# CHAPTER 4
# *Methodolgical Issues*

Introduced by R. Louise Woodburn

There is much interest in the estimation of personal wealth in the United States. The most common methods of computing these estimates are: collecting wealth data directly via a survey, capitalizing income flows reported on individual tax returns, and using wealth data reported on Federal estate tax returns. As discussed in the Scheuren and McCubbin paper, perhaps none of these methods alone is adequate. Certainly, a joint effort combining the strengths of each method would be better. In order to accomplish this task, it is necessary to understand the relative strengths and weaknesses of each method. The collection of papers in this chapter provides an understanding of these underlying issues for the Estate Multiplier technique. The Smith paper details the history of the estate multiplier technique. The technique has improved over the years, although some of the concerns raised in the Smith paper still haunt researchers today. The Scheuren paper also provides a historical perspective, with an Afterwords discussing the changes since 1975.

The beauty of wealth estimates computed using the estate multiplier technique is the rich administrative estate data from which the estimates derive and the clever use of these data to estimate the wealth of the living population. The administrative data on an estate tax return are quite detailed and relatively error free, when compared to comparable survey data. Underlying the beauty of this technique, however, are several important methodological issues, which can be separated into two categories: data and estimation. The estimation issues are more easily quantified than the data issues. Indeed, since administrative data are used, the data issues will, most likely, continue to plague researchers.

There are three main types of data issues. First, the estate data are affected by the actions of the individual in preparation for death. This is especially a concern with elderly and terminally ill individuals, who may choose to pass on wealth before death or who need to pay extensive medical expenses. The remaining two data issues are of particular concern when researchers compare results from the estate data to estimates computed using household surveys (e.g., the Survey of Consumer Finances sponsored by the Federal Reserve Board). One main concern is the definition and nature of the data that are required to be included on the estate return. For instance, the full value of the life insurance is reported, rather than the cash surrender value as would be appropriate for survey-measured wealth. Also, data reported on the estate return are influenced by the tax consequences and are subject to change during an audit. The McCubbin paper discusses a study of post-audit data changes. The Scheuren and McCubbin paper discusses the asset definitions in detail. The final data concern is the population that is included in the estate universe; it is based on individuals and is limited to those with total gross estate above the filing threshold. The Johnson and Woodburn paper attempts to deal with these coverage and definitional differences by constructing a household wealth file with the estate data for more direct comparison with the Survey of Consumer Finances household results.

Typical estimation issues in a survey begin with the design of an appropriate sample and continue through the computation of appropriate sampling weights, desired estimates and their corresponding variances. These issues are also important in the case of the estate multiplier estimates. The difficulty in the latter case is that the researcher has no control over the decedent population (that is, the sample of the living population selected by death). This leads to a very inefficient sample design for the estimation of wealth for the living population. Additionally, when computing the estate multiplier estimates, the researcher must estimate the probabilities of selection. Typically, the base mortality rates by age and sex are used, with adjustments estimated for a differential mortality for the wealthy population. There has been much work on the estimation of an appropriate differential, as described in

the Smith and Scheuren papers. In order to reflect the uncertainty inherent in the multipliers, Johnson and Woodburn estimate the differentials using a regression model and incorporate the model uncertainty. They then develop bootstrap samples that reflect all the sources of uncertainty, in order to compute the variance of the resulting estimates.

Finally, a researcher well-versed in the issues described in these papers is ready to compute wealth estimates and compare them to outside estimates. This has been done here via thorough comparisons of estate multiplier estimates to those from the Survey of Consumer Finances found in the Scheuren and McCubbin and Johnson and Woodburn papers.

In conclusion, the papers in this chapter not only detail the history of the estate multiplier technique and provide an understanding of the methodological issues, but they also provide exciting suggestions for future research.

# Estimating the Wealth of Top Wealth-Holders From Estate Tax Returns

*by James D. Smith, Ph.D*

Introduction

The estate multiplier technique, as currently used, rests on the assumption that death draws a random sample, stratified by age and sex, of the living population. If one has available age-sex-specific mortality rates, an estimate of the wealth of the living in a given period of time can be made by stepping-up the wealth of decedents in each age-sex class by the inverse of the mortality rate associated with that age-sex class, and summing the results across all age-sex classes:

$$W_t = \sum_{i=1}^{m} \sum_{j=1}^{2} \frac{V_{ij}}{M_{ij}} w_{ij}$$

Where $V_{ij}$ is the number of living persons, $M_{ij}$ is the number of decedents, and $w_{ij}$ is the wealth of decedents, all associated with the ijth age-sex class. The term $V_{ij}/M_{ij}$ is the estate multiplier for the ijth age-sex class. The technique can also be used to derive distributions for the living by any identifiable characteristic of the decedents or their wealth.

Using the Federal estate tax returns, the Internal Revenue Service is preparing estate multiplier estimates of the wealthiest strata of the United States population in 1962. This is gratifying to economists looking toward comprehensive estimates of U.S. wealth and national balance sheets by the end of the decade of the '60's.

This paper presents (1) a short discussion of the problems and limitations of estate multiplier estimates, (2) a brief review of previous estate multiplier estimates, (3) some results from a 1958 estimate, and (5) some ideas for future estate multiplier estimates (by no means a plan for their realization, in view of the demand for other statistics). A technical appendix demonstrates mathematically the derivation of estimates by use of the estate multiplier technique.

Problems and Limitations

Administrative records used for the collection of death taxes have been employed in England, Wales, Scotland, Australia, New Zealand and the United States as inputs to the estate multiplier.

As is almost always the case, however, administrative records reflect the immediate needs of administrators; only indirectly the needs of scholars -- and often policy makers. Death tax returns, for instance, are required only for decedents with estates above a rather high level of wealth. In the United States the present filing requirement is very high, $60,000. (We hereafter refer to persons with gross assets of over $60,000 as top wealth-holders.)

Because of the high filing requirement, the estate multiplier method is not suited to estimating total private wealth in the United States or its distribution along a complete Lorenz curve. At the upper levels, however, it enjoys a comparative advantage over field surveys. In 1963, for instance, 78,393 estate tax returns were filed for persons with assets of over $60,000. The Federal Reserve Board, on the other hand, used a total sample of only 3,600 families to estimate the distribution of wealth for the entire population.[1]

But even with the very large sample of top wealth-holders provided by estate tax returns, considerable sampling variability attaches to estimates of ownership of assets such as municipal and corporate bonds, the distributions of which are highly skewed even among the rich. Further, the sampling variability attaching to estimates of wealth held by persons of younger ages is greater than corresponding estimates for older persons because death draws a much thinner sample of the

young.

But beyond the general problems associated with any sample, three areas of difficulty are inherent in the application of the estate multiplier to U.S. estate tax returns. First, there is the problem of selecting the appropriate set of mortality rates; second, that of informational gaps in the returns; and third, the necessity to infer year of death.

If mortality rates and wealth are correlated, then a biased estimate will be produced using mortality rates unadjusted for wealth level. Indirect evidence supports the view that an inverse correlation exists -- the rich do live longer.[2] Under this circumstance the estate multipliers will be too low, and under-state the wealth of top wealth-holders.

The major information gaps in the U.S. estate tax returns are missing ages and the absence of life insurance cash surrender value and of post audit asset valuations.

Each year a number of returns are filed without age information (1,383 out of 55,685 in 1958). It is necessary, therefore, either to exclude the returns for decedents of unspecified age or to impute ages.

Life insurance in the estates of the decedents, unlike other assets, is not isomorphic with that in the hands of the living. The economic value of a life insurance contract to a living person is its cash surrender value, but death brings the face value of the contract into the estate. In order to estimate the wealth of top wealth-holders, it is necessary to adjust downward the life insurance component reported on estate tax returns.

Although evidence suggests that auditing may increase asset values reported on estate tax returns by as much as 10 percent, only tabulations of unaudited returns have been available for estate multiplier estimates.[3] Under-estimation here, however, is probably less than in field surveys.

For administrative purposes it makes sense to tabulate returns by calendar year of filing. Consequently, one does not have the sample death has drawn of the living population in a calendar year; rather returns filed in a calendar year, which include returns for deaths of several years. The executor has 15 months after decedent's date of death in which to file a return, and extensions may be granted beyond that. During 1965 returns filed within the 15 month filing period may be for decedents whose date of death was as early as October 1963. On the other hand, returns for some 1964 decedents will not be filed until 1966. A few returns filed in 1965 with extensions of time may be for decedents whose date of death was over 10 years ago.

Although the first study of the temporal distribution of dates of death will be done with the 1966 filings, it is believed, on the basis of limited evidence, that the great majority of returns filed in a given calendar year represent deaths in the preceding year. In all estate multiplier estimates it has been inferred that a return filed in a given year represented death in the preceding year. Because the number of returns and asset prices have moved secularly upward, the inference of the year of death probably introduces a downward bias in the wealth estimate.

## Previous Uses of the Estate Multiplier Technique

Although financial information about decedents was used to estimate total wealth of the living by the "interval devolution" method in the 19th century, the estate multiplier technique was first suggested by Coughlin in 1906.[4]

The first estate multiplier estimate was made by Bernard Mallet[5] in 1908 when he applied inverse mortality rates to English estate duty tabulations for 1905 and 1906 and the second was apparently made by Laughton for Victoria, Australia for 1911-12.[6]

In 1918 G. H. Knibbs published estimates for Australia for the years between 1878 and 1911.[7] He used age-sex specific mortality rates, but his data did not provide a break-down by asset type. He was well aware of the possibility that mortality rates might be inversely correlated with wealth, but after an examination of life insurance records,

decided the evidence for Australia did not support reducing the age-sex-specific mortality rates.

Estate multiplier estimates for England and Wales for the years 1911 to 1913, 1924 to 1930 and 1936, were produced by Daniels and Campion.[8] They contended the £100 filing exclusion filtered lower social classes out of the sample. Comparing occupations of decedents for whom estate duty returns had been filed with the occupational distribution in the Decennial Supplement on Occupational Mortality of the 1921 British Census of Population, they found the majority of decedents with more than £100 were in the top social classes used in the census. They then pointed to the significantly lower mortality rates for each of the upper classes in each of the four age brackets spanning the age interval 25 to 65. On the basis of this evidence, they lowered the mortality rates (thus raising the multipliers used for their estimate).

Kathleen Langly has published estimates for England, Scotland and Wales for 1936-38, 1946-47, and 1950-51.[9] In each case she used general age-sex-specific mortality rates unadjusted for social class. An estimate for England for 1947-49 by A. M. Cartter, however, did employ age-sex-specific mortality rates so adjusted.[10]

Lydall and Tipping, using age-sex-specific mortality rates for the top two social classes defined in Great Britain's 1951 Census of Population, have made estimates for each of the years 1951 through 1958 for England, Scotland and Wales (England and Wales together for each year except 1957 and 1958).[11] As with prior estate multiplier estimates for Great Britain, they were not able to directly estimate the asset composition of wealth because Her Majesty's Commissioners did not publish tabulations of asset type by age and sex of decedent. Lydall and Tipping imputed an asset composition on the basis of the size distribution of estates within each age-sex cell.

To dampen the effect of sampling errors, they averaged the estimates of wealth above £2000 for the years 1951 through 1956, taking the result as their best estimate for beginning of year 1954 for persons with wealth of £2000 and over.

The first British estate multiplier estimate to get directly at the composition of wealth was done by J.R.S. Revell for 1957-58. His findings show that Lydall and Tipping's imputation of asset composition based entirely on size distributions was far from correct.[12] An official estimate for Great Britain for 1960, also produced a direct estimate of the composition of the wealth of the wealthy.[13]

Two estate multiplier studies previous to the 1958 results presented below have been made for the United States. In the first, Mendershausen made an estimate for each of the years 1922, 1924, 1941, 1944 and 1946.[14] For the year 1944 a special tabulation of gross estate by type of asset and age of decedent was prepared for him by Internal Revenue Service. Unfortunately, the tabulations did not provide sex of decedents. Using both white age-specific mortality rates and a set of rates adjusted for social class, Mendershausen estimated the wealth of top wealth-holders by type of asset. The set of social class adjusted rates were based on the experience of the Metropolitan Life Insurance Company with a group of risks called the "$5,000 whole life classification." composed predominantly of well-to-do individuals.[15]

With a tabulation by asset type, Mendershausen was able to isolate life insurance and adjust for the difference between the value of proceeds reported in the estate of a decedent and cash surrender value the instant before death. To do this, he obtained from "one fairly large" insurance company the ratios of reserves to face values by age groups of policyholders. It was basically this set of ratios which he used to reduce the proceeds reported on estate tax returns to estimate the life insurance equity of top wealth-holders in 1944. Mendershausen excluded those returns on which age of decedent was not reported.

Lampman estimated the wealth of top wealthholders in 1953.[16] As did Mendershausen, he worked with a special Internal Revenue Service tabulation. Decedents were classified by State and marital status, as well as age and sex. Assets were classified by 10 types (including debt). He used

social class mortality rates based primarily on a study of differential mortality by Moriyama and Guralnick and the mortality experience of a large insurance company with a group of risks buying relatively large policies.[17]

Life insurance proceeds reported in the estates of decedents were reduced by a set of ratios of reserves to face values by age of policyholder. The ratios were obtained by reducing Mendershausen's ratios on the ground that the overall ratio of reserves to face value had decreased since 1944.

Lampman imputed to decedents of unknown age the average age of all decedents, and for the first time related U.S. estimates to national balance sheets.

The 1958 Estimates

The estimates for 1958 which follow are from a study by Smith of the income and wealth of top wealth-holders in 1958.[18] The mortality rates used were obtained by reducing the 1958 white age-sex-specific mortality rates, based on post 1960 Census population estimates, by the same proportion Lampman had reduced the comparable rates for 1953. Insurance was reduced by the same ratios used by Lampman. Decedents of unknown age were imputed the average age of all decedents of the same sex in the same size of gross estate class. Table 1 shows the composition by type of property and size of gross estate of the wealth of top wealth-holders in 1958.

Because one of the important uses of estate multiplier estimates is to gauge the concentration of wealth, a mid-year 1958 national balance sheet for individuals has been constructed. The balance sheet was constructed by modifying Goldsmith's balance sheet for nonfarm households to include noncorporate farms and to exclude nonprofit institutions. Goldsmith's balance sheet values are for the end-of-year.[19] His estimates were converted to mid-1958 by taking the arithmetic mean of his end-of-year 1957 and 1958 values. This was done to achieve correspondence with the wealth estimates which are based on a sample of decedents assumed to have been drawn rather evenly over the year 1958.

The method of constructing the balance sheet for individuals differed slightly from that used by Lampman.[20] Because of this, and also because Lampman worked with preliminary data, a new balance sheet for individuals was constructed for mid-1953 to permit a direct comparison of the share of top wealth-holders in personal wealth based on his finding for 1953 and Smith's for 1958. The revision of the 1953 balance sheet had slight effect on the share of top wealth-holders as reported by Lampman.

Table 2 shows the 1953 and 1958 balance sheets. In accordance with the concepts adopted by Lampman, an individual sector was constructed to show both prime wealth and total wealth. Total wealth includes all personal wealth from which one receives "direct" benefits. Thus, it includes pension and trust funds though their corpus may not be subject to invasion. Prime wealth is total wealth less the value of assets in trust funds and pension reserves.

Because of one extremely unusual case which appeared in the Internal Revenue printouts, some adjustment to the composition of assets of top wealth-holders is called for. One female under 40 years of age was tabulated as having an estate of $14,526,000. Examination of the detailed IRS tabulations shows that $13,609,000 of this estate was in annuities. Blowing-up this value by the high multiplier associated with females under 40, yields an estimate of annuities of $19.8 billion, a very dubious value.[21]

Assuming the gross estate of this one decedent was distributed among assets in the same proportions as assets in the aggregate gross estate of all other top wealth-holders in the same estate size class, then the distribution of assets and their respective shares appears as shown in table 3. Adjusting the total composition shown in table 1 for this one case results in the estimated concentration of State and local bonds, other bonds and corporate stock being considerably increased; and that of "miscellaneous assets" decreased.

In order to place the share of wealth owned

Table 1. COMPOSITION OF GROSS ESTATE BY SIZE OF GROSS ESTATE FOR TOP WEALTH–HOLDERS IN 1958

| Size of Gross Estate * | Number of top wealth–holders (Thousands) | Type of Property | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Real estate | Federal bonds | State and local bonds | Other bonds | Corporate stock | Cash | Notes and mortgages |
| | | (Billion dollars) | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Total | 2,595 | 114.4 | 16.2 | 10.6 | 3.5 | 182.0 | 39.3 | 17.6 |
| $60,000 under $70,000 | 274 | 6.2 | 0.8 | 0.1 | 0.1 | 3.6 | 2.5 | 0.6 |
| $70,000 under $80,000 | 303 | 7.7 | 0.9 | 0.1 | 0.1 | 4.6 | 2.7 | 0.8 |
| $80,000 under $90,000 | 241 | 7.0 | 0.8 | a | 0.1 | 4.0 | 2.2 | 0.7 |
| $90,000 under $100,000 | 211 | 6.5 | 0.8 | a | 0.1 | 4.4 | 2.0 | 0.6 |
| $100,000 under $120,000 | 357 | 12.8 | 1.4 | 0.1 | 0.2 | 8.7 | 4.1 | 1.4 |
| $120,000 under $150,000 | 350 | 13.6 | 1.6 | 0.1 | 0.2 | 11.8 | 4.5 | 1.7 |
| $150,000 under $200,000 | 310 | 14.2 | 1.9 | 0.2 | 0.3 | 14.7 | 4.6 | 2.4 |
| $200,000 under $300,000 | 269 | 15.4 | 2.2 | 0.6 | 0.5 | 21.8 | 5.2 | 2.6 |
| $300,000 under $500,000 | 151 | 11.8 | 1.8 | 1.0 | 0.6 | 24.0 | 3.9 | 2.1 |
| $500,000 under $1,000,000 | 88 | 9.8 | 1.8 | 2.1 | 0.6 | 29.9 | 3.7 | 2.1 |
| $1,000,000 under $2,000,000 | 28 | 4.2 | 1.2 | 2.3 | 0.3 | 21.2 | 1.7 | 1.5 |
| $2,000,000 under $3,000,000 | 6 | 1.4 | 0.3 | 1.1 | 0.1 | 9.1 | 0.5 | 0.4 |
| $3,000,000 under $5,000,000 | 2 | 1.2 | 0.2 | 1.5 | 0.2 | 5.3 | 0.5 | 0.2 |
| $5,000,000 under $10,000,000 | 2 | 0.7 | 0.3 | 0.9 | 0.1 | 6.1 | 0.7 | 0.2 |
| $10,000,000 under $20,000,000 | 2 | 1.5 | a | 0.4 | a | 9.9 | 0.3 | 0.2 |
| $20,000,000 or more | b | 0.2 | 0.1 | 0.4 | a | 2.9 | 0.1 | 0.2 |

Detail may not add to total because of rounding.
Notes at end of table

Table 1. COMPOSITION OF GROSS ESTATE BY SIZE OF GROSS ESTATE FOR TOP WEALTH–HOLDERS IN 1958 –– Continued

| Size of Gross Estate * | Type of Prpperty – – Continued | | | | Gross Estate | | Debts and mortgages | Economic estate ** |
|---|---|---|---|---|---|---|---|---|
| | Life insurance | | Annuities | Miscel–laneous assets | Using face value of life insurance | Using equity value of life insurance | | |
| | Face value | Equity value | | | | | | |
| | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Total | 52.4 | 13.3 | 19.8 | 55.2 | 511.1 | 472.0 | 42.9 | 429.0 |
| $60,000 under $70,000 | 1.9 | 0.5 | 0.1 | 2.0 | 17.8 | 16.4 | 1.2 | 15.2 |
| $70,000 under $80,000 | 3.1 | 0.7 | 0.1 | 2.6 | 22.7 | 20.3 | 1.7 | 18.6 |
| $80,000 under $90,000 | 3.2 | 0.7 | 0.1 | 2.3 | 20.5 | 18.0 | 1.5 | 16.4 |
| $90,000 under $100,000 | 3.2 | 0.8 | 0.1 | 2.2 | 20.1 | 17.6 | 1.6 | 16.0 |
| $100,000 under $120,000 | 5.9 | 1.4 | 0.2 | 4.3 | 39.0 | 34.5 | 3.3 | 31.2 |
| $120,000 under $150,000 | 7.6 | 1.8 | 0.1 | 5.4 | 46.9 | 41.0 | 4.5 | 36.5 |
| $150,000 under $200,000 | 8.6 | 2.0 | 0.2 | 6.3 | 53.4 | 46.8 | 5.0 | 41.8 |
| $200,000 under $300,000 | 8.0 | 2.1 | 0.3 | 8.1 | 64.6 | 58.7 | 6.1 | 52.7 |
| $300,000 under $500,000 | 5.3 | 1.5 | 0.1 | 6.8 | 57.4 | 53.6 | 5.0 | 48.6 |
| $500,000 under $1,000,000 | 3.7 | 1.2 | 0.2 | 5.7 | 59.6 | 57.2 | 5.2 | 51.9 |
| $1,000,000 under $2,000,000 | 1.4 | 0.5 | a | 4.7 | 38.4 | 37.5 | 3.4 | 34.0 |
| $2,000,000 under $3,000,000 | 0.3 | 0.1 | a | 2.0 | 15.3 | 15.1 | 1.2 | 13.9 |
| $3,000,000 under $5,000,000 | 0.1 | a | a | 0.6 | 9.7 | 9.7 | 0.6 | 9.1 |
| $5,000,000 under $10,000,000 | 0.1 | a | a | 1.7 | 10.6 | 10.6 | 0.8 | 9.7 |
| $10,000,000 under $20,000,000 | a | a | ++ 18.4 | 0.6 | 31.3 | 31.3 | 1.8 | 29.5 |
| $20,000,000 or more | a | a | a | a | 3.7 | 3.7 | a | 3.6 |

Detail may not add to total because of rounding.

a. Rounds to less than $100,000,000
b. Rounds to less than 1,000

* Gross estate size distribution obtained by using the face value of life insurance.
** Gross estate (using equity value of life insurance) less Debts and mortgages, column 14 less column 15.
++ See footnote 21.

Table 2. DERIVATION OF NATIONAL BALANCE SHEET FOR INDIVIDUALS BY TYPE OF PROPERTY FOR MID–YEAR 1958 AND 1953

PART I –– MID–YEAR 1958

| Type of Property | Nonfarm household | Farm household | Nonfarm noncorporate businesses | Trust funds | Nonprofit institutions | Individuals | |
|---|---|---|---|---|---|---|---|
| | | | | | | Total wealth | Prime wealth |
| | (Billion dollars) | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Real estate, total | 452.8 | 113.5 | 63.4 | – | 30.4 | 599.3 | 599.3 |
| Residential structures | 338.6 | 18.1 | 16.1 | – | – | – | – |
| Nonresidential structures | 25.3 | 15.8 | 24.8 | – | 25.3 | – | – |
| Land | 88.9 | 79.6 | 22.5 | – | 5.1 | – | – |
| Federal bonds, total | 59.7 | 4.9 | – | 2.7 | 1.7 | 62.9 | 60.2 |
| Short–term | 3.9 | – | – | – | – | – | – |
| Savings bonds | 43.5 | 4.9 | – | – | – | – | – |
| Other Federal bonds | 12.3 | – | – | – | – | – | – |
| State and local bonds | 24.1 | – | – | 7.8 | 0.6 | 23.5 | 15.7 |
| Other bonds | 11.0 | – | – | 2.9 | 3.2 | 7.8 | 4.9 |
| Corporate stock, total | 299.6 | – | – | 33.3 | 9.0 | 290.6 | 257.3 |
| Preferred | 10.4 | – | – | 1.5 | 0.8 | – | – |
| Common | 289.2 | – | – | 31.8 | 8.2 | – | – |
| Cash, total | 193.6 | 8.6 | 12.9 | 0.4 | 5.3 | 209.8 | 209.4 |
| Currency and demand deposits | 59.9 | 5.8 | 12.9 | 0.4 | 5.3 | – | – |
| Other deposits | 133.7 | 2.8 | – | – | – | – | – |
| Notes and mortgages, total | 28.9 | – | 16.1 | 0.7 | 0.4 | 44.6 | 43.9 |
| Nonfarm mortgages: | | | | | | | |
| Residential | 12.4 | – | – | – | – | – | – |
| Nonresidential | 9.4 | – | – | – | – | – | – |
| Farm mortgages | 4.4 | – | – | – | – | – | – |
| Consumer credit | – | – | 4.8 | – | – | – | – |
| Trade credit | – | – | 11.3 | – | – | – | – |
| Other loans | 2.7 | – | – | – | – | – | – |
| Life insurance reserves | 96.8 | 6.2 | – | – | – | 103.0 | 103.0 |
| Pension and retirement funds: | | | | | | | |
| Private | 25.0 | – | – | – | – | 25.0 | – |
| Government | 65.0 | 0.4 | – | – | – | 65.5 | – |
| Miscellaneous assets, total | 172.5 | 56.4 | 43.5 | 1.9 | 1.9 | 270.5 | 268.6 |
| Equity in mutual financial institutions | 7.7 | – | – | – | – | – | – |
| Producer durables | 2.0 | 17.4 | 26.7 | – | 1.9 | – | – |
| Consumer durables | 162.2 | 13.3 | – | – | – | – | – |
| Inventories | – | 22.2 | 16.8 | – | – | – | – |
| Other intangible assets | 0.6 | 3.5 | – | 0.6 | – | – | – |
| Other tangible assets | – | – | – | 1.3 | – | – | – |
| Gross assets | 1,429.1 | 190.0 | 135.9 | 49.7 | 52.5 | 1,702.5 | 1,562.3 |
| Debt | 170.2 | 19.0 | 39.1 | – | 5.5 | 222.8 | 222.8 |
| Economic estate | 1,258.9 | 171.0 | 96.8 | 49.7 | 47.0 | 1,479.7 | 1,339.5 |

Table 2. DERIVATION OF NATIONAL BALANCE SHEET FOR INDIVIDUALS BY TYPE OF PROPERTY FOR MID-YEAR 1958 AND 1953--Continued

PART II -- MID-YEAR 1953

| Type of Property | Nonfarm household | Farm household | Nonfarm noncorporate businesses | Trust funds | Nonprofit institutions | Individuals | |
|---|---|---|---|---|---|---|---|
| | | | | | | Total wealth | Prime wealth |
| | (Billion dollars) | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Real estate, total | 330.1 | 91.5 | 49.0 | – | 20.3 | 450.3 | 450.3 |
| Residential structures | 254.8 | 16.0 | 14.8 | – | – | – | – |
| Nonresidential structures | 17.0 | 13.2 | 16.9 | – | 17.0 | – | – |
| Land | 58.3 | 62.3 | 17.3 | – | 3.3 | – | – |
| Federal bonds, total | 60.3 | 4.5 | – | 5.5 | 1.7 | 63.1 | 57.6 |
| Short-term | 1.8 | – | – | – | – | – | – |
| Savings bonds | 46.4 | 4.5 | – | – | – | – | – |
| Other Federal bonds | 12.1 | – | – | – | – | – | – |
| State and local bonds | 16.4 | – | – | 5.3 | 0.4 | 16.0 | 10.7 |
| Other bonds | 6.3 | – | – | 1.9 | 1.8 | 4.5 | 2.6 |
| Corporate stock, total | 162.9 | – | – | 19.6 | 5.1 | 157.8 | 138.2 |
| Preferred | 9.4 | – | – | 1.6 | 0.7 | – | – |
| Common | 153.5 | – | – | 18.0 | 4.4 | – | – |
| Cash, total | 141.8 | 8.3 | 10.4 | 0.6 | 3.9 | 156.6 | 156.0 |
| Currency and demand deposits | 56.7 | 6.0 | 10.4 | 0.6 | – | – | – |
| Other deposits | 85.1 | 2.3 | – | – | – | – | – |
| Notes and mortgages, total | 20.4 | – | 12.8 | 0.8 | 0.3 | 32.9 | 32.1 |
| Nonfarm mortgages: | | | | | | | |
| Residential | 9.4 | – | – | – | – | – | – |
| Nonresidential | 6.2 | – | – | – | – | – | – |
| Farm mortgages | 3.1 | – | – | – | – | – | – |
| Consumer credit | – | – | 4.1 | – | – | – | – |
| Trade credit | – | – | 8.7 | – | – | – | – |
| Other loans | 1.7 | – | – | – | – | – | – |
| Life insurance reserves | 70.4 | 4.9 | – | – | – | 75.3 | 75.3 |
| Pension and retirement funds: | | | | | | | |
| Private | 10.5 | – | – | – | – | 10.5 | – |
| Government | 50.3 | 0.5 | – | – | – | 50.8 | – |
| Miscellaneous assets, total | 123.7 | 51.6 | 33.2 | 1.9 | 1.0 | 207.5 | 205.6 |
| Equity in mutual financial institutions | 4.8 | – | – | – | – | – | – |
| Producer durables | 1.0 | 15.7 | 18.2 | – | 1.0 | – | – |
| Consumer durables | 117.3 | 13.2 | – | – | – | – | – |
| Inventories | – | 20.0 | 15.0 | – | – | – | – |
| Other intangible assets | 0.6 | 2.7 | – | 0.6 | – | – | – |
| Other tangible assets | – | – | – | 1.3 | – | – | – |
| Gross assets | 993.1 | 161.3 | 105.4 | 35.6 | 34.5 | 1,225.3 | 1,128.4 |
| Debt | 98.3 | 14.1 | 24.6 | – | 3.2 | 133.8 | 133.8 |
| Economic estate | 894.8 | 147.2 | 80.8 | 35.6 | 31.3 | 1,091.5 | 994.6 |

Notes for Table 2

Column 1, Nonfarm households, is the average of end-of-year asset values: for 1953, end-of-year, 1952 and 1953; for 1958, end-of-year 1957 and 1958 from Goldsmith, Studies in the National Balance Sheet, Vol. II, pp. 118f. Nonfarm noncorporate business assets of individuals are not included in column 1, but shown as a separate sector, Nonfarm Noncorporate Businesses, in column 3.

Column 2, Farm households, was derived by averaging Goldsmith's year-end values for his agriculture sector, Studies in the National Balance Sheet, Vol. II, pp. 132f: for 1953, end-of-year 1952 and 1953; for 1958, end-of-year 1957 and 1958. The values obtained were then reduced by 5 percent to eliminate corporate farms. The basis for this adjustment is Mary M. B. Harmon, A Statistical Summary of Farm Tenure, Agriculture Research Service, U.S.D.A., 1958, p. 2, which shows five percent of farm acreage was owned by corporations in 1954. Discussions with personnel of the Department of Agriculture and the Bureau of the Census who deal with agricultural data cast doubt upon the assumption that only five percent of the value of farm assets is owned by corporations. It is suspected that the five percent of farm acreage owned by corporations is above average in value and that corporate farms are more capital intensive than the average. However, for lack of hard data to support a further reduction in Goldsmith's agriculture sector, assets were reduced by only five percent.

Column 3, Nonfarm noncorporate businesses, is an average of Goldsmith's end-of-year asset values for such businesses from Studies in the National Balance Sheet, Vol. II, pp. 126f.

Column 4: The assets and liabilities of trust funds, all of which are included in the nonfarm household sector, are listed separately here as the trust sector. Trust funds, for 1958 is an average of common trust funds for 1957 and 1958 from Goldsmith, Studies in the National Balance Sheet, Vol. II, pp. 122f, plus the values for personal trust funds from the "Report of National Survey of Personal Trust Accounts," (ABA mimeo., 1959) p. 4. For 1953, trust funds is the average of Goldsmith's year-end values for 1952 and 1953 for personal and common trust funds combined, Studies in the National Balance Sheet, Vol. II, pp. 122f

Column 5, Nonprofit institutions, was derived by applying to the mid-year asset values of nonfarm households (column 1) the percent that each asset held by nonprofit institutions in 1949 was of that asset held by households in 1949. See Goldsmith, A Study of Savings in the United States, Vol. III, p. 72 This ratio estimating procedure was made necessary because 1949 is the last year for which Goldsmith estimated a nonprofit sector. Goldsmith points out in the preface page to the 1949 nonprofit sector balance sheet, the estimates are rough approximations: "Whoever reads the notes to the tables -- or has worked in the field -- will be aware of how precarious the estimates are...," (Ibid. p. 449.). In spite of the roughness of the 1949 estimate, it is appropriate to use the estimate of the outstanding authority in the field as a basis to adjust downward the assets of the nonfarm household sector, which are known to be too high.

Column 6: To arrive at the total wealth concept for the individual sector, the assets and liabilities of farm households and unincorporated businesses were added to, and those of nonprofit institutions were subtracted from, the nonfarm household sector. (The assets and liabilities of trust funds are already included in the nonfarm household sector.) Thus Individuals total wealth is the sum of columns 1,2, and 3, minus column 5.

Column 7: To obtain a prime wealth individual sector, assets of trust funds and pension reserves were subtracted from total wealth. Thus Individuals prime wealth is the sum of columns 1, 2, and 3, minus columns 4 and 5 and minus private and government pension and retirement funds.

Table 3. TOP WEALTH–HOLDERS SHARE IN NATIONAL BALANCE SHEET ACCOUNTS BY TYPE OF PROPERTY FOR 1958 AND 1953

| Type of Property | 1958 | | | 1953 | | |
|---|---|---|---|---|---|---|
| | Top wealth–holders * | Individuals national balance sheet prime wealth ** | Share of top wealth–holders | Top wealth–holders * | Individuals national balance sheet prime wealth ** | Share of top wealth–holders |
| | (Billion dollars) | | (Percent) | (Billion dollars) | | (Percent) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Real estate | 115.7 | 599.3 | 19.3 | 70.1 | 450.3 | 15.6 |
| Federal bonds | 16.3 | 60.2 | 27.1 | 17.4 | 57.6 | 30.2 |
| State and local bonds | 12.2 | 15.7 | 77.7 | 10.8 | 10.7 | 100.9 |
| Other bonds | 3.7 | 4.9 | 75.5 | 2.8 | 2.6 | 107.7 |
| Corporate Stock | 195.4 | 257.3 | 75.9 | 105.7 | 138.2 | 76.5 |
| Cash | 39.5 | 209.4 | 18.9 | 44.6 | 156.0 | 28.6 |
| Notes and mortgages | 17.9 | 43.9 | 40.8 | 10.5 | 32.1 | 32.7 |
| Life insurance equity | 13.3 | 103.0 | 12.9 | ++ 7.1 | 75.3 | 9.4 |
| Miscellaneous assets + | 57.9 | 268.6 | 21.6 | 39.6 | 205.6 | 19.3 |
| Gross assets | 472.0 | 1,562.3 | 30.2 | 309.2 | 1,128.4 | 27.4 |
| Debt | 42.9 | 222.8 | 19.3 | 27.7 | 133.8 | 20.7 |
| Economic estate | 429.0 | 1,339.5 | 32.0 | 281.5 | 994.6 | 28.3 |

Detail may not add to total because of rounding.

* For 1958, the value of all top wealth–holders wealth based upon decedents of known and unknown age with $60,000 or more gross estate. For 1953, basic variant , a concept used by Lampman to include the value of all top wealth–holders wealth based upon decedents of known and unknown age for whom estate tax returns were filed. Conceptually these valuations were made in the same way except that Lampman included the value resulting from the blow–up of the wealth of 23 decedents with gross estates of less than $60,000. The insignificance of this difference will be realized by noting that the total wealth of the living attributable to the 23 decedents with less than $60,000 gross estate in Lampman's estimate is $79,000,000 or .02 percent of his $309,203,000,000 basic variant. Amounts shown in column 4 are from Lampman, op.cit., pp. 191f.

** Prime wealth estimates are from table 2. For the derivation of these estimates see the notes to that table.

\+ Top wealth–holders "Miscellaneous assets" includes annuities and the national balance sheet estimates excludes Pension and retirement funds to achieve comparability with Lampman. The annuity figure for 1958, $19.8 billion, (shown in talbe 1) was adjusted to $2.7 billion before being included in miscellaneous assets. See footnote 21.

++ The value of life insurance equity shown by Lampman in table 90 (Lampman, op. cit. pp. 192f) appears to be incorrect. The correct value is believed to be at least $8.7 billion. He shows $8.7 billion in table 23, Ibid., p. 51, before an addition for the estate of decedents with age unspecified. Because, a negative value for insurance equity for the age unspecified group is not possible, we assume this figure to understate by at least 1.6 billion the basic variant value of life insurance equity of top wealth–holders. Based on a value of $8.7 billion, the share of top wealth–holders in life insurance equity in 1953 would be 11.6 percent.

Table 4. SHARE OF TOP ONE PERCENT OF WEALTH–HOLDERS IN NATIONAL BALANCE SHEET ACCOUNTS MID–YEAR 1958 AND 1953

| Type of Property | Top One Percent of Wealth–holders | |
|---|---|---|
| | 1958 * | 1953 |
| | (Percent) | |
| Real estate | 15.7 | 15.3 |
| Federal bonds | 22.8 | 30.2 |
| State and local bonds | 76.4 | 100.9 |
| Other bonds | 69.4 | 107.7 |
| Corporate Stock | 71.0 | 76.0 |
| Cash | 15.2 | 28.1 |
| Notes and mortgages | 35.1 | 31.5 |
| Life insurance equity | 11.0 | 9.3 |
| Miscellaneous assets 3* | 18.8 | 18.5 |
| Gross assets | 26.7 | 26.1 |
| Debt | 17.2 | 20.5 |
| Economic estate | 28.1 | 27.8 |
| Economic estate | | |

* Based on asset holdings after adjustment for special case. See notes to table 3.

Table 5. SHARE OF TOP ONE PERCENT OF ADULTS IN NATIONAL BALANCE SHEET ACCOUNTS. SELECTED YEARS 1922 TO 1958

| Year | Share of Top One Percent of Adult Wealth–holders |
|---|---|
| | (Percent) |
| 1922 | 31.6 |
| 1929 | 36.3 |
| 1933 | 28.3 |
| 1939 | 30.6 |
| 1945 | 23.3 |
| 1949 | 20.8 |
| 1953 | 24.3 |
| 1954 | 24.0 |
| 1956 | 26.0 |
| 1958 | 23.8 |

NOTE: All figures execept that for 1958 are from Lampman, op. cit. p. 204. The percent of basic variant wealth owned by the top one percent of adult wealth–holders for the years 1922 through 1956 was computed by Lampman on the basis of his balance sheets. The 1958 share is based on the balance sheet presented in this study. No adjustment has been made for Lampman's 1953 estimates which overstated the gross estate of the age unknown group and understated life insurance equities. See notes to table 3.

by top wealth-holders in perspective, their total number can be compared to the total population. On July 1, 1958, according to the Bureau of the Census, the population of the United States was 174.9 million. Top wealth-holders according to our estimate numbered 2.6 million. Therefore, in 1958 1.5 percent of the population held 32 percent of net prime wealth owned by all individuals in the United States.

For a comparison of the shares of top wealth-holders in 1953 and 1958, table 3 also shows Lampman's 1953 estimates as a percent of the mid-1953 balance sheet.[22] The shares of real estate, notes and mortgages, and life insurance equity held by top wealth-holders appear to have increased since 1953. Federal bonds, corporate stock, and miscellaneous assets appear to represent about the same proportion of their respective totals in 1958 as they did in 1953. State and local bonds, other bonds, and cash represent lesser shares in 1958 than in 1953. The fact that large sampling variability may attach to individuals assets, particularly those with small aggregates such as municipal and "other" bonds which tend to be held by a very small number of persons, demands caution in interpreting differences between 1953 and 1958. It is unlikely that a large swing in the share of a particular asset owned by top wealth-holders occurred in a period as short as five years.

The most reliable estimates are those for gross and economic estate. Table 3 shows that top wealth-holders owned 27.4 percent of gross and 28.3 percent of net prime wealth in 1953, but increased their share to 30.2 and 32.0 percent respectively by 1958. These data support Lampman's conclusion that the share of top wealth-holders has been increasing since 1949.[23]

The increased share of top wealth-holders in prime wealth between 1953 and 1958 is probably understated. Because of what appears to be an arithmetic error, Lampman included $16.4 billion in gross estate as the blow-up of assets of decedents of unknown age.[24] The correct amount according to the procedure described by Lampman should be $7.6 billion.[25] If $7.6 billion is taken as the correct estimate of gross estate for the age unknown group, then his estimate for all wealth-holders would be reduced to $300.4 billion. On this basis, the share of top wealth-holders in national balance sheet gross prime wealth in 1953 would have been 26.6 percent compared to 30.2 percent in 1958.

But in order to get at the concentration of wealth, a constant percentage of the population should be considered. The proportion of the total population represented by top wealth-holders has been increasing. In 1953 the group consisted of approximately 1.66 million persons, or about 1.04 percent of the total U.S. population. In 1958 the number of persons had risen to 2.60 million or 1.48 percent of the total population.

Table 4 shows the percent of each asset in total prime wealth owned by the top 1 percent of all wealth-holders. In the aggregate, the wealthiest strata have at least maintained their share position of 1953. With respect to specific assets, the top 1 percent of wealth-holders held about the same share of real estate, corporate stock, notes and mortgages, life insurance equity, and miscellaneous assets in 1958 as in 1953. The share of all types of bonds in the hands of the top 1 percent of wealth-holders declined as did cash holdings.

A longer perspective of the concentration of wealth is available if one uses Lampman's data for the top 1 percent of adults. Table 5 shows the proportion of wealth held by the top 1 percent of persons over 20 years of age from 1922 to 1958. The estimate of 23.8 percent for 1958 is slightly lower than Lampman's estimates for 1953, 1954, and 1956. When it is remembered that there are differences in the balance sheet used for 1958 and for other years, that sampling errors exist in all the estimates, and that the wealth of the age unknown is overstated in 1953, one is forced to look at the whole series of estimates to assess changes in the concentration of wealth. Doing this, it appears that over the period of these estimates [wealth] was most highly concentrated in the 1920's, decreased in concentration during the depression and war years, and has been increasing since 1949. Lampman has already pointed out this movement in concentration, we merely add the most recent data in support of his observation.[26]

The 1962 Internal Revenue Service Estimates

The first IRS estate multiplier study will be published in 1966.[27] Besides updating past estimates it will incorporate technical improvements in mortality rates and insurance valuation. Decedent of unknown age will be imputed the average age of all decedents of the same sex in the same size of gross estate class.

Data from the study "Social and Economic Differentials in Mortality Rates" being done by Hauser at the University of Chicago will be used to evaluate and probably adjust age-sex-specific mortality rates.

The adjustment for life insurance proceeds will be made on the basis of a special study being done for the IRS by the Institute of Life Insurance. A return filed for an estate which includes life insurance proceeds must provide a statement of the face value, policy loans, accumulated dividends and proceeds (among other things) for each life insurance contract on the life of the decedent. The information is supplied by attaching to the return a Form 712 completed by the carrier. Unfortunately, cash surrender value has not been one of the items of information requested. The Institute of Life Insurance, however, collected from a group of companies cash surrender value and age of decedent as well as all the information requested in Form 712 each time the form was completed during a recent two-month period. The Institute plans to tabulate ratios of cash surrender value to proceeds by age group. This set of ratios will be used to reduce the life insurance proceeds of decedents in each age group for the 1962 estimate. The decedents for whom the information is being tabulated are not, of course, those for whom estate tax returns were filed in 1963. Our assumption is that the ratios do not vary much from year to year.

The IRS study will cross-classify top wealth-holders' gross and net wealth by size, age, sex, marital status, State, and type of asset. Of particular interest to social scientists will be the distributions by net wealth after adjustment of life insurance to equity value. These distributions will permit better estimates of the concentration of wealth than has been possible with the "size of gross estate" classification used in earlier estimates.

Future Application of the Estate Multiplier in the U.S.

In presenting the following ideas we wish to emphasize they represent the thinking of the authors and of scholars who have worked in the field, not the official position or plans of the IRS and Treasury.

The estate tax returns are an underdeveloped source of economic information. True, successive applications of the estate multiplier have expanded the number of questions asked of the returns, but their full potential is far from exploited.

What is the propensity of top wealth-holders for financial risk? Does increased wealth shift portfolio composition toward growth stocks? How significant is the closely held corporation? Since estate tax returns provide security information on an issue-by-issue basis, indices could be devised to provide answers to these questions.[28]

What are the occupational characteristics of top wealth-holders? Occupation and social security number of the decedent are contained in the return. A cross-sectional occupation pattern may be obtainable directly from the returns; the life cycle pattern might be obtained by a social security number match with SSA work history records. Further, wealth-holding by occupational groups could be estimated.[29]

What is the income of top wealth-holders? What is the income of the heirs? Using social security numbers, estate tax returns can be matched with previous income tax returns, thus putting together the income flow and wealth stock. A slight modification of the estate tax returns would make possible a study of the intergenerational flows by wealth and income of decedents, and income of heirs.

What is the relation between inter vivos giving and transmission of assets at death? What are the effects of the creation of inter vivos and testamentary trusts? The addition of grantors' and

donors' social security numbers on fiduciary and gift tax returns would permit a computer match of these returns with estate tax returns.

For further applications of the estate multiplier to U.S. data certain methodological improvements constitute the immediate needs. The tabulation of returns for four or five consecutive years, sorted by year of death, would minimize the error caused by the assumption of inferred year of death. It would also permit a reduction of sampling variability by combining returns for two or more years.

Reporting by life insurance companies of cash surrender value for each contract in the estates of decedents for which an estate tax return is filed would vastly improve estimates of life insurance equity.

Further research to improve mortality rates assigned to decedents filing estate tax returns should be undertaken. One path is that of relating death to income size. Another would be an exploration of the information on the cause of death (supplied by a physician) and occupation contained in the return.

FOOTNOTES

1. See Dorothy S. Projector, "Survey of Financial Characteristics of Consumers," Federal Reserve Bulletin, March 1964, p. 289.

2. See Constantine A. Yeracaris, "Differential Mortality, General and Cause Specific in Buffalo, 1934-41,"Journal of the American Statistical Association, December 1955; Louis I. Dublin, Alfred J. Lotka, and Mortimer Spiegelman, Length of Life; A Study of the Life Table, New York: The Ronald Press, 1949; I.M. Moriyama and L Guralnick "Occupational and Social Class Differences in Mortality" in Trends and Differentials in Mortality, proceedings of the 1955 Annual Conference, Milbank Memorial Fund. Unpublished statistics provided by the Department of Health, City of New York, show mortality rates for high income health districts to be significantly lower than those for low income districts.

3 C. Lowell Harris, "Wealth Estimates as Affected by Audit of Estate Tax Returns," National Tax Journal, December 1949, p. 333.

4. The interval devolution method estimates total wealth by multiplying the wealth of decedents by the average interval, in years, between generations. A discussion of attempt to use the interval devolution method will be found in G.H. Knibbs, The Private Wealth of Australia and its Growth, Melborne: McCarron, Bird and Co., 1918, pp. 168-81.

   T. A. Coughlin's suggestion is found in the discussion of a paper W. J. Harris and K. A. Lake, "Estimates of the Realizable Wealth of the United Kingdom Based Mostly on Estate Duty Returns," Journal of the Royal Statistical Society, December 1906, pp. 709-32.

5. Bernard Mallet, "A Method of Estimating Capital Wealth from Estate Duty Statistics," Journal of the Royal Statistical Society, March 1908, pp. 65-84.

6. Victorian Yearbook, 1911-12, p. 216.

7. Knibbs, op. cit.

8. G.W. Daniels and H. Campion, The Distribution of National Capital, Manchester: Manchester University Press, 1936; and H. Campion, Public and Private Property, Oxford: Oxford University Press, 1939.

9. Kathleen Langly, "The Distribution of Capital in Private Hands in 1936-1938 and 1946-1947," Bulletin of the Oxford University Institute of Statistics, December 1950, p. 339 and February 1951, p. 33; and Kathleen Langly, "The Distribution of Private Capital, 1950-51," Bulletin of the Oxford University Institute of Statistics, January 1954, p. 1.

10. A.M. Cartter, "A New Method of Relating British Capital Ownership and Estate Duty Liability to Income Groups," Economica

August 1953, p. 247.

11. H.F. Lydall and D.G. Tipping, "The Distribution of Personal Wealth in Britain," Bulletin of the Oxford University Institute of Statistics, January 1961, p. 96.

12. J.R.S. Revell "Assets and Age," Bulletin of the Oxford University Institute of Statistics, March 1962, p. 363. Revell further analyzes the 1957 and 1958 British data in his forthcoming monograph on national balance sheets, now in manuscript.

13. Report of the Commissioners of Her Majesty's Inland Revenue for the Year Ended 31st March 1961, London: Her Majesty's Stationary Office, 1962, pp. 154-160.

14. Horst Mendershausen, "The Pattern of Estate Tax Wealth," in Raymond W. Goldsmith, Dorothy S. Brady, and Horst Mendershausen, A Study of Savings in the United States, Vol. III Princeton: Princeton University Press, 1956.

15. Ibid., p. 299.

16. Robert J. Lampman, The Share of Top Wealth-holders in National Wealth 1922-56, Princeton: Princeton University Press, 1962.

17. Moriyama and Guralnick, op. cit.

18. James D. Smith, unpublished research submitted to the University of Oklahoma in connection with a doctoral dissertation. The original estate multiplier estimate by Smith was based upon tabulations in Statistics of Income--1958, Fiduciary, Gift, and Estate Tax Returns, and the composition of wealth by asset type was estimated by a different technique. However, Jeannette Fitzwilliams and Raymond W. Goldsmith generously made available a special Internal Revenue Service tabulation (upon which considerable work toward an estate multiplier estimate had been made by Fitzwilliams) which permitted the direct estate multiplier estimate of asset composition in table 1.

19. Raymond W. Goldsmith, Robert E. Lipsey and Morris Mendelson, Studies in the National Balance Sheet.

20. Lampman, op. cit., pp. 191-5.

21. The occurrence of such a high value may merely reflect the excessive sampling variability attaching to a rare event, or it may have been the result of faulty transcription in processing the returns by the Internal Revenue Service. An attempt to check the Internal Revenue transcription was frustrated by the fact that the edit sheets and punch cards used in the tabulation of the 1958 returns had been destroyed.

22. The major differences in the 1953 Lampman balance sheet and that constructed for this study are: 1. Lampman used end-of-year values. 2. Lampman apparently allocated assets to trust funds on the basis of the findings reported in Goldsmith and Shapiro's "Estimates of Bank-Administered Trust Funds," Journal of Finance, March 1959, pp. 11-17; the mid-1953 balance sheet uses Goldsmith's later estimates in Studies in the National Balance Sheet and the "Report of Survey of Trust Accounts." 3. Lampman's estimate of 16.1 billion "equities in mutual financial institutions" held by the household sector appears far too large in comparison with Goldsmith's National Balance Sheet entry of $4.8 billion.

23. Lampman, op. cit., p. 24.

24. Lampman, op. cit., p. 62.

25. See Lampman, op. cit., p. 55. In discussion with Lampman he has stated to Smith that he was unable to reconcile the $16.4 billion shown in his table 29 with the procedure described on page 55 of The Share of Top Wealth-Holders, but that the procedure should yield the correct estimate for the age unknown group.

26. Lampman, op. cit., p. 24.

27. Yeoman labor in preparing the specifications for the IRS estimate was done by Jeannette Fitzwilliams. She also, with Robert Lampman and Raymond Goldsmith, contributed to the initial planning of the project, at the request of the late Ernest Engquist, Director of the Statistics Division. Helen Demond with assistance from Jeannette Fitzwilliams drafted specifications for the project.

28. See, for instance, I. R. Atkinson, The Pattern of Financial Asset Ownership: Wisconsin Individuals, 1949, Princeton: Princeton University Press, 1956.

29. See Leonard Hamilton, "The Distribution of Capital Among the Medical Profession in England and Wales, 1940-41," Bulletin of the Oxford University Institute of Statistics, January 1950, p.1.

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## Technical Appendix*

The estate multiplier technique rests on the assumption that death draws a random sample, stratified by age and sex, of the living population.

If one has available age-sex-specific mortality rates, an estimate of total wealth can be derived as:

$$W=\sum_{i=1}^{m}\sum_{j=1}^{2}\frac{V_{ij}}{M_{ij}}w_{ij}$$

where $w_{ij}$ is the wealth of decedents, $V_{ij}$ is the number of living persons, and $M_{ij}$ is the number of deaths, all associated with the ith age and jth sex. Decedents' wealth can be dimensioned to any degree, subject only to the tolerable sampling error for the purposes to which the estimates are to be put. For instance, $w_{ijkg}$ may be used to represent the wealth of decedents of the ith age, jth sex, of asset type k in the gth gross wealth size class. Using such a four-way classification, there is a partitioned matrix W, such that the distribution of wealth by any combination of the classification categories can be obtained as a result of pre-and/or post-multiplication of W by suitable vectors and/or matrices. The matrix W is defined by $W = ( t_{ij} w_{ijkg})$ where $t_{ij} = V_{ij} / M_{ij}$ and where $i = 1, 2, \ldots, m$; $j = 1, 2$; $k = 1, 2, \ldots, n$; $g = 1, 2, \ldots, s$.

If we let $W_{kg}=\begin{pmatrix} t_{11}w_{11kg} & t_{12}w_{12kg} \\ \vdots & \vdots \\ t_{m1}w_{m1kg} & t_{m2}w_{m2kg} \end{pmatrix}$ Then we can write: $W=\begin{pmatrix} w_{11} & w_{12} & \cdots & w_{1s} \\ w_{21} & w_{22} & \cdots & w_{2s} \\ \vdots & \vdots & \cdots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{ns} \end{pmatrix}$

The following example illustrates how a particular cross-category distribution of wealth may be obtained from W.

For any integer p, let $J_p$ be the p-dimensional column vector of ones. Then, multiplication of W on the left by $J'_{mn}$ gives a 1 X 2s matrix whose elements are column sums of W:

$$J'_{mn}W = [(J'_mW_{11} + J'_mW_{21} + \ldots + J'_mW_{n1}), (J'_mW_{12} + J'_mW_{22} + \ldots + J'_mW_{n2}), \ldots, (J'_mW_{1s} + J'_mW_{2s} + \ldots + J'_mW_{ns})]$$

$$=([\sum_{k-1}^{n} J_mW_{k1}], [\sum_{k-1}^{n} J_mW_{k2}], \ldots, [\sum_{k-1}^{n} J_mW_{ks}])$$

* The assistance of Michael G. Billings, Mathematical Statistician, Statistics Division, Internal Revenue Service, is gratefully acknowledged.

$$\text{Now, } J'_m W_{kg} = (1,1,1,..,1) \begin{pmatrix} t_{11}w_{11kg} & t_{12}w_{12kg} \\ t_{21}w_{21kg} & t_{22}w_{22kg} \\ . & . \\ . & . \\ t_{m1}w_{m1kg} & t_{m2}w_{m2kg} \end{pmatrix} = (\sum_{i=1}^{m} t_{i1}w_{i1kg}, \sum_{i=1}^{m} t_{i2}w_{i2kg})$$

Therefore $J'_{mn}W =$

$$([\sum_{k=1}^{n}\sum_{i=1}^{m} t_{i1}w_{i1k1}, \sum_{k=1}^{n}\sum_{i=1}^{m} t_{i2}w_{i2k1}], [\sum_{k=1}^{n}\sum_{i=1}^{m} t_{i1}w_{i1k2}, \sum_{k=1}^{n}\sum_{i=1}^{m} t_{i2}w_{i2k2}], \ldots, [\sum_{k=1}^{n}\sum_{i=1}^{m} t_{i1}w_{i1ks}, \sum_{k=1}^{n}\sum_{i=1}^{m} t_{12}w_{i2ks}])$$

Each of the s 1 X 2 vectors in $J'_{mn}W$ has as one of its elements the total wealth of females and the other of males in a given wealth class. Thus, the product matrix $J'_{mn}W$ can be thought of as the distribution of total wealth by size of wealth-holding and sex of holder.

Similarly, the distribution of wealth by size of holding, sex and age of holder can be obtained as follows: Let $I_{pq} = (I_p, I_p, I_p, \ldots I_p)$ be the p-rowed matrix consisting of q p x p identity matrices.

Then, $I_{mn}W = (\sum_{k=1}^{n} W_{k1}, \sum_{k=1}^{n} W_{k2}, \ldots, \sum_{k=1}^{n} W_{ks})$ . The submatrix $\sum_{k=1}^{n} W_{kg}$ of $I_{mn}W$ has as its ijth component the sum of the wealth size class g held by persons in age group i, sex group j.

The composition of wealth by asset type, age and sex of holder is given by $WI'_{2s} = (\sum_{g=1}^{s} W_{1g}, \sum_{g=1}^{s} W_{2g}, \ldots, \sum_{g=1}^{s} W_{ng})'$. The submatrix $\sum_{g=1}^{s} W_{kg}$ of $WI'_{2s}$ has as its ijth component the value of asset type k held by persons of age group i, sex group j.

Once the matrix W has been set-up, any desired distribution of wealth using the selected variables can be extracted by choosing the appropriate vector and/or matrix multipliers. The following definitions and table summarize the multipliers which would be used to obtain the various breakdowns in our four-way classification.

Definitions of the multipliers:

1. For any integer p, $J_p$ is the column vector of p ones.

2. For any integers p and q, $I_{pq}$ is the p-rowed matrix which can be partitioned into q p x p identity matrices:

$$I_{pq} = (I_p, I_p, I_p, \ldots I_p)$$

3. For any integers m, n, p, $p \leq n$, $J^p{}_{nm}$ is the n x m matrix whose pth row is $J'_m$, where $J_m$ is defined in (1).

4. For any integers m, n, $K_{nm}$ is the n x nm matrix which can be partitioned as follows:

$K_{nm} = (J^1{}_{nm}, J^2{}_{nm}, J^3{}_{nm}, \ldots, J^n{}_{nm})$, where $J^p{}_{nm}$ is defined in (3).

With the matrices, vectors, and their transposes, defined above, any desire cross-classified wealth distribution can be obtained from W. If we think of W as an hierarchy of classification, we can write W = asset (age-sex) size. Then,

1. Multiplication of W on the left by $I_{mn}$ eliminates an asset.
2. Multiplication of W on the right by $I'_{2s}$ eliminates size.
3. Multiplication of W on the left by $K_{nm}$ eliminates age.
4. Multiplication of W on the right by $K'_{s2}$ eliminates sex.
5. Multiplication of W on the left by $J'_{mn}$ eliminates asset and age.
6. Multiplication of W on the right by $J_{2s}$ eliminates size and sex.
7. Sequential eliminations are obtained by performing operations in sequence (see table below).

**MATRIX MULTIPLIERS, OPERATIONS AND PRODUCTS**

| Multipliers | | | | Product gives |
|---|---|---|---|---|
| Left | Right | Eliminates | Product | wealth-holding by |
| $J'_{mn}$ | - | Asset, age | $J'_{mn}W$ | Sex, size |
| - | $J_{2s}$ | Sex, size | $WJ_{2s}$ | Asset, age |
| $I_{mn}$ | - | Asset | $I_{mn}W$ | Age, sex, size |
| - | $I'_{2s}$ | Size | $WI'_{2s}$ | Asset, age, sex |
| $K_{nm}$ | - | Age | $K_{nm}W$ | Asset, sex, size |
| - | $K'_{2s}$ | Sex | $WK'_{s2}$ | Asset, age, size |
| $I_{mn}$ | $K'_{2s}$ | Asset, sex | $I_{mn}WK'_{s2}$ | Age, size |
| $K_{nm}$ | $I'_{2s}$ | Age, size | $K_{nm}WI'_{2s}$ | Asset, sex |
| $I_{mn}$ | $I'_{2s}$ | Asset, size | $I_{mn}WI'_{2s}$ | Age, sex |
| $I_{mn}$ | $J_{2s}$ | Asset, size,sex | $I_{mn}WJ_{2s}$ | Age |
| $J'_{mn}$ | $I'_{2s}$ | Asset, age,size | $J'_{mn}WI'_{2s}$ | Sex |
| $J'_{mn}$ | $K'_{s2}$ | Asset, age, sex | $J'_{mn}WK'_{s2}$ | Size |
| $K_{nm}$ | $J_{2s}$ | Age, sex, size | $K_{nm}WJ_{2s}$ | Asset |
| $K_{nm}$ | $K'_{s2}$ | Age, sex | $K_{nm}WK'_{s2}$ | Asset, size |

$$
\mathbf{W} = \left( \begin{array}{cccc}
\begin{pmatrix} t_{11}w_{1111} & t_{12}w_{1211} \\ t_{21}w_{2111} & t_{22}w_{2211} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m}w_{m111} & t_{m2}w_{m211} \end{pmatrix} & \begin{pmatrix} t_{11}w_{1112} & t_{12}w_{1212} \\ t_{21}w_{2112} & t_{22}w_{2212} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m112} & t_{m2}w_{m212} \end{pmatrix} & * & \begin{pmatrix} t_{11}w_{111s} & t_{12}w_{121s} \\ t_{21}w_{211s} & t_{22}w_{221s} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m11s} & t_{m2}w_{m21s} \end{pmatrix} \\
\begin{pmatrix} t_{11}w_{1121} & t_{12}w_{1221} \\ t_{21}w_{2121} & t_{22}w_{2221} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m121} & t_{m2}w_{m221} \end{pmatrix} & \begin{pmatrix} t_{11}w_{1122} & t_{12}w_{1222} \\ t_{21}w_{2122} & t_{22}w_{2222} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m122} & t_{m2}w_{m222} \end{pmatrix} & * & \begin{pmatrix} t_{11}w_{112s} & t_{12}w_{122s} \\ t_{21}w_{212s} & t_{22}w_{222s} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m12s} & t_{m2}w_{m22s} \end{pmatrix} \\
* & * & * & * \\
\begin{pmatrix} t_{11}w_{11n1} & t_{12}w_{12n1} \\ t_{21}w_{21n1} & t_{22}w_{22n1} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m1n1} & t_{m2}w_{m2n1} \end{pmatrix} & \begin{pmatrix} t_{11}w_{11n2} & t_{12}w_{12n2} \\ t_{21}w_{21n2} & t_{22}w_{22n2} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m1n2} & t_{m2}w_{m2n2} \end{pmatrix} & * & \begin{pmatrix} t_{11}w_{11ns} & t_{12}w_{12ns} \\ t_{21}w_{21ns} & t_{22}w_{22ns} \\ \cdot & \cdot \\ \cdot & \cdot \\ \cdot & \cdot \\ t_{m1}w_{m1ns} & t_{m2}w_{m2ns} \end{pmatrix}
\end{array} \right)
$$

# Historical Perspectives on IRS Wealth Estimates With a View to Improvements

*by Fritz Scheuren, Ph.D*

My role, in these few minutes Jim Smith has given me, is to provide a short history of IRS estimates of wealth and their limitations. Let me begin with a little background on how IRS started making estate multiplier wealth estimates in 1962. Then we'll look briefly at the handout which you have. This contains the details of exactly what was done and why. Finally, I'd like to reflect with you on the experience.

Contributors to IRS Wealth Estimates

So think back with me to the early 60's. Under the late Ernie Engquist, the IRS Statistics Division, at the suggestion of Raymond Goldsmith, agreed to try to repeat for 1962 the wealth estimation procedures that Robert Lampman had used in his work for 1953. A number of people played important roles in the early planning, including Helen Demond, Jeanette Fitzwilliams, and Dave Cassidy. Jim Smith joined the Statistics Division for a while in 1965-66 and contributed his experience on the 1958 estate tax wealth estimates he had made. He continued to contribute as a technical consultant thereafter. While at IRS, Jim helped set up a cooperative effort to determine the equity values of the life insurance reported on Federal estate tax returns. This study was carried out at the Institute of Life Insurance under the direction of Virginia Holran and Robert Chiapetta.

The late Mortimer Spiegelman at Metropolitan Life also acted as a technical consultant, since Metropolitan Life's policyholder experience played an integral part in the construction of the estate multipliers used. The actual estimates and the 1962 report which resulted were prepared by me under the direction of Staunton Calvert and, later, Keith Gilmour.

Since 1962, estate multiplier wealth estimates have been done routinely at IRS. The work at IRS after 1962 has proceeded under Keith Gilmour and Charlie Crossed, with the very active participation of the Statistics Division's current Director, Vito Natrella.

Description of 1962 Estimates

So much for the credits. Now let me show you a little of the movie. If you will turn to the handout please [see SOI Personal Wealth, 1962].

The paper you have presents a general summary description of the assets and demographic characteristics of living individuals with gross holdings of $60,000 or more in 1962. The focus is on the age, race, sex, and marital status of those "top wealthholders," as well as the size and composition of their wealth.

The estimates of the wealth of the living in the paper are based on Federal estate tax returns filed during 1963 for decedents with a gross estate of $60,000 or more. Each decedent's estate was weighted by the inverse of the mortality rate appropriate to his age and sex. Adjustments were made for social class mortality differentials using Metropolitan's $5,000 or more Whole Life experience for men and assuming the mortality differentials between white men and women in the general population held for top wealthholders as well.

Reflection on 1962 Estimation Procedure

Let me now turn to some reflections on the 1962 wealth estimates. There are many lessons to be learned from the 1962 experience which can be helpful in planning future work.

A great deal of thinking, for example, needs to be done about the valuation problems that exist when using estate tax returns to estimate wealth.

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Prepared remarks delivered on May 2, 1975, at the Workshop on Estate Multiplier Estimates of Wealth sponsored by the National Bureau of Economic Research. The help of Wendy Alvey, Laverne Rauman, Lois Gale, H. Lock Oh, and Catherine Murphy is gratefully acknowledged.

The wealth concept itself has some unattractive features, in that wealth represented only by an income right is not included. Historical comparisons, particularly concentration estimates, are subject to considerable interpretation problems due to this.

The importance of pension rights, for instance, has grown tremendously in recent years and will become even more important. There is also the effect of transfers in trust which confer an income right on one generation with the remainder interest going to the next. In such cases, the wealth is includable on the Federal estate tax returns only every other generation.

I don't know what can be done about these problems in future estimates, beyond combining the estate multiplier technique with other measuring devices; notably, household surveys which include matching to administrative information (something we are doing a great deal of at Social Security right now).

"Sampling" problems are the area in which I personally have the greatest interest. These principally include deriving a better sense of the selection "probabilities" appropriate for the mortality of the wealthy. Standard concerns such as sampling variability (especially for the young and the very rich) and sample control are also very important and have not been given enough attention. I am particularly concerned with the use of a year's filings to represent a year's deaths. Since there is such a long period in which executors can file, a good deal of uncertainty is introduced by not controlling the sample more. (Also, the very largest estates may never even get into the statistics at all because auditors are reluctant to give them up.)

I've always had the suspicion that Lampman got too many returns filed in 1954 for his 1953 estimates because of the law changes which occurred at that time. When one looks at the estate tax filing historically (1945-1973), there do seem to be little extra increases in filings during the period just before major changes in the law go into effect. However, let me add that I have not really looked closely enough at this phenomenon to say whether or not there is anything to the causal structure I am implying.

The fundamental sampling problem is, of course, what probabilities of selection should we use. I have three things to say about this.

Use of Death Certificates

First, we need to study the mortality of the well-to-do by using the estate tax returns themselves. Unlike any other tax return, the Form 706 has a great deal of demographic information. This, of course, is what makes it attractive as an alternative to household surveys for information on the wealthy. In the past basically only age, sex, and marital status have been edited off the return. Other available data which could be picked up include occupation (even though perhaps only of moderate usefulness except for those under 65), nativity (foreign or native born), cause of death, length of last illness, date and length of widowhood.

The results of a 1965 pilot study on the reporting of these demographic characteristics indicated that, except for cause of death, the response was reasonably good. The proposal I made some time ago, and make again now, which bears on this "cause of death" problem is that the Form 706 be changed to require the executor to submit the death certificate or at least the death certificate number. Since the National Center for Health Statistics (NCHS) codes all U.S. deaths by cause, a computer match with their records would make it possible to obtain this important data item. Except for race, the estate tax return already requires essentially the same information provided on most death certificates, so little if any additional burden is being placed on the executor.

The problems of disclosure in such an arrangement exist and may preclude such a match. As far as I know, NCHS has no problem of this sort.[1] IRS, by providing to NCHS only the date of death and death certificate number, would be disclosing no more than that a particular decedent had an estate tax return filed for him. It may even be possible to buy (or borrow) the NCHS data files and do the matching at IRS.

For literally decades we have been trying to study mortality patterns by socio-economic class.

All sorts of proxies have been used: housing, occupation, income, education, size of insurance. However, it is the estate tax return, itself, which is the best place to look, if not for differential rates, at least for differences in patterns of mortality, in the causes and seasonality of death.

Valuation Study Proposal Sketched

My second point is the following: Certain direct tests should be applied to the mortality differentials that are thought to be appropriate for the estate multiplier. (For example, Jim Smith, in the 1969 work, used 12 different sets of differentials. The choice among these had to be largely subjective.)

The project I have in mind would be carried out jointly by Social Security and Internal Revenue Service, and it could be part of the estate tax program IRS has planned for returns filed in 1977. SSA would provide IRS with a file of 1976 male decedents from its 10 percent Continuous Work History Sample. (For males 35 or older, the reporting of deaths to SSA is about 95% complete. One of the reasons that it is so complete is that, in most cases, the heirs are entitled to a lump sum death benefit of $255.) IRS would then merge this file with their estate tax file of 1976 decedents. SSA will validate and, if necessary, supply the social security numbers for records on the estate tax file so this matching can be carried out. The resulting file, appropriately weighted, will be matched with the 1974 Individual Income Tax Master File. Marital status (type of return), 1974 AGI, wages and salaries, and other income information from the Master Tax File will be added to the decedent file.[2] The weights on this file will be adjusted by mortality multipliers based on age-race-and marital status to produce estimates of all income tax filers for 1974. After this adjustment, IRS would prepare tabulations from this tape of the population by AGI class, etc. These results will be compared to actual totals from Statistics of Income for 1974. Any discrepancies found (aside from those attributable to sampling variability), can be interpreted, with qualifications, as measuring the net impact of the differential mortality which exists within age-sex-race-marital status groups in 1976.

When the discrepancies between the income comparisons of the decedent sample and the basic income tax files have been resolved (using a "raking" procedure developed at SSA), the decedent file may give useful estimates of the distribution of both income and wealth, at least in so far as this is available from the administrative records being used.

The project which I just described briefly is still in the discussion phase. A number of problems must be resolved. Preserving the confidentiality of SSA and IRS data is, of course, an essential legal requirement. Furthermore, it is not clear at this stage whether or not the recently passed Privacy Act will permit the kind of matching we have in mind.[3]

This project has another major deficiency in that it only allows us to test the mortality differentials for men. Deaths for females are not reported very well to Social Security. (For example, only about 2/3rds of the deaths among women in 1972 were reported.) We need to provide some other means of testing mortality differentials for women. One that occurred to me is to use the community property information on the estate tax return to test these female differentials, since conceptually the number of married male top wealthholders with community property (above a certain size) must equal the number of married females with community property. A small and incomplete test of this idea was carried out with the 1969 filings, and I think it has promise for the future work at IRS. (The results of this 1969 work are shown in Table 1 below.)

Overemphasis on Wealth Concentration Estimates

The third thing I'd like to say has to do specifically with the use of the estate multiplier technique for work on wealth concentration. I think that undue emphasis has been given to this aspect in previous research, given the uncertainty that now surrounds the mortality rates that one should use. On the other hand, for looking at patterns of asset holdings among different age, sex, net worth, marital status groups and so forth, the estate multiplier technique seems to be fairly reliable. For example, Jim Smith, in his 1969 work, examined 12 different mortality assumptions. The variance between the total top wealth-

holder figures was enormous. However, the overall percentage distributions by size of wealth were practically identical for all 12. (See Table 2 below.) This suggests that the analysis of patterns of wealthholding may be robust over a very wide range of reasonable alternative assumptions about what the multipliers are. The overall aggregate estimates are obviously very sensitive to one's assumptions and must be considered (in Kendall's words) to be quite frail.

In saying this, I do not wish to sound as if I favor abandoning the attempt to make wealth concentration estimates using the estate multiplier technique. Rather, I am suggesting that there are a number of other interesting areas which can be productively studied that may not be as sensitive to the uncertainty surrounding what the mortality rates are for "top wealthholders."

## ENDNOTES

1. It turns out that NCHS does, as I should have assumed, have such problems, but, if suitable safeguards are instituted, these need not be insurmountable.

2. Our later work indicates that there might be enough of a downturn in income near death to require an earlier master file be used. With the help of Census Bureau staff, therefore, a match will also be made to the 1969 IRS master file as well. Under this revised procedure "weights" would be determined from the 1969 file. The 1974 matched data could then be examined (as weighted) to see what income differences exist between persons who will die two years later and those who will not.

3. It does not cover deceased individuals.

## 1993 AFTERWORDS

In rereading this long-ago talk, I thought some afterwords might be worth adding about what has happened since 1975.

- First, it is particularly gratifying, thanks to Barry Johnson, Marvin Schwartz, and Louise Woodburn (among others), that so many recommendations made here were actually implemented. Notable among these was the shift to a year-of-death rather than a year-of-filing sample and the establishment of a partnership with the Federal Reserve Board so that their Survey of Consumer Finances can be used jointly with the estate wealth estimates.

- Second, even though nearly 20 years have passed and many heroic efforts have been made, the talk also illustrates all too well a truth of human affairs, "When all is said and done, more is said than is done." For example, while some work was attempted with the National Death Index on directly studying mortality patterns of the wealth from estate returns, this project proved harder and less immediately rewarding than I envisioned. The work of linking together SSA and IRS income and estate files was actually completed and well documented by Keith Gilmour (and the combined file is available at the National Archives); however, to my knowledge, the study called for has not been done, even though the file is available.

- Third, one of the benefits of revisiting something done so long ago is to see how much or how little one's understanding stood the test of time. In some ways my views have stood up fairly well. The dimensions of the problem as I understood them then were roughly right. What I didn't understand were all the new dimensions of wealth estimation that others would bring. Here I'm thinking not only of IRS staff but particularly of Gene Steuerle and, more recently, David Joulfaian and Arthur Kennickell. Whole perspectives (vistas) have been added to my thinking and a deeper appreciation of this subject has been gained from them. I look forward to this kind of change continuing and for still more dimensions to be added by researchers whose names are not yet known.

Table 1 -- Number of Married Wealthholders in 1969 in Community Property States by Size of Total Assets

(Numbers in thousands; ratios based on unrounded counts.
Detail may not add top totals because of rounding.)

| Total Assets Modified (in dollars) | Community Property States | | | |
|---|---|---|---|---|
| | Total | California | Texas | All other (except New Mexico) |
| | Part I: Married Female Top Wealthholders | | | |
| Total | 376 | 226 | 102 | 49 |
| 60,000 under 100,000 | 155 | 97 | 35 | 24 |
| 100,000 under 150,000 | 96 | 60 | 26 | 10 |
| 150,000 under 300,000 | 77 | 41 | 26 | 9 |
| 300,000 under 1,000,000 | 40 | 22 | 12 | 5 |
| 1,000,000 or more | 8 | 6 | 2 | 1 |
| | Part II: Married Male Top Wealthholders | | | |
| Total | 407 | 205 | 101 | 101 |
| 60,000 under 100,000 | 177 | 87 | 47 | 43 |
| 100,000 under 150,000 | 89 | 47 | 22 | 20 |
| 150,000 under 300,000 | 87 | 44 | 20 | 23 |
| 300,000 under 1,000,000 | 47 | 23 | 11 | 13 |
| 1,000,000 or more | 6 | 3 | 1 | 2 |
| | Part III: Ratio of Female to Male Top Wealthholders (in percent) | | | |
| Total | 92.7 | 110.3 | 101.6 | 48.1 |
| 60,000 under 100,000 | 87.7 | 110.9 | 75.2 | 54.4 |
| 100,000 under 150,000 | 108.4 | 127.4 | 121.5 | 49.3 |
| 150,000 under 300,000 | 88.0 | 93.0 | 131.8 | 40.2 |
| 300,000 under 1,000,000 | 85.1 | 96.3 | 114.2 | 41.1 |
| 1,000,000 or more | 134.9 | 176.5 | 149.3 | 34.0 |

Note: Total assets was modified for this table by subtracting twice the marital deduction so as to more nearly approximate the community property holdings of married persons. Community property states in addition to California and Texas are Arizona, Idaho, Louisiana, Nevada, New Mexico, and Washington. New Mexico was not included because of the special treatment given community property at death (see STATISTICS OF INCOME 1962 -- PERSONAL WEALTH, p. 74).
The mortality rates underlying the estimates in the table are described in detail in STATISTICS OF INCOME, 1969 -- PERSONAL WEALTH, p. 75. See also pp. 57–58 of that same report, where data on Top Wealthholders are presented by State

Generally (except for insurance), whatever property is acquired by the efforts of either the husband or wife during marriage belongs to the marital community, and not to the husband or wife separately. Property acquired either before marriage, or after marriage by gift or inheritance, usually is considered the separate property of the spouse who acquired it and is taxed as such. For estate tax purposes, only half the community property at date of death is included in the gross estate of the decedent. Community property was not shown separately in the estate tax statistics for 1969; therefore, the crude approximation, total assets less twice the marital deduction, was created.

Table 2 -- Percentage Distribution of 1969 Top Wealthholders by Size of Economic Estate

| Size of Economic Estate (in dollars) | Estimates of Top Wealthholders for 1969 Under Differing Mortality Assumptions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Number of Top Wealthholders (in thousands) | 4,964 | 7,355 | 8,124 | 6,139 | 6,904 | 5,342 | 5,187 | 7,703 | 8,506 | 6,424 | 7,171 | 5,587 |
| Percent | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| 60,000 under 80,000 | 23.90 | 23.94 | 23.88 | 24.00 | 24.15 | 24.05 | 23.29 | 23.31 | 23.27 | 23.36 | 23.52 | 23.40 |
| 80,000 under 100,000 | 18.88 | 19.03 | 18.98 | 19.02 | 18.69 | 19.01 | 18.95 | 19.08 | 19.02 | 19.10 | 18.77 | 19.11 |
| 100,000 under 150,000 | 26.95 | 26.97 | 26.96 | 26.96 | 26.46 | 26.96 | 27.28 | 27.34 | 27.32 | 27.33 | 26.83 | 27.32 |
| 150,000 under 200,000 | 11.44 | 11.40 | 11.36 | 11.43 | 11.32 | 11.45 | 11.61 | 11.57 | 11.52 | 11.61 | 11.50 | 11.64 |
| 200,000 under 300,000 | 8.92 | 8.91 | 9.00 | 8.84 | 9.26 | 8.78 | 8.97 | 8.96 | 9.04 | 8.88 | 9.32 | 8.82 |
| 300,000 under 500,000 | 5.67 | 5.59 | 5.63 | 5.59 | 5.73 | 5.59 | 5.65 | 5.57 | 5.62 | 5.56 | 5.69 | 5.56 |
| 500,000 under 1,000,000 | 2.88 | 2.83 | 2.86 | 2.82 | 3.03 | 2.81 | 2.89 | 2.84 | 2.88 | 2.83 | 3.00 | 2.81 |
| 1,000,000 under 2,000,000 | 0.93 | 0.90 | 0.91 | 0.92 | 0.94 | 0.92 | 0.95 | 0.92 | 0.92 | 0.93 | 0.95 | 0.95 |
| 2,000,000 under 3,000,000 | 0.21 | 0.20 | 0.20 | 0.21 | 0.21 | 0.21 | 0.19 | 0.18 | 0.19 | 0.19 | 0.19 | 0.19 |
| 3,000,000 under 5,000,000 | 0.12 | 0.12 | 0.12 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.12 | 0.11 | 0.12 | 0.11 |
| 5,000,000 under 10,000,000 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 |
| 10,000,000 or more | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 |

Note: Economic estate is gross estate less lifetime transfers, debts and mortgages, and policy loans on insurance. The full face value of the insurance is included, not just the equity amount. The multipliers used in making the estimates were constructed by Smith in his work for 1969. Column-by-column notes are provided on the next page.

MULTIPLIERS FOR EACH COLUMN OF TABLE 2

Column

(1) - Reciprocals of 1969 white age-sex-specific mortality rates.

(2) - Reciprocals of age-sex-specific mortality rates based on the experience of the Metropolitan Life Insurance Company with preferred risk whole life policies. The policy is issued in minimum amounts of $5,000 (later $10,000). The experience over the period 1964 to 1969 was used, but only policies issued before 1960 and which had been in force a minimum of six years were considered. Because the insured were predominantly male, rates for females were calculated by assuming that the same ratio of male to female mortality existed as in the white population in 1969.

(3) - Reciprocals of age-sex-specific mortality rates based on the Metropolitan Life Insurance Company's experience with the broader Preferred Risk category issued since 1960. The policy is issued in a minimum amount of $25,000. Because insured rates were for males, female rates were estimated in the same manner as in (2).

(4) - Reciprocals of age-sex-specific mortality rates calculated by splitting the difference between the rates of (2) and a set of modified occupational class mortality rates based on the work of Moriyama and Guralnick for ages 20-65. For age 65 and on, the rates were calculated by splitting the difference between the rates of (1) and (2).

(5) - Reciprocals of age-sex-specific mortality rates calculated in the same manner as (4), by with the rates of (3) substituted for those of (2).

(6) - Reciprocals of age-sex-specific mortality rates based on the occupational mix of wealth ($600,000 or more) Washington, D.C. decedents in 1967. Due to insufficient observations for ages less than 35 the average of Moriyama and Guralnick's top two occupational classes updated to 1969 were used. For ages 65 and over, (1) rates were used because social class differentials were believed to have disappeared.

(7) - Reciprocal of the rates from (1) adjusted for marital status differentials based on the work of Klebba ("Mortality from Selected Causes by Marital Status," Vital and Health Statistics, Series 20, Nos. 8a and 8b, 1970).

(8) - Reciprocals of the rates from (2) adjusted for marital status differentials.

(9) - Reciprocals of the rates from (3) adjusted for marital status differentials.

(10) - Reciprocals of the rates form (4) adjusted for marital status differentials.

(11) - Reciprocals of the rates from (5) adjusted for marital status differentials.

(12) - Reciprocals of the rates from (6) adjusted for marital status differentials.

# Improving Wealth Estimates Derived From Estate Tax Data

*by Janet McCubbin*

The estate tax multiplier method may currently be the best available estimator of the personal wealth of the U.S. population of individuals with total assets greater than the estate tax filing requirement. In this method, values from the estate tax return are multiplied by the inverse of an appropriate age and sex specific mortality rate to provide an estimate of wealth for the living population. This method has certain advantages over survey methods, but it may tend to underestimate the number and net worth of the wealthiest individuals. Much of the ongoing research at the Statistics of Income Division of the IRS is focused on enhancing the quality and usefulness of data extracted from estate tax returns, and on improving the accuracy of the multipliers used. A variety of approaches aimed at developing better wealth estimates is being explored; three of these are described in this paper.

While the estate tax code has been fairly consistent over time relative to some other tax law areas, several notable changes have been legislated during the past decade. Data collectors and data users should be aware of these alterations as they can cause subtle or sometimes dramatic changes in the nature of the data. Because a basic understanding of the estate tax code and changes to it is necessary for intertemporal analysis of the data, a review of some aspects is presented here.

Estate multiplier estimates may be too low if assets as reported on the returns are undervalued or if they are omitted from the returns. In the interest of timeliness, data are extracted from returns before they are audited. However, developing an adjustment factor that reflects observed changes in net worth figures as a result of the audit process should reduce the downward bias in estate multiplier estimates. A pilot study of post-audit information is being conducted and preliminary results are discussed in the second section of this paper.

Finally, supplementary sources of data may be used to evaluate and correct for the underenumeration of wealthholders and possibly the undervaluation of assets. One available source is the listing of 400 of the wealthiest Americans published annually in Forbes. Analysis of this data set, including exact-matching with the estate tax returns of decedents from this group, is ongoing. Results to date are discussed in the third section of the paper.

## ESTATE TAX LAW CHANGES

In order to compare wealth estimates produced by different organizations, it is necessary to understand differences in the ways in which assets are defined and valued. Similarly, when considering wealth estimates produced over time by the Internal Revenue Service, it is necessary to note how tax law changes have affected the types of assets reported and the valuation of those assets.

New tax provisions sometimes affect the estimates directly by redefining what assets are to be reported on the estate tax return. For example, the 1976 Tax Act required that all transfers made within 3 years of death be included in the total gross estate. This increases the net worth figure directly. In addition, a new provision may affect wealth estimates indirectly, by influencing the behavior of taxpayers. If, as a result of the requirement discussed above, taxpayers alter their patterns of gift-giving, other asset categories would be affected indirectly.

Finally, new legislation might redefine the population of taxpayers. For 35 years, the estate tax law required that a return be filed for any decedent with a gross estate of $60,000 or more. That filing requirement has increased annually since 1977. For those dying in 1987, it will be $600,000. This has, of course, drastically reduced the size of our population. Statistics of Income estimates are now limited to a much smaller portion of the wealth distribution curve. [1]

The Tax Reform Act of 1976 became effective on January 1, 1977. Since it pertains to individuals dying after December 31, 1976, its changes will be most evident on returns received after September 1977. (Returns are due to be filed within nine months of death unless an extension is granted.) The Economic Recovery Tax Act of 1981 (ERTA) is effective for individuals dying after December 31, 1981, except for some retroactive changes. Effects resulting from ERTA will be most evident on returns filed after September 1982. Changes in the estate tax law mandated by the Tax Reform Act of 1976 and the Economic Recovery Tax Act of 1981, which have the potential for significantly impacting estate tax multiplier estimates, are discussed below.

### The Tax Reform Act of 1976

The Tax Reform Act of 1976 was the first major revision of the estate tax law since its inception. Several components of the revision which had important implications for estate tax data are reviewed below. [2-4]

The Unified Rate Schedule, Unified Credit and Filing Requirement.--One of the most sweeping changes mandated by the 1976 Act involved the revamping of the basic structure of the estate and gift taxes. For those dying prior to January 1, 1977, gift tax rates were lower than estate tax rates, and the rate at which an estate was taxed was independent of the amount of gift taxes previously paid by the decedent. Estate planners could cushion the impact of progressive estate tax rates and take advantage of lower gift tax rates by transferring property before death rather than at death. The very wealthy benefitted most from this strategy, as they could afford to transfer large amounts of property prior to death.

The 1976 Tax Act unified the estate and gift tax schedules. Transfers made after December 31, 1976, that are not included in the total gross estate, are added to the taxable estate, in order to determine the rate of taxation. (Gift taxes paid on such transfers are then subtracted from the gross estate tax.)

A unified credit was developed to replace the exemption which was previously used to calculate the estate tax due. The exemption, which was applied to the gross estate before the tax computation, was especially favorable to wealthier individuals because it provided a tax savings from the higher tax brackets. The unified credit, which is subtracted from the gross estate tax after the computation of the tax, constitutes a savings from the lower tax brackets. At the same time, the filing requirement was increased from $60,000 to $175,000 over a period of five years. The unified credit was increased in a similar manner.

| Year of Death | Filing Requirement | Credit |
|---|---|---|
| 1976 | $60,000 | N/A |
| 1977 | $120,000 | $30,000 |
| 1978 | $134,000 | $34,000 |
| 1979 | $147,000 | $38,000 |
| 1980 | $161,000 | $42,500 |
| 1981 | $175,000 | $47,500 |

These changes, designed to bring tax relief and fairness to small and medium estates, affect wealth estimates by removing smaller estates from the population. However, our estimates derived from estates above the filing requirement should not be affected, except to the extent that gift-giving is influenced by the unification of the estate and gift tax schedules.

Transfers within Three Years of Death.--Prior to 1977, transfers of property made within 3 years of death were assumed to have been made in contemplation of death and were includable in the gross estate. The executor of the estate could contest the presumption that a gift was made in contemplation of death and sometimes have the value of the transfer removed from the estate. This rebuttable presumption led to a significant amount of litigation. The Tax Reform Act of 1976 amended section 2035 to include in the gross estate all transfers made within 3 years of death, other than bona fide sales, regardless of the decedent's motivation.

In addition, any gift tax paid after December 31, 1976, and within 3 years of death, was also includable in the gross estate. Prior to 1977, gift taxes reduced the total gross estate by the amount paid, regardless of the timing of the transfer. The abolishment of the rebuttable contemplation of death presumption and the inclusion of the gift tax "gross-up" rule served to simplify the valuation of estates and to remove the incentive to make death-bed transfers for the purpose of tax avoidance.

The effect of the changes in the treatment of transfers on wealth estimates is undoubtedly complex. Under the 1976 Act provisions, more transfers are includable in the gross estate and the gift taxes on these transfers are also includable. Thus, we might expect the amount of transferred wealth reported on the estate tax return to increase. Yet, since the tax advantages of making death-bed transfers are eliminated, the amount of transfers might decrease. This would result in a decrease in the wealth reported as transfers and some increase in the wealth reported as other types of assets. The overall effect, regardless of whether or not there is a decrease in gift-giving, should be some increase in the total gross estate. (The extent of the effect is at least partially dependent upon the extent to which individuals make transfers to minimize taxes.)

Joint Property Held by Spouses.--Prior to 1977, the total gross estate included the entire value of property held by the decedent as a joint tenant or tenant by the entirety with a spouse, except for the portion of the property attributable to consideration furnished by the survivor. The 1976 Act replaces the "consideration furnished" rule with a "fractional interest" rule for qualified joint interests. Under the "fractional interest" rule, only one-half of property held entirely by the decedent with a spouse is includable in the gross estate, provided that: the tenancy was created after December 31, 1976, by the decedent, the spouse or both and the creation of the interest constituted a completed gift for gift tax purposes. (Spouses are permitted to dissolve joint interests and recreate them after December 31, 1976, in order to take advantage of the new law.) The donor must have elected to treat the joint tenancy of real property as a taxable event, even if no gift tax is paid due to the annual exclusion, marital deduction or application of the unified credit.

While the entire value of joint property assets is often referred to on Schedule E of the estate tax return, only one-half of the value of a qualified joint interest must be included in the total gross estate. Therefore, our net worth estimates will be reduced to the extent that such interests are created. This reduction may be partially offset by the inclusion of one-half of the property as transferred wealth, when a qualified joint tenancy is created by a decedent within 3 years of death. The net worth of surviving spouses is not affected by the provision, as the entire property will be includable in the surviving spouse's gross estate, if it was not disposed of prior to death.

Special Use Valuation.--Prior to 1977, all assets in the gross estate were included at their fair market or "highest and best use" value. This created severe liquidity problems for some farmers and owners of closely held businesses, forcing them to sell their inherited property in order to pay the estate taxes on it. The 1976 Act allowed executors to refer to the capitalization of earnings or similar methods, as well as to the fair market value, when valuing assets and thereby reduce the value of the property by up to $500,000.

To qualify for special use valuation, the decedent and the heirs must meet stringent requirements regarding citizenship, the size of the property relative to the total estate and

the use of the property prior to and subsequent to the time of death. Because of the specific requirements allowing for special use valuation and the limitation of the reduction to $500,000, the effect of this provision on wealth estimates may be slight and is more significant for smaller estates.

The generation-skipping transfer tax also first appeared in the 1976 Act; however, because of subsequent, ongoing revisions and problems with compliance, the eventual effects of this tax are not yet apparent.

The Economic Recovery Act of 1981

The Economic Recovery Tax Act (ERTA) mandated the next significant estate tax code revisions. Those which are likely to have affected IRS data are discussed here. [5,6]

The Filing Requirement, Unified Credit and Tax Rate.--The 1976 Tax Act increased the estate tax filing requirement from $60,000 to $175,000 over a period of 5 years. ERTA provided for further increases in the filing requirement and corresponding unified credit.

| Year of Death | Filing Requirement | Credit |
|---|---|---|
| 1982 | $225,000 | $ 62,800 |
| 1983 | $275,000 | $ 79,300 |
| 1984 | $325,000 | $ 96,300 |
| 1985 | $400,000 | $121,800 |
| 1986 | $500,000 | $155,800 |
| 1987 and after | $600,000 | $192,800 |

In addition, ERTA decreased the maximum estate and gift tax rate from 70 percent to 50 percent over 4 years beginning in 1982 and enlarged the highest tax bracket to include taxable transfers of $2.5 million or more, rather than $5 million or more. (The Tax Reform Act of 1984 delayed the effective year of the final reduction by 3 years.)

The increase in the filing requirement will further limit estate tax multiplier estimates to the very wealthiest Americans. Taxpayer response to lower estate tax rates is another subject worthy of consideration. Given lower tax rates, taxpayers may decide to avoid the inconvenience of sheltering assets and,thus, more wealth would be reported on the estate tax return.

The 1981 Act also increased the annual gift tax exclusion from $3,000 to $10,000. This increase should induce individuals to make more lifetime transfers, thus resulting in some decrease in estate multiplier estimates, as assets are removed from the estate.

Interspousal Transfers and Joint Property.--The 1981 Act drastically liberalized the treatment of interspousal transfers, eliminating limits on estate and gift tax marital deductions. After December 31, 1981, individuals can transfer unlimited amounts to their spouses tax-free. (The Act includes a transitional rule to address marital deduction clauses in wills executed or trusts created before 30 days after the enactment of ERTA.) Provisions which prohibit estate and gift tax deductions for transfers of community property between spouses were removed. Furthermore, only one-half of the value of joint property owned by spouses with rights of survivorship must be included in the total gross estate, regardless of which spouse furnished consideration for the property or the purpose for which the property is used.

Certain lifetime income interests granted to spouses may also pass tax-free. To qualify for this Qualified Terminable Interest Property (QTIP) deduction, the decedent's executor must make an election. No person may have the power to appoint any part of the property before the second spouse's death. The property is taxed when the second spouse disposes of it or dies.

Since the marital deduction is taken after the computation of the total gross estate, the deduction will not directly affect the wealth observed after the death of the first spouse. However, it is possible that the total gross estate figure will increase somewhat if taxpayers, able to pass an entire estate to a spouse tax-free, shelter fewer assets. In addition, since wives are more often the surviving spouse, wealth estimates for women may increase, as husbands minimize estate taxes by bequeathing more assets to their wives and fewer to children or other beneficiaries. Under ERTA, the gross estate figure will be lower for some owners of joint property (those who furnished consideration), and higher for others, than it would have been under previous law.

Transfers within Three Years of Death.--Under the 1976 Tax Act, all gifts made within 3 years of the donor's death were to be included in the gross estate at their value as of the date of death or as of the alternate valuation date. Under ERTA, only certain gifts made within 3 years of death are included. These are gifts of life insurance, gifts in which life estates are retained, gifts in which the decedent had a reversionary interest, revocable transfers and gifts of general powers of appointment.

This change will lead to some decrease in our net worth estimates. Gifts within 3 years of death will still be taxed when the gift is made, and the gift tax paid will still be included in the total gross estate, but the value of the transferred property will not be included in the total gross estate. Patterns of gift-giving will probably not be significantly affected. (Under ERTA, estates will only be saved the tax on the appreciation of property which occurred between the date of the gift and the date of death.)

Special Use Valuation.--ERTA liberalizes the special use valuation provisions enacted in 1976. The changes are generally retroactive to January 1, 1977. The amount by which the value of farms and closely held businesses may be reduced is increased from $500,000 to $750,000 over 3 years. The liberalization of these provisions will reduce our net worth estimates to the extent that more estates will qualify for special valuation and that some estates will be allowed larger reductions in property values.

Summary

The discussion here of indirect effects on our

estimates is not supported by theory or empirical evidence; yet, it is important to consider such possibilities, especially when using estate tax (or other IRS) data for intertemporal analysis. It is also necessary to consider legislative changes when evaluating the ability of the estate multiplier method to estimate the distribution of wealth in the United States.

## POST-AUDIT DATA

As previously noted, estate tax multiplier estimates of wealth produced by the Internal Revenue Service are based on data edited from estate tax returns before the returns are audited. All estate tax returns are examined by the Service, but in the interest of timeliness, returns are edited for statistical purposes prior to the audit process. While it has long been recognized that asset valuations might change significantly during the audit, no review of these changes has been conducted in recent years. [7] A pilot study of post-audit returns is currently being conducted by the Internal Revenue Service. Returns are being examined to evaluate the nature and magnitude of changes in the valuation of assets made by auditors using these data. We may be able to develop adjustment factors to apply to estate data to compensate for inaccuracies in reporting by taxpayers.

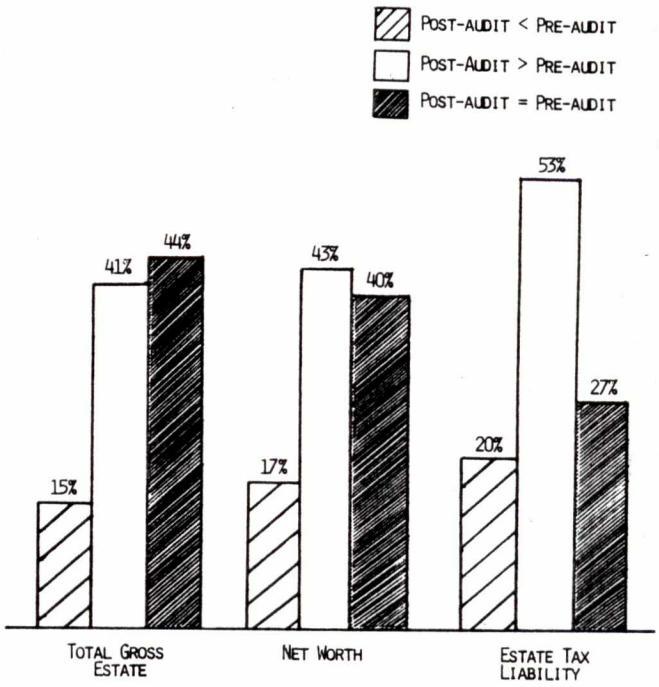
Currently, returns filed in 1983 at two IRS service centers are being examined. It was determined that returns filed in 1983 would be old enough to have completed the audit process, yet recent enough to provide insight applicable to future wealth estimates. In addition, there are also personal wealth estimates available which are focused on this filing year. [8] These returns represent primarily individuals dying in 1982. The estate tax filing requirement in that year was $225,000.

One hundred thirty-seven returns have been sampled thus far. Eighty-three percent of the returns are for estates with at least $5 million in assets. All of the returns with at least $5 million in assets, from the two IRS service centers involved, are included in the sample; the sample does not include any returns with less than $500,000 in the gross estate. Seventy-two percent of these returns have been received and examined; we expect to receive the remaining returns shortly.

### Preliminary Results

Figure 1 shows the frequency and direction of changes in the total gross estate, net worth and estate tax liability. Thus far, the post-audit differences we have observed have been smaller than expected. Aggregate net worth, defined as the total gross estate less debts and mortgages, increased by about 2 percent. If we consider only the cases for which net worth increased, the increase was over 4 percent. A fair amount of the 2 percent increase in aggregate net worth is due to a 1.7 percent decrease in debts and mortgages allowed as deductions. Of the assets, the largest increases were to real estate (1.8 percent), corporate stock (1.9 percent) and miscellaneous assets (4 percent). In addition

Figure 1.--Direction and Frequency of Change: Pre-audit Versus Post-audit Amounts




to personal effects and automobiles, this miscellaneous category includes some types of property which are difficult to value, such as artwork, mineral rights and royalties.

As you might expect, some assets, including bonds, cash, insurance and annuities, are relatively easy to value and are only rarely subject to significant changes. Harriss estimated "that probably one-third to two-fifths of gross taxable estates consist of property presenting no significant valuation problems." [9] In the newer data, real estate, corporate stock and miscellaneous assets make up over 75 percent of the aggregate total gross estate. The value of each of these assets changed in about 26 percent of the returns examined. While these assets are more likely to be revalued than others, auditing apparently does not significantly change the portfolio distribution of assets.

In addition, auditing does not significantly change the size distribution of aggregate wealth. While larger estates may be scrutinized more vigorously by IRS examiners, they do not seem to be revalued more frequently nor are the changes in the gross estate proportionately larger than those made to smaller estates. This may be because larger estates had, on average, proportionately larger marital and charitable deductions. Estates with less than $5 million in assets claimed, on average, marital deductions of 22 percent, while estates of $5 - 7.5 million and estates of greater than $7.5 million claimed marital deductions which averaged over 23 and 37 percent, respectively.

Again, the valuation changes are somewhat smaller overall than expected. Perhaps the differences in asset values before and after audits are not significant. It would, though, be premature to conclude this after examining only 98 returns. Most of the returns not yet

examined are for estates with at least $5 million in assets. Some of the most complicated returns must still be retrieved from district offices. Most of these remaining returns will probably have been subject to some change during auditing.

But still, perhaps the returns reviewed thus far are a representative sample of our population of returns. Why, then, are the percentage changes so low? One reason is that because of the complexity of the estate tax laws, many estate tax decedents have designated professional executors and tax form preparers. As Harriss noted, "The widespread participation of corporate and professional legal fiduciaries in executing estates, therefore, probably insures a high minimum level of integrity in estate tax compliance." [10] Secondly, inaccuracies in reporting which result from ignorance or computational errors should not be biased toward over- or underestimation. The current study of returns seems to support this assumption.

Of course, the accuracy of post-audit valuations must also be considered. Indeed, the audit process is designed to increase tax revenues, rather than to provide a more accurate valuation of every estate. While every return is examined, field audits are not always conducted. (This review is, however, more thorough than the review of individual income tax returns, only a fraction of which are examined for anything other than mathematical accuracy and consistency.) Efforts to increase the value of smaller estates may not be pursued, when such efforts are obviously not cost effective. Even very large estates may escape increases in the gross estate when such changes would not lead to increases in tax, due to corresponding increases in marital or charitable deductions. Of the cases in which the value of the estate was changed, the aggregate gross value of estates claiming marital deductions of 50 percent of the gross estate or less changed by nearly 4 percent; the value of estates in which the marital deduction exceeded 50 percent of the gross estate changed by less than 2 percent. Even when a change in the value of an estate does occur, it may be the result of a compromise between the auditor and the executor, rather than an increase which the auditor believes to be absolutely correct. (In fact, only one of the cases reviewed was litigated and in nearly every case, an agreement was secured with the executor.)

Despite these factors and the small magnitude of change observed thus far, we are convinced that a bias towards the underestimation of estates exists. A review of audited returns provides at least some indication of the size and nature of this bias. That information can then be used to adjust our data and yield more accurate wealth estimates.

### Future Plans

At this time, we do have plans to expand the post-audit study. The first step will be to retrieve and examine the remaining returns already sampled. At that point, our sample will consist of about 140 returns, most of which were filed for decedents with at least $5 million in the gross estate. Next, we will probably expand the study in two ways, by including additional service centers and by sampling more returns with less than $5 million in the gross estate. After the data are analyzed, we should be able to develop the adjustment factors to at least partially correct for the undervaluation of estates. Finally, we would, of course, need to update these adjustment factors periodically.

## USING OUTSIDE SOURCES TO ENRICH ESTATE TAX DATA

Other efforts to improve wealth estimates involve using sources outside of the Internal Revenue Service for additional financial and demographic information. One such source is Forbes magazine and its annual listing of the 400 wealthiest Americans. [11] The demographic information provided allows us to evaluate the changing nature of the population of very wealthy individuals. In addition, while the reliability of their net worth estimates is limited, direct comparisons of the information published in Forbes with the figures reported on estate tax returns may provide clues about the types of assets and amounts of wealth not fully captured by our current estimation techniques. In addition, data from Forbes are a particularly useful supplement, as they focus on very wealthy individuals. Current IRS estimates associated with these economically powerful individuals suffer from large variances, due to the small sample sizes.

Forbes has published a report on wealthy Americans each year since 1982. This information, gathered by a small group of Forbes staff members, is obtained from public documents, published information and interviews with financial experts. They also try to contact the 400 members themselves, although many, of course, do not respond. Tabulations of the data published in Forbes have been completed. These are classified according to demographic characteristics including age and sex.

The estate tax returns of members of this population are examined as they become available. There are currently less than 50 known decedents from the population. Most of these individuals were still listed among the 400 wealthiest Americans at the time of their death. Approximately 30 returns have been examined; less complete information is available for several additional individuals. The summary statistics presented here are based on all of these decedents, except where otherwise indicated.

### Preliminary Results

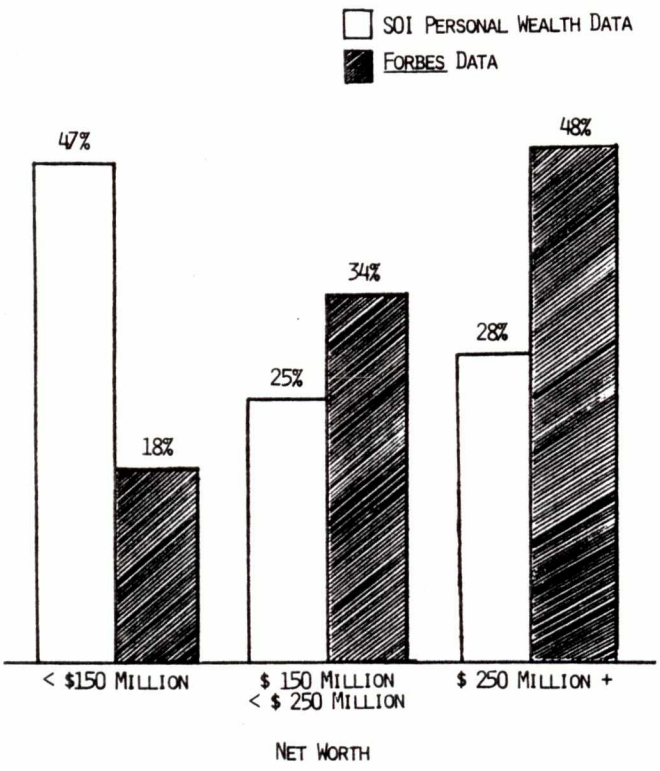
The estate tax mean and median figures are lower than the Forbes figures. The examination

| Net Worth | Estate Tax Data | Forbes Data |
|---|---|---|
| Mean | $ 114,134,312 | $ 199,000,000 |
| Median | $ 94,694,396 | $ 170,000,000 |

of returns revealed that Statistics of Income estimates were, on average, 35 percent lower than estimates published in Forbes. (The figures on several returns were not comparable due to major financial changes, such as the sale

of family-owned businesses, occurring during the time elapsed between the two estimations.) The net worth figure reported on the estate tax return was less than the estimate appearing in Forbes in 79 percent of the cases. Figure 2 shows the distribution of IRS net worth figures versus the distribution of Forbes net worth estimates for the decedents studied. Nearly

Figure 2.--Percentage Distribution of Net Worth by Net Worth Size Class: Forbes Versus IRS




half of the wealth reported on the estate tax returns (47 percent) is held by decedents with less than $150 million. As the bar graph shows, the distribution of wealth as reported by Forbes peaks much later.

Certainly many factors contribute to these differences in valuation. Forbes' researchers assume that "the separate elements of ownership (control of principal, receipt of income, power to name heirs, etc.) are deliberately spread among different people to defend against the inheritance tax laws." [12] Thus, they generally attribute the wealth of spouses and other family members to a principal family member. Similarly, assets in trust are generally assigned "to the person who created the wealth, where still alive and in control, or to the principal controlling family member where he is not." [13] (Irrevocable charitable trusts are not considered to be personal wealth by Forbes' researchers, even where they are used to retain control of family companies.)

On the other hand, the estate tax law is quite specific in determining what constitutes legal ownership. In addition, some types of assets are not required to be reported on the estate tax return or are not required to be reported at their full value. For example, only one-half of most jointly owned property is included in the estate. Not surprisingly, when net subtractions for jointly owned property (reported on Schedule E of the estate tax return) are added back to the values of the estates, the net worth figures are, on average, only 28 percent lower than those published in Forbes. (This adjustment is applicable to approximately one-third of the estates.)

In addition to ownership and valuation issues, the timing of the two sets of estimates must be considered. Forbes' estimates are usually published in October. The cutoff date for 1986 was September 12. [14] The estate tax valuation date for the individuals studied ranged from 33 months to less than 1 month after the valuation for the Forbes estimate. The average length of time between the two estimates is approximately 10 months. (Eighty-nine percent of the estates were valued as of the date of death; the alternate valuation date, defined as 9 months after the date of death, was elected for the others.)

We would expect the wealth of these individuals to increase over time, and the lower cutoff value of the living Forbes population has indeed increased in every year except 1985. However, the average age of these decedents at the time of death is about 81 years. A number of them have undoubtedly distributed a significant portion of their assets to family members or other beneficiaries prior to their deaths. (As noted before, some of these distributions are so complete that the two estimates are not comparable.) Thus, we might expect the estate tax figures to be lower.

Finally, we have also taken note of all of the estate tax returns filed for very wealthy individuals dying after the first Forbes report was published. Sixty-one percent of those individuals with estates of $60 million or more and 47 percent of those with $100 million or more never appeared in Forbes. These individuals may have held assets which Forbes was unable to uncover. The timing issue discussed earlier may also have contributed to these differences in the two populations. At any rate, we will have to consider these factors when using Forbes data to model the wealth distribution curve.

## Future Plans

Despite the differences in the units and items measured and in the timing of the estimates, we feel that supplementary sources of data such as that published in Forbes can enhance our understanding of the population of very wealthy Americans. Future plans for this effort include reviewing Forbes' work as it is published. We are also continuing to track the decedents from this group. In addition, we are using other outside sources to supplement our data. Recent work by Scheuren and McCubbin describes some of these developments. [15]

## CONCLUSION

The recent ongoing work at IRS has reenforced our opinion that the estate tax multiplier

method may currently be the best available estimator of the personal wealth in the U.S. population, for individuals above the estate tax filing requirement. Nevertheless, we realize that this method probably tends to underestimate the number and net worth of the very wealthiest individuals. The variety of approaches discussed here is aimed at developing better wealth estimates. The post-audit and Forbes projects are both just beginning and the data presented here are preliminary. Yet it appears that information available from these sources will be useful. The post-audit study and the use of data collected by Forbes and others will continue to be part of our research program, as will the evaluation of any changes to the estate tax code. The results of these efforts and the cooperation we are receiving from researchers outside the IRS should ensure that the quality of our data will continue to improve.

## ACKNOWLEDGMENTS

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# Piecing Together Personal Wealth Distributions

*by Fritz Scheuren, Ph.D and Janet McCubbin*

The American economy is undergoing enormous stress, brought about by forces that are of a size unprecedented in history. Large trade and budget deficits come readily to mind. Concerns about the Society's long-run international competitiveness exist, as well. Savings rates in the United States have historically been low and appear to be getting lower [1]. What to do about all this is unclear, especially since various industrial sectors seem to be affected to a greater or lesser degree [2].

Various nostrums have been proposed and, in some cases, may even be having a beneficial effect. For instance, the new emphasis on quality in the manufacturing sector is one response that may have started to work, although American goods have a long way to go in many areas [e.g.,3]. There is a widespread belief that the massive tax law changes of the 1980's will also help, particularly the 1986 Tax Reform Act [e.g., 4]. Cuts in marginal rates, for example, should confer at least a short-run advantage on most American businesses.

With all this change in the American economy, how well are we "keeping score?" On a "macro" level, of course, we have the National Income and Product Accounts prepared by the Bureau of Economic Analysis and the "Flow-of-Funds" accounting done by the Federal Reserve Board (FRB). These measures, while subject to weaknesses, have served to monitor economic trends in income and wealth reasonably well. It may be time, however, to heed calls for an integrated approach [5], combining both macro- and microdata [e.g., 6].

A great many of the elements are in place. The Census Bureau's new Survey of Income and Program Participation (SIPP) clearly is a major step [7]. Advances in the measurement of income in the Current Population Survey also are an important factor [8]. Renewed emphasis on improvements in the National Income and Product Accounts is encouraging [9]. In addition, the Federal Reserve Board is undertaking a thorough re-examination of the methodology underlying its "Flow-of-Funds" accounting [10].

Of most interest at this session is the renewal of the Federal Reserve Board's interest in using survey techniques to measure the distribution of wealth [e.g., 11]. The 1962 wealth study by the Board, which was conducted by Dorothy Projector and Gertrude Weiss [12], was a milestone in this area. The 1983 FRB study, as we have heard at this session, offers great promise as a new beginning of what is hoped will be a more regular measurement of wealth by the Board. In both of these FRB efforts the Internal Revenue Service (IRS) offered support. While this cooperation was considerable, in many ways it has been incomplete. (The estate multiplier wealth estimation periodically done at IRS has, until very recently, been carried out as a separate, stand-alone activity.)

This paper addresses a number of the issues that need to be faced if IRS information is to play a larger role in measuring wealth. Our goal, however, is not to set out a detailed agenda for research, but to suggest areas where more work might lead to improvements. While the main focus of the remarks made is on the upper tail of the wealth distribution, there is also some discussion of the problems of measurement at lower ranges of the Lorenz curve, as well.

Organizationally, the paper is divided into five sections. The first section provides a framework within which the overall wealth distribution measurement problem might be set. Section 2 focuses on a general description of the history and limitations of the estate multiplier method. The paper by Medve [13], also given at these meetings, will be one of the sources drawn on here. Sections 3 and 4 further develop the concerns about estate multiplier limitations, specifically in terms of how the 1982 multiplier results relate to the 1983 Federal Reserve Board survey figures. Particular attention is given in these sections to the results found in the companion papers at these meetings by Schwartz [14] and McCubbin [15]. We conclude the paper in Section 5, with some observations intended to set the stage for considering what priorities should be given to the future work ahead.

## 1. WEALTH MEASUREMENT TYPOLOGY

The measurement of the U.S. personal wealth distribution can be looked at as consisting of three pieces:

- First, there is the bulk of the population, the nonwealthy. (Here we will define this group as persons with total gross assets of less than $500,000.)
- Next, comes those who have moderate but not great wealth. (In this paper we will define that group as individuals with gross assets of $500,000 but net worth of less than $10,000,000.)
- Finally, there is the very small group of exceedingly wealthy people, who are the hardest of all to measure. (Here we define these individuals as having net worth of $10,000,000 or more.)

A good survey vehicle is essential for the study of each of these groups but could profit from supplementation of various sorts [e.g., 16]. This would be true even if a multiple frame survey approach were taken, as in the 1962 and 1983 FRB studies. (For a description of the

1983 supplementary high-income sample, see [11] and [17].)

Nonresponse problems would undoubtedly remain, despite whatever improvements in field techniques might be made. Also, for the very wealthy, sheer sample size is an issue. In the 1983 FRB Study for instance, there were only 36 individuals in the sample aged 26 years or older who could be said to be very wealthy. (See Figure A.) Even in the absence of concerns about nonresponse biases and response errors, such a sample seems simply too small to be used alone; certainly this would be the case if the aim is to produce aggregate wealth estimates and concentration ratios.

FIGURE A.--Distribution of 1983 Federal Reserve Board Sample By Wealth Group

| Wealth Group | 1983 FRB Sample Adults | |
|---|---|---|
| | Number | Percent |
| Total..... | 6442 | 100.0 |
| Nonwealthy..... | 5569 | 86.4 |
| Moderately wealthy. | 837 | 13.0 |
| Very wealthy..... | 36 | 0.6 |

Source: Special unpublished tabulations prepared by the Federal Reserve Board.

Concerns about the measurement errors among those of moderate wealth exist as well, even though the sample size there might be judged by some as adequate; however, when looked at in terms of households, the 1983 FRB sample size of 837 adults falls sharply (to 478 households). In addition to potentially major nonresponse and response errors among this group, there is an inherent inefficiency in the sampling frame that needs to be addressed, since the income measures used were not always adequate proxies for wealth [18]. Improvements in the sample design of the high income cases will help here but are likely to fall short and the survey might profitably be supplemented through the use of other measurement devices. Indeed, as will be seen later in this section, we strongly recommend augmenting the sample of nonwealthy individuals in various ways, as well.

## Nonwealthy Individuals

The nonwealthy are such a large and diverse category that separating them into subgroups might be helpful. Four such divisions are made in Figure B and discussed below.

Least Affluent Group.--According to the 1983 FRB Survey, about one-fifth of the nonwealthy aged 26 years or older [19] had little, if any, assets and what they had consisted essentially of consumer durables and personal effects. The policy questions pertaining to this group may relate, not to an actual estimate of their wealth, but to their relative frequency in the population by age, sex, race, education and so on.

Included in this first group are individuals who also have small savings accounts and certain claims for income from private pensions, which indeed they may already be receiving. Again, the main questions concerning this group may relate not so much to their aggregate wealth as individuals, but to their relative frequency in various subpopulations. Welfare claims against society by members of these groups, whether real

FIGURE B.--Some Potential Information Sources on Income and Wealth of Individuals with Total Assets Less Than $500,000

| Wealthholding Group | Some Potential Information Sources on Income and Wealth |
|---|---|
| Individuals with less than $2,000 in financial assets and no home ownership. | Surveys, like SIPP and the FRB study, might be sufficient, supplemented possibly by Social Security Administration earnings and benefit information. |
| Individuals with less than $2,000 in financial assets plus some home ownership. | Survey information would again be the dominant source, but local tax assessment records could be helpful and the taxes paid and mortgage interest deductions on the Federal income tax return would be of value for itemizers. |
| Individuals with $2,000 to $10,000 in financial assets. | Survey information could be greatly augmented by Federal income tax records, possibly supplemented by social security benefit data. Direct use, through income capitalization or "gross-up" methods, would be possible, plus indirect help through post-stratification. |
| Individuals with $10,000 or more in financial assets | |

Source: Statistics on the size of these various groups shown in the text all came from unpublished tabulations made available by the Federal Reserve Board from its 1983 Survey.

or contingent, may need to be considered, as well as social security claims, actual or potential.

Survey vehicles would seem to be the best method of looking at this first group. The Census Bureau's Survey of Income and Program Participation (SIPP), in particular, may be suitable, especially since plans are to obtain Social Security Administration earnings and benefit data, so a social security wealth variable can be calculated [20]. The Federal Reserve Board survey would be an excellent source as well, although it is a lot smaller than SIPP and, hence, its results would be more limited [21]. On the other hand, the FRB survey has developed a method for estimating private pension wealth, something that SIPP does not now do. (By the way, adding social security variables to the FRB is possible and was proposed at one time for the 1983 study.)

Homeowners with Few Other Assets.--It may be useful to continue our "typology" of various wealth groups by looking next at homeowners with less than $2,000 in financial assets. In 1983, nearly 30 percent of all persons 26 years or older fell in this group.

With few exceptions, once individuals move from a position of having limited personal and consumer items, small savings accounts and cash-on-hand, plus some pension wealth, the next asset they often own is a personal residence of some sort. Important exceptions might be the very old or sole proprietors (who may have plowed all their resources into their businesses).

In the case of social security wealth, we have already seen the value of record linkages to administrative records; FRB pension data also made use of record linkage techniques [22]. With the home ownership variables, the use of record checks may be important to confirm the information being supplied. The use of tax assessment records and bank or other mortgage holder records would be a valuable device to build in routinely to the SIPP or FRB surveys. Tying in to tax assessment records provides a direct link between the survey data and similar estimates in the "Flow-of-Funds" accounting [23]. A concern that needs examination, particularly for real estate, is the question of who really owns the asset. The survey-supplied answer and the strict legal answer may differ. Tax assessment and bank records may help in this connection but could need supplementation; for example, powers of appointment might not be recorded and the information about transfers into trusts might also be incomplete. Determining an individual's share of jointly owned property (here and elsewhere) may be particularly tricky in some cases.

Wealthholders with Significant Income-Bearing Assets.--We are now ready to talk briefly about the remaining two nonwealthy population groups shown in Figure B. Both of these have significant amounts of income-bearing assets. Incidentally, based on the 1983 FRB Survey, these groups are of about equal size and collectively account for around half of the nonwealthy, aged 26 years or older.

The major new source of information we will consider is using the Federal income tax return. One approach might be simply to augment the survey data by a wholly separate sample, like the IRS Individual Tax Model [24]. The incomes shown on the returns could be capitalized or "grossed-up" to produce the corresponding asset values, as described in [25]. Direct record linkages of the survey data with tax returns might also be contemplated [26], if concerns about confidentiality and access can be overcome. In our judgment a combination of both of these approaches is needed.

The "gross-up" method is not just confined to incomes, but has been applied to real estate taxes as well; hence, we could improve our wealth estimates for less wealthy homeowners too, by linking to their Federal income tax returns. Certainly, the deductions for real estate taxes and mortgage interest may be of some value as a check of the reasonableness of the corresponding asset and liability amounts supplied on the survey.

Recent changes arising from the landmark 1986 Tax Reform Act make the "gross-up" approach even more attractive, in that interest from state and local bonds is now required to be reported. Valuing business assets may also be possible from the return, at least in the case of sole proprietorship holdings. The technique would be to employ detailed information on income and expenses from Schedule C and to use the net income flows, possibly for several years, as a way of valuing the asset. Linkage of tax and survey records here would be the key to such an approach, since we would need to calibrate the survey and tax sources to see that each was reasonable. (Incidentally, partnership income reported on Schedule E may also be a good starting point to calculating the value of that source of wealth, as well, provided we were willing to go back to the partnership returns for more information.)

It should be pointed out that "grossing-up" incomes like interest, dividends and so on has merit, but cannot be done separately, without regard to the individual's overall income position; this is because, as real incomes rise, investors tend to shift portfolios to assets that have smaller realized (i.e., taxable) flows, possibly deferring the remainder to be taxed as a capital gain or to be transferred (perhaps untaxed) to their heirs at death [27].

It is recommended, therefore, that the use of "grossed-up" data from income tax samples (like the IRS' Individual Tax Model files) should be adjusted, by using the survey data to obtain information about how the income-to-asset ratio changes as income or assets increase. Alternatively, the SIPP or FRB survey data, once linked to income tax records, could be post-

stratified to overall administrative aggregates developed using one (or more) "gross-up" techniques. Either method, plus hybrids, may have significant advantages in reducing sampling and nonsampling errors for wealth distribution data.

Difficulties in achieving high quality record linkages may be a problem, especially for the FRB survey; SIPP, though, has had outstanding success in obtaining good social security numbers [28]. The units problem--tax returns versus individuals versus households--also needs to be met head on. For SIPP and FRB, the family or household is the primary wealthholding unit. Based on our experiences in the 1973 IRS-CPS-SSA Exact Match Study of some years ago, we believe that, in most cases, the tax returns can be brought into alignment, but not always, since some members of tax units may be living separately. (Incidentally, it is conjectured that, when property ownership is joint with individuals not living together, the survey data on wealth, whether from FRB or SIPP, may suffer greater nonsampling errors because of confusion about who owns what.)

Moderately Wealthy Individuals

Individuals of moderate wealth are a fairly small group, consisting of less than 2 percent of the population of adults. Even so, with a multiple frame survey approach, like that employed in the FRB studies, reasonably large sample sizes can be achieved. Nonetheless, the use of additional sources of data appears particularly attractive because of the potentially large measurement errors that can arise.

Above the estate tax return filing threshold, the "grossed-up" income tax records can be augmented by direct wealth measurement for sources covered by the estate tax [29]. Estate data are invaluable, but their limitations should be kept in mind. Assets not covered by the estate tax return are items for which the individual had only a life interest: pension and annuity wealth, for example; incomes from trusts or other estates; and insurance claims on the life of the decedent from policies for which the decedent did not possess any incidents of ownership. Additional concerns exist in using the estate tax wealth measures, particularly with regard to the valuation of assets, like unincorporated business interests, that change their character as a result of the owner's death. The asset in life could be of potentially much greater value. Life insurance assets, includable in the estate, also have this problem but in the opposite direction, since the face value comes into the estate rather than the cash-surrender value. Finally, like the survey approach, the estate multiplier estimates have many sampling and nonsampling error issues of their own that need discussion, including which estate multipliers to use, how to deal with potential undervaluations by executors on the unaudited returns employed, and so on. These issues will be discussed further in the next two sections.

Very Wealthy Individuals

The very wealthy are an extremely small group of only a few thousand. Certainly survey estimates, despite supplementation by cases from a high-income frame, are entirely too sparse to be relied upon. In fact, while estate tax methods are still useful to a limited extent, even they break down for this wealthy group. We could look instead to approaches like that taken by Forbes [30], as well as to various extrapolation fitting procedures employing variants of the Pareto distribution. Taken together, especially if averaged over several years, these techniques may yield reasonable results. Somewhat more will be said about this in Section 5.

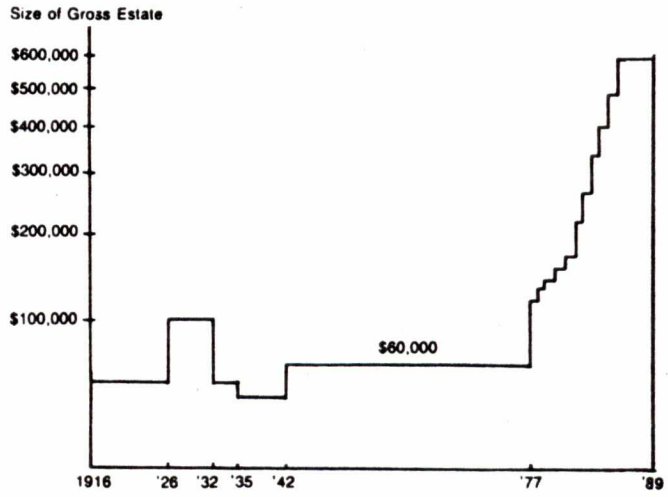
## 2. ESTATE MULTIPLIER ESTIMATION

Estimates of U.S. personal wealth from IRS estate tax returns have been made for decades using the so-called "estate multiplier technique." Actually, the technique appears to have originated in England, with the work of Baxter in the nineteenth century. Baxter used the inverse of the overall mortality rate to estimate total personal wealth from probate records [31]. In 1908, Mallet [32] modified the method by using age-related multipliers. His work has guided most subsequent researchers in Great Britain and elsewhere since then.

Wealth studies for the United States have focused on data from U.S. Federal estate tax returns. Many studies of less than National scope have also been conducted, using state and local inheritance tax and probate records. See, for example, [33].

The United States estate tax was instituted by the Revenue Act of 1916 for the dual purpose of producing revenue and redistributing wealth. As illustrated in Figure C, this legislation required estate tax returns to be filed for the estates of individuals who, at death, held gross

Figure C.--Estate Tax Return Filing Requirements: 1916-1989



assets exceeding an annual legal filing threshold. From the inception of the tax in 1916 until the 1970's, the minimum filing requirement ranged between $40,000 and $100,000; in fact, for most of this period it was set at $60,000. Since 1976, the minimum filing limit has been rising fairly steadily. By 1982 it stood at $225,000 and it reached $600,000 in 1987. (The limit is scheduled to be $600,000 in 1989 also, which is the next year that the FRB plans to conduct a major wealth survey.)

Using IRS tabulations, the first estate multiplier estimates made for the United States were by Mendershausen for 1922, 1924, 1941, 1944 and 1946 [34]. Mortality rates were adjusted based on data provided by the Metropolitan Life Insurance Company. In a later study, Lampman [35] produced a set of estimates for 1953. Lampman also conducted an extensive study of the wealth of estate taxpayers from 1922 through 1956. Smith produced estimates for 1958 [36], following the approach taken by Lampman. Scheuren [37] produced the first Internal Revenue Service personal wealth estimates (for 1962). Later, IRS wealth estimates were made by Crossed for 1969 [38] and Gilmour for 1972 [39]. In 1974, Smith and Franklin [40] revised the estate multiplier technique to produce new estimates of wealth for 1922 to 1969. Recently, estimates of estate tax wealth have been made for 1976, 1981 and 1982, largely by Schwartz and his colleagues [41]. Smith has also produced figures for some of those years [42]. In the remainder of this section we will go on to describe the estate multiplier method and point out some of its major limitations, especially those involving the calculation of the multipliers themselves.

## Basic Approach

To start things off, we might begin by noting that the estate multiplier method assumes that "death draws a random sample of the living population." This assumption allows one to apply statistical sampling theory to the result obtained by weighting estate tax return data by the inverse of the mortality rate characteristic of the demographic group from which the decedent was "selected."

Let $x_i$ be some measure of wealth, say corporate stock, taken from a sample of i = 1, 2, ..., n decedents, where the probability of "death's selection" is denoted by $\pi_i$. The estate multiplier estimator of the total

$$\hat{X} = \sum_{i=1}^{n} \left(\frac{1}{\pi_i}\right) x_i \qquad (2.1)$$

is then seen to be simply a conventional Horvitz-Thompson estimator [e.g., 43], where $\pi_i > 0$ for all n members of the population. (Incidentally, if the decedents are themselves a sample from all the returns available, then obviously our estimator should be of the form

$$\hat{X} = \sum_{i=1}^{n} \left(\frac{1}{\pi_i \, p_i}\right) x_i \qquad (2.2)$$

where the $p_i > 0$ are known return selection probabilities.)

Now the probabilities of dying, $\pi_i$ depend on the particulars of an individual's life state--age and sex are variables that come readily to mind. However, many other characteristics have also been shown to be factors, including marital status, geographic location, social class and, obviously, a whole host of health indicators.

The IRS estate multipliers typically have been adjusted to take account of only three variables: age, sex and social class. In terms of the typology of Section 2, the assumption has been made that, for a given age and sex group, the social class differential in mortality is the same for the moderately wealthy and the very wealthy. Technically, the effect of this is to treat the other factors in the selection as ignorable [44] or, more informally, to assume simply that they average out, so that $\hat{\pi}_i$ is unbiased.

Another way to look at this is to consider estate tax return sample averages by age and sex (weighted by the inverse of the design probabilities, $p_i$, if necessary). By assumption, these sample averages are unbiased estimators of the "true" averages in the corresponding living population of wealthy individuals of the same age and sex, no matter what multipliers are chosen.

This is an important observation because to date there is no completely satisfactory method of estimating the multipliers. IRS practice has been to follow the 40-year old precedent of Mendershausen and to employ Metropolitan's whole life series (initially, for those with $5,000 or more in coverage and, more recently, for persons with $25,000 or more). Controversy exists on this issue and, indeed, the work of Smith [e.g., 45] employs selection probabilities that are less favorable to the wealthy than those used by IRS. Empirical studies of plausible alternative selection probabilities show that, while overall wealth estimates are affected greatly by our lack of knowledge of these probabilities, wealth composition is not particularly sensitive to the probabilities chosen. Intuitively, the main reason for this appears to be the relative robustness of the sample averages by age and sex, combined with the fact that alternative multipliers tend to raise or lower selection probabilities in such a way that the possible weights behave like a family of curves, when plotted by age and sex, each of which is roughly parallel to those being used by IRS [46].

Scheuren [37, 47] and Schwartz [14] go into the details of the calculation of estimates for the $\hat{\pi}_i$. It seems unnecessary to rehash that material beyond noting that, for intertemporal comparisons, reasonable alternative multipliers will yield roughly the same trends, provided that the calculations at each point in time can be carried out in a consistent manner.

The issue of what multipliers to use may never be settled, but recent results from longitudinal studies of the population will allow us to recast the concerns which exist. For example, the National Death Index [48] could be linked to surveys like the National Longitudinal Survey [49] and the Retirement History Survey [50]. Both of these vehicles obtained asset information; if linked to the National Death Index, mortality differentials by wealth status (and a host of other factors) could be calculated [51]. A similar effort involving SIPP, or even the 1983 FRB Study, would also be desirable, if that could be initiated.

Variances and Other Limitations

If we assume that death's selections are, for the most part, independent from one individual to another, then there are a number of variance estimators available. For example, to estimate the variance of $\hat{x}$ as given by expression (2.1), we could employ [52]

$$\frac{1}{n(n-1)} \sum_{i \neq j} \left( \frac{1}{\pi_i p_i} x_i - \frac{1}{\pi_j p_j} x_j \right)^2 \qquad (2.3)$$

where the summation is over all different pairs of selections drawn in the sample. Another possibility that has been tried is balanced repeated replication [53], with months of death being paired based on overall similarities in mortality experience [54].

One problem with the Horvitz-Thompson variance estimator is that if we simply substitute $\hat{\pi}_i$ for $\pi_i$, we are effectively treating the multipliers as being without error. The balanced repeated replication approach, if the $\hat{\pi}_i$ are recalculated for each pair of months, is an improvement over expression (2.3), because it captures some of the variability of the $\hat{\pi}_i$; however, it severely restricts the degrees of freedom available.

Another variance estimator that might be more satisfactory, albeit much more work than either of the above, could be developed as follows:

- First, information about the variability of the $\hat{\pi}_i$ can be obtained from the data smoothing process that went into their estimation. A prior distribution also could be postulated for the $\pi_i$ explicitly bringing in our uncertainty about their true values.

- Second, we could then draw samples from the posterior distribution of the $\hat{\pi}_i$ and simultaneously make stratified bootstrap selections from the overall estate tax decedent file [55].

This approach has more the flavor of sensitivity analysis than the others; however, that seems entirely appropriate under the circumstances and may be well worth trying.

Before going on to the next section one other aspect of "death's selection," while obvious, may need to be underscored. It is simply that, by and large, death is not a random point in an individual's life. No amount of adjustment may fully compensate for this. For example, the effects of terminal illness may result in a smaller estate or a larger debt burden.

In a 1976 study [54] done at the Social Security Administration, it was determined that earnings for decedents became unrepresentative up to six years before death, with very sharp effects in the last two years or so. For a stock measure, like wealth, rather than a flow measure, like earnings, we speculated at the time that the effects would be much smaller. We are no longer so sure of this, especially given the recent advances in the prolongation of life. Certainly for many noncorporate businesses, changes in the asset value of the business might parallel possible declines in income.

## 3. CONCEPTUAL COMPARISONS BETWEEN FRB AND IRS WEALTH ESTIMATES

Extensive comparisons have been made by a number of researchers between the 1962 estate tax wealth estimates and the corresponding figures produced by Projector and Weiss from the 1962 FRB work [e.g., 56]. The results of the two approaches seem remarkably close, especially given the initial differences which existed between the 1982 IRS estimates of wealth and those taken from the 1983 FRB effort. The differences between the 1982 IRS and 1983 FRB estimates are still striking and are too large to be entirely attributable to sampling error. The comparability of the 1962 estimates, on the other hand, would be remarkable even if sampling error was the only source of differences. That closeness is probably partially coincidental.

When the original survey figures came out for 1983, they were quite surprising to us, in that they showed an upward movement in the concentration of wealth, which was not reflected in the estate tax data [14, 42]. Frankly, we felt that there had to be an error in the survey results. This, of course, turned out to be the case. Even after correction, however, large discrepancies still remained; clearly, more work was called for.

We had already started, with help from the Census Bureau, to carry out an in-depth analysis of the possible nonresponse bias in the IRS high income sample. (Research in this area will be reported elsewhere in detail [57]). We then began working with the Federal Reserve Board and the Institute for Social Research's Survey Research Center to see if there were other ways to help. A collaborative effort was undertaken, which still continues. Among other things, that effort has addressed the development of alternative FRB survey weights--a topic touched on elsewhere at this session and, hence, one that will not be covered here.

An intensive examination of the estate tax wealth estimator also seemed in order. Particu-

larly troublesome was the sharp drop in wealth concentration which occurred for 1976 and which was coincidental with major changes in the estate tax law at about that time. We didn't have a good explanation for this and we needed one, especially since the preliminary 1981 and 1982 data showed that only a minor upward shift had been made since then. The paper by McCubbin [15], mentioned earlier, was written in part to address these concerns. This discrepancy has yet to be resolved, but we are continuing to study the issue.

At the suggestion of Bob Avery at the FRB, we looked closely at a number of the many valuation issues that plague the estate multiplier. For example, what is the net effect of using unaudited, rather than audited, tax returns? What about trust assets, transfers in anticipation of death, the tax treatment of jointly owned property and so on? There hasn't been enough time to come to a definite conclusion on each of these issues. (Indeed, there may never be enough time for some of them.) Small samples were studied in a few cases, though, and we consulted with experts on the law and administration of the estate tax to see what, if anything, might have changed in recent years.

## Asset-by-Asset Comparisons

The review undertaken by McCubbin [15], and related work for the present paper, allow us to discuss Avery's conjectures (and others). This is done below on an asset-by-asset basis.

Financial Assets.--Financial assets (cash, corporate stock, bonds and notes and mortgages) appear to be extremely well reported on the estate tax return and in a manner, for the most part, that is conceptually consistent with that in the FRB study. Some net undervaluation of corporate stock may exist, because of the fact that the returns used are unaudited; but, in the sample studied by McCubbin, this impact was quite small--only about 2 percent. Undervaluation of the other financial assets appears to be even less of an issue.

The estate tax law was changed in 1976 to provide special use valuation provisions for farmers and owners of closely-held businesses. This could have led to some further undervaluation of corporate stock; however, because of the stringent nature of the requirements allowing for this provision and the limitation of the reduction to $500,000, the effects on wealth estimates may be slight and, in any case, would be more significant for smaller estates. (The reduction limit was raised to $600,000 for those dying in 1981, $700,000 in 1982 and $750,000 for decedents in 1983 and thereafter.) Another valuation technique available for corporate stock, the "blockage adjustment," has been available since 1958. If the decedent owned a sizable percentage of a corporation's traded stock, a downward adjustment of the stock's selling price was allowed, if the executor could prove that the disposal of the stock would cause its market price to be depressed.

Nonfinancial Assets.--The various valuation issues are considerably more important for nonfinancial assets (real estate, noncorporate business equity, and other, mainly tangible, assets). Miscellaneous assets, for example, in the McCubbin sample had an adjusted value after audit that was 4 percent greater than its pre-audit amount. Real estate increased by 2 percent during audit. The special use valuation provisions mentioned above also apply to real estate, although again our belief is that these would have only a limited effect. Changes in the treatment of jointly owned property also need to be considered. After 1976, only one-half of the value of certain joint property owned by spouses must be included in the estate. After 1981, only one-half of any joint property owned by spouses must be included, regardless of which spouse furnished consideration for the property [58]. This could have a sizable effect particularly on time series comparisons of wealth concentration. According to Schwartz [14], for 1982 about $213 billion was held by wealthy married individuals as their share of jointly owned property.

We have already commented on valuation issues with regard to noncorporate business equity. Unquestionably, the valuation of these assets may be affected by the death of the owner (or part-owner). In addition, the special use valuation provisions described for closely-held corporate stock apply to unincorporated businesses, as well.

In the case of other (nonfinancial) assets, it was conjectured that there might be some problems in locating all of this miscellaneous property for estate tax purposes. In addition to automobiles, furnishings and personal property, the category of other assets includes such things as works of art, copyrights, royalty interests, and gift taxes paid within three years of death. The McCubbin sample found, however, only a few cases where previously unincluded property was added as a result of audit. Virtually all of the 4% increase in the value of other assets was due to revaluations of property.

Insurance and Life Interests.--Insurance, annuities and trust assets in which the decedent possessed only a life interest are particularly troublesome to value properly using estate tax data. The face value of includable life insurance comes into the estate. In the past, an adjustment has been made to lower the face amount to its cash surrender value, but this is a rough adjustment at best. Annuities and life income interests in trust, plus pension and social security wealth, are seriously undervalued or omitted altogether. One solution to this problem is simply to change the scope of the wealth estimates to exclude these assets. This is possible; however, it may result in misleading conclusions about wealthholding patterns in the United States, since pension wealth, for example, has grown enormously in importance in recent years. As noted earlier [in 29], linkages between the estate and income tax returns for decedents and beneficiaries are

being carried out; these might be a source for a partial correction of such problems (especially if carried back far enough for decedents and forward enough for beneficiaries).

Some Other Considerations

Three other overall estate tax valuation issues might be mentioned briefly, even though their effects for 1982 appear likely to be small.

- First, there is some flexibility available in the point at which an asset can be valued for estate tax purposes. While usually the date of death value is used, this need not be the case. As a result of this option, on balance there was a slight decrease in the total assets estimated for 1982 for the wealthy; however, this was far less than 1 percent overall.

- Second, originally all gifts (and related gift taxes) made within three years of death, in contemplation of death, had to be reported on the estate tax return. The 1976 Act required that all transfers made and gift taxes paid within three years of death, regardless of motivation, be included in total gross estate. After 1981, this changed again so that only certain transfers made within three years of death, but all gift taxes paid, had to be included. We are not sure, but it is likely that the estate tax wealth series may have been affected because of these changes, relative to what it was historically. Certainly there is an overstatement relative to what a survey would measure. Such gifts have two chances of being "sampled" (since both donor and donee would have them in their estates if they died); hence, their inclusion in estate tax wealth leads to double counting. Including gift taxes paid is entirely inappropriate since the wealth is no longer in the household sector at all. The extent of this problem does not appear great; however, no current estimates are available.

- Third, in general the wealth of an individual declines during the last few years prior to death, as assets are transferred to heirs or as savings are depleted by expenditures during retirement, including those for the expenses of last illnesses. Thus, the value of many estates might be less at death than at some other (random) time. In addition, some assets in particular are especially likely to decrease in value at death. The undervaluation of annuities was mentioned earlier. The gross estate includes the value of an annuity or pension payment that a beneficiary is due to receive because he or she survives the decedent. The value of payments which terminate at death are not included. Similarly, income interests in trust assets which terminate at death are not included in the estate. In this case, the decedent did not legally own the assets from which the income was derived and so these assets are not included in the estate. (The income stream is not included, as it terminates at death.) Yet even though the decedent did not own the assets for estate tax purposes, he or she benefitted from them and the exclusion of them results in an understatement of economic well-being.

The value of business interests may also decline at death, especially if the decedent was a sole proprietor or important partner in the business. The value of professional (medical, legal) practices certainly could fall around the time of death, since human capital is lost. Survey methods may be more useful in capturing this type of wealth. There are also ways to correct for the decline in wealth which occurs near death. Income tax or other data can be collected and later matched with estate tax records, to provide a picture of economic well-being for more than one point in time [59].

Summary

While our analysis of valuation concerns in this section is incomplete and preliminary, we conjecture that most of the valuation issues on the estate tax are relatively small, correctible or both. In particular, we believe that, within the conceptual limitations of the estate tax law, the assets shown on estate tax returns are extremely well reported. They draw notable strength from having been taken from administrative records, by highly skilled people and under exacting legal sanctions.

Unlike survey data, such as that collected in SIPP (or in the FRB study), it is thought that estate tax returns do not suffer greatly from response variation. One exception may be for particularly hard-to-value assets, such as an interest in a partnership or closely-held corporation or real estate assets for which there are no ready markets; in such cases, the valuation may be subject to some difference of opinion. Usually there is a financial stimulus for the executor to use the lowest value he thinks can be sustained. It is not uncommon, therefore, that valuations are changed when returns are subjected to audit. In the McCubbin study, such increases occurred nearly half the time. Even so, the percentage changes were fairly small overall and not always in the same direction.

It should be noted, by the way, that sometimes there are good financial reasons for the executor to select the higher rather than lower value of an asset. Because the estate valuation establishes the basis for future taxation of the asset in the hands of the heirs, a higher basis may minimize income taxes, so that while a higher estate tax is paid the net effect is a tax saving. For example, a higher basis for business property subject to depreciation will increase the allowable deductions for depreciation; a higher basis for property which the heirs intend to sell will minimize the income

taxes paid on the difference between the estate tax return valuation and the selling price.

While on balance estate assets may be undervalued, the McCubbin data indicates that this bias is small. Even if the outdated study by Harriss is used as a guide, the bias in valuations would still be fairly modest. [60] A larger sample of more recent returns would be needed to conclude this definitively, but it seems unlikely that undervaluation can be a major factor in explaining FRB/IRS differences.

On the other hand, we feel less comfortable about whether or not ownership issues are a factor in the FRB/IRS differences. De facto and de jure differences may exist and there could be some confusion on the survey leading to double counting. Large swings are possible in the estate multiplier estimates depending on how jointly owned property is treated.

Undoubtedly the timing of the estate tax valuations is of some importance. As previously discussed, some assets decrease in value when the owner dies. The value of at least one asset, life insurance, increases at death. (We can correct for this, however.) In addition, the savings of many nonwealthy and moderately wealthy individuals may be depleted after retirement, especially during the last illness. The FRB estimates, on the other hand, are based on a survey of individuals at various life stages.

Individual assets, as we have seen, may be systematically undervalued on the estate tax return due to particular provisions of the law allowing for special valuations in certain cases for family businesses and farms. While we speculate that this cannot be a major factor, we have no data yet to back that up. It certainly will have some effect on time series comparisons with earlier estate multiplier estimates, as will the change in the treatment of jointly owned property and lifetime transfers. On the survey side, we conjecture that there may be some confusion about where to report certain assets. For example, notes and mortgages could be too low in the FRB study and real estate too high, as a consequence.

The way the "other assets" questions were asked in the survey suggests that a great deal of wealth may simply have been missed altogether. On the estate tax returns, based on a small sample study, we found all kinds of property that were not showing up at all in the survey or, if reported, were being mentioned far less frequently [61]. As noted above, these assets include jewelry, art work, home furnishings, copyright interests and other items.

## 4. NUMERICAL COMPARISONS BETWEEN FRB AND IRS WEALTH ESTIMATES

This section continues the discussion of differences between the 1982 Estate Tax Wealth estimates and those made by the Federal Reserve Board for 1983. To make the numerical comparison shown here, we obtained the help of the Federal Reserve Board in producing special tabulations of individual than wealth from their data on household wealth. Asset by asset price adjustments were made to shift the 1983 FRB figures to 1982 price levels [62]. Attention was confined for each asset type just to individuals or estates with $500,000 or more of that asset since estate tax returns with gross estate of less than $500,000 did not have to report asset by asset detail for 1982 decedents. To the extent possible, we have omitted assets that clearly would not be comparable, notably insurance, annuities and pensions interests. Comparisons are made in two ways. First there is an overall discussion of differences in average amounts; this is followed by more detailed distributional comparisons.

### Comparisons Between FRB and IRS Asset Averages

Comparisons between FRB and IRS asset averages are made in Figure D. Substantial differences exist. For example, all but one of the individual asset amounts show the IRS average to be higher than those from the FRB survey (and four of these differ by about 20 percent or more). The one exception--real estate--may arise, in part, due to the difference between the two sources in the treatment of jointly owned property. We estimate that 80 percent of the joint property owned by married individuals is real estate. Adding 80 percent of the unincluded joint property held by married IRS top wealthholders to the real estate total yields an average real estate figure of $1,402,395, or $24,804 less than the FRB average. This adjusted figure may be conceptually closer to the FRB estimate.

The two totals for financial assets and gross assets show FRB average amounts greater than the corresponding IRS figures. This seems a paradox given the fact that nearly all of the individual components that make up these amounts differ in the opposite direction. The reason for this apparent contradiction lies in the large differences in the relative frequencies of the FRB and IRS amounts. In particular, for corporate stock, real estate and noncorporate business assets, the FRB survey reports many, many more individuals holding that asset type than does IRS. (See Figure E.)

As an aside, it might be noted that we are not uncomfortable about the differences at the mean for each asset type. These accord with our expectations about the relative strengths of the estate and survey approaches to wealth estimation. What troubles us greatly are the large differences in the relative frequencies for each asset type. At this point we are unable to account for these. Weaknesses in the estate multiplier being used could be one contributing cause, but it is hard to attribute all of the differences to this one factor. Some uncertainty in how the FRB weighting might be done is another possibility which we are still exploring.

FIGURE D.--Comparison of Federal Reserve Board and Estate Multiplier Wealth Estimates

(Average amounts in thousands of dollars; data confined to observations greater than or equal to $500,000 in each category.)

| Asset Type | Average Amounts | | Difference | |
|---|---|---|---|---|
| | Federal Reserve Board (1) | Internal Revenue Service (2) | Amount (3) | Percent (4) |
| Total assets..... | 1,504 | 1,269 | 235 | 15.6 |
| Financial assets..... | 1,463 | 1,430 | 33 | 2.3 |
| Cash..... | 828 | 878 | -50 | -6.0 |
| Stock..... | 1,350 | 1,601 | -251 | -18.6 |
| Bonds..... | 1,052 | 1,305 | -253 | -24.0 |
| Notes and mortgages.. | 858 | 1,105 | -247 | -28.8 |
| Real Estate..... | 1,426 | 1,020 | 406 | 28.5 |
| Noncorporate business.. | 1,407 | 1,437 | -30 | -2.1 |
| Other..... | 724 | 1,316 | -592 | -81.7 |

Source: The FRB data are the basic "corrected" data that have been made publicly available, deflated from 1983 to 1982 [62]. The IRS data are the final 1982 estimates made by Schwartz [14]. See the text for a discussion of the differences found.

FIGURE E.--Comparison of Federal Reserve Board and Estate Multiplier Frequency Estimates

(Frequency of wealthholders in thousands; data confined to observations greater than or equal to $500,000 in each category.)

| Asset Type | Frequency | | Difference | |
|---|---|---|---|---|
| | Federal Reserve Board (1) | Internal Revenue Service (2) | Frequency (3) | Percent (4) |
| Total assets..... | 2,581 | 1,832 | 749 | 29.0 |
| Financial assets..... | 927 | 660 | 267 | 28.8 |
| Cash..... | 53 | 56 | -3 | -5.7 |
| Stock..... | 661 | 335 | 326 | 49.3 |
| Bonds..... | 93 | 72 | 21 | 22.6 |
| Notes and mortgages. | 20 | 32 | -12 | -0.6 |
| Real Estate..... | 718 | 446 | 272 | 37.9 |
| Noncorporate business. | 370 | 71 | 299 | 80.8 |
| Other..... | 19 | 71 | -52 | -273.7 |

Source: The FRB data are the basic "corrected" data that have been made publicly available, deflated from 1983 to 1982 [62]. The IRS data are the final 1982 estimates made by Schwartz [14].

Comparisons Between FRB and IRS Asset Distributions

When FRB and IRS asset distributions were compared in our presentation of this paper at the ASA meetings, they were shown graphically, in terms of the cumulative percentage of individuals in each asset size class. (See, for example, Figure F.) The discussant, Edward Budd, noted that the graphs were difficult to interpret, because of the closeness of some of the curves. In response to his comments, we have re-presented the information here, employing quantile-quantile (Q-Q) plots, as described by Wilk and Gnanadesikan in 1968 and reviewed by Hoaglin et al.[63]. By this method, a plot of the inverses of the two cumulative distribution functions, $F^{-1}_{IRS}(p_i)$ and $F^{-1}_{FRB}(p_i)$, can be used to compare the shapes of the distributions as well as look at differences in their means and variances. In particular, the Q-Q chart corresponding to Figure F is shown alongside it as Figure G. Notice first that both plot the data on the "Y" or vertical axis in the same way, i.e., by size of total assets beginning at $500,000.

For Figure F, the X or horizontal axis is the cumulative percentage of estates or individuals with total assets less than or equal to the amount shown on the Y axis. Thus, we see that for the estate top wealthholder data there are 68 percent with assets of $500,000 to $1,000,000; the corresponding percentage for the FRB survey is 60 percent.

For Figure G the Y axis is the same as the X axis, i.e., it plots total assets by size. The difference between the X and Y axes is that on the X axis we plot the FRB data at a fixed set of percentiles, while on the Y axis, we plot the IRS data at the same set of percentiles. Three lines are shown in Figure G:

- a dashed line, which corresponds to the actual plot of the pair of points

  $$F^{-1}_{IRS}(p_i) \text{ and } F^{-1}_{FRB}(p_i) \text{ for } p_i$$

  at each decile .40, .50, .60, ..., .90 plus at .95, .98, .99, and .995;
- a straight-line smoothing of the basic $F^{-1}_{IRS}(p_i)$, $F^{-1}_{FRB}(p_i)$ data we obtained by employing ordinary least squares using the equation (4.1) below; and
- a bold-faced 45 degree line that passes through the origin. This last line is included for reference.

We derived Figure G from Figure F by taking the two original simple cumulative distributions for the FRB and IRS data and then interpolating at the Pi values mentioned above. To do the interpolation, we used new procedures described in a companion paper being given at these meetings [64].

Now, if the distributions are exactly the same, the plot of $F^{-1}_{IRS}(p_i)$ versus $F^{-1}_{FRB}(p_i)$ will form a straight line which passes through the origin and has a slope of 1. If the distributions do not have the same shape, the plot will be nonlinear. In general, if $F^{-1}_{IRS}(p_i)$ and $F^{-1}_{FRB}(p_i)$ have the same shape, then the Q-Q plot is of the form

$$F^{-1}_{IRS}(p_i) = \mu + \sigma F^{-1}_{FRB}(p_i) \qquad (4.1)$$

where the mean $\mu$ is a scaled difference between the mean of the IRS data $\mu_{IRS}$ and the FRB data, $\mu_{FRB}$, i.e.,

$$\mu = \mu_{IRS} - \left(\frac{\sigma_{IRS}}{\sigma_{FRB}}\right) \mu_{FRB} \qquad (4.2)$$

Figure F.--Cumulative Percent of Individuals/ Households with $500,000 or More of Gross Assets

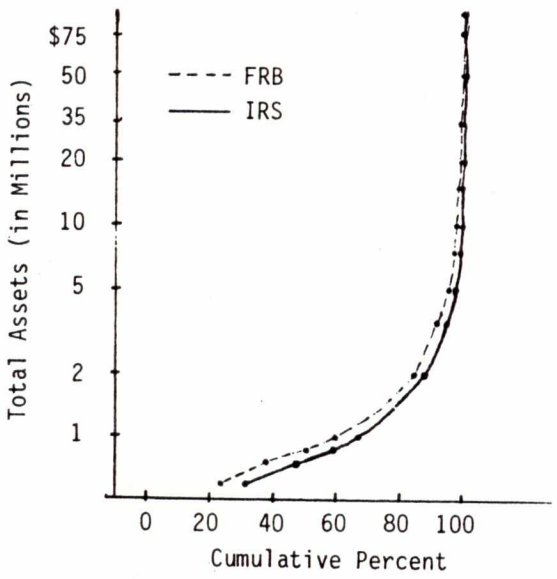
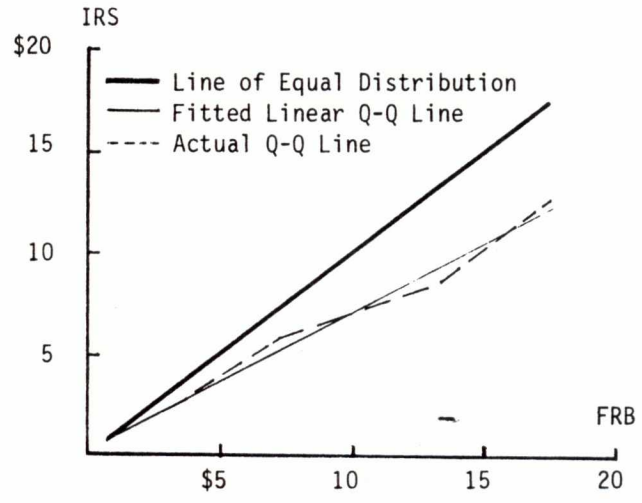



Figure G.--Quantile-Quantile (Q-Q) Plot for Total Assets, FRB and IRS Distributions Compared ($ in Millions)



The quantiles $\sigma_{IRS}$ and $\sigma_{FRB}$ are the population standard deviations of the IRS and FRB distributions, respectively. (Estimates of $\mu_{IRS}$ and $\mu_{FRB}$ have, of course, already been provided in Figure D.)

The slope of the linear relationship between $F^{-1}_{IRS}$ and $F^{-1}_{FRB}$ in expression (4.1) is of the form

$$\sigma = \frac{\sigma_{IRS}}{\sigma_{FRB}} \quad (4.3).$$

Hence, if $\sigma = 1$, the variances of the IRS and FRB are equal and if, further, $\mu = 0$ and the shapes are same, then expression (4.1) will be a straight line through the origin.

Quantile-Quantile Chart Comparisons

Given the machinery we have just described, what can we conclude from Figure G about the differences between the IRS and FRB measurement of total assets for persons with $500,000 or more in gross wealth?

- First, as to shape, the dashed line definitely is not straight; it is not badly bowed, however; hence, we might be willing to conclude that the two distributions are not that dissimilar.
- Second, the slope of the Q-Q plot of total assets is less than 1, indicating that the IRS distribution rises faster than that from the FRB survey (in fact, $\hat{\sigma} = .69$).
- Third, as we have already seen in figure D, $\mu_{IRS}$ and $\mu_{FRB}$ differ at the mean for total assets and this, along with dispersion differences, i.e., $\hat{\sigma} \neq 1$ yield the value $\hat{\mu} = \$231,240$.

All in all, the Q-Q chart for total assets nicely extends the insights of Figure D and indicates that despite large differences at the mean, there are still important similarities, at least as to shape.

Figure H provides a complete set of Q-Q charts for each asset type, beginning with financial assets as a total, then graphing each of its components: cash, corporate stock, bonds, and notes and mortgages. Three nonfinancial assets also are shown: real estate, noncorporate business assets, and other assets. In what follows, we will comment on each of these briefly:

Cash.--The FRB distribution rises very fast and looks to be quite different in shape from the corresponding IRS data as well. We speculate that reporting of cash in the survey was less complete than on the estate returns, with the consequences that the IRS mean is greater and the IRS distribution is more spread out (with $\hat{\sigma} = 2.27$ and $\hat{\mu} = -\$1,001,560$).

Corporate Stock.--The shapes of the IRS and FRB stock distributions are fairly similar over at least a portion of their range. The IRS distribution does rise faster than the FRB around the 60th through 90th percentiles, possibly due to some rounding by the survey respondents in their answers. The IRS mean is higher than that for the FRB and, on the whole, the IRS data are somewhat more spread out (with $\hat{\sigma} = 1.23$ and $\hat{\mu} = -\$59,500$).

Bonds.--The shapes of the IRS and FRB distributions for bonds seem very similar, although there are sizable differences in relative dispersion and in overall means. The IRS data have a much heavier tail than the FRB survey information (with $\hat{\sigma} = 1.77$ and $\hat{\mu} = -\$557,040$).

Notes and Mortgages.--Notes and mortgages are very infrequently reported in amounts of $500,000 or more in the FRB data. The Q-Q plot, perhaps for sampling reasons, shows almost no relationship between the two possible distributions. Nonsampling errors due to misclassification of notes and mortgages as real estate are conjectured to be a factor in the survey as well. (In any event, $\hat{\sigma} = 4.23$ and $\hat{\mu} = -\$2,524,340$.)

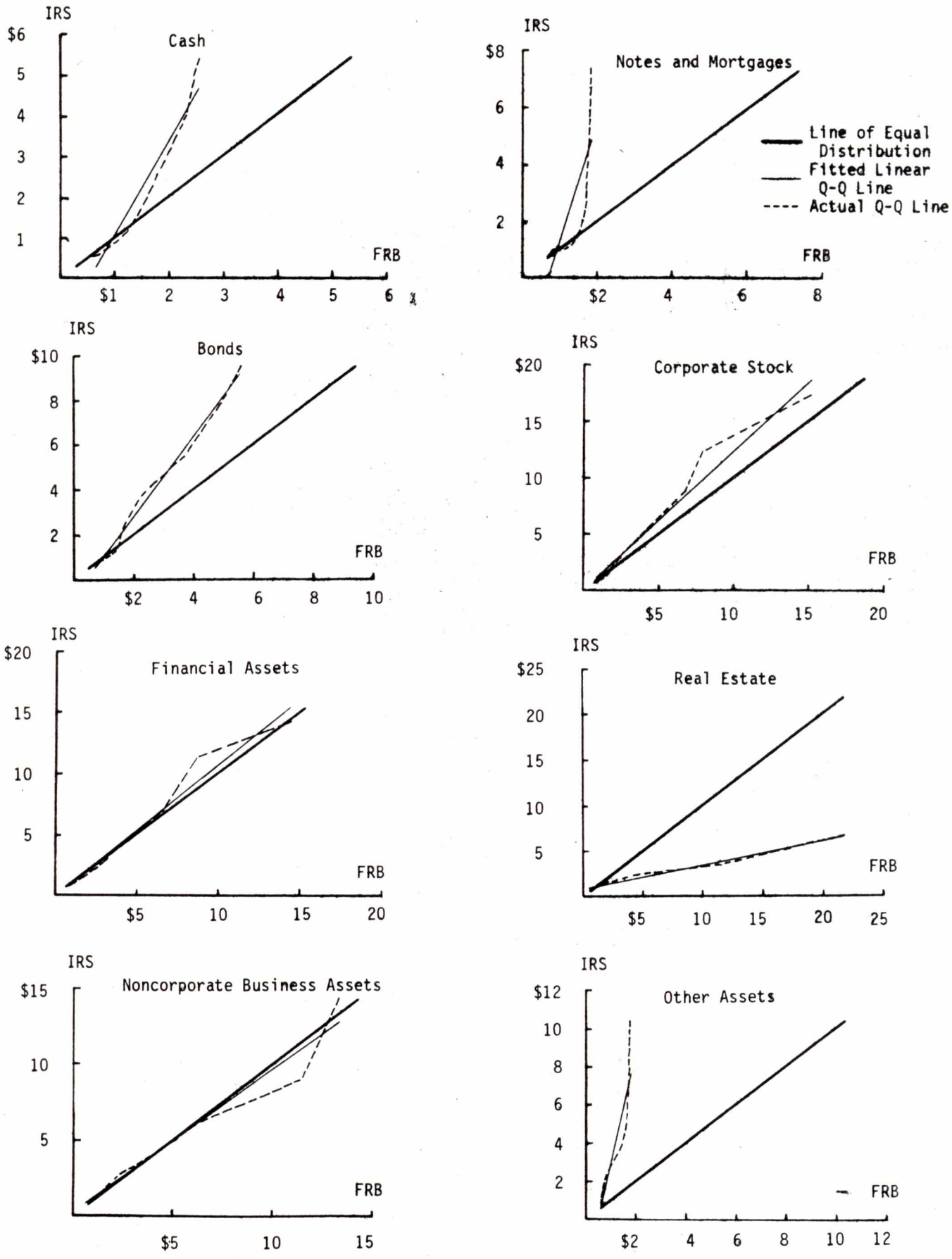
Financial Assets.--Financial assets appear quite similar in distribution between the FRB and IRS data sets. There is still a slight bow in the shape (caused by the dominance of corporate stock). Differences in the other components (bonds, cash, and notes and mortgages) tend to cancel out somewhat. The IRS and FRB distributions have nearly the same variances (with $\hat{\sigma} = 1.01$) and differ in their means only slightly as well ( $\hat{\mu} = -\$47,630$).

Real Estate.--For all intents and purposes, the IRS and FRB distributions for real estate are identical in shape. On the other hand, they differ greatly in their means and variances (with $\hat{\sigma} = .26$ and $\hat{\mu} = \$649,240$). The IRS data source is picking up considerably less real estate overall, perhaps partly due to the possible difference in the way jointly owned property is being treated. As we noted earlier in Figure D, if 80 percent of jointly owned property is added to the IRS real estate amount, than the difference between the FRB and IRS mean shrinks from $406,000 to about $25,000. We have not replotted the real estate Q-Q chart to see what this change would do to the distribution as a whole, but that effort is underway.

Noncorporate Business Assets.--We were quite surprised, given the valuation issues surrounding this asset, at how close the FRB and IRS distributions came. As with corporate stock, there is a bow in the Q-Q chart (which, again, could be due to rounding in the survey). In any event, the IRS distribution rises more quickly between the 60th and 80th percentiles (and less quickly between the 90th and the 98th percentiles). The means and variances of the two distributions are quite close (with $\hat{\sigma} = .95$ and $\hat{\mu} = \$100,350$).

Other Assets.--As with notes and mortgages, we see little similarity between the FRB and IRS distributions for this component. Ample evidence, as already noted, seems to indicate

Figure H.--Quantile-Quantile (Q-Q) Plots for Each Asset Type, Federal Reserve Board and IRS Distributions Compared
($ in Millions)



that the survey may have omitted large amounts of other assets. On the other hand, the IRS data may overstate this component, due to the inclusion of gift taxes paid within three years of death. (In any event, $\hat{\sigma}$ = 5.75 and $\hat{\mu}$ = -$2,847,000.)

Other Considerations

In this section and the last, we have only touched the surface in our comparisons between FRB and IRS data. Most of what has been done can be taken as illustrative of the issues which exist and of how hard it will be to pin down any specific difference to a particular cause or set of causes.

The approach taken has been descriptive and exploratory. Detailed calculations of sampling errors from the FRB and IRS data sets remain to be carried out within the context of the comparisons made here. We originally planned to have some information on these, but time ran out on us. We now expect to report on these later.

## 5. FUTURE PLANS

The new initiatives by the Federal Reserve Board in measuring wealth deserve complementary, cooperative developments elsewhere in the Federal statistical system. Bob Avery's work and that of his colleagues at FRB, notably Art Kennickell and Greg Elliehausen, have enormously stimulated the IRS' personal wealth estimation program based on estate tax returns. As we have seen in this paper, there are a whole host of issues that need to be studied if these two sources (and others) are to be pieced together. Various levels of integration are possible, depending on the degree to which asset definitions can be made comparable and on our knowledge (or assumptions) about the error properties of each source. We may want to mix the two data sets (and others) in different ways, depending on our analytic objectives. Factors to consider in the blending of data sources include relative response (and nonresponse) biases, response variation and, of course, differences in sample size. The research has simply not been done yet that will allow for a clear choice of approaches. There are some areas (like household and family statistics) that must be based heavily on a survey vehicle. On the other hand, heavy reliance on sources other than a survey may be essential for, say, detailed information on the aggregate wealth of individuals with net worth of $10,000,000 or more. In between these two extremes there is a great deal of flexibility about how the multiple sources available could be used.

For example, for asset items known to be comparable between the survey and estate data and for which the survey response variance was not too great, a post-stratification approach using a variant of raking ratio estimation [65] might be possible. For asset items known to be better reported on the estate tax returns, some form of multiple imputation or multiple statistical matching might be tried [66], where the estate tax information is "matched" into the survey. The item "other assets" might be improved on the survey by such an approach. Greenwood's work, cited earlier, bears on this point as well [25]. Finally, estate tax return data could be employed to model the upper tail distributions of each asset type as part of an error detection and outlier protection procedure; this would certainly help to avoid the problems that arose last summer [42]. Record check studies of survey reported asset information, like those conducted in the earlier FRB work [12] seem to be needed. When anomolies are detected, correcting response error or down-weighting the cases might be viable options [67].

All of these strategies rely on the notion that what we should do with our outside information is to use it to produce adjusted microdata survey records. This may not always be desirable; for example, in the case of the very wealthy, there are likely to be just a handful of survey schedules available. Less elaborate methods could be adequate or even superior, including just tabulating the survey and estate data. For the extreme upper tail of the wealth distribution, whether of families or individuals, an explicit modelling approach seems unavoidable. Relying on just survey records, however adjusted, won't be enough; even with major improvements here, the sample of the very wealthy will still need supplementation. The important work being done by Forbes [30] in this area might be of great assistance as pointed out by McCubbin [15]. Pareto smoothing of the upper tail also shows promise and needs to be given continued attention [64].

It is possible, given the retrospective nature of the comparisons that we will never be able to completely explain the differences between the 1983 FRB and 1982 IRS wealth estimates. Nevertheless, this exercise has already been a source of several valuable conjectures that have spurred special studies of IRS wealth measurement issues. Many more of these studies are needed and we hope to undertake some of them over the next several years. (See Figure I.)

More independent work on IRS' (or FRB's) part will not be enough however. For a major advance in our understanding to occur, a tightly coordinated joint IRS-FRB effort seems essential. The proposed 1989 FRB survey of wealth offers one such opportunity, since an estate tax multiplier estimation program is also planned for that year. Within the limitations of these two measurement mediums, there are a fair number of steps that could be taken to improve our ability to align the two data sets. Reducing definitional differences in asset types would be one example. Deeper exploration of types of ownership in both sources would be another, especially for jointly owned and community property but also for partnership holdings. A better method of using an IRS frame for high income individuals seems to be another area where improved cooperation would help greatly, provided legal restrictions on access can be properly addressed. We look forward to working cooperatively to produce better wealth estimates for 1989 and beyond.

Figure I.--Selected IRS Estate Tax Multiplier Issues That Might Need to be Addressed in Piecing Together Personal Wealth Distributions

| Issue | Implications | Research Needed |
|---|---|---|
| The undervaluation of assets including closely held corporate assets, non-corporate business assets and real estate is of some concern, as are laws allowing for special use valuation and the valuation of jointly owned property. | Wealth estimates will tend to be biased downward and the portfolio distribution of assets may be skewed away from the assets for which obtaining an accurate valuation is difficult. | More study of changes to asset valuations made during auditing, as described in Harriss [60] and McCubbin [15] could result in the development of a method to adjust asset valuations. The fair market value of property included at the special use value could be captured from the return. Types of jointly owned property could be captured in detail. |
| Some assets, in particular, terminable interests including some trust interests and some pensions, are not required to be included on the estate tax return. | Wealth estimates will be biased downward. This effect may be stronger for very wealthy individuals with more complex types of assets. | Additional review of the estate tax law in this area might enable researchers to understand better what types of adjustments are needed in the estate multiplier wealth estimates to correct for this omission. New sources of data can be looked at too. For example, the re-structured generation skipping transfer tax requires that lifetime trust interests be reported each time an interest terminates. A study of the new tax might improve our understanding of this area. |
| Some assets, including large blocks of stock in closely held corporations and business interests which derived value from the skill and experience of the decedent (eg., professional practices, small, owner-run businesses) decline in value around the date of death. In addition, debts usually increase at this time, due to the expenses of the last illness. | Wealth estimates will be biased downward and they will not reflect the wealth of the living population. The full importance of these assets will not be reflected in estimated portfolio distribution of assets. | Income tax data, if linked in, could provide a picture of economic well-being for more than one point in time. These data might also be grossed-up to provide estimates of the worth of income producing assets. Information on the length of the last illness will also be useful in determining when an individuals net worth might begin to decline. To the extent that they are identifiable on the estate tax return, debts due to the expenses of the last illness could be excluded from debt measures derived from the estate return. |
| Life insurance is one asset which increases in value at death. | Wealth estimates are biased upward and the estimated portfolio distribution of assets is incorrect. | The use of average cash surrender values, rather than the full value of life insurance has been the traditional adjustment here. A new study of the relationship between face and cash surrender values might be valuable. |

Figure I.--Selected IRS Estate Tax Multiplier Issues That Might Need to be Addressed in Piecing Together Personal Wealth Distributions--Continued

| Issue | Implications | Research Needed |
|---|---|---|
| The alternate valuation date provision complicates the timing issue by allowing executors to elect to vlue estates six months after the date of death, rather than at the date of death value. | Wealth estimates may be biased. (Prior to July 1984, executors could use the alternate valuation election to increase the value of estates, in order to avoid future income taxes. This is no longer allowed, so the bias for years to be studied in the future will be downward.) | The date of death value, which is available on the estate tax return, should be used for wealth estimation. |
| Changes in the estate tax code affect the scope and meaning of estate tax data, making time-series analyses difficult. | Fluctuations in the level and distribution of wealth and in the portfolio distribution of assets due to tax law changes may be erroneously attributed to exogenous economic factors. | An ongoing study of the nature and magnitude of such effects, along with the promotion of an awareness of the effects, may make this complication more manageable (e.g., [15]). Selecting additional samples of returns for recent years (especially 1976) might also help us to assess reporting effects. When possible, wealth estiamtes for different points in time will be corrected for tax law differences which are measurable. |
| Incomplete demographic information on decedents and the unknown nature of differential mortality rates with respect to wealth complicate the weighting of the "sample." | Wealth may be over- or underestimated by the estate multiplier technique. | Longitudinal income tax data or wealth survey data linked with estate and probate records could be used to calculate mortality differentials by wealth status. |

## AFTERWORD AND ACKNOWLEDGMENTS

All-in-all there are clearly enough challenges in the area of personal wealth estimation to fill the professional lives of the authors of this paper and their colleagues at IRS many times over. We are greatly indebted to all those who helped us in the preparation of what turned out to be an interim report on the implication of FRB-IRS comparisons for future research.

Special thanks are due to Marvin Schwartz at IRS who has labored mightly in this field for many years. The importance of the fresh insights of Bob Avery, Arthur Kennickell and their colleagues at the Federal Reserve Board has already been noted several times. Their help in preparing special tabulations of the 1983 Survey was enormous. The early mentoring of Jim Smith and Dorothy Projector deserves a special note of gratitude. They have set the standard for leadership and excellence in this area and our hope is only to follow in their footsteps. The good sense and support of Beth Kilss and Wendy Alvey must also be mentioned, along with Dan Skelly's persistence in egging us on at certain points. H. Lock Oh, as always, gave invaluable assistance. Typing support was provided by Nancy Dutton, Sheila Gray and Bettye Jamerson.

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is adjusted by adding back the wealth removed by the specific exemption) was increased by an average of 9.9 percent after audit. The Harriss study is not directly comparable with the current study, because Harriss estimated the amount of increase in net estate, given the distribution by size of net estate after audit and the distribution of the amount of tax change, while we are now looking at individual returns which have been audited. (In addition, our published post-audit data are focused on changes in net worth and in the gross estate, rather than on changes in the net estate, which could arise, in part, due to the disallowance of deductions.) Harriss, C. Lowell, "Wealth Estimates as Affected by Audit of Estate Tax Returns," National Tax Journal, December, 1949, pp. 316-333.

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# The Estate Multiplier Technique, Recent Improvements for 1989

*By Barry W. Johnson and Louise Woodburn*

The distribution and composition of personal wealth in the United States has attracted considerable attention in recent years. The effects of changes in tax laws, and other public policies, on the economy and on the concentration of wealth have been widely debated. Accurate and comprehensive estimates of wealth, however, are difficult to obtain because individuals are not generally required to report wealth information on any tax return or other public document. The most common methods of estimating personal wealth are collecting wealth data directly via a survey, such as the Federal Reserve Board's Survey of Consumer Finances [Kennickell and Shack-Marquez, 1992, Avery and Kennickell, 1992], capitalizing income flows reported on individual tax returns [Greenwood, 1981], or using wealth data reported on Federal estate tax returns. This paper focuses on the third alternative, using the 'estate multiplier technique' to estimate the wealth of the living population from estate tax return data collected by the Internal Revenue Service's Statistics of Income Division (SOI).

This paper is divided into four sections. The first will review the estate multiplier technique, the underlying data base, and some of the conceptual challenges associated with the methodology. Next, we will look in detail at the application of the methodology and at the uncertainty associated with the estimation technique by quantifying the effects of our assumptions on the variance of the resulting estimates. We will then evaluate our estimates by comparing them to those developed using the Federal Reserve Board's 1989 Survey of Consumer Finances. Finally, some areas for future research will be discussed.

## I. The Technique, Data, and Conceptual Challenges

Researchers have been using the estate multiplier technique since the beginning of the 20th century to draw conclusions about the wealth of the living population by studying the wealth of the deceased. The multiplier technique assumes that estate tax returns, taken as a whole, represent a random sample of the living wealthy population, and thus provide a means of producing reasonable estimates of personal wealth utilizing existing data. These estimates are limited by the estate tax filing threshold, which is currently $600,000 in total gross estate. While this threshold is somewhat restrictive, the resulting estimates account for the top 1 to 2 percent of the population. In 1989, these top wealthholders controlled between 25 and 30 percent of personal wealth in the U.S. [Johnson and Schwartz, 1993].

The multiplier is equivalent to a sampling weight where the probabilities of selection include the probability of being a decedent and that of being included in the SOI sample of estate tax returns. The difficult computation is the probability of being a decedent. Death is not a truly random event and therefore the decedent sample is not a simple representative sample of the living population under consideration. The probability that a person will die in a given year depends on many factors. Age and sex have often been taken as the most important factors relating to mortality. However, there is much evidence that the wealthy have mortality rates significantly lower than those of the population as a whole, perhaps due to better access to health care, better nutrition, less hazardous occupations, or better housing [see Menchik, 1991, Kitagawa and Hauser, 1973]. Thus, the probability of being a decedent in our sample has two components, a mortality rate, based on age and sex, and an adjustment, called a differential, which adjusts the mortality rates of the general population for the added longevity of the top wealthholder population. The mathematical expression of the estate multiplier is given in equation (1).

(1) MULT = 1 / (p * r * d) where:

p = probability of selection to the estate tax sample,
r = mortality rate,
d = rate differential.

There have been several studies as to the best way to compute the differentials. The first researchers to try to make such an adjustment to mortality rates were Daniels and Campion in preparing wealth estimates for England and Wales in the 1920's [Daniels and Campion, 1936]. Horst Mendershausen was the first U.S. researcher to adjust mortality rates, applying them to IRS data from the 20's and 40's [Mendershausen, 1956]. He used data on the mortality experience of the Metropolitan Life Insurance Company for policies in the $5,000 whole life classification to adjust white, age-specific mortality rates. He was also the first to attempt to isolate insurance values and make an estimate of the cash surrender value, an issue which is discussed in the next section.

Robert Lampman made similar estimates for 1953 based on IRS data [Lampman, 1962]. His estimates carried Mendershausen's work a step further, creating a composite mortality differential adjustment based on three factors: the mortality experience of professional, technical, administrative, and managerial workers for 1950; the 1953 white-male mortality rates; and an average of the 1953 Metropolitan Life data with the data of male Ordinary Life Insurance policy holders. The IRS has been using data from Metropolitan Life comparable to that used by Mendershausen and Lampman to produce estimates since 1962.

**Data Sources**

There are three main components of the estate multiplier personal wealth estimates: the estate tax sample, the mortality rates, and the rate differentials.

**Estate Tax Data**

The 1989 SOI Personal Wealth data file is based on Federal estate tax return data compiled by the Statistics of Income Division (SOI) of the IRS. For the 1989 wealth estimates, the SOI estate tax data were derived from a stratified sample of estate tax returns filed from 1989 through 1991 for individuals who died in 1989. The sample is stratified by year of death, age at death, and by size of total gross estate (TGE). Only estates with a gross estate value of $600,000 or more, the estate tax filing threshold, are included in the sample. All returns filed for both the very wealthy (those with gross estates of $5 million or more) and the young (those under 40 years of age) were selected with certainty.

In the past, wealth estimates, such as the preliminary estimates for 1982, were derived from the SOI sample of estate tax returns filed in a particular year. Because a decedent's estate has up to nine months to file an estate tax return and an extension of six months is not uncommon, returns filed in a given year can include decedents who died in several different years. By sampling returns filed over a 3-year period, nearly all the returns filed for the cohort of 1989 decedents can be represented. We estimate that only 1 percent of 1989 decedents were not included in the study file. These decedents tend to have larger, more complicated estates. We use data for prior years to compute an adjustment to account for these decedents.

The strength of the estate multiplier technique is due, in part, to the nearly complete coverage of the wealthiest portion of the decedent population. Approximately 21,500 estate tax returns for individuals with total assets of $600,000 or more are included in the 1989 SOI Personal Wealth file. Despite the sample size advantages, the limited number of returns filed each year for decedents who were young or very wealthy can make estimates for those sub-groups subject to considerable variance [Smith, 1965].

The number of very young or wealthy decedents tends to vary from year to year and is relatively small in comparison to their representation in the living population. This can result in significant short-term fluctuations in our estimates attributable solely to the 'sample variance' associated with these two groups. To dampen the effect of these variations, we 'smooth' the sample by including all returns for these individuals filed between 1989-91, without regard to the year of death. The data are then reweighted to represent the true 1989 decedent population.

Three measures of wealth are used in this article: gross estate (or gross assets), total assets, and net worth. The gross estate criterion is a Federal estate tax concept of wealth that does not conform to the usual definitions of wealth. Gross estate reflects the gross value of all assets, including the full face value of life insurance reduced by policy loans but excluding any reduction for other indebtedness. This is the measure used in assessing the estate tax and thus defines the individuals included in the top wealthholder group. The amount of total assets, a lower wealth value, is still essentially a gross measure. Total assets differ from gross assets in that the cash value of life insurance, i.e., the value of insurance immediately before the policyholder's death, replaces the 'at death' value of life insurance included in gross assets [1]. Net worth is the level of wealth after all debts have been removed from total assets.

**Mortality Rates**

The mortality rates used here are derived from data compiled by the National Center for Health Statistics and are the death rates for white males and females in the United States, by 5-year age groups, for 1989. The rates range from .481 per 100,000 for females, age 20-24 years, to 179.78 per 100,000 for males older than 85. These rates are sample estimates and thus subject to sampling error; however, the sampling error is very small. Thus, we disregard the variance associated with these estimates in our analysis.

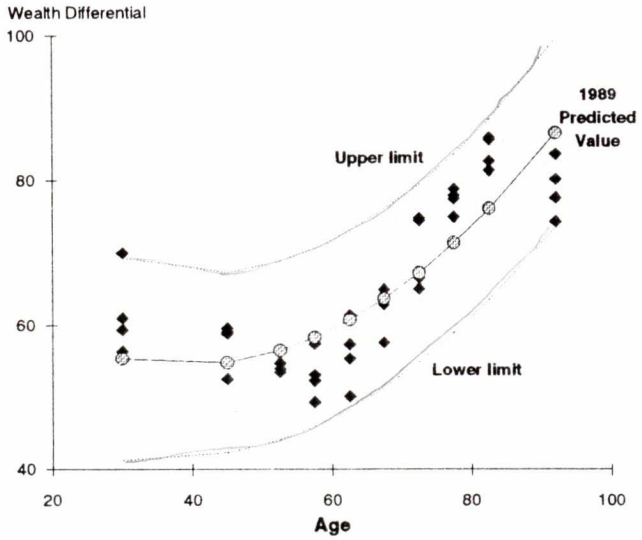
**Rate Differentials**

The rate differentials are derived from information supplied by the Metropolitan Life Insurance Company and are based on the expected vs. realized deaths of their large policy holders. We do not compute sex specific differentials, rather we account only for age at death differences. [2] Our 1989 differential estimates are predicting using differentials in 6 age categories for the years 1969, 1971, 1975 and 1978 from Metropolitan Life. We investigated different models for these data using age and year as the independent variables in an ordinary least squares regression. Year of death was not a significant predictor in any of the models. Our final model is given by equation (2):

$$(2)\quad diff = 71.808 - 0.89(age^2) + 0.011(age) + E\sim(N(0,5.95))$$

The predicted values range from about 58% of the general mortality rate for those under thirty, to 85% for those age 90 and over. The plot in Figure A shows the data, the fitted regression line and the 5% and 95% confidence limits for the individual predictions. We incorporate the inherent model uncertainty in the variance computation as detailed in the next section.

**Figure A.--1989 Mortality Differential Underlying Data and 95% Confidence**




## II. Estimation Methodology

There are two main estimation concerns inherent in sampling applications: the computation of sampling weights and a methodology for computing variance estimates. We first describe the sampling weight computation which is itself composed of two steps: the computation of the selection probability and adjustments to this probability. As shown in equation (1) and discussed earlier, the selection probability consists of the mortality rate, rate differential, and probability of selection to the SOI sample. We refer to the inverse of this probability as the multiplier. Once all the components are known, we considered adjustments such as post-stratification and weight trimming.

The extremely skewed distribution of net worth is of particular interest to researchers. Because the underlying sample of estate tax returns was stratified by gross assets, which is not highly correlated with net worth, it would be appropriate to post-stratify. However, the necessary control totals are not readily available. Thus, our strategy was to constrain the tails of the net worth distribution to resemble a Pareto distribution, which is often used in wealth and income models.

For our purposes, the upper tail of the net worth distribution was defined as those individuals with net worth of $250 million or more. In order to determine the parameters of the Pareto, we examined the empirical distribution of net worth implied by the individuals in the *Forbes* 400 for the years 1982-1989. We found that the data approximated a Pareto with parameters varying from 1/2 to 1/3. The SOI data were then divided into the following net worth categories: $250 to $450 million, $450 to $700 million and greater than $700 million.

First, we decided to trim the multipliers in the bounded net worth categories at the 3rd quantile. The remaining unbounded category contained an estimated 45 individuals. The multiplier values in this category were fit to a Pareto of parameter 1/3, preserving the final estimate of 45. When these adjustments had been made, the distribution of individuals with net worth of $250 million or more approximated a Pareto, so no further changes were made [3]

Similar adjustments were made for returns with extreme negative net worth (less than -$1 million). These cases were grouped into three categories: -$1 to -$5 million, -$5 to -$15 million, and less than -$15 million. Again, a distribution of the multipliers was computed and the multipliers trimmed at the 3rd quantile in each of the categories.

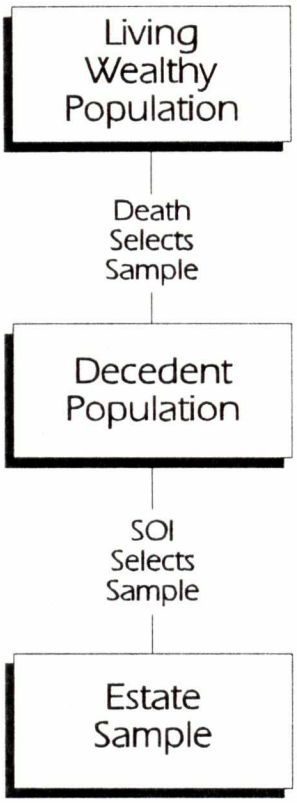
### Variance Estimation

In this section we detail the methodology used in the computation of variance estimates. We quantify the uncertainty inherent in the estate tax data and in the differential used in the computation of the estate multipliers by developing distributional models for these components. These individual measures of uncertainty are used as input to a total error, as described later in this section. Such treatment of the multipliers as an unknown quantity with an error distribution was suggested by Scheuren and McCubbin [1987]. Our overall strategy is to select bootstrap samples that reflect the sampling process from the living population through the selection of the estate sample, incorporating the different estimation steps along the way.

The three components of the estate multiplier are the probability of selection to the estate tax sample, the mortality rate, and the rate differential. These approximate a two-stage sampling scheme, where the first stage is death, with the probability of selection equal to the mortality rate times the differential. The second stage is the SOI sample selection (see Figure B). Note that for both stages, the sampling unit is an individual. We have nearly complete knowledge of the probability of selection to the estate tax sample. The sample is a stratified random sample with sample rates varying from 7 to 100 percent. We also have some limited information for the entire population of estate tax filers. It is worth pointing out that the sample is post-stratified to the population of filers. This allows us to adjust for returns that were misclassified due to keying errors prior to sample selection. Still, there is sampling error associated with the SOI sample.

Less is known about the probability that an individual will die in a particular year. While we have mortality rates, a degree of uncertainty must be attributed to this process as well. (We have already detailed our efforts to 'smooth' the

**Figure B.--SOI Estate Tax Sample Schematic**




variance of the sample selection of the young and wealthy in section I.) Also, because the differentials are modeled using a time series of data, they add to the uncertainty of the multiplier [4]. In order to measure the contribution of each of these components of uncertainty (sampling and modeling) we choose the bootstrap method of variance estimation.

The bootstrap method of variance estimation is a resampling technique where many random samples are drawn, with replacement, from the original sample. The bootstrap samples are selected using the same sampling scheme as was used for the original sample. These bootstrap samples are used to produce estimates which are then combined to produce estimates of bias and variance for desired statistics. The advantage of a resampling method is that it is possible to estimate the variance of both linear and nonlinear statistics, and to incorporate uncertainty due to the estimation process. Additionally, inferential analysis, such as the computation of confidence intervals, is not limited to the assumption of an underlying normal distribution; the actual distribution of the bootstrap sample estimates can be studied.

In order to select bootstrap samples, we must recall that the estate tax sample is derived from a two-stage selection process. This sample is not a traditional cluster sample because the sampling unit is the same for both stages and the samples are selected independently of each other. However, the estate sample is a subsample of death's decedent sample. We assume death's sample is stratified by age at death and sex. In order to capture the sampling variance due to death's selection, we recreated death's decedent sample. Based on the SOI sample weights, records were duplicated creating a decedent sample of 53,000 (the total number of estate tax filers who died in 1989). We then resampled, with replacement, in the age/sex categories we used in assigning mortality rates--our assumed stratification of death's sample.

At this point, we have a 'bootstrap decedent sample' reflecting death's selection. From here, we reselect an SOI estate tax sample, according to the original SOI sample design. We now have a bootstrap estate sample incorporating both the sampling error attributed to death, and that attributed to the SOI sample. Next, we choose a differential from the estimated distribution, incorporating the model error. We constrain the differential choice to be within the computed 95% confidence interval, seen previously, to keep the resulting values in a feasible range. Finally, using the known probability of selection to the estate sample, the assumed mortality rate, and the estimated differential, we compute the multipliers. We bound the multipliers for decedents with net worth over $250 million or net worth less than -$1 million, as discussed earlier. These adjustments are data driven, the third quantile bound was computed for each bootstrap sample.

Figure C shows a box plot of 11 bootstrap estimates for total assets. The median of the bootstrap estimates is $5.37 trillion, with a high of $5.50 trillion and a low of $5.25 trillion. As expected, the distribution of the estimates is slightly skewed. Because there are no control totals to use in computing the multipliers, the estimate of the number of individuals is also of interest. Figure D is a box plot of 11 bootstrap estimates of the number of individuals with total assets over $600,000. The median of the estimates is 3.06 million, with a high of 3.08 million and a low of 3.04 million. The distribution is much tighter than that of the sum of total assets.

In computing the estimates, it was possible to measure the variance associated with each of the multiplier components. The post-stratification adjustments, which included the weight trimming, decreased the variance of the sum of total assets by 54%. The resulting estimate was about 1.4 percent less than the original, unpost-stratified estimate. The variance of the frequency estimate decreased 16% as a result of post-stratification; the effect on the value of the estimate was negligible.

Allowing the mortality rate differentials to vary within the 95 percent confidence interval suggested by the model increased the variance of the total asset estimate by about 29 percent; the variance of the frequency estimate increased by less than 2 percent. In both cases the resulting estimates were almost 4 percent higher than the estimates based on a fixed differential. Further investigation revealed that calculating the differentials based on the age of each decedent using equation (2), rather than assigning them in broader age categories as was done previously, further increases the estimate of both the number of top wealthholders and the total value of their assets.

**Figure C.--Box Plot of Aggregate Total Assets Using 11 Bootstrap Estimates**

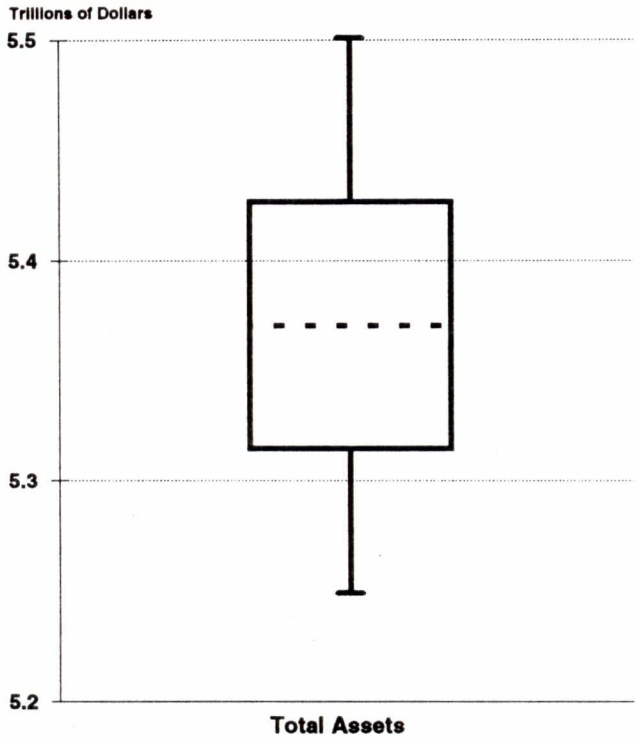
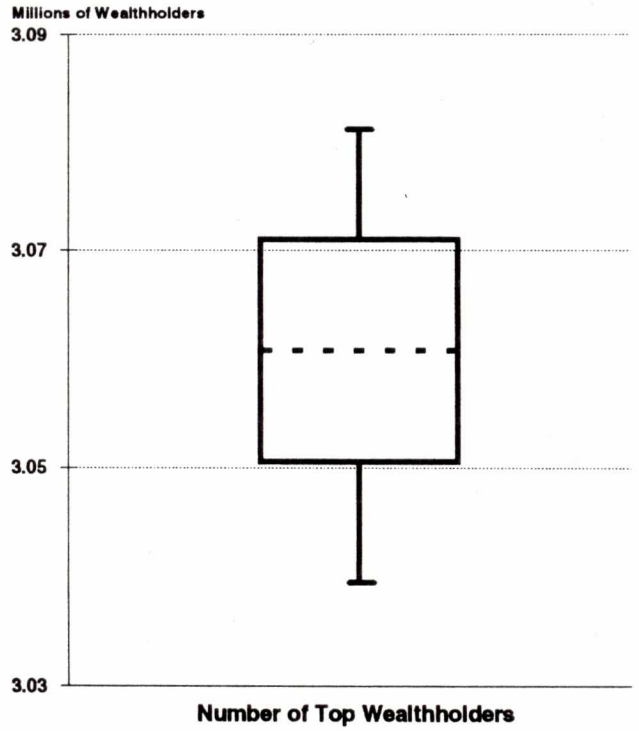



**Figure D.--Box Plot of Number of Top Wealthholders using 11 Bootstrap Estimates**




## III. Comparison to Other Data

Having created estimates of individual or personal wealth, the next step is to validate them, using an independent data source. As mentioned, there is very little information on the wealth of individuals in the U.S., particularly for those in the upper end of the wealth distribution. One excellent source of wealth data, however, is the Survey of Consumer Finances, sponsored triennially by the Board of Governors of the Federal Reserve System.

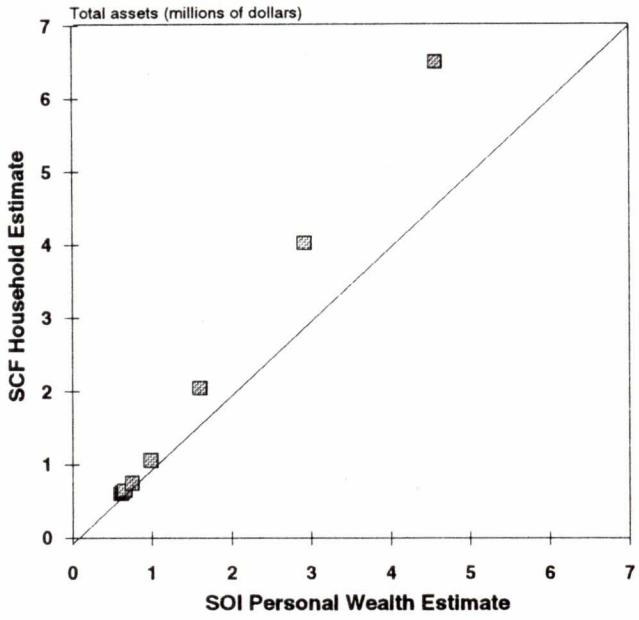
The Survey of Consumer Finances (SCF) is a household survey from which estimates of wealth, income, savings, etc. for the entire nation can be derived. One main objective of the SCF is to provide a good representation of the entire wealth distribution. In order to do this, the SCF incorporates a dual frame sample. One sample is a multi-stage area probability sample; the other is a list sample stratified by a measure of wealth and sampled disproportionately [see Kennickell and Woodburn, 1992]. It is particularly appropriate to use estimates derived from the SCF to validate the SOI estimates because of the supplemental coverage of wealthy individuals provided by the list sample [5].

Because the SCF produces household estimates of wealth, while the estate multiplier technique produces estimates of individual wealth, it is not possible to compare aggregate totals directly [see Scheuren and McCubbin, 1987]. However, there should be some relationship between the distributions of the estimated populations. This comparison can be shown graphically using quantile-quantile (QQ) charts, which compare the cumulative percentage of individuals over a fixed set of percentiles [see Wilk and Gnanadesikan, 1968 for an explanation of this technique]. If the distributions of these functions are exactly alike, the plot will be a straight line, passing through the origin, with slope=1. If the variances are the same, the y-intercept represents the difference in the means. The slope represents the ratio of the variances. If the distributional forms are dissimilar, the plot will be nonlinear.

Figure E is a QQ comparison for estimates of total assets for individuals (SOI) vs households (SCF) with at least $600,000 in total assets. The linear arrangement of the points indicates that the two distributions are of similar functional form. The slope is greater than one, which shows that the values of the SCF estimates rise more quickly than those derived from the estate data.

The linear relationship between the two sets of estimates observed in the QQ plot suggests that the underlying distributions are similar, albeit, derived in different ways. It is possible to carry the comparison further by using additional SOI data to create a household data base from the individual wealth file for households with total assets of at least $600,000. We start with the assumption that single individuals, whether they are widowed, separated,

**Figure E.--QQ Comparison, SCF vs. SOI Estimates for Households/Individuals with Total Assets of $600,000 or More**




divorced or never married, each represent a household. We are left with devising a way to create 'families' from the data for married individuals.

The household wealth of a married couple can be separated into three parts: assets belonging solely to one of the two spouses (WFEM or WMALE) and assets held jointly (WJOINT). The data in the SOI estimates represent individuals for which WFEM + 1/2 WJOINT (for females) or WMALE + 1/2 WJOINT (for males) was at least $600,000. The value of the second spouses' assets (WMALE for females or WFEM for males) is missing and must therefore be imputed.

We first took up the task of imputing WFEM for the males in our file, simply because there were more records for married males in the database than married females. In order to impute a value for WFEM, we made the following assumptions:

1. Some, but not all, of the married individuals in the SOI estimates are married to each other.

2. The separate assets of the married females in our file were representative of those belonging to the spouses (WFEM) of the males in the file.

In general, imputation of missing values is most effective when based on a model derived from a distribution of known values [Little, 1986]. Since WFEM is missing for all cases, we have no information on how WFEM relates to WMALE, or for that matter, to any other data for a given male. Therefore, an explicit model was not feasible. We instead chose the hotdeck procedure within adjustment cells [Hinkins and Scheuren, 1986]. Records for married males for which a value of WFEM were to be imputed were matched to records for females (donor records) in the same adjustment cell. The missing value was estimated using the known value from the donor records.

In order to implement this procedure, the donor records must first be divided into cells. The original SOI sample TGE categories were used, creating 3 strata: TGE under $1 million, $1 million under $5 million and $5 million or more. Each of these strata was further divided into four quantiles based on the distribution of joint assets within that strata, creating a total of 12 cells. Records for the males were divided into the same cell categories. A value of WFEM was then chosen randomly, with replacement, from a donor record, for each married male in a corresponding cell. Repeated applications of the procedure showed that the variance attributable to the imputation process had a relatively minor effect on the distribution of the value of Total Assets in the resulting data set. This variance is incorporated later.

The results of the hotdeck procedure produced a data set containing estimates of households where WMALE + 1/2 WJOINT was at least $600,000. While we assume that some of the males and females in our file are members of the same household, there remain a number of households for which the female spouse's assets (WFEM + 1/2 WJOINT) totaled at least $600,000, but the husband's did not. We assumed that households in which females owned separate assets of at least $600,000 (WFEM > $600,000) best represented these missing families. The males on our file which best represented their spouses were those for whom WMALE < $600,000. A weighting adjustment was made to account for these additional 'families'.

This final adjustment gave us a file of households for which at least 1 individual owned $600,000 or more in gross assets. We were not able to represent married households for which each individual owned less than $600,000 but where the couples' combined assets totaled $600,000 or more. These households are, however, included in the SCF estimates and thus, direct comparisons of the SOI and SCF households at the $600,000 threshold are not meaningful.

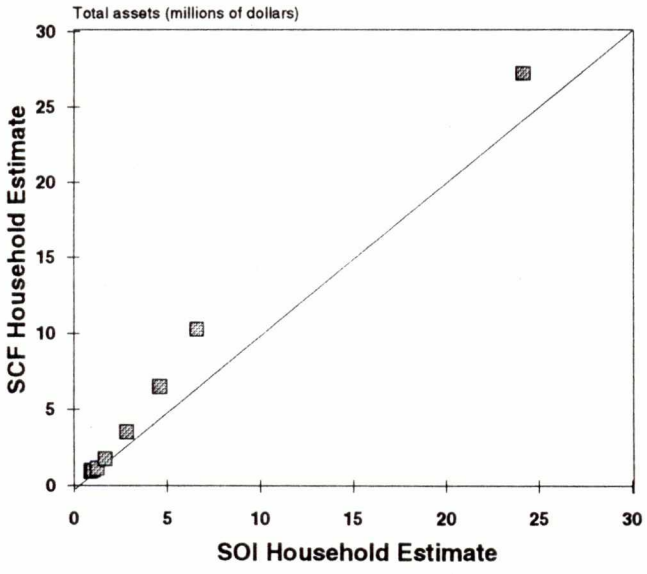
The effect of these 'missing' families on the frequency and dollar estimates should diminish at higher total asset thresholds; the SCF and SOI estimates should eventually converge. Figure F gives frequency and dollar estimates of total assets for different thresholds between $600,000 and $1 million. The frequencies converge between $850,000 and $900,000. At this level their aggregate estimates of total assets differ by about $890 billion, with the SOI estimate about 12 percent less than that of the SCF. A QQ

**Figure F.--SCF vs SOI Household Estimates of Aggregate Total Assets for Increasing Total Asset Thresholds**

| Total asset threshold | SCF estimate | | SOI estimate | | Percent difference between SCF and SOI | |
|---|---|---|---|---|---|---|
| | Number | Amount | Number | Amount | Number | Amount |
| $600,000 | 3.93 | 8.89 | 2.94 | 7.26 | 25.19 % | 18.34 % |
| $650,000 | 3.51 | 8.62 | 2.80 | 7.20 | 20.23 | 16.47 |
| $700,000 | 3.10 | 8.36 | 2.67 | 7.11 | 13.87 | 14.95 |
| $750,000 | 2.93 | 8.24 | 2.58 | 7.04 | 11.95 | 14.56 |
| $800,000 | 2.61 | 7.99 | 2.48 | 6.97 | 4.98 | 12.77 |
| $850,000 | 2.42 | 7.83 | 2.39 | 6.90 | 1.24 | 11.88 |
| $900,000 | 2.30 | 7.71 | 2.32 | 6.83 | -0.87 | 11.41 |
| $950,000 | 2.16 | 7.59 | 2.25 | 6.76 | -4.17 | 10.94 |
| $1,000,000 | 2.03 | 7.46 | 2.17 | 6.69 | -6.90 | 10.32 |

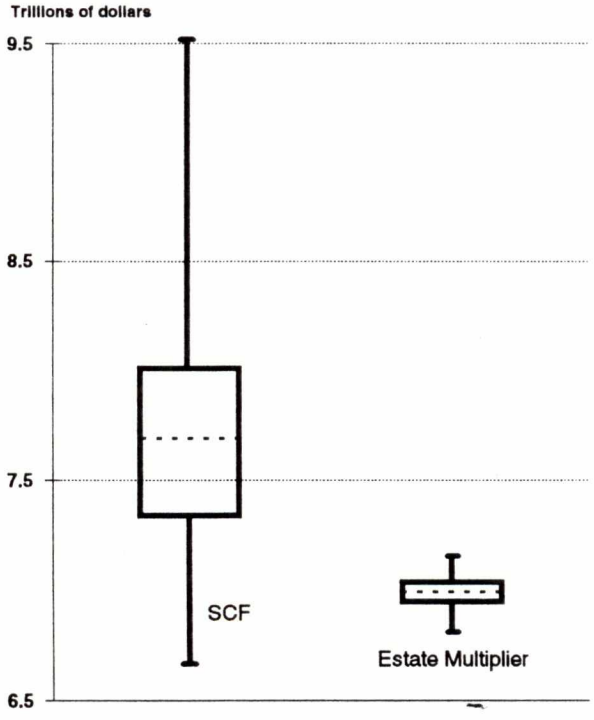
plot of total assets for households with at least $900,000 in assets is given in Figure G. The distributions are more similar than before, but the distribution of the SCF estimates still increases more rapidly than that of the more conservative SOI estimates. Interestingly, some researchers have estimated that the pre-audit values of some estates increase by as much as 10 percent after an audit has been completed [Harris, 1949], while a more recent study found that the increase was between 2 and 4 percent, overall [McCubbin, 1987]. It is also reasonable to expect that values which are acceptable for administrative purposes may be more conservative than those given during a survey interview.

**Figure G.--QQ Comparison, SCF vs. SOI Estimates for Households with Total Assets of $900,000 or More**




Finally, by applying the variance methodology previously described, including the additional variance due to the imputation of "families," we can see that much of the difference in the two estimates is attributable to the uncertainty associated with the two estimation techniques. Figure H shows a box plot of 11 bootstrap estimates of the value of assets for households at or above the $900,000 threshold. The overall variance of the SCF estimate is much greater than that of the SOI estimate, largely because of the much

**Figure H.--Comparison of Bootstrap Estimates: Aggregate Total Assets for Households with Total Assets of $900,000 or more**



smaller sample size on which the SCF estimates are based. (Remember that at this threshold, the frequency estimates are nearly the same.) This graph shows that the more conservative SOI estimate of the value of total assets is within the survey's margin of error.

## IV. Summary and Future Research

In his 1965 paper presented to the American Statistical Association, James Smith suggested several areas for future studies relating to the Estate Multiplier Technique and wealth estimation. Likewise, Scheuren and McCubbin gave a similar set of suggestions in their 1987 paper. In closing, it seems appropriate to visit their "wish lists" and give a progress report on those things we have not already specifically addressed.

1. The major information gaps in the Federal estate tax return data had been missing ages and the absence of a cash surrender value of life insurance. The first problem, that of missing ages has been virtually eliminated through the use of death certificate data, now required of each filer, to supplement data reported on the return itself. For our present sample, there were a mere 22 decedents for whom ages were imputed.

   Estimating the cash value of life insurance remains a problem which will only get worse in light of the many new products being marketed by the industry. Some of these products are sophisticated investment instruments, the return on which is determined by an individual's attitude toward risk as well as by market performance. We are continuing to investigate ways to capture more information from the supplemental data filed with each tax return in order to improve in this area.

2. Data captured from estate tax returns is prior to an audit. C. Lowell Harriss estimated that the value of some estates may increase by as much as 10% after audit. A more recent preliminary study by Scheuren and McCubbin suggest that the difference may be much less significant. SOI is planning a more extensive study, to begin in 1994, which will look at this important issue.

3. What is the income of top wealthholders and their heirs? What is the relationship between inter vivos giving and the transmission of assets at death? These issues are very important to the estimation of wealth and are being addressed through a series of estate collation studies, beginning with a sample of 1976 decedents. These studies link income, gift and fiduciary tax returns filed for decedents and their heirs, for several years prior to a decedent's death, and, in the case of heirs, several years hence. We are currently beginning to process data for 1989 decedents and are planning a larger scale study for 1992 decedents. The advent of the SOI individual income tax panel sample (see Czajka and Walker, 1990) will also offer important opportunities to follow income patterns of individuals over long periods of time and then relate that data to their estate tax returns at their death.

4. Finally, of course more research is needed into the appropriate mortality rates. We have shown that allowing the mortality rate differentials to vary within age categories can have a significant influence on the final estimate and its variance. Further, the practice of assigning the differentials within broad age categories seems to bias the resulting estimates downward. We are looking at several sources for more detailed information on the influence of wealth on mortality, the most promising being the National Longitudinal Mortality Study sponsored by the National Institutes of Health.

## Notes

[1] The cash value of life insurance included in total assets and net worth was approximated based on the face value of life insurance reported on the estate tax return and on the decedent's age. This was done by applying an equity valuation ratio in the form:

$$\frac{\text{Cash Value of Life Insurance}}{\text{Face Value of Life Insurance}}$$

This ratio was developed based on two independent sources of data. The first was a study conducted by the Institute for Life Insurance which looked at the life insurance policies which had been reported in the estates of Federal estate tax filers in mid 1971. The second was the Federal Reserve Board's 1989 Survey of Consumer Finances. This survey asked respondents to approximate the total cash and surrender values of their life insurance values. Only households with total assets of at least $600,000 were considered.

The results generated from each of these sources were encouragingly similar. A simple regression in which age was the independent variable was used to predict the values used in our estimates. No attempt was made to adjust for the presence of term insurance in our data. The same set of ratios was used for both males and females due to lack of sex-specific data.

***Life Insurance Equity Values***

| AGE | Equity Ratio |
|---|---|
| Under 40 | 3.9% |
| 40 under 45 | 8.9 |
| 45 under 50 | 14.0 |
| 50 under 55 | 18.4 |
| 55 under 60 | 24.2 |
| 60 under 65 | 31.1 |
| 65 under 70 | 38.6 |
| 70 under 75 | 47.0 |
| 75 under 8 | 56.1 |
| 80 and over | 82.5 |

[2] We have derived a single set of mortality rate differentials, based on the decedent's age, which were used for both males and females. Based on the knowledge that these groups have very different mortality rates, this may inappropriate. A simple test of this is to compare the estimates of community property for married males and females living in states where such property is common [Scheuren, 1975]. It seems reasonable to expect that the frequency and dollar estimates of community property would be roughly equal between men and women if the differentials have been assigned appropriately.

The table below shows estimates for all community property states combined and for California, the state for which we had the largest sample. In both cases, the aggregate dollar estimate is higher for women than for men; the frequency estimates are reasonably close. Based on these results, no further adjustments were made, although more research is needed in determining the characteristics of the mortality differential between the wealthy and the general population.

***Community Property Estimates***

(Amounts are in billions)

| | Males | | Females | |
|---|---|---|---|---|
| | Number | Amount | Number | Amount |
| All | 270,000 | $741 | 266,000 | $949 |
| Calif | 157,000 | $472 | 158,000 | $584 |

[3] It is interesting to note that the adjusted data base estimated that there were nearly 400 individuals with net worth greater than $250 million, the *Forbes* 400 cut-off in 1989.

[4] Additionally, there is a degree of uncertainty in the estimation of the various components of wealth (real estate, stock, bonds, etc.) due to errors introduced during data capture. These errors are, however, beyond the scope of this paper.

[5] The Survey of Consumer Finances does not include any individuals with net worth greater than $250 million. We therefore constrain the SOI estimates in the following comparison to the same upper bound.

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