

PIECING TOGETHER PERSONAL WEALTH DISTRIBUTIONS

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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 <u>no</u> 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 <u>plus</u> 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.

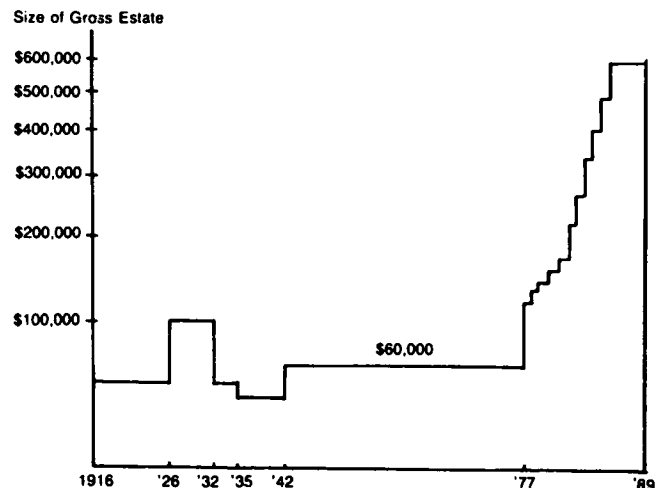
2. ESTATE MULTIPLIER ESTIMATION

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 $i = 1, 2, \dots, n$ decedents, where the probability of "death's selection" is denoted by π_i . The estate multiplier estimator of the total

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

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

$$\hat{\chi} = \sum_{i=1}^n \left(\frac{1}{\pi_i P_i} \right) x_i \quad (2.2)$$

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

Now the probabilities of dying, π_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]

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

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 π_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 π_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 unincorporated 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

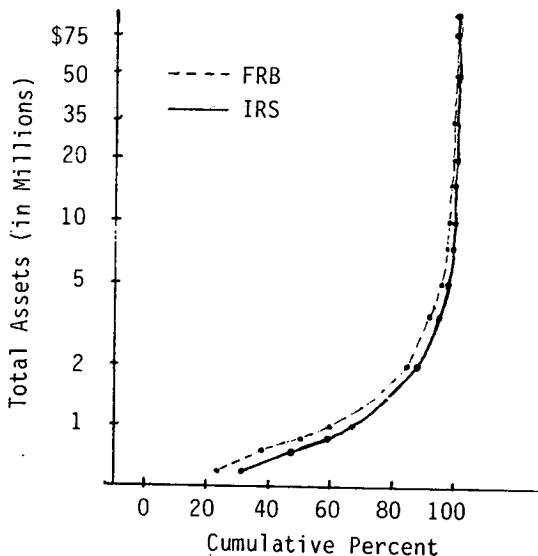
distribution functions, $F_{IRS}^{-1}(p_i)$ and $F_{FRB}^{-1}(p_i)$,

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:

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



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

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

at each decile .40, .50, .60, ..., .90 plus at .95, .98, .99, and .995;

- a straight-line smoothing of the basic $F_{IRS}^{-1}(p_i)$, $F_{FRB}^{-1}(p_i)$ 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 p_i values mentioned above. To do the interpolation, we used new procedures described in a companion paper being given at these meetings [64].

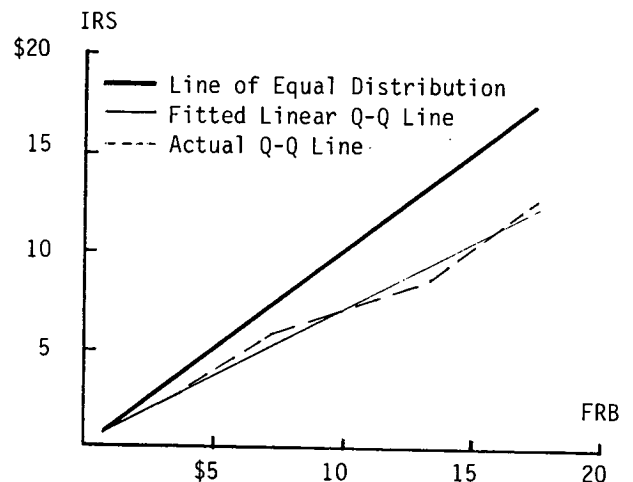
Now, if the distributions are exactly the same, the plot of $F_{IRS}^{-1}(p_i)$ versus $F_{FRB}^{-1}(p_i)$ will form a straight line which passes through the origin and has a slope of 1. If the distributions do not have the same shape, the plot will be nonlinear. In general, if $F_{IRS}^{-1}(p_i)$ and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

$$F_{IRS}^{-1}(p_i) = \mu + \sigma F_{FRB}^{-1}(p_i) \quad (4.1)$$

where the mean μ is a scaled difference between the mean of the IRS data μ_{IRS} and the FRB data, μ_{FRB} , i.e.,

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

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



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

The slope of the linear relationship between F_{IRS}^{-1} and F_{FRB}^{-1} 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, μ_{IRS} and μ_{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 $\hat{\mu} = -\$2,524,340$.)

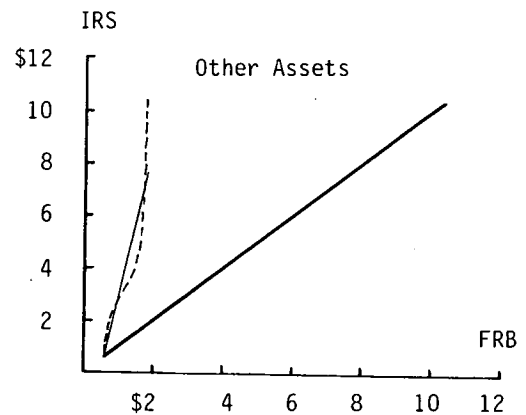
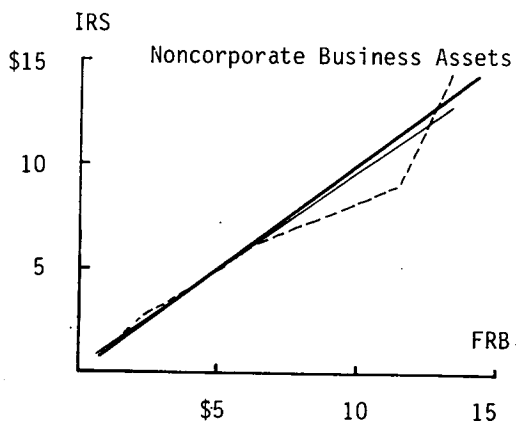
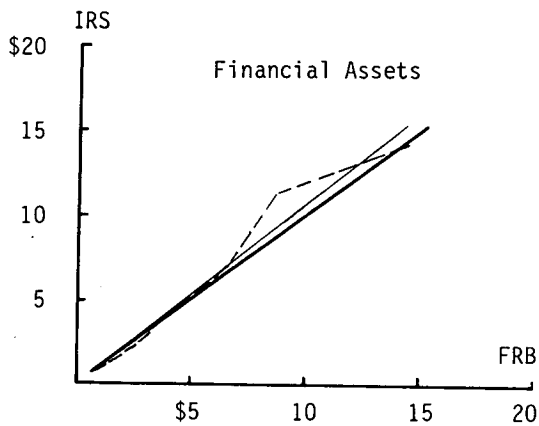
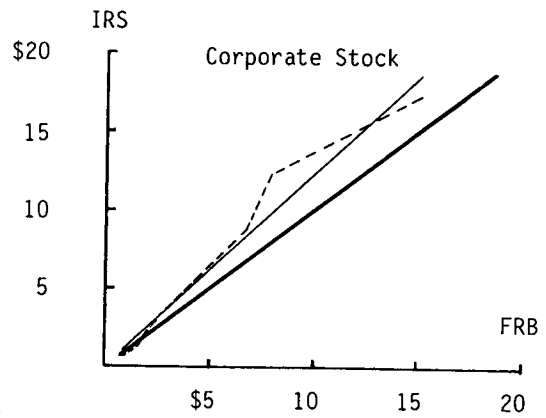
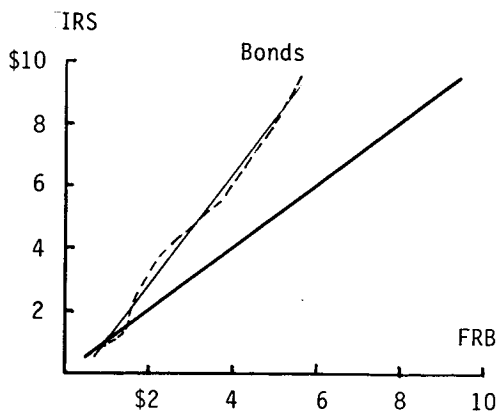
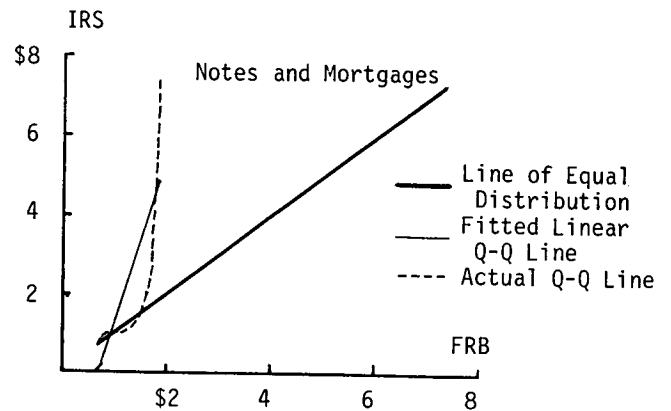
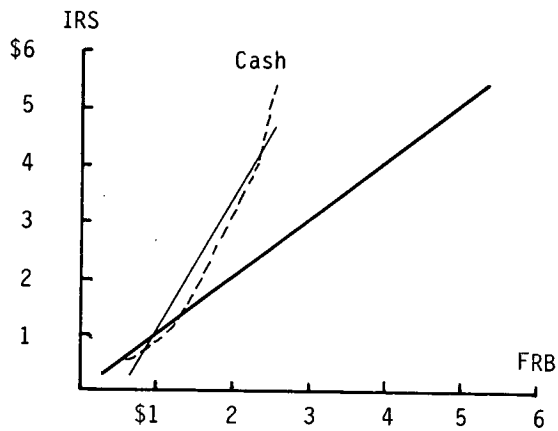
Financial Assets.--Financial assets appear quite similar in distribution between the FRB and IRS data sets. There is still a slight bow in the shape (caused by the dominance of corporate stock). Differences in the other components (bonds, cash, and notes and mortgages) tend to cancel out somewhat. The 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, then 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 anomalies 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
<p>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.</p>	<p>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.</p>	<p>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.</p>
<p>Some assets, in particular, terminable interests including some trust interests and some pensions, are not required to be included on the estate tax return.</p>	<p>Wealth estimates will be biased downward. This effect may be stronger for very wealthy individuals with more complex types of assets.</p>	<p>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.</p>
<p>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.</p>	<p>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.</p>	<p>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.</p>
<p>Life insurance is one asset which increases in value at death.</p>	<p>Wealth estimates are biased upward and the estimated portfolio distribution of assets is incorrect.</p>	<p>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.</p>

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
<p>The alternate valuation date provision complicates the timing issue by allowing executors to elect to value estates six months after the date of death, rather than at the date of death value.</p>	<p>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.)</p>	<p>The date of death value, which is available on the estate tax return, should be used for wealth estimation.</p>
<p>Changes in the estate tax code affect the scope and meaning of estate tax data, making time-series analyses difficult.</p>	<p>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.</p>	<p>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 estimates for different points in time will be corrected for tax law differences which are measurable.</p>
<p>Incomplete demographic information on decedents and the unknown nature of differential mortality rates with respect to wealth complicate the weighting of the "sample."</p>	<p>Wealth may be over- or underestimated by the estate multiplier technique.</p>	<p>Longitudinal income tax data or wealth survey data linked with estate and probate records could be used to calculate mortality differentials by wealth status.</p>

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.

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