbering 2.35 million, into structures of origin erected before or after 1890. Some tendency was found for age to influence the distribution in both cases. Surviving older units are more prone to conversion, and it seems plausible that owners or managers of surviving older units are more likely to be ignorant of vintage. The evidence on hand indicated a stronger tendency for conversion to be correlated with age. We accepted the results of regression analysis, which put 76.7 per cent of the 1940 stock of converted units into the post-1890 vintage category. With less clear-cut evidence, the vintage category of nonreporting units was adjusted by the same percentage. With other adjustments, this produced an estimated total of 24,020,000 permanent housekeeping nonconverted dwelling units built between 1890 and 1940, or 20.7 per cent more than the number in BLS-NBER series. A detailed explanation of the adjustments set forth in Table 2 is given in the Appendix.

The table and Appendix presuppose that the vintage attributions are correct, or that errors of judgment or estimation as to year built were random. What are the probabilities of correct information and the direction of probable bias? In their rejoinder to Margaret Reid's use of vintage data along lines indicated above, Grebler, Blank, and Winnick pointed to the unreliability of vintage attributions for particular years.¹⁵ For the individual years of the 1930's, the reports follow closely the index patterns derived from permit data (see Chart 13) except for a tendency to over-estimation in 1930 and 1935. This is a manifestation of the well-known bias by which census age distributions cluster at multiples of 5. Census respondents should ordinarily have known the year-built of residential properties less than ten years old. Probably at least half the properties were resided in by people responsible for their original construction; only a small proportion would have passed through more than a second set of

¹⁵ "Second, and more importantly, the number of dwelling units reported to the 1950 Census as being in structures built in, say, 1925 or even 1941 bears only a vague resemblance to the number of dwelling units actually built in 1925 or 1941" (Grebler, Blank, and Winnick, "Once More: Capital Formation in Residential Real Estate," *Journal of Political Economy*, 1959, p. 613).

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owners.¹⁶ Those owners, in turn, would have purchased with awareness of age.

If the decade of the 1930's passes muster, so can the decade of the 1920's. The total reported 7,253,000 units falls well within the range of the volume of starts estimated independently by Blank and by Wickens (see Table 1, lines 1 to 5). A respectable proportion of the properties were still lived in by people who would have had direct information about the timing of original construction.

As we turn to earlier decades, confidence in vintage attribution diminishes. The proportion of original or even second owners would have been much smaller. Age has a marked bearing on value, and abstracts of deeds available for scrutiny by owners or held by them usually indicate year of construction. But not all buyers commonly inspect abstracts, and census enumerators were instructed to accept estimates deemed reliable.¹⁷ Under these circumstances, a bias toward over- or under-age estimation is possible. We can only check the returns for indications of any consistent bias cumulated in one direction.

¹⁶ Tabulation of "year moved into" data from owner occupants in the 1960 Census shows that about half the owner occupants in Wisconsin have resided in the properties for ten years or longer. The average length of occupancy of an owner-occupied home is seven to ten years. (E. M. and R. M. Fisher, *Urban Real Estate*, New York, Henry Holt, 1954, p. 232). Nationwide census tabulation in 1960 of the urban population (including renters) showed that 23.9 per cent of the urban population had resided in the "present house" for ten years or longer or had always lived in the "same house." *Census of Population: 1960. General Social and Economic Characteristics, United States Summary*, Final Report PC(1)-IC GPO, 1962, Tables 71 and 72.

¹⁷ The enumerators were instructed to find out the year built from an owner occupant, a well-informed neighbor, or a tenant. If the exact answer was not obtainable, the enumerator was instructed to enter "the approximate year based on available information and observation" (1940 Census, *Housing*, Vol. II, Part I, p. 195). The Census Bureau conducted no formal evaluation for this item. The responsible head of the Housing Division of the Bureau asserted: "From a qualitative standpoint we believe that this item [year-built data] is subject to rather large response errors, particularly for renter occupied units that have been built more than ten years prior to the date of the Census" (letter from D. B. Rathburn, Mar. 24, 1962). Systematic check of year-built census returns by census tracts in Milwaukee revealed that the returns tallied very closely with year-built returns of the independent real property inventory carried out between 1934 and 1936 (H. G. Berkman, *The Delineation and Structure of Rental Housing Areas*, University of Wisconsin Commission Reports, Vol. IV, 1956, p. 31, n. 5). So also a closely aligned vintage pattern was found between the 202 cities (1934-6) and 64 cities (1934) canvassed in the real property inventory surveys and the 1939 urban census enumeration (Peyton Stapp, *Urban Housing, A Summary of Real Property Inventories, 1934-1936*, WPA, GPO, 1938).

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Inspection of the decade patterns of vintage returns generally indicates a tendency to understate age for properties older than twenty years. Such understatement would cause the vintage attributions for the 1890's, 1900's, and 1910's to be improbably high in the light of other acceptable measurements. Thus, for the twenty years between 1900 and 1920, vintage records account for 9,805,000 units or 16 per cent more than the highest decade estimates from other sources (see Table 1). A tendency to understate age on older properties would result in vintage patterns showing high rates of implicit shrinkage or loss. Thus the 8,319,000 housing units of standard stock recorded in the 1890 Census became reduced to 3,220,000 vintage units recorded in the 1940 count. If nonreporting offsets conversion, the gap becomes the measure of loss through disaster or demolition. At that rate, housing stocks were halved in thirty-eight years or declined annually at a rate of 2.09 per cent, which seems higher than likely. At the same time there are distinct limits to the tendency to understate age. For older properties, features of style, location, method of construction, size of lot, and items of equipment give clues to the decade of origin. If we assume that the date was displaced a decade for 15 per cent of the vintage attributions of the 1910's and by rising percentage rates for later decades, properties labeled with post-1890 vintage rise by only 1.4 million units. Given the premise that the tendency to understating age commenced with properties older than twenty years of age and intensified with age, it becomes very difficult to account for more than 2 million units improperly shifted to the post-1890 category.¹⁸ Hence we conclude that the vintage count of 1940 sets a limit, after adjustment for

¹⁸ We used the following hypothetical schedule of underaging displacements, units in thousands:

Decade	Vintage Increment	Per Cent Displacement	Reduction	Increase	Corrected Decade Total
1910's	5,009	15	- 751		4,258
1900's	4,796	25	-1,199	+ 751	4,348
1890's	2,804	50	-1,402	+1,199	2,601
1880's	1,492	75	-1,119	+1,402	1,775
1860-79	1,106	100%	-1,106	+1,119	1,119
Pre-1860	632			+1,106	1,738

Under this schedule about a third of the properties are displaced backward by a full decade; for properties older than forty years, the mean rate rises to near 70 percent. Yet only 1.4 million units are improperly shifted to the post-1890 age category.

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comparability, of underestimation in the BLS-NBER series of around 20 per cent, or some 4 million units for the fifty-year period, 1890-1940, or at the very least 10 per cent and 2 million units; and that any independently supported estimate falling within that range should be acceptable.

How should the BLS-NBER decade estimates for 1890-1940 be corrected for a tendency to underestimation ranging between 10 and 20 per cent? All decade totals could be scaled upward at a uniform rate. That would, however, presuppose the forces that biased the starts count to have worked uniformly over the decades concerned. A uniform bias is, however, unlikely in view of the varying coverage of permit-reporting areas and the unequal and shifting currents of rural, urban, and central city growth over the surveyed period. Hence, adjustment for underestimation has been based upon review, decade by decade, of the available evidence and judgment of the likely shifts in decade growth patterns.

For the decade of the 1930's we can accept with slight modification the verdict of the 1940 vintage report. For these relatively new properties, age estimates by census respondents should be reliable. Implicit annual rates of vintage production tallied closely with starts patterns (see Chart 13). Few of the newer vintage units of the thirties would have been converted, unreported for age, or wiped out by fire or demolition. Accordingly, we subtract from the vintage report only an appropriate allowance for nonpermanent or "ineligible" units, or for units built in the 1930's and transferred from the farm to the nonfarm sector.¹⁹

¹⁹ In an unpublished note on "Naigles' Reconciliation of BLS Decade Starts with Census Stock Increments and Vintage Attributions," Moses Abramovitz allowed the following magnitudes (my estimates for the same items are in parenthesis).

Adjustments for Structures Built in the Thirties (thousands)

1. Conversions	70.8 (0)
2. Temporary and nonhousekeeping	141.6 (59)
3. Reclassification from farm sector	91.0 (8)
4. Demolition and other loss	- 4.0 (0)
5. Nonreporting vintage	-67.0 (0)

I follow Abramovitz in estimating that items 1, 4, and 5 substantially offset each other. My estimate for item 2 is the total number of ineligible units classified under the "other dwelling place" category and with a vintage traced back to the thirties. I have scaled down the possible reclassification from the farm sector to 8,000 units because the 1940 Census count disclosed that only 8.2 per cent of the rural-farm dwelling unit 1940 stock was built during the 1930's. If transference to the nonfarm sector was unaffected by age, then only some 8.2 per cent of the transferred rural-farm units were built in the thirties (see p. 95 below).

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For the decade of the 1920's we have available two independent efforts at measurement by Wickens and by Blank (7,035,000 and 7,497,000 units, Table 1, lines 1, 3). The sample of building-permit data utilized by both investigators was of the same magnitude, and both utilized refined estimating techniques. Blank commented quite properly that "external evidence affords no possibility of determining with any precision the degree of error in either of the two series."²⁰ However, since permit data tended to underestimation, it seemed reasonable to take the higher of the two estimates. Since the tendency to urban sprawl was inhibited in the twenties by the building splurge in central cities, permit statistics in the twenties were much closer to target than in the decade of the thirties with its marked drift of building outside the permit reporting-system.²¹

For the 1890's we have available decade estimates derived from Blank and from our own projections of the Ohio data (see Chapter 3). For checking, these results may be contrasted with census increments in household or dwelling stocks both unadjusted or as adjusted by Wickens or by myself (see Table 1). For various reasons the Ohio projections seemed preferable as an estimation basis for the 1890's. The Ohio-derived estimate tallies very closely with results reached by Wickens with the original census returns. Blank's sample of reporting systems started out in the 1890's with only 25 cities covering only 14.5 per cent of the nonfarm population; by 1900 sampled cities numbered 68 but with a population coverage of only 24.0 per cent.²² The reporting sample was obviously too limited to permit refined estimation by urban size classes and regions. At the same time, the rapid growth of the sample may have generated bias. Finally, a basic assumption of the Blank expansion procedure is highly questionable, namely, that "nonfarm nonurban residential construction bears the same relationship to the increase in rural nonfarm population

²⁰ Blank, *Volume of Residential Construction*, p. 59.

²¹ The acceleration of urban sprawl in the thirties is indicated by a variety of evidence. Thus population growth—and by inference residential building—was maintained during the thirties for the "rural ring" in metropolitan areas, though specific urban population growth fell off sharply (see GBW, p. 100). Likewise the 1940 Census vintage reports show that the urban segment of nonfarm building was steadily maintained within 3 percentage points of 80 per cent for the four decades after 1890 but fell to 63.4 per cent in the thirties. Since permit reporting systems provided weak coverage of building in the small towns or rural environs of central cities, the disparate behavior of permit-reporting systems in the twenties and thirties is explicable.

²² Blank, *Volume of Residential Construction*, p. 35.

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that urban construction bears to the increase in urban population."²³ This overstates rural building by not allowing for the smaller urban-family size; it understates rural building on the other hand by not allowing for replacement building which would be unrelated to population growth. With these limitations, the Blank estimate for the 1890's seemed less acceptable than our Ohio-derived estimates. If the Blank level were accepted and given the decade patterns that seemed indicated, the aggregate level of building output for the eighty years after 1860 would be excessive in the light of end-1939 dwelling stocks and probable loss rates.

This leaves for judgment the two decades between 1900 and 1920, during which indications are that decade production was maintained substantially at the same level.²⁴ Likewise, indications are that the level in question involved an appreciable boost over the nineties and another boost to the twenties. Only two students, Chawner and Blank, have attempted a detailed canvass of the available records in order to derive an annual set of estimates on residential construction for the period. The Blank investigation was more thorough and involved a fuller set of building permit records; the Chawner estimates were prepared, however, under

TABLE 3
PERCENTAGE CHANGE OVER PRECEDING DECADE
IN RESIDENTIAL BUILDING AGGREGATE, 1890-1920

	<i>1900's over 1890's</i>	<i>1920's over 1910's</i>
New estimates (Gottlieb)	68.6	77.6
Blank	22.8	109.0
Wickens	63.5	80.8
Chawner		60.3
Census dwelling-stock increments	64.5	83.9
Ohio, statewide	67.3	

SOURCE: See Table 1, lines 1, 2, 3, 9, 14; and Table 11, col. 8.

²³ *Ibid.*, p. 48.

²⁴ See Table 1 lines 1, 2, and 3. Even the vintage magnitudes are within 5 per cent of each other.

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very competent direction. The Blank estimates level out at 3,600,000 units for the 1900's, the Chawner at 4,200,000 (see Table 1, lines 1, 2). As it happens, our Ohio-derived estimates for the decade of the 1900's run very close to Chawner's (4,135,000, Table 1, average of lines 12 and 13). The bias for underestimation of permit statistics would argue for the use of the higher of two independent sets of permit-derived estimates. Finally, such use in conjunction with the levels previously fixed for the nineties and the twenties yields a plausible set of decade-shift patterns (see Table 3).

For the five decades surveyed, our aggregate estimated production is 22,427,000 units or 12.8 per cent over the BLS-NBER aggregate. Our upward adjustments allow for about two-thirds of the gap between the vintage and the BLS-NBER aggregates.