Volume Title: Studies in Income and Wealth, Volume 14

Volume Author/Editor: Conference on Research in Income and Wealth

Volume Publisher: NBER

Volume ISBN: 0-870-14169-4

Volume URL: http://www.nber.org/books/unkn51-2

Publication Date: 1951

Chapter Title: Using Assessed Valuations in Wealth Measurement

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Chapter URL: http://www.nber.org/chapters/c9720

Chapter pages in book: (p. 181 - 194)

Part V

Using Assessed Valuations in Wealth Measurement

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This article is abridged from a paper, 'Wealth Measurement and the 1952 Census of Governments'. The Census Bureau has since decided, for budgetary reasons, not to attempt to develop state by state estimates of the market value of taxable real property in connection with the 1952 Census of Governments.

A STATEMENT IN THE INTRODUCTION to an 1880 Census volume might well, I believe, be taken as a watchword for this and all past and future conferences concerned with the measurement of national wealth:

"There is, probably, no nicer or more difficult task in the statistical line to be exacted of any man than an estimate of the true value of large masses of wealth spread over a wide expanse of territory."[1]

Many of the problems Garnett had in mind are still with us. Yet while some have become even more difficult with the growing scale and complexity of our economy, the simultaneous development of sources of information and statistical tools should permit more precise and useful measurement of wealth today. I shall attempt to outline a contribution to this effort which is being studied as a part of the Census of Governments for 1952.

A REAL PROPERTY AND ASSESSED VALUATIONS

Since 1880 estimators of national wealth have commonly distinguished public utility property and various classes of personal property otherwise held from other 'real property and improvements', divided into tax-exempt and taxable. Taxable real property and improvements other than public utilities accounted for 45 percent of the 1937 estimate of national wealth by the National Industrial Conference Board. In 1922 it was slightly over 50 percent according to the same source, and slightly less than 50 percent according to the Census.

While new sources of basic data have been increasingly applied to other segments of total wealth, the treatment required for this large and more or less 'residual' segment is basically the same now as it was 70 years ago. It involves two major steps: ascertaining the assessed value of all taxable real property other than that of public utilities, and adjusting such amounts upwards in accordance with the ratio of assessed to 'full' value. Although the two major steps are still the same as they were when the Census Bureau first undertook to estimate this segment of national wealth a century ago, there is a world of difference in the available tools, especially for the second step, which, of course, requires a determination of the fraction of the full value at which the real property is assessed.

In previous Census measurement of this wealth component, this frac-

[1] Henry Garnett, 'The True Valuation of Real and Personal Property in the United States', Census Office, Department of the Interior, *Report on Valuation, Taxation and Public Indebtedness in the United States . . . 1880* (Washington, 1884), p. 3.

tion has been 'determined' primarily in terms of legal requirements and by soliciting judgments from state and local officials on the current average ratio of assessed to full value. It has long been established, however, that legally prescribed ratios — usually 100 percent but sometimes a smaller fraction, even 50 percent — are usually not actually attained (or in some instances, even aimed at) in practice. Reliance upon tax officials' judgments is similarly hazardous. Temperaments and attitudes doubtless influence considerably the figures offered and, in general, one might presume a tendency for tax officials to exaggerate the proportion of 'true' value represented by assessments.

At least three other means of arriving at the ratio, and its reciprocal factor for the upward adjustment of assessments, may be recognized: independent appraisal of real property and comparison of values so determined with assessed values; imputation of the market value of properties from their current rent or earnings, and comparison of values so determined with assessed values; and calculation of the ratio of the assessed value to the sales price of parcels of property actually traded. State tax agencies use all three approaches to some extent in reviewing and 'equalizing' initial local assessments. For any widespread application, such as would be required in constructing ratios for use in estimating national wealth, any of these three approaches would necessarily be on a sample basis. It is particularly in this respect that recent technical advances should enable today's research statistician to do a better job than his predecessors.

Of the three approaches, however, the first two are subject to serious limitations. Even on a sample basis, independent appraisal of properties is relatively costly, and the final result — a comparison of amounts with values fixed by regular assessing officials — basically juxtaposes two sets of judgments, and thus provides data that may contain subjective errors. The second approach, which involves determining the full value from some other economic attribute such as current rent, can be applied only to a small and possibly biased sample of properties; more important, it involves determining a reasonably consistent and probable relation between the two factors. The third approach, involving reliance upon the sales price of traded properties as a measure of full value, also has problems and possible limitations, discussed below. However, applied rather extensively during recent years by certain state and private agencies, it has been gaining wider acceptance as a means of determining the general level and degree of uniformity of property assessments.

The growth in such measurement of assessment ratios, plus even more fundamental developments in the field of statistical sampling, suggest that a far more scientific and valid contribution to the measurement of the 'estimated market value' of taxable real property should be feasible now than was possible in 1922 and earlier.

B Determining Assessment Ratios for Traded Properties

In general, assessment ratios for traded parcels of realty are determined in five steps.

1) From record books maintained by, and copies of instruments filed with, local officials (most commonly the county recorder of deeds) certain information is compiled regarding transfers of realty. Much of the information will be of an identification nature — the date, contracting parties, location of property, kind of instrument, source record reference, and the like. Also essential is the money consideration stated in the instrument and the amount of federal revenue stamps affixed.

2) Transfers are screened to eliminate sales that "do not satisfy the requirements of an arm's length transaction between a willing buyer and a willing seller."[2] For example, foreclosures, bankruptcy and tax delinquency sales, and similar distress transactions are rejected, as well as transfers between family and corporate affiliates.

3) The apparent sales price of the property is ascertained. Except when there is some legal requirement that the total consideration be stated on the instrument of transfer, not usually the case, the sales price may be at least initially imputed from the federal revenue stamps affixed, plus the stated indebtedness, if any, assumed by the purchaser. However, information from the buyer or seller or their agents may be needed at least to confirm questionable items and preferably on a more extensive scale.

4) The assessed value of the property is ascertained. Another set of local records, commonly available from a county tax official, must be scrutinized.

5) The apparent sales price determined from the first three steps is related to the assessed value derived from the fourth step. In some assessment ratio studies this final step aims primarily at a weighted mean ratio. In others a ratio is computed for each transfer, and a median of these individual ratios is used as the 'average'. Some studies provide also measures of dispersion of individual parcel ratios, e.g., in terms of the range, quartiles, or deciles.

C Application to Fiscal Administration and to Wealth Measurement

In two important respects information on the relation between sales and assessed values — needed especially by those concerned with fiscal administration, including the effective and equitable application of property

[2] George Mitchell, 'Using Sales Data to Measure the Quality of Property Tax Administration', *National Tax Journal*, Dec. 1948, p. 334. Much of this paper is based upon that excellent article.

taxes – differs from ratio information – needed especially for estimating national wealth.

Although both fields of interest call for an 'average' relation, the fiscal administrator and those concerned with his work need very much to know also how uniformly this relation holds for individual parcels of property which, legally and equitably, should be similarly assessed. Explicit determination of the dispersion of ratios is therefore an important product of assessment-sales measurement for fiscal use. On the other hand, while wide variation of ratios applicable to particular properties may complicate the task of the research statistician concerned with estimating the realty factor of national wealth, e.g., by requiring him to use a relatively large sample of transfers, it is not otherwise of direct concern to him.

The state or local administrator, furthermore, is primarily interested in ratios for relatively small areas; he ordinarily has little interest in a summary average for an entire state except in relation to such component ratios. Yet the measurement of wealth, as such, is primarily in terms of national and at most state by state amounts, not because estimates for smaller areas would be useless but because basic data for so many important wealth components are not available below the state-area level.

D Importance of Sampling

These two differences in purpose or interest largely determine the extent to which sampling, as against complete coverage of transfers, can be applied. For either purpose it would appear desirable to limit the period covered by a single set of comparisons of sales prices and assessments to not more than a year. The property tax normally operates on an annual basis, and real estate markets can change so rapidly as to increase materially the dispersion of the ratios as the period covered is lengthened.

For many minor areas and classes of property, however, ordinary realty transfers during a year are few.[3] Then all, instead of only a small sample of such transactions, must be covered to arrive at ratios for such segments as can be directly applied to the needs of fiscal administration.

In most of the 101 downstate counties of Illinois, all 1946 sales trans-

[3] Information on the rate of turnover of real estate is scanty. The Bureau of Agricultural Economics reports that the percentage of farms changing ownership annually through voluntary sales and trades ranged from 1.6 in 1932 to 5.8 in 1947. Scattered data on owner-occupied urban residences suggest considerable changes in the turnover rate from year to year, with perhaps an average annual rate of something like 10 percent, including 'distress' transfers. The rate on other classes of urban property may well be lower.

actions found applicable to ratio measurement for the year numbered about 10 per 1,000 county inhabitants. On the assumption that this proportion holds generally, there are fewer than 500 'usable' transactions per year in each of 2,600 of the nation's 3,100 counties, fewer than 250 in some 2,000 counties, and fewer than 100 in about 700 counties. Similarly, only about 400 of the 16,200 incorporated municipalities and 100 of the 19,000 organized township government areas in the nation may be expected to have at least 250 'usable' realty transfers during a year. The vast majority of the country's 100,000 or so school districts would also fall far below this level.

With the important exception of the most populous county and city areas, therefore, the statistician deriving assessment ratios for fiscal administration may need to aim at complete coverage of all valid transfers during a year. Even in urban centers his concern with separate ratios for particular classes of property and local areas (townships or city sections) may indicate a need for complete coverage of some, or even all, classes of transfers.

For determining summary state by state ratios useful for wealth estimation purposes, however, random sampling seems to offer possibilities of great economy of effort. Only 14 states have fewer than 1,000,000 inhabitants, and of these only one, Nevada, fewer than 250,000. On the assumption of 10 transfers annually per 1,000 population, the total number of valid transfers per year would thus be more than 10,000 in 34 states and between 2,500 and 10,000 in 13 of the remaining 14.

As indicated below, it is usually desirable to estimate over-all average ratios from a sample that is extensively stratified — often in terms of the geographic or other categories with which the fiscal administrator also is concerned. But, for this purpose the ratio determined for any such subclass is merely a single component contributing to the final answer rather than a datum itself intended for direct application.

For any given degree of exactness the size of the sample needed depends largely upon the degree to which individual parcels of property exhibit a relatively constant or a widely ranging ratio of assessed value to sales price. Census Bureau tests of ratio data for several states (see the Appendix) yield two tentative conclusions: (a) Data on about 1,000 transfers per state, selected at random from all transfers during a year, would be sufficient to give an average assessment ratio, in terms of a weighted mean, with a sampling variation of 2 percent;[4] the number would be about 4,000

[4] I.e., differing from the average based on coverage of all transfers in 2 cases out of 3 by not more than the stated percentage, and in 19 cases out of 20 by not more than double the stated percentage. The percentages are for the average ratio disclosed, not for percentage points of sales value.

per state for a sampling variation of 1 percent, and about 500 for a sampling variation of 3 percent. (b) County sampling, i.e., use of data for a random stratified sample of counties in certain states, would be possible without great sacrifice of precision. Thus, if 1,800 transfers were taken from a sample of only 25 of the 101 downstate counties of Illinois in 1946, the estimated average assessment ratio for the entire area would have a sampling variation of 5 percent; if the same number of transactions were taken from all 101 counties, the variation would be below 2 percent.

Putting the two conclusions together, and assuming that downstate Illinois is like other states with respect to the variation of assessment ratios within and between counties, only about 90,000 representative transactions from some 1,100 county areas would yield state by state assessment ratios having a sampling variation of 5 percent or less. Where the actual ratio of assessed value to sales price of traded properties was 20 percent, the results would be 19-21 percent in 2 cases out of 3 and 18-22 percent in 95 cases out of 100. Different combinations of sampling – more transfers from fewer areas or fewer transfers from more areas – could of course be planned to yield equivalent results.

E Representativeness of an Assessment Ratio for Traded Properties

None of the foregoing discussion has taken direct account of what to many interested persons may seem the most important question concerning assessment ratios: to what extent is an average ratio based on real property transfers likely to reflect accurately the relation between the assessed and market value of all taxable realty, including that not actually traded during the period?

In some degree a similar question arises with respect to certain other fields of wealth estimation, where values imputed from the prices of items actually sold currently are applied to the entire existing stock. It is recognized, of course, that simultaneous demand for, or offering of, the entire stock would give rise to a very different price and value computation. The problem with respect to assessment ratios is considerably more complex, however: to find an adjustment factor that can be applied to over-all assessment amounts, not to average sales prices and multiply by the number of realty parcels in existence.

This question is not directly and completely answered when a high correlation is found between relative ratios of particular jurisdictions from one year to another, or between ratio-computed estimates of value and estimates otherwise derived for various areas.[5] An over- or understatement

[5] Some such comparisons of Illinois and Kentucky county by county data are offered in Edgar Z. Palmer, 'Assessment Ratios for Real Property Tax Equalization', *Bulletin*

of the true ratios could give similar results if the bias were consistent among the periods and areas.

A simple ratio for traded properties will differ from that representative of all properties, including those not actually sold during the period, where, and to the extent that: (a) diverse proportions of different classes of taxable properties are actually traded during the period, i.e., the various classes – by type, size, location, etc. – have different rates of turnover; (b) there is a tendency toward differential assessment of such classes of property, i.e., their assessment ratios differ consistently; and (c) the biases in the foregoing tendencies are not mutually offsetting in effect.

It is easy to see how, theoretically, a closely representative over-all ratio – or actually, in the first instance, an estimate of the full value of all taxable realty – could be derived. The process would be to get an average ratio for transfers of each of all potentially significant classes, or strata, of realty; apply these average ratios to the total assessed value of each class of property; and add the resulting estimates of sales prices of various classes of taxable property to obtain a figure representing the market value of all taxable real property. Dividing this figure into the related total of assessments would, obviously, give a weighted average over-all assessment ratio.

The importance of some stratification is suggested by Census tests of Illinois assessment data for 1946. Between a figure derived from an unstratified over-all ratio for all transfers and from separate over-all rural and urban strata the difference in the computed total sales value of taxable realty in the 101 downstate counties was almost 10 percent. Some bias results from a failure to deal separately with improved and unimproved property, but the latter was so small a proportion of the assessed value of all property that the difference in the estimated total sales value would be relatively slight.

The procedure for stratification outlined above requires information on the total assessed value of the various strata of property concerning which distinct assessment ratios need to be initially developed. The bases having possible significance in terms of differential assessment tendencies include such characteristics as location, nature of use, age of improvement, recency of transfer, and total value. Of these, only those relating to location, including the derivable distinction between urban and rural, are universally reflected in over-all assessed value figures, i.e., in totals for considerable numbers of pieces of property as against individual parcels.[6]

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of the National Tax Association, Feb. 1945, pp. 152-7, which deals mainly with the best type of 'average' to use in ratio studies.

[6] This takes for granted, as implicit in the wealth measurement being discussed, the availability of separate assessed value totals for railroad and other public utility property.

Some of these characteristics are not commonly recorded even on assessment records for individual parcels. There are severe limitations, therefore, upon the degree to which the stratification approach can be applied unless data not officially maintained on a regular basis are specially compiled.

In the long run, state taxing agencies may well seek, by promoting legislation and using their existing powers regarding local assessment practices, to extend the kinds of class of property information reflected in assessment records. Pending such action, it will continue to be relatively difficult and costly to ascertain or minimize bias in assessment ratios and estimated market values of realty which are necessarily based on rather undetailed assessment data.

F Conclusions

Random sampling of bona fide realty sales within each state and direct construction of an average statewide assessment ratio would require only limited effort. Application of this ratio to the total assessed value of all taxable real property other than that of utilities in the state would yield an estimate of its market value. The resulting figures, though reasonably representative of all regularly traded properties, might have a bias due to differential assessment practices and turnover rates as among various classes of property.

The data would be more valid if property was classified to the utmost degree permitted by the assessment data available within each state and component ratios were weighted by totals of assessed value for each stratum used. This approach would involve relatively complex procedures for gathering and handling the basic data, and considerably more effort and expense than the method outlined above.

Perhaps intermediate approaches deserve consideration and advance exploration. For instance, some stratification might well be applied to limit bias, e.g., dealing separately with individual counties and with urban and rural properties. Moreover, evidence of remaining possible bias might be sought even when explicit measurement would be difficult or expensive. For example, official assessment records are not usually so kept as to show the assessed value represented by various value-size classes of property. However, if the number of transfer items was adequate, it would be possible to determine whether there tended to be a relatively high correlation, positive or negative, between the value-size class of realty parcels and the sales-value ratio. If the correlation was not high, the possibility of a bias thus arising could be discounted. Only if a definite relation were discovered would it be necessary to consider whether rates of turnover

also were correlated with value. If evidence on this score could be found, at least the direction of the bias could be determined.

Another characteristic of property for which information on individual parcels might be used to test for bias, even though assessed value totals are often lacking, is the difference between improved and unimproved parcels. Other characteristics in terms of which similar testing would be desirable — nature of use, age of improvement, and the like — are less widely shown in official records.

Fortunately, in large urban centers where significant proportions of assessed value are often concentrated in industrial or other property of high unit value, there is sometimes fairly detailed assessment information by type of property. The stratification approach, or at least search for evidence of material bias in ratios based on sales, could therefore go further in such areas than elsewhere.

A different and perhaps considerably more costly means of checking would be to supplement and test sales-value ratios by appraisals. This might involve a standardized appraisal of random samples of traded and untraded properties; derivation of a 'probable' sales value of the untraded properties in the light of the relation between the appraised value and the actual sales price of the traded properties; derivation of a 'constructive' sales-assessed value ratio for the untraded properties; and comparison of the actual sales-value ratio of traded properties with this constructive ratio for untraded properties.

APPENDIX

TESTS OF PROPERTY ASSESSMENT DATA FOR DOWNSTATE ILLINOIS

Having previously conducted tests with fragmentary data for Kentucky and Indiana, the Census Bureau undertook more detailed tests late in 1949 of assessment data for downstate Illinois, using punch cards lent by the Illinois Department of Revenue. Each of the 48,557 cards gave the sales price and assessed value of a parcel of realty in 1946. The Department aimed to include all real estate transfers in the 101 downstate counties during 1946, except those of a distress nature, those apparently not involving an 'arm's length' relation between buyer and seller, and those of such small amount that, in the absence of some other basis for determining the sales price, federal revenue tax stamps would not afford a reasonably close measure.

SAMPLING POTENTIALITIES

The tests were designed primarily to ascertain how many transactions and how many counties would need to be covered to obtain an average downstate assessment ratio within specified ranges of a ratio based upon all 48,557 transactions for which data were available.

The sampling variation ranged from 1 percent for 3,636 transactions (covering all counties, and treating urban and rural properties separately) to 4 percent for 227 transactions. The sampling variation for counties

Transactions (number)	Sampling Variation (percentage)	Counties (number)	Sampling Variation (percentage)
3,636	1	61	1.6
908	2	44	2.7
404	3	25	4.6
227	4	10	8.3

The chances are 2 out of 3 that the ratio based on sampling would be within the specified percentage over or under the ratio based on complete coverage. Thus with an actual 'complete coverage' ratio of 25 percent, use of a sample subject to 1 percent sampling variation would yield results between 24.75 and 25.25 percent in 2 cases out of 3.

(using all transactions for the counties involved) ranged from 1.6 percent in 61 counties to 8.3 percent in 10 counties. Combinations of coverage and 'take' for downstate Illinois could be designed to meet certain standards of sampling variation. Thus, results subject to almost 5 percent sampling variation could be obtained either from 1,816 items drawn from a sample of 25 counties or from 227 items drawn from a sample of 44 counties.

Transactions (number)	Counties	Sampling Variation* (percentage)
3,636	44	2.9
3,636	25	4.7
1,816	44	3.1
1,816	25	4.8
908	61	2.6
908	44	3.4
908	25	5.2

* Computed as the square root of the sum of the squared variations of the two elements of sampling – counties and transactions.

The weighted average 1946 assessment ratio for downstate Illinois was 20.2 percent, based on coverage of all 48,557 usable transfers and treating urban and rural property separately in each of the 101 counties. If only 908 transfers were to be used, with similar stratification and counties selected to give appropriate weighting to size in terms of assessed

value, i.e., each county having an opportunity to be selected, but for any one county the chance of selection being in proportion to the assessed value of its total real estate, the average assessment ratio would apparently be within the range indicated in the accompanying tabulation.

Counties (number)	Assessment Ratio (%) Based on 908 Transfers	
	In 2 cases out of 3	In 19 cases out of 20
101 (all)	19.8-20.6	19.4-21.0
61	19.7-20.7	19.2-21.2
44	19.5-20.9	18.8-21.6
25	19.2-21.2	18.2-22.2
10	18.5-21.9	16.8-23.6

NEED FOR STRATIFICATION

The Illinois materials were used also to evaluate the need for stratification to limit bias in computing an average downstate assessment ratio. The raw data permitted three kinds of classification with which totals of assessed value (covering untraded as well as traded parcels) could be associated — in terms of county, urban-rural, and improved-unimproved categories.

The turnover rate (in terms of assessed value) of urban property was found to be more than three times that of rural property, and the two classes tended to be assessed at different fractions of their sales value. The differences between improved and unimproved properties were less marked.

	RURAL			URBAN		
	Total	Unimproved	Improved	Total	Unimproved	Improved
Av. assessment ratio (%)	24.5	23.7	24.6	17.5	12.8	17.6
% of all property sold (in terms of assessed value)	1.38	3.40	1.26	4.65	2.09	4.81

Based on all usable bona fide sales in downstate Illinois during 1946.

Since unimproved properties accounted for only about 5 percent of all real estate value, and transfers were few in some counties, this basis of stratification was dropped in the county by county testing. However, separate treatment of urban and rural properties was important, as indicated by the ratios based on different applications of data for all usable bona fide 1946 transfers.

	AVERAGE DOWNSTATE RATIO	
	With County Stratification	Without County Stratification
With urban-rural stratification	20.2*	20.8
Without urban-rural stratification	19.0	19.0

* This is the 'best' of the 4 figures, involving the most detailed stratification. Its use would indicate an estimated 1946 sales value of all Illinois downstate realty of $10.4 billion; the value based on the 19 percent ratio figure is $11.1 billion.

This very limited test of the relation between sales price and assessment ratio suggested a slight tendency toward 'progression' for traded urban properties: those sold at over $15,000 had an average ratio of 18.2 percent; those sold at smaller prices had an average ratio of 17.3 percent. A wider disparity, in the opposite direction, was found for rural properties: 22.1 and 27.3 percent respectively. Over-all data are not available, however, to permit adjustments for bias due to differential assessment of properties at various sales value levels.

OTHER FINDINGS

In its own development of sales ratio data, the Illinois Department of Revenue derives a median for each group of transactions being treated as a stratum, e.g., in most downstate counties for urban and rural property separately, and derives an average by weighting these medians by the total assessed value of the class of property involved.

In the Census Bureau tests medians were not used. Instead, for each stratum the sum of the assessed value of the traded properties was divided by the sum of their sales prices. The resulting ratios were then weighted by the total 1946 assessed value of the respective stratum.

It is noteworthy that the two approaches yield quite similar results for the downstate area as a whole, and for most individual counties. The downstate average ratio based on the use of weighted medians was 19.4 percent; that on weighted means, 20.2 percent. The two methods yielded assessment ratios within 1 percentage point of one another in 59 of the 101 counties; differing by 1 to 2 percentage points in 27 other counties; and differing by at least 4 points in only 2 of the remaining 15 counties. The figure based on weighted means exceeded that based on weighted medians for 60, and was less for 41, of the 101 counties.