An Examination of Changes in the Distribution of Wealth From 1989 to 1998: Evidence from the Survey of Consumer Finances

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This paper considers the distribution of wealth over the period from 1989 to 1998 as an indicator of the economic condition of households. The financial well being of a family depends both on its flow of income and its stock of wealth.[1] Typically, one thinks of income as providing the resources for routine expenses and for saving, and wealth as providing a hedge against downward fluctuations in income, a fund for extraordinary expenses, and resources for consumption in retirement. Income, viewed over time and taken in the broadest sense to include inheritances, unrealized capital gains, incremental changes in pension rights, etc. gives a clear picture of the physical consumption possibilities available to a family—at least to the degree that such a unit has a consistent meaning over time. A similarly broad measure of wealth might encompass the present value of income rights—such as future payments from a defined-benefit pension—as well as a number of financial and nonfinancial assets all net of liabilities. In addition, there are aspects of wealth in itself that provide less tangible types of consumption—the "insurance" value of having a stock of wealth, an enhanced ability to exert control over the set of options available, etc., but these might be taken to have an implicit service flow that should be included in the broad measure of income. Ultimately, the appropriate notions of income, wealth, and even consumption are determined by the particular model one applies to evaluate the welfare of households, by the definition of the household over time, by individuals' expectations, by institutional constraints, and many other factors. There is no universally applicable set of definitions, and one might want quite different definitions for different purposes.

There are also serious problems in measuring both income and wealth. The broad measure of income is almost impossible to observe clearly except in special cases; although perhaps conceptually simpler, narrower definitions of income (total wages, total cash income, etc.) are easier to observe. In the case of wealth, there are no commonly agreed standards for valuing such items as income-only trusts, defined-benefit pension rights, a variety of government entitlement programs, privately-held businesses, etc. Moreover, in contrast to the case of income, there is not usually a simple set of summary measures of net worth that could be reported easily by respondents; in general, wealth measurement depends on aggregating over many categories of assets and liabilities, each of which may raise different measurement

1. In this paper, the terms "net worth" and "wealth" are used interchangeably to refer to the difference of assets and liabilities.

problems. Finally, both income and wealth are "sensitive" subjects for many people, and it is often quite difficult to persuade people to share information about such topics.

In the face of both conceptual and measurement difficulties, the best alternative may be to develop multiple indicators of financial well being, and to rely as much as possible on multiple sources of data. For the U.S., the Bureau of the Census provides information on changes in the distribution of income over time based on the Current Population Survey, and these data and others have been the subject to strenuous arguments of interpretation (see, for example, Bernstein *et al.*, 2000 and Rector and Hederman, 1999). As a byproduct of the administration of individual income taxes, the Internal Revenue Service maintains records of income data defined by the concepts enumerated in the tax code, and the Statistics of Income Division (SOI) creates statistical files of such data for research purposes. These data have been used to study income trends (see, for example, Williams, 1993). SOI also assembles information from estate tax records, and researchers there (most recently Johnson, 1999) have used this information to draw inferences about wealth in the whole population. Survey data on wealth are more limited: The primary sources that have been analyzed are the Survey of Income and Program Participation (see, for example, Anderson, 1999), the Panel Study on Income Dynamics (Hurst *et al.*, 1996), and the Survey of Consumer Finances.

This paper examines changes in the distribution of wealth over the period from 1989 to 1998 mainly using data from the Survey of Consumer Finances (SCF). Some of the SCF data used here have previously been studied by Weicher (1996), Wolff (1996), and Kennickell and Woodburn (1992 and 1999). As background, the paper also uses some estimates published by *Forbes* magazine on the 400 wealthiest people in the U.S. The first section of the paper briefly discusses the data. The next section uses the *Forbes* data to characterize changes at the very top of the wealth distribution. The third section presents a variety of estimates of wealth changes for the population below the "*Forbes* 400" level using SCF data. The fourth section examines the sensitivity of the SCF estimates to a variety of assumptions about systematic mismeasurement in the data. The final section summarizes the findings of the paper.

I. Data sources

A. Forbes data

Beginning in 1982, *Forbes* has published annual estimates of the 400 wealthiest people in the U.S. [2] According to the magazine, these estimates are "highly educated guesses" based on a variety of sources. The input data include both information that may be provided by the individuals, which is reviewed for plausibility, and publicly available data. The latter type of information may take the form of registered ownership in publicly traded corporations, records of sales of privately held firms and property, and similar types of information. Some assets—notably trusts—are very difficult to value, and misestimation of such assets may introduce error. Often distinctions must be made about the "true" owner of assets that have a complex distribution over members of a family, and this process may also introduce error. As a check, the *Forbes* estimates are reviewed by a panel of outside experts in a number of financial and business areas.

The *Forbes* figures used in this paper are for years from 1989 to 1999. Unfortunately, it is impossible to judge the consistency of the *Forbes* methodology over time on the basis of the limited documentation available. Because the estimates published in the magazine are used to describe short-term changes, the incentives to maintain methodological consistency may not be as strong as in the case of official statistical series.

B. Survey of Consumer Finances

The SCF is a triennial survey conducted by the Board of Governors of the Federal Reserve System in cooperation with SOI.[3] Although the current SCF series began in 1983, only the surveys beginning with 1989 were built on a strongly common methodology. The survey data have been collected by the National Opinion Research Center at the University of Chicago (NORC) since 1992, and they were collected by the Survey Research Center at the

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2. See Canterbury and Nosari [1985] and the October 1998 issue of *Forbes*. It is not known publicly just how broad the wealth definition used by *Forbes* is. Although it seems likely that the measure does not include some common items, e.g. automobiles and checking accounts, it does seem likely that the value of such omitted items a are very small fraction of that of the items that are included.

3. See Kennickell, Starr-McCluer, and Surette (2000) for a general description of the recent data and Kennickell (2000a) for a review of the SCF history and methodology.

University of Michigan prior to that time.[4] This paper uses data from the four surveys conducted between 1989 and 1998.[5]

The SCF is designed as a survey of household wealth and associated characteristics. The survey covers assets and liabilities in detail with carefully framed questions intended to aid respondents in remembering their holdings and classifying them as accurately as possible. The survey data indicate that wealth is disproportionately concentrated in a relatively small fraction of all families. To allow for more precise estimation of tail-sensitive statistics (such as the mean of net worth) than would be possible with a more simple random sample and to deal with complex nonresponse problems, the SCF employs a dual-frame sample design: One part is an multi-stage area-probability sample that selects individual households with equal probability, and one part is a list sample selected from statistical records maintained by SOI under strict protections for the privacy of taxpayers (see Kennickell, 1998a). The list sample is designed to oversample relatively wealthy families, though it explicitly excludes observations in the *Forbes* 400.[6]

Missing information is a significant problem in the SCF. Compensation for nonrespondent households is made through weighting adjustments, and a facility for estimating sampling error is provided by a set of replicate weights (see Kennickell and Woodburn, 1999 and Kennickell, 2000b). Missing data in otherwise completed cases are

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4. It is possible that the change in survey vendors between 1989 and 1992 altered the data collection process in a way that affected the distribution of outcomes. However, the project staff at the Federal Reserve Board have always maintained a very strong involvement in the design and execution of interviewer training, and they have also exercised intensive oversight of field operations. Moreover, data processing beyond the data entry stage and initial coding stages has always been largely conducted by the Federal Reserve staff. Since these are the most critical points at which the data might be affected by variations in survey procedures, the "house effects" in looking at changes between the 1989 and 1992 SCFs are likely to be quite small.

5. Data from the 1983 SCF are not included in the comparison. The methodology of the 1983 survey is sufficiently different from that of the later surveys that it is not possible to prepare statistically comparable estimates from the current data file (see Kennickell, 2000a). The recent discovery of a part of the original sample design materials offers hope that it will be possible to place the 1983 survey on a more nearly comparable statistical basis.

6. A small number of relatively famous people are also removed from the sample before it is released to the field. The motivation for this censoring is to eliminate cases that would be particularly difficult to disguise in the public use version of the dataset, and that interviewers would be very unlikely to be able to contact in any case.

imputed using a multiple imputation technique that allows one to estimate the variation in point estimates attributable to the missing information (see Kennickell, 1998b).

The SCF wealth measure used in this paper is obtained by aggregating over a a large number of individual assets and liabilities. Assets are taken to include real estate, businesses, vehicles, account-type pension plans, loans made to others, all types of financial assets, and miscellaneous tangible assets. Liabilities include mortgages, loans against other assets (chiefly pension account, cash value life insurance, and stocks) lines of credit, credit card debt, all types of installment loans, and other miscellaneous debts. Perhaps the most significant omissions are a measure of the present value of income entitlement, particularly defined-benefit pensions and Social Security income.[7].

II. *Forbes* estimates

The annual *Forbes* estimates of the 400 wealthiest Americans are widely reported, and they appear to have a powerful role in shaping perceptions of changes in the distribution of net worth. Being personally identified, the information about the fortunes of these individuals is much more memorable for most people than relatively dry statistics about the distribution of the wealth of other households as measured in anonymous survey data.

Between 1989 and 1995, most measures of the wealth of the wealthiest people grew relatively modestly in real terms: The minimum wealth level in the *Forbes* 400 group grew 3 percent, total wealth of the group grew 10 percent, the number of billionaires rose 14 percent, while the average wealth of the top ten grew 79 percent (table 1).[8] However, the data suggest that in recent years there has been a distinct jump in the level of wealth among the wealthiest families.

From 1995 to 1998, the total amount of net worth held by the *Forbes* 400 rose in real terms from about $379 billion to about $740 billion (a 95 percent increase); the number of

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7. The calculation of such present values entails a significant number of assumptions. See Kennickell and Sundén (19xx) for one such calculation.

8. Unless otherwise noted, dollar figures in this paper have been adjusted to 1998 dollar terms using the "current methods" price index series developed by the Bureau of Labor Statistics. To the degree that it is possible to do so, this index extrapolates backwards the methodological improvements that have been made to the official Consumer Price Index.

billionaires rose from 97 to 191 (a 97 percent increase). Although these changes might be taken to imply that similar changes occurred at the same time all across the broader upper end of the net worth distribution, the data also indicate that the largest gains were at the very top, and they tapered off at lower levels even within the *Forbes* group. In particular, while the maximum level of wealth and the average of the top ten members of the list increased 270 percent, the minimum level of wealth needed to qualify for the *Forbes* list rose by a somewhat more moderate 39 percent increase.[9]

The 1999 data, the most recently available, show signs of faster growth of the wealth of the top holders. From 1998 to 1999 alone, there was acceleration in the growth in the total wealth of the *Forbes* group (a 36 percent increase) and the number of billionaires (a 40 percent increase); although the cutoff for membership continued to grow less rapidly than these measures (a 22 percent increase), its growth also accelerated.

9. Figures for 2000 are available in the October 200 issue of *Forbes*.

Table 1: Net worth of the 400 wealthiest families; 1989, 1992, 1995, 1998, and 1999; based on data from *Forbes.*

	Year				
Item	*1989*	*1992*	*1995*	*1998*	1999
Total wealth of group (billions of 1998 $)	343	348	379	740	1009
Number of billionaires (in 1998 $)	85	73	97	191	267
Minimum wealth needed to be included in group (millions of 1998$)	350	303	361	500	609
Average of top 10 (millions of 1998$)	3,895	5,788	6,978	18,980	27,691
Maximum wealth (millions of 1998$)	6,621	7,193	15,720	58,400	82,975
Total wealth of group as percent of SCF estimate	1.5	1.7	1.7	2.6	NA

III. SCF estimates

Although the SCF sample explicitly excludes members of the *Forbes* 400, households with wealth up to that level are eligible to be included, and a large proportion of the sample is devoted to relatively wealthy families.[10] The SCF should provide good information on the wealth of the upper end of the net worth distribution below the very top level, even though the survey estimates are subject to non-negligible statistical variability implied by the sample size and other such technical characteristics of the underlying measurement.

For comparing distributions of net worth, there are no unambiguous and universally agreed summary measures. Several indicators are presented here for the net worth distributions implied by the four cross-sections of SCF data from 1989 to 1998: the percent

10. As shown in table 1, the Forbes estimates for the total wealth of the 400 wealthiest people over the 1989-1995 period ranged between 1.5 and 1.7 percent of total wealth estimated by the SCF. This fraction jumped up nearly a percentage point from 1995 to 1998.

distributions of families over constant-dollar wealth categories, the means and medians of the distributions of net worth, the Gini coefficients for wealth, and the shares of total net worth held by different groups within the distribution. In addition, a graphical summary is provided of the shifts in wealth levels and of the percentage changes in wealth across the distributions for the survey years.

A. Percentage distribution

The 1989 SCF was conducted before the peak of a business cycle, and the surveys up through 1998 were done during phases of the subsequent recovery. Consistent with what one might expect after a recession, the point estimate of the percentage of families with net worth over $250,000 fell from 1989 to 1992, and it surpassed the 1989 figure again only in 1998 (table 2). At the same time, the proportion of families with wealth between zero and $5,000 declined over the period. Many of the changes from 1992 to 1998 are statistically significant,

Table 2: Percentage distribution of families over constant-dollar wealth groups; 1989, 1992, 1995 and 1998 SCF.

	Survey year			
Net worth (1998 dollars)	*1989*	*1992*	*1995*	*1998*
Negative	7.3	7.2	7.2	8.0
	0.6	*0.4*	*0.4*	*0.4*
0-$4,999	16.0	14.1	12.1	12.1
	0.7	*0.5*	*0.4*	*0.5*
$5,000-$24,999	13.3	15.3	15.5	13.5
	0.8	*0.6*	*0.6*	*0.6*
$25,000-$49,999	10.1	10.9	11.1	9.8
	0.6	*0.6*	*0.7*	*0.6*
$50,000-$99,999	14.0	15.0	16.4	14.5
	1.1	*0.6*	*0.6*	*0.7*
$100,000-$249,999	20.3	21.3	21.4	20.5
	1.8	*0.8*	*0.7*	*0.9*
$250,000-$499,999	10.0	8.5	8.4	11.8
	1.6	*0.9*	*0.8*	*1.4*
$500,000 or more	9.1	7.7	8.0	9.8
	3.1	*0.7*	*0.6*	*1.0*
All families	100.0	100.0	100.0	100.0
	0.0	*0.0*	*0.0*	*0.0*

Note: Standard errors with respect to imputation and sampling are given in italics.

and the decline from 1989 to 1998 in the proportion of families with net worth between zero and $5,000 is also significant. However, the estimates imply that the change in the proportion of families with net worth of $500,000 or more in 1989 is not significantly different from the estimates in 1992 or 1998.[11]

B. Medians and Means

Both the mean and median of net worth show a downturn after 1989 and steady increases after that, surpassing the 1989 levels in 1998 (table 3). The changes from 1992 to 1998 and from 1995 to 1998 are statistically significant, but reflecting the large estimated standard errors for the 1989 estimates, only the change in the median is significant from 1989 to 1998.

Between 1995 and 1998, median net worth rose 18 percent from $60,900 to $71,600 (table 2). At the same time, mean net worth rose 26 percent from $224,800 in 1995 to $282,500 in 1998. The growth in the median was about two-thirds as great as the growth of the mean, which was two-thirds as large as the growth in the cut-off for the *Forbes* 400. Thus, the pattern is consistent with the diminishing growth rates seen within the *Forbes* group. One might expect the faster growth in the mean than in the median to imply that the concentration of wealth among groups in the top half of the wealth distribution increased; however, as shown in more detail below, closer examination of the data reveals a more complicated result.

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11. In general, the bootstrap methodology used for simulating the variability of the SCF estimates also implies relatively large standard errors for many other estimates using the 1989 data. These variance estimates appear to be robust to a large variety of alternative approaches using elements of the original design to generating bootstrap samples of the respondents. Two factors explain a part of the relatively large standard errors for the 1989 data. The most important factor appears to be that the list sample was only about half the size of the list sample in later surveys. A secondary factor is that the area-probability sample was based on an overlapping panel/cross-section design which was driven in substantial part by a need to reduce the cost of the project but which was less efficient than the area-probability designs used in the subsequent surveys.

Further research into the methodology of variance estimation for the survey is ongoing (Kennickell, 2000b). The preliminary results of that work suggest that the use of an alternative assumption in the calculation of the replicate weights may reduce some key standard errors with respect to sampling by about half or more. At this level, the variability due to sampling and to imputation are more often about the same order of magnitude. For example, one alternative estimate of the standard error of the proportion of families with net worth of $500,000 or more in 1989 is 1.2 percentage points; the standard error attributable to sampling and that due to missing data are both 0.8 percentage point. For the corresponding 1998 estimate, the overall standard error is 0.5 percentage point, the standard error attributable to sampling is 0.4 percentage point, and that attributable to missing data is 0.3 percentage point.

Table 3: Median and mean net worth, 1989, 1992, 1995 and 1998 SCF, thousands of 1998 dollars

	Median	*Mean*
1989	59.7	236.9
	5.2	*50.1*
1992	56.5	212.7
	3.3	*13.8*
1995	60.9	224.8
	2.4	*14.9*
1998	71.6	282.5
	4.1	*16.4*

Standard errors due to imputation and sampling are given in italics.

C. Gini Coefficients

The Gini coefficient is frequently used to characterize changes in wealth distributions. This statistic for wealth is defined in terms of the Lorenz curve, which is a graph of the share of total wealth held by all families at or below each percentile of the wealth distribution, plotted by the percentiles of that distribution. Thus, the graph ranges from the origin (where the wealth share and the population percentile are identically zero) to the point where both the cumulative percentage share of wealth and the percentile of the distribution are equal to 100 (everyone altogether owns all the wealth); the graph lies below a straight line connecting those two points. The farther the graph lies below the line at any point, the more unequal is the distribution between groups higher and lower. The Gini coefficient summarizes the differences as the ratio of the area between the line and the curve and the total area beneath the line. Thus, higher levels of the Gini coefficient indicate greater inequality in this sense.

Following the pattern of the previous descriptions of the wealth distribution, the point estimates of the Gini coefficient fall from 1989 to 1992 and rise successively to a point in 1998 that is above the 1989 level (table 4). However, none of the changes are statistically significant. Part of the explanation for the lack of significance is that the Gini coefficient is not particularly efficient in its use of information. To illustrate this point, figure 1 shows the difference between the Lorenz curve for net worth in 1998 and that in 1995.[12] The change in the level of the Gini coefficient is proportional to the negative of the size of the total area above and below the zero line in the figure. The slope of the line indicates the direction of change: a negative slope indicates that the wealth shares of groups are progressively lower in 1998 than in 1995, and a positive slope indicates the opposite. The shape of the line in the figure is consistent with the difference in the point estimates of the Gini coefficient. Variation in estimates of the wealth share at a given point has the direct effect of making the local estimate noisy, and the indirect effect of altering the basis of change for points further along the distribution. As the pointwise 95 percent confidence interval (the large dots) shows, the cumulative effect of the local variability is quite large relative to the estimated area.

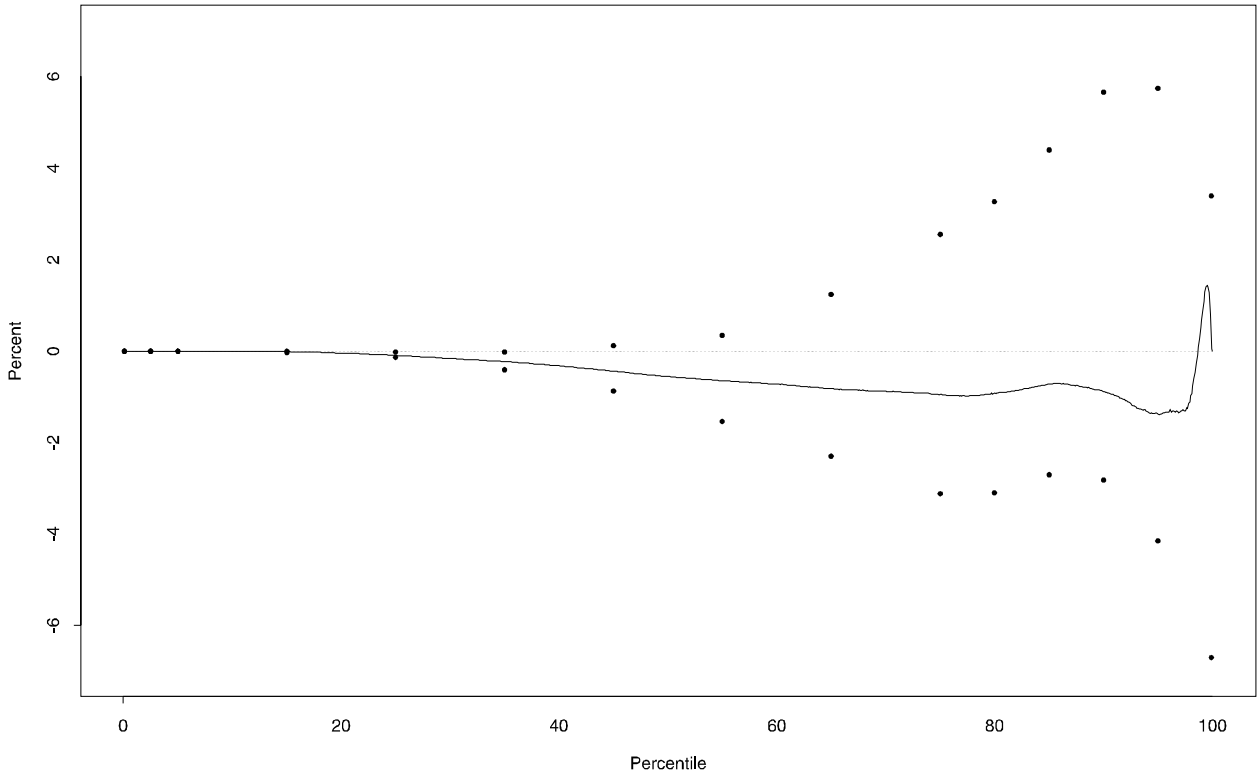
Table 4: Gini coefficients for net worth, 1989, 1992, 1995, and 1998 SCF.

1989	0.787 *0.016*
1992	0.781 *0.010*
1995	0.785 *0.011*
1998	0.794 *0.010*

Standard errors due to imputation and sampling are given in italics.

12. For convenience, wealth values less than zero were set to zero in computing the estimates displayed in this figure.

Figure 1: Pointwise differences between 1998 and 1995 lorenz curves for net worth, by percentiles of the distribution of net worth, and estimates of pointwise 95 percent confidence intervals.



D. Wealth Shares

Because the Gini coefficient aggregates across the entire wealth distribution, it could mask important changes that would emerge by breaking out different parts of the wealth distribution. Estimates based on the SCF indicate that the share of wealth held by the wealthiest ½ percent of families varied from about 23 percent in 1989 and 1992 to about 27 percent in 1995 and about 26 percent in 1998 (table 5). However, from survey to survey, only the change from 1992 to 1995 is statistically significant. Overall, what seems most striking is the relative stability of the point estimates over the nine-year period.

To provide a more detailed understanding of the underlying wealth changes, tables 6a-6d show estimated portfolio holdings in the four surveys from 1989 to 1998 for the wealth percentile groups in table 3. One contrast is particularly striking across these years of data: For the bottom 90 percent of the net worth distribution, principal residences are the most important asset overall, and for the top of the distribution, businesses (including closely-held corporations and all other types of businesses that are not publicly traded) are by far the most

Table 5: Proportion of Total Net Worth Held by Different Percentile Groups: 1989, 1992, 1995 and 1998 SCFs

	Percentile of the net worth distribution			
Survey year	0 to 89.9	90 to 99	99 to 99.5	99.5 to 100
1989	32.7	37.1	7.3	22.9
	3.1	*3.5*	*1.2*	*2.8*
1992	33.0	36.9	7.5	22.6
	1.7	*1.9*	*0.5*	*1.4*
1995	32.2	33.1	7.6	27.1
	1.8	*1.4*	*0.7*	*2.0*
1998	31.3	34.7	8.2	25.8
	1.7	*1.7*	*0.5*	*1.8*

Standard errors due to imputation and sampling are given in italics (standard errors are not available for 1983 and 1963).

important asset overall.

Underlying the stability of the overall wealth shares, there were some large shifts in the portfolios of all of the wealth groups. From 1989 to 1998, stock holdings (here including only directly held publicly traded stocks, stock mutual funds, and stocks and stock funds held through IRAs and Keogh accounts—but *not* stock held through thrift accounts, which include mainly 401(k)-type accounts) grew 243 percent, thrift accounts grew 120 percent, and total debts rose 45 percent. The growth in stocks and debts was relatively concentrated between 1995 and 1998; the rise in pension accounts was more spread over the period from 1992 to 1998.

For the bottom 90 percent of the wealth distribution, increased holdings of principal residences account for the largest share of their wealth gains over the 1989 to 1998 period, even though the 17 percent growth in the value of such assets was substantially below the 242 percent growth in stock holdings; the factor driving this divergence is that the value of holdings of principal residences was 18 times that of stocks for this group in 1989. Nevertheless, stocks and thrift account holdings also contributed strongly to the increased wealth of the group over the period. The sizable increase in liabilities of the group–largely principal residence debt–offset nearly two-thirds of their rise in asset holdings.

For the households in the top 10 percent of the wealth distribution, changes in debt were relatively less important in their portfolios. Their wealth gains were largely driven by increased holdings of stocks and business assets.

Table 6a: Holdings and distribution of assets, debts, and income (in billions of 1998 dollars), by percentiles of net worth, 1989.

	Percentile of the net worth distribution									
	All households		*0 to 89.9*		*90 to 99*		*99 to 99.5*		*99.5 to 100*	
Item	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total
Assets	26,432.5	100.0	9,842.1	37.3	9,242.2	34.9	1,721.4	6.5	5,621.9	21.3
	5,043.1	*0.0*	*1,904.2*	*3.2*	*2,379.1*	*3.4*	*570.2*	*1.1*	*1,068.1*	*2.6*
Princ. residence	8,376.4	100.0	5,319.8	63.5	2,465.3	29.4	234.8	2.8	356.0	4.3
	958.1	*0.0*	*559.1*	*2.4*	*420.2*	*2.3*	*48.0*	*0.5*	*101.1*	*0.9*
Other real estate	4,059.1	100.0	779.2	19.2	1,549.2	38.1	295.5	7.3	1,434.1	35.4
	1,202.0	*0.0*	*320.0*	*4.3*	*443.9*	*5.3*	*275.3*	*3.1*	*541.6*	*6.7*
Stocks	1,578.2	100.0	291.4	18.5	687.0	43.5	134.1	8.5	465.2	29.5
	369.9	*0.0*	*102.5*	*3.9*	*193.9*	*5.7*	*81.5*	*3.3*	*113.4*	*5.6*
Bonds	1,093.6	100.0	139.8	12.8	448.1	40.9	104.0	9.5	401.3	36.8
	308.9	*0.0*	*84.5*	*4.1*	*139.9*	*7.0*	*80.9*	*4.7*	*145.8*	*8.1*
Trusts	581.6	100.0	80.1	13.8	234.7	40.7	102.0	17.4	164.8	28.1
	192.6	*0.0*	*62.4*	*6.0*	*135.1*	*13.8*	*67.9*	*10.3*	*82.0*	*9.3*
Life Insurance	468.4	100.0	241.9	51.7	151.4	32.3	30.4	6.5	44.6	9.4
	84.9	*0.0*	*41.3*	*5.5*	*39.7*	*5.2*	*16.9*	*3.3*	*35.8*	*5.2*
Checking accts	308.0	100.0	149.5	49.1	128.5	41.0	16.4	5.5	13.6	4.5
	61.5	*0.0*	*25.6*	*7.2*	*50.2*	*8.8*	*13.1*	*4.4*	*6.5*	*2.2*
Thrift accounts	810.9	100.0	382.0	47.2	319.0	39.2	43.9	5.4	66.1	8.2
	165.9	*0.0*	*102.2*	*6.7*	*89.9*	*6.2*	*23.8*	*2.6*	*28.8*	*3.5*
Other accounts	2,585.2	100.0	1,057.6	40.9	1,003.5	38.8	219.0	8.5	304.9	11.8
	457.9	*0.0*	*199.9*	*4.4*	*287.5*	*6.0*	*68.4*	*2.6*	*173.8*	*5.5*
Businesses	4,490.8	100.0	407.2	9.1	1,588.1	35.2	425.3	9.5	2,068.4	46.1
	1,463.0	*0.0*	*411.9*	*4.2*	*698.3*	*6.8*	*255.5*	*3.5*	*562.3*	*7.9*
Automobiles	977.6	100.0	725.9	74.2	194.9	19.9	18.7	1.9	38.1	3.9
	74.4	*0.0*	*38.8*	*2.8*	*42.9*	*2.7*	*12.4*	*1.2*	*16.7*	*1.3*
Other assets	1,102.6	100.0	267.9	24.4	472.5	42.7	97.4	8.7	264.7	24.1
	274.9	*0.0*	*102.4*	*5.0*	*180.7*	*6.8*	*53.1*	*3.5*	*65.3*	*6.6*
Liabilities	4,041.4	100.0	2,518.5	62.3	925.8	22.9	89.9	2.2	506.6	12.5
	446.8	*0.0*	*300.4*	*4.3*	*184.2*	*3.4*	*41.4*	*0.9*	*184.6*	*3.7*
Princ. res. debt	2,158.9	100.0	1,693.3	78.4	400.8	18.6	23.3	1.1	41.4	1.9
	167.2	*0.0*	*158.5*	*2.7*	*61.4*	*2.6*	*15.3*	*0.7*	*17.3*	*0.8*
Other r/e debt	1,049.7	100.0	187.3	17.9	410.6	39.0	56.2	5.4	395.1	37.7
	263.9	*0.0*	*111.7*	*7.1*	*114.3*	*8.1*	*29.8*	*2.2*	*169.6*	*9.1*
Other debt	832.7	100.0	637.9	76.6	114.3	13.7	10.3	1.3	70.0	8.4
	111.4	*0.0*	*95.6*	*5.9*	*56.0*	*5.0*	*16.7*	*2.0*	*32.2*	*3.6*
Net worth	22,391.2	100.0	7,323.6	32.7	8,316.4	37.1	1,631.6	7.3	5,115.3	22.9
	4,675.7	*0.0*	*1,651.8*	*3.1*	*2,233.5*	*3.5*	*560.1*	*1.2*	*985.2*	*2.8*
Total income	4,654.1	100.0	3,029.1	65.1	986.9	21.2	187.4	4.0	450.5	9.7
	325.1	*0.0*	*185.5*	*2.5*	*153.8*	*2.2*	*54.6*	*1.1*	*105.2*	*2.1*
Memo items:										
Min net worth ($Th)	(Negative)		(Negative)		453.4		2,929.1		4,428.4	
Num. of obs.	3,143.0		2,164.0		560.0		89.0		330.0	
Wgtd num. units (M)	93.0		83.7		8.4		0.5		0.5	

Standard errors due to imputation and sampling are given in italics. See notes for definitions of the categories

Table 6b: Holdings and distribution of assets, debts, and income (in billions of 1998 dollars), by percentiles of net worth, 1992.

	Percentile of the net worth distribution									
	All households		*0 to 89.9*		*90 to 99*		*99 to 99.5*		*99.5 to 100*	
Item	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total
Assets	24,318.1	100.0	9,274.3	38.2	8,471.7	34.8	1,625.7	6.7	4,935.5	20.3
	1,452.0	*0.0*	*473.0*	*1.8*	*883.7*	*1.8*	*186.9*	*0.5*	*380.3*	*1.3*
Princ. residence	7,863.2	100.0	5,061.4	64.4	2,223.4	28.3	231.0	2.9	346.9	4.4
	291.9	*0.0*	*202.1*	*1.6*	*155.7*	*1.4*	*46.2*	*0.6*	*37.4*	*0.5*
Other real estate	3,453.7	100.0	633.5	18.4	1,345.5	39.0	329.4	9.5	1,143.1	33.1
	388.1	*0.0*	*66.2*	*2.0*	*205.1*	*3.1*	*129.7*	*2.9*	*175.6*	*4.0*
Stocks	1,998.0	100.0	377.2	18.9	845.5	42.3	220.5	11.1	553.7	27.7
	195.2	*0.0*	*41.6*	*2.2*	*148.9*	*4.1*	*58.0*	*3.0*	*75.9*	*3.2*
Bonds	1,026.3	100.0	121.0	11.8	485.0	47.2	155.3	15.1	264.4	25.8
	116.2	*0.0*	*21.5*	*1.9*	*85.9*	*4.3*	*51.5*	*4.5*	*40.4*	*4.1*
Trusts	409.9	100.0	65.0	15.9	186.2	45.5	23.1	5.6	135.1	33.0
	64.6	*0.0*	*15.2*	*2.9*	*37.4*	*5.8*	*17.7*	*3.5*	*33.2*	*5.0*
Life Insurance	460.7	100.0	257.6	56.0	169.2	36.7	10.4	2.3	23.4	5.1
	52.2	*0.0*	*20.9*	*5.6*	*44.3*	*5.9*	*2.4*	*0.6*	*4.2*	*1.0*
Checking accts	245.2	100.0	141.6	57.7	67.8	27.7	16.3	6.6	19.5	8.0
	15.8	*0.0*	*8.7*	*2.6*	*8.3*	*2.3*	*6.6*	*2.5*	*3.7*	*1.5*
Thrift accounts	803.0	100.0	343.4	42.8	380.5	47.4	36.2	4.5	42.8	5.3
	81.3	*0.0*	*33.7*	*4.2*	*63.7*	*4.5*	*16.0*	*2.0*	*13.9*	*1.7*
Other accounts	2,233.6	100.0	977.4	43.8	894.8	40.1	147.5	6.6	213.6	9.6
	130.7	*0.0*	*70.6*	*2.5*	*86.0*	*2.4*	*46.6*	*2.0*	*49.0*	*2.1*
Businesses	4,176.1	100.0	389.2	9.3	1,414.7	33.9	368.7	8.9	1,998.2	47.8
	480.1	*0.0*	*52.4*	*1.4*	*268.0*	*3.6*	*101.8*	*2.2*	*274.8*	*4.2*
Automobiles	930.6	100.0	697.0	74.9	188.8	20.3	16.3	1.8	28.3	3.0
	24.4	*0.0*	*15.4*	*1.1*	*13.6*	*1.1*	*3.8*	*0.4*	*3.9*	*0.4*
Other assets	718.0	100.0	210.0	29.3	270.2	37.6	71.2	9.9	166.5	23.2
	79.9	*0.0*	*27.1*	*3.1*	*52.6*	*4.3*	*17.1*	*2.4*	*34.7*	*3.6*
Liabilities	3,935.7	100.0	2,558.1	65.0	948.1	24.1	94.9	2.4	333.8	8.5
	180.5	*0.0*	*113.8*	*2.2*	*93.4*	*1.8*	*37.0*	*0.9*	*45.1*	*1.0*
Princ. res. debt	2,521.1	100.0	1,898.2	75.3	526.7	20.9	37.8	1.5	58.5	2.3
	100.4	*0.0*	*90.3*	*2.0*	*51.7*	*1.9*	*12.2*	*0.5*	*8.0*	*0.3*
Other r/e debt	764.7	100.0	158.2	20.7	342.4	44.8	44.6	5.8	219.0	28.6
	93.5	*0.0*	*26.3*	*2.9*	*54.0*	*3.8*	*27.9*	*3.0*	*37.9*	*4.0*
Other debt	649.7	100.0	501.7	77.2	79.1	12.2	12.3	1.9	56.5	8.7
	32.4	*0.0*	*27.2*	*2.3*	*13.0*	*1.8*	*5.5*	*0.8*	*13.4*	*1.9*
Net worth	20,382.4	100.0	6,716.3	33.0	7,523.6	36.9	1,530.8	7.5	4,601.6	22.6
	1,321.3	*0.0*	*388.9*	*1.7*	*818.6*	*1.9*	*159.3*	*0.5*	*359.6*	*1.4*
Total income	4,273.9	100.0	2,992.3	70.0	923.3	21.6	112.0	2.6	245.7	5.8
	104.6	*0.0*	*68.6*	*1.3*	*65.3*	*1.2*	*16.6*	*0.4*	*28.0*	*0.6*
Memo items:										
Min net worth ($Th)	(Negative)		(Negative)		416.3		2,681.8		4,030.2	
Num. of obs.	3,906.0		2,571.0		686.0		106.0		543.0	
Wgtd num. units (M)	95.9		86.3		8.6		0.5		0.5	

Standard errors due to imputation and sampling are given in italics. See notes for definitions of the categories

Table 6c: Holdings and distribution of assets, debts, and income (in billions of 1998 dollars), by percentiles of net worth, 1995.

	Percentile of the net worth distribution									
	All households		*0 to 89.9*		*90 to 99*		*99 to 99.5*		*99.5 to 100*	
Item	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total
Assets	26,351.0	100.0	10,088.0	38.3	8,165.3	31.0	1,802.1	6.8	6,284.3	23.8
	1,563.7	*0.0*	*406.2*	*1.8*	*600.0*	*1.2*	*267.6*	*0.6*	*756.7*	*1.9*
Princ. residence	8,097.8	100.0	5,398.1	66.7	2,057.2	25.4	221.8	2.7	420.0	5.2
	204.3	*0.0*	*145.1*	*1.1*	*98.0*	*0.9*	*22.3*	*0.3*	*54.8*	*0.6*
Other real estate	2,851.5	100.0	582.4	20.4	1,242.5	43.6	250.7	8.8	774.2	27.2
	247.7	*0.0*	*69.0*	*2.0*	*127.8*	*2.8*	*47.2*	*1.4*	*133.1*	*3.3*
Stocks	2,923.6	100.0	469.8	16.1	1,26.0	41.9	307.6	10.5	918.7	31.4
	349.0	*0.0*	*51.0*	*1.8*	*144.7*	*3.9*	*70.6*	*1.7*	*222.1*	*4.6*
Bonds	1,218.5	100.0	123.4	10.1	415.8	34.1	115.8	9.5	562.4	46.1
	146.9	*0.0*	*19.0*	*1.6*	*54.7*	*3.7*	*47.6*	*3.2*	*102.6*	*4.5*
Trusts	561.3	100.0	77.4	13.8	236.3	42.1	57.5	10.2	189.8	33.8
	77.0	*0.0*	*13.7*	*2.6*	*41.3*	*5.4*	*38.7*	*5.8*	*55.5*	*7.7*
Life Insurance	689.4	100.0	383.9	55.7	186.3	27.0	42.6	6.2	76.5	11.1
	51.8	*0.0*	*29.4*	*3.4*	*28.9*	*3.2*	*20.3*	*2.9*	*22.4*	*2.9*
Checking accts	283.0	100.0	162.8	57.6	74.1	26.2	13.1	4.6	32.7	11.6
	13.1	*0.0*	*7.2*	*2.1*	*6.9*	*1.9*	*2.9*	*1.0*	*6.2*	*1.9*
Thrift accounts	1,313.0	100.0	577.0	44.0	566.6	43.1	88.0	6.7	81.4	6.2
	90.0	*0.0*	*50.7*	*3.1*	*71.5*	*3.8*	*35.3*	*2.7*	*35.8*	*2.6*
Other accounts	2,161.8	100.0	833.8	38.6	748.9	34.6	157.9	7.3	420.6	19.5
	182.6	*0.0*	*68.8*	*2.9*	*63.3*	*2.6*	*57.4*	*2.4*	*126.8*	*4.6*
Businesses	4,262.5	100.0	329.6	7.7	882.2	20.7	484.4	11.4	2,561.4	60.1
	568.7	*0.0*	*32.9*	*1.1*	*163.2*	*2.7*	*156.1*	*2.4*	*361.4*	*3.7*
Automobiles	1,176.8	100.0	912.9	77.6	209.4	17.8	23.6	2.0	30.8	2.6
	23.1	*0.0*	*18.7*	*0.8*	*8.8*	*0.7*	*4.9*	*0.4*	*5.0*	*0.4*
Other assets	812.0	100.0	236.8	29.2	319.8	39.4	39.3	4.8	215.7	26.6
	77.4	*0.0*	*19.3*	*2.8*	*53.3*	*4.2*	*13.3*	*1.5*	*40.5*	*4.0*
Liabilities	4,177.5	100.0	2,951.6	70.7	818.3	19.6	123.9	3.0	283.2	6.8
	121.7	*0.0*	*87.4*	*1.6*	*62.8*	*1.3*	*25.1*	*0.6*	*50.8*	*1.1*
Princ. res. debt	2,813.5	100.0	2,199.4	78.2	487.4	17.3	51.6	1.8	74.8	2.7
	74.4	*0.0*	*67.8*	*1.2*	*37.6*	*1.2*	*9.1*	*0.3*	*11.2*	*0.4*
Other r/e debt	615.7	100.0	151.3	24.6	257.0	41.7	61.2	9.9	145.7	23.7
	62.5	*0.0*	*27.4*	*3.6*	*37.0*	*4.2*	*18.6*	*2.8*	*32.9*	*4.4*
Other debt	748.4	100.0	600.9	80.3	73.8	9.9	10.9	1.5	62.6	8.4
	31.2	*0.0*	*16.4*	*2.8*	*9.5*	*1.2*	*8.4*	*1.1*	*20.5*	*2.5*
Net worth	22,173.5	100.0	7,136.4	32.2	7,347.0	33.1	1,678.3	7.6	6,001.2	27.1
	1,479.9	*0.0*	*340.4*	*1.8*	*557.4*	*1.4*	*263.6*	*0.7*	*730.0*	*2.0*
Total income	4,564.3	100.0	3,133.0	68.6	905.6	19.8	156.9	3.4	367.8	8.1
	106.0	*0.0*	*61.1*	*1.1*	*48.8*	*0.8*	*21.7*	*0.5*	*49.0*	*1.0*
Memo items:										
Min net worth ($Th)	(Negative)		(Negative)		412.6		2,723.0		5,058.1	
Num. of obs.	4,299.0		2837.0		799.0		168.0		495.0	
Wgtd num. units (M)	99.0		89.1		8.9		0.5		0.5	

Standard errors due to imputation and sampling are given in italics. See notes for definitions of the categories

Table 6d: Holdings and distribution of assets, debts, and income (in billions of 1998 dollars), by percentiles of net worth, 1998.

	Percentile of the net worth distribution									
	All households		*0 to 89.9*		*90 to 99*		*99 to 99.5*		*99.5 to 100*	
Item	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total	Holdings	% of total
Assets	34,179.1	100.0	12,699.1	37.2	11,183.5	32.7	2,469.1	7.2	7,811.7	22.9
	1,802.6	*0.0*	*720.1*	*1.7*	*996.6*	*1.6*	*207.8*	*0.5*	*606.7*	*1.5*
Princ. residence	9,644.8	100.0	6,219.4	64.5	2,565.3	26.6	327.2	3.4	532.2	5.5
	304.7	*0.0*	*223.9*	*1.4*	*152.4*	*1.3*	*52.9*	*0.5*	*68.3*	*0.7*
Other real estate	3,526.4	100.0	900.3	25.5	1,447.5	41.0	359.8	10.2	817.5	23.2
	298.9	*0.0*	*122.6*	*2.8*	*162.4*	*2.8*	*94.9*	*2.3*	*106.8*	*2.7*
Stocks	5,617.4	100.0	999.1	17.8	2,213.3	39.4	638.3	11.4	1,763.8	31.4
	450.8	*0.0*	*118.4*	*1.9*	*295.7*	*3.2*	*93.7*	*1.8*	*224.9*	*3.2*
Bonds	1,174.2	100.0	163.8	14.0	505.9	43.0	125.9	10.8	377.7	32.2
	104.1	*0.0*	*28.3*	*2.4*	*86.4*	*5.3*	*43.1*	*3.6*	*53.0*	*4.1*
Trusts	1,229.9	100.0	123.2	10.1	477.9	38.8	116.5	9.4	511.6	41.7
	155.4	*0.0*	*19.5*	*2.1*	*102.7*	*6.1*	*52.6*	*3.8*	*106.3*	*7.5*
Life Insurance	874.1	100.0	425.8	48.7	358.9	41.1	25.3	2.9	64.1	7.3
	74.9	*0.0*	*53.0*	*4.5*	*54.6*	*4.3*	*9.7*	*1.2*	*12.5*	*1.5*
Checking accts	333.4	100.0	189.4	56.8	91.8	27.5	20.5	6.2	31.7	9.5
	29.3	*0.0*	*13.1*	*4.1*	*17.5*	*4.6*	*1.9*	*5.1*	*9.3*	*2.6*
Thrift accounts	1,578.7	100.0	839.5	53.2	536.5	34.0	65.1	4.1	137.5	8.7
	122.1	*0.0*	*76.2*	*3.0*	*65.2*	*2.9*	*30.4*	*1.9*	*33.8*	*1.9*
Other accounts	2,628.1	100.0	1,167.1	44.4	1,004.8	38.2	148.1	5.6	307.7	11.7
	169.5	*0.0*	*95.0*	*2.7*	*109.8*	*2.8*	*39.2*	*1.6*	*54.9*	*1.9*
Businesses	5,598.9	100.0	481.3	8.6	1,481.2	26.4	564.2	10.1	3,063.9	54.8
	570.5	*0.0*	*60.7*	*1.2*	*230.3*	*2.8*	*142.9*	*2.2*	*365.5*	*4.0*
Automobiles	1,293.3	100.0	971.8	75.1	241.9	18.7	27.3	2.1	52.1	4.0
	31.9	*0.0*	*26.9*	*1.1*	*15.0*	*1.0*	*5.9*	*0.5*	*6.9*	*0.5*
Other assets	679.8	100.0	218.4	32.1	258.4	38.0	50.8	7.5	151.9	22.4
	65.1	*0.0*	*28.5*	*3.3*	*42.0*	*4.3*	*17.6*	*2.4*	*25.8*	*3.6*
Liabilities	5,250.2	100.0	3,657.1	69.7	1,138.0	21.7	107.0	2.0	347.4	6.6
	187.0	*0.0*	*136.6*	*1.6*	*94.7*	*1.5*	*22.8*	*0.4*	*55.3*	*1.0*
Princ. res. debt	3,499.9	100.0	2,632.5	75.2	681.6	19.5	58.1	1.7	127.7	3.6
	115.5	*0.0*	*98.0*	*1.5*	*54.3*	*1.4*	*20.0*	*0.6*	*37.1*	*1.0*
Other r/e debt	716.5	100.0	243.1	33.9	288.5	40.3	40.1	5.6	144.3	20.2
	76.5	*0.0*	*44.4*	*4.4*	*44.0*	*4.3*	*11.7*	*1.6*	*29.7*	*3.8*
Other debt	1,033.8	100.0	781.5	75.6	167.9	16.2	8.8	0.9	75.4	7.3
	51.5	*0.0*	*40.2*	*2.3*	*23.1*	*2.0*	*4.5*	*0.4*	*19.1*	*1.7*
Net worth	28,928.9	100.0	9,042.1	31.3	10,045.5	34.7	2,362.1	8.2	7,464.3	25.8
	1,684.8	*0.0*	*622.6*	*1.7*	*931.8*	*1.7*	*204.1*	*0.5*	*590.1*	*1.8*
Total income	5,371.5	100.0	3,577.5	66.6	1,135.8	21.1	184.3	3.4	472.6	8.8
	158.3	*0.0*	*90.7*	*1.4*	*86.9*	*1.2*	*37.6*	*0.7*	*62.3*	*1.1*
Memo items:										
Min net worth ($Th)	(Negative)		(Negative)		489.4		3,692.8		5,721.7	
Num. of obs.	4,309.0		2924.0		750.0		120.0		515.0	
Wgtd num. units (M)	102.5		92.2		9.3		0.5		0.5	

Standard errors due to imputation and sampling are given in italics. See notes for definitions of the categories.

Notes to tables 6a–6d.

Definitions of assets, liabilities and income.

Assets: All types of assets.
Principal residence: The residence that the survey respondent considered his or her principal residence.
Other real estate: All other types of real estate except those owned through a business.
Stocks: All types of stock and stock mutual funds (including "balanced" funds), including those held through an IRA or Keogh, but not those held through a thrift account.
Bonds: All types of bonds except savings bonds, and bond mutual funds, including those held through an IRA or Keogh, but not those held through a thrift account.
Trusts: All trusts with an equity interest, managed investment accounts, and private annuities.
Life Insurance: Cash value of whole life and universal life insurance.
Checking accounts: All types of standard checking accounts and share draft accounts.
Thrift accounts: Pension and other retirement accounts from a current job from which withdrawals can be made or loans taken out.
Other accounts: Money market and savings accounts, certificates of deposit, and savings bonds.
Businesses: All types of businesses except corporations with publicly-traded stock.
Automobiles: Automobiles, trucks, motorcycles, boats, air planes, and other vehicles not owned by a business.
Other assets: Includes all other assets (antiques, paintings, jewelry, metals, futures contracts, oil leases, etc.).

Liabilities: All types of debts.
Principal residence debt: All mortgages and home equity lines associated a principal residence.
Other real estate debt: All other debt secured by real estate.
Other debt: All other types of debt (installment credit, credit cards, etc.).

Net worth: Assets minus liabilities.

Total income: Total household income from all sources in the year preceding the survey.

All items are defined for the primary economic unit within each survey household.

E. Graphical Summary

In contrast to the summary statistics considered so far, the final options considered here for characterizing the changes in wealth are two graphical devices that look directly at changes across the *entire* distribution. First, figures 2a-2c show the difference at each percentile of the net worth distribution between the levels of real net worth associated with the percentile in 1998 and the corresponding level for the same percentile in each of the three earlier surveys. [13]

13. It is important to emphasize that because the underlying data are cross-sectional, the comparisons only describe changes in the distribution, which are not necessarily the changes that were experienced by individual households at a given point in the distribution in either 1995 or 1998. To

(continued...)

The dashed horizontal lines indicate the average of the changes in each figure, and the large dots mark the boundaries of the 95 percent confidence interval at selected values of the central estimates.[14]

For the period from 1989 to 1998, figure 2a shows increased real wealth holdings at all points in the distribution except for one part between about the 95th and 98th percentiles and a group at the very bottom with negative wealth. Hiwever, largely as a result of the high variability of the 1989 estimates, most of the change is not significantly different from zero. However, the changes to 1998 from 1992 and 1995 (figures 2b and 2c respectively) are more broadly positive and significant, and the dollar amount of gains tends to be progressively larger for groups higher in the wealth distribution.

Even though the data show that some groups had a higher *level of change* than others, for a group to increase its share of wealth, it would also need to have had a greater than average *percentage change* in the level of its wealth. Figures 3a-3c show the percentage changes in wealth corresponding to the level changes in figure 2a-2c.[15] The jumpy part of the graphs below about the 20th percentile are largely a product of modest changes amplified as a result of dividing by very small base values. Above that point, the percentage changes are generally positive, and at least for the changes from 1992 and 1995, they are also largely significant. Moreover, the changes from all three base years show a jump in the percentage gain at the top of the distribution. For the percentage change from 1995 to 1998, the gains are

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13. (...continued)
show meaningful variation in the changes across the distribution, the horizontal axis in figures 2a-2c has been transformed using the inverse hyperbolic sine with a scale parameter of 0.0001. Close to zero, the transformation is approximately linear; away from zero, it is approximately logarithmic for positive values and approximately the negative of the logarithm of the absolute value for negative values.

14. The confidence interval is constructed on a “pointwise” basis to represent the central 95 percent range of the variation in the estimates that can be attributed to sampling alone. A normal rule of thumb in the SCF is that accounting for variation due to data that were originally missing increases the confidence intervals by about 15 percent.

15. The percentage change is defined as the 100*(wealth in 1998 - wealth in base year) / max(1, absolute value(wealth in base year)).

roughly increasing with the percentile of the distribution, but the confidence intervals are sufficiently wide that few of the differences are statistically significant.[16]

16. One might argue that the confidence intervals reported are not actually the appropriate information needed to make comparisons of change. Because the intervals are constructed on a pointwise basis, they do not account for the possibility that the changes at the various percentiles may be correlated within the simulated distributions. Thus, one might want to characterize variability of the complete joint distributions of outcomes across the wealth distribution. However, there is no obvious graphical device for displaying this substantially more complicated information. A simpler approach might be to test the likelihood that the share of one group goes up as another goes down, but this method loses the comprehensive overview of the figures.

Figure 2a: Change in the level of real net worth from 1989 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent pointwise confidence intervals; 1998 dollars.

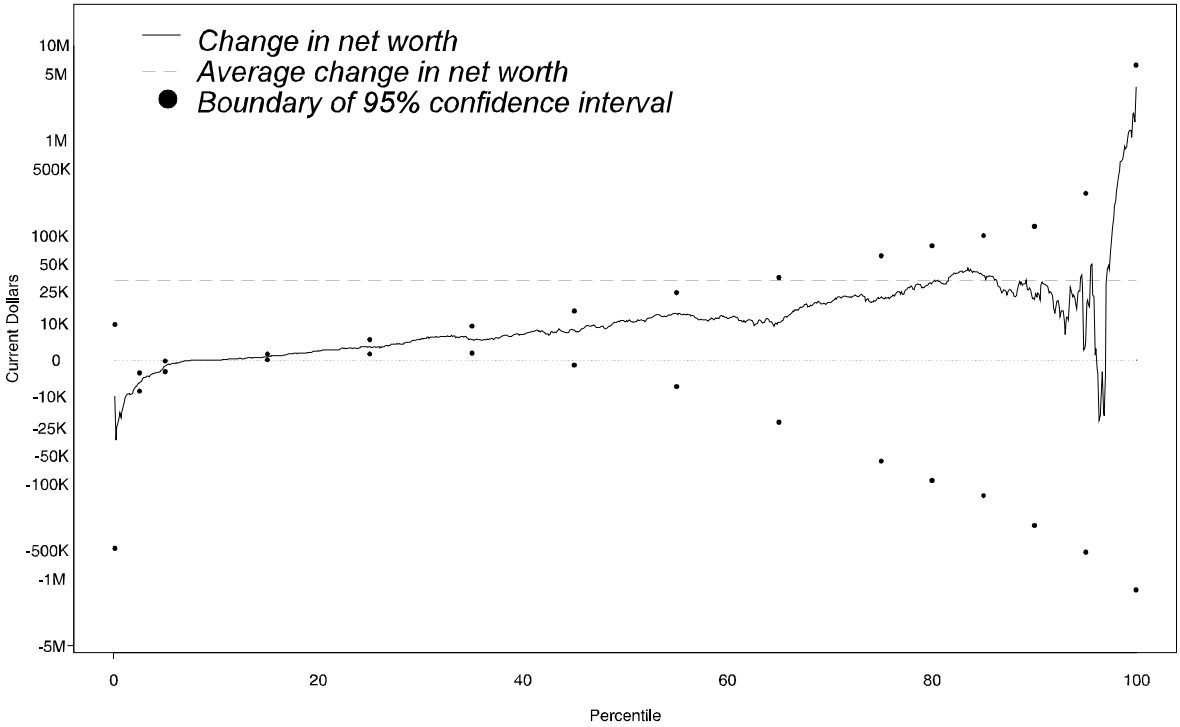


Figure 3a: Percentage change in real net worth from 1989 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent pointwise confidence intervals.

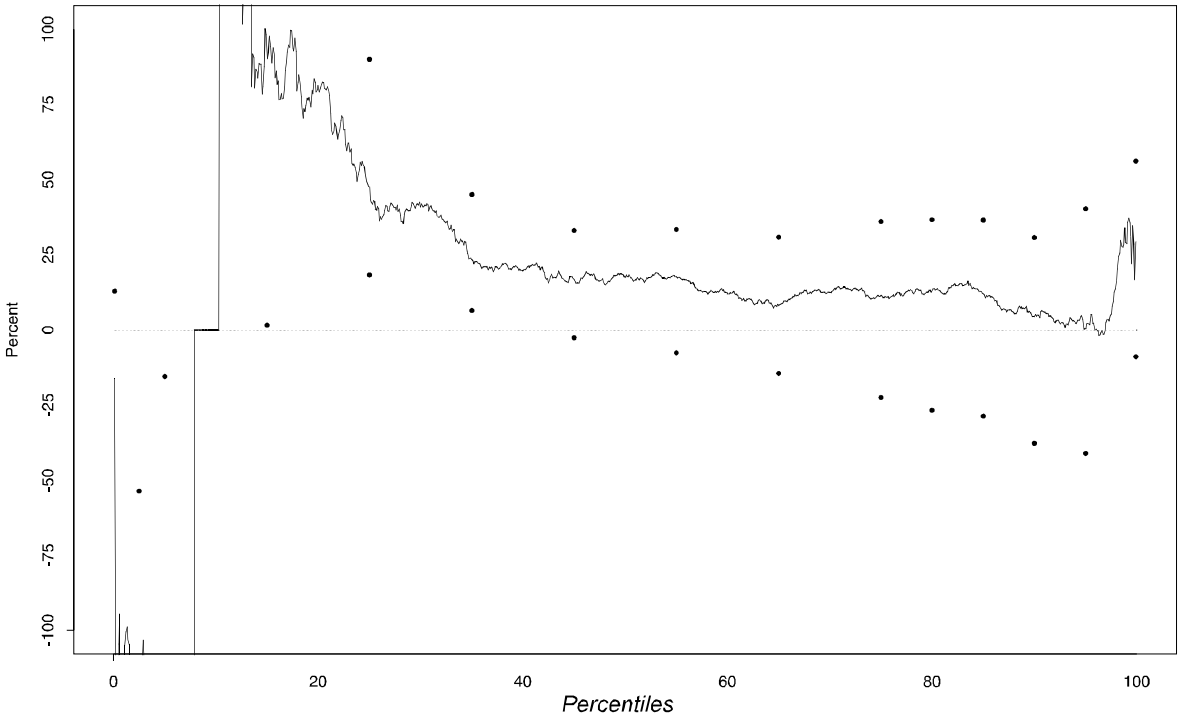


Figure 2b: Change in the level of real net worth from 1992 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent point-wise confidence intervals; 1998 dollars.

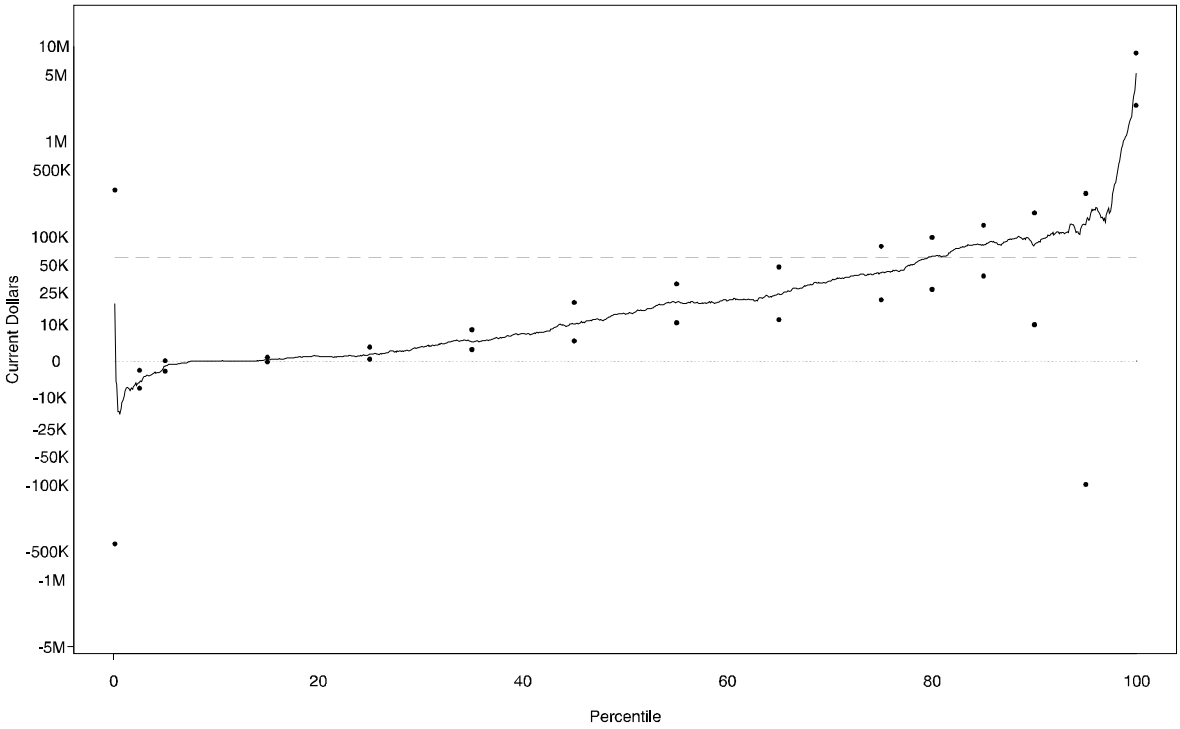


Figure 3b: Percentage change in real net worth from 1992 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent pointwise confidence intervals.

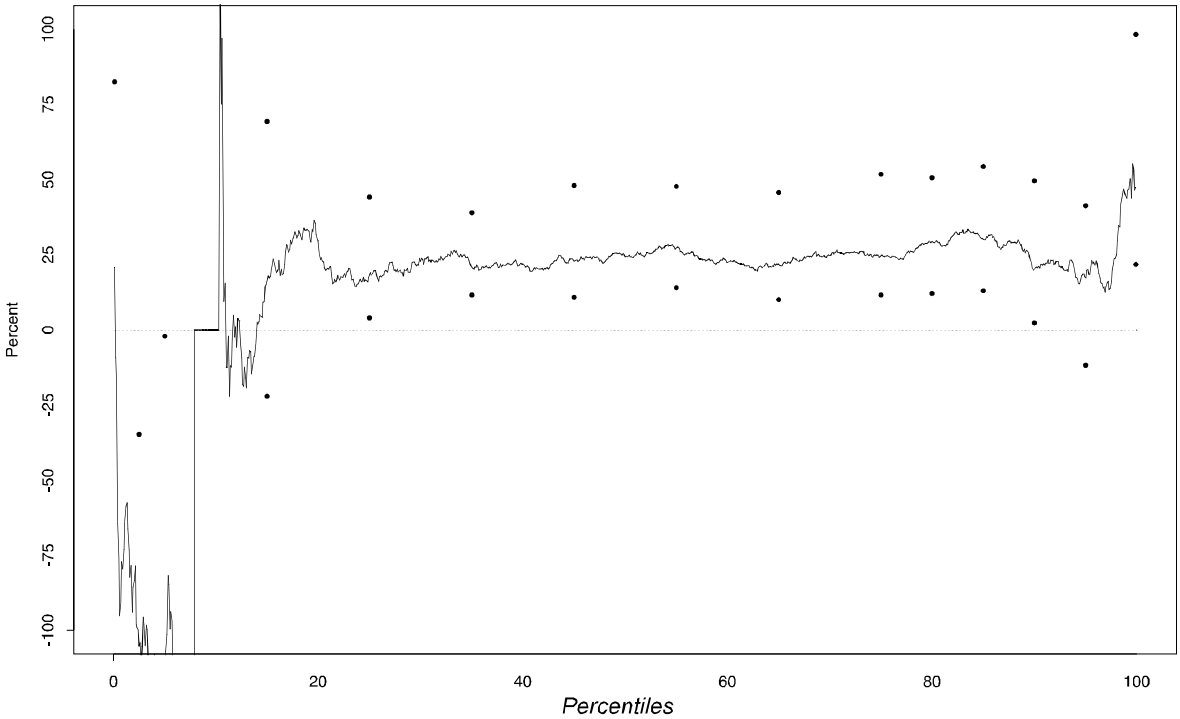


Figure 2c: Change in the level of real net worth from 1995 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent pointwise confidence intervals; 1998 dollars.

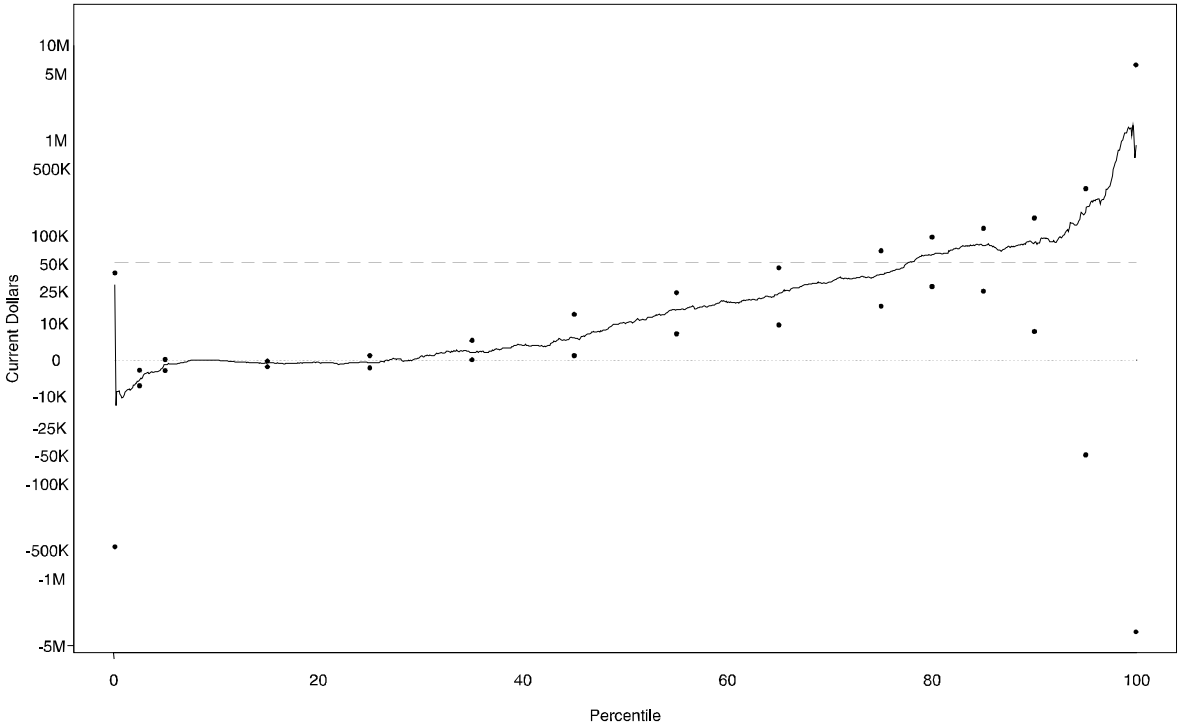
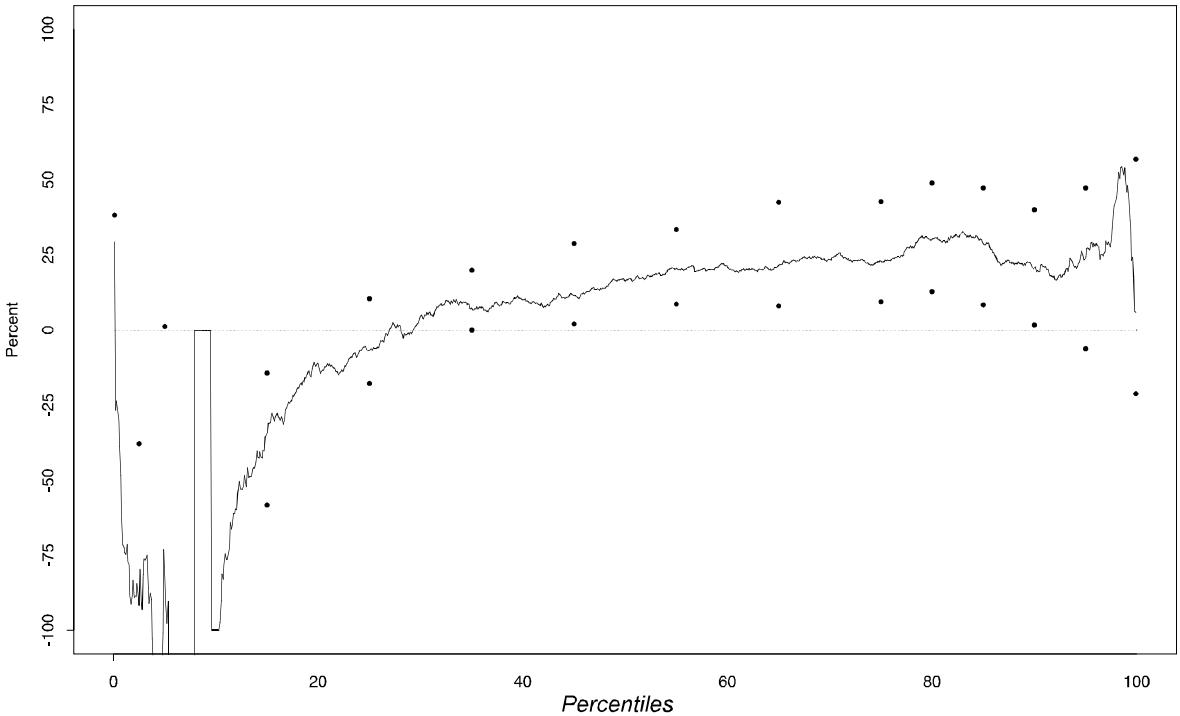


Figure 3c: Percentage change in real net worth from 1995 to 1998 by percentiles of the distribution of net worth, and estimates of 95 percent pointwise confidence intervals.



IV. Data adjustments and their effects on estimates of the wealth distribution

In his influential analyses of the distribution of wealth using data from the SCF, Wolff (1996 and elsewhere) has directly adjusted the survey data with the motivation of attempting to compensate for any shortcomings in the SCF in capturing all of household net worth. His approach is to uniformly rescale various assets and liabilities so that their weighted values sum to estimates for similar concepts in the aggregate flow of funds accounts (FFA), which are constructed by the Federal Reserve Board based on an aggregate accounting system using data from financial institutions, SOI, and many other sources (see Board of Governors, 2000).[17]

It is a very common practice in constructing analysis weights for surveys to align key dimensions of the part of the original sample that has actually been interviewed with external control totals that are either known with certainty or are known with substantially higher precision than the comparable raw survey estimates. In the SCF, post-stratification adjustments of this sort are made to the analysis weights on the basis of age, location, home ownership; for the list sample, information on financial income and predicted wealth are also used (see Kennickell and Woodburn, 1999). One can also use this approach to adjust the data to reproduce control totals from the FFA.[18]

In principle, these two types of adjustments are a part of a larger family of adjustments to both data and weights that are possible where reliable extra-sample information is available to refine the survey measurements. Reflecting the importance that many people attach to matching survey data with FFA estimates, the material in this section examines the differences between the SCF and the FFA, develops a set of adjustments to the SCF data that reproduce the FFA estimates (one of which is similar to Wolff's adjustments), and characterizes the effects of such adjustments on estimates of the distribution of wealth.

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17. In some cases, the wealth measure Wolff chooses is also different from that used in this paper. For example, generally he excludes the value of vehicles, but includes the value of vehicle debt as a liability.

18. Implicitly, Wolff has also taken this approach. Although the SCF has a series of weights that is computed using a comparable adjustment model for all the surveys since 1989, Wolff has selected weights from earlier series on the basis of how close their implied estimates come to FFA estimates.

A. Problems with aligning SCF and FFA data

In deciding whether or how to align SCF and FFA data, there are two particularly large problems. Most importantly, the concepts measured in the FFA and the SCF are often quite different. A key aspect of this difference turns on the fact that the standard published FFA tables deal with the "household sector," which includes nonprofit organizations, while the SCF includes only households.[19] In addition, because of the constraints on the information available in the construction of the FFA and the limitations of what can be asked of survey respondents, there is quite often not a straightforward match of FFA and SCF concepts. Antoniewicz (1996) has made extensive efforts to define comparable items in the SCF and the FFA while accounting to the degree possible for the nonprofit subsector. Ultimately, the set of items that can be defined on a more comparable basis fall short of the set of items available in either system. Moreover, as she notes, some potentially important comparability issues remain.

Second, because both the SCF and FFA provide *estimates*, standard statistical practice suggests that the control totals for alignment should be derived from pooled estimates from the two data sources where the two estimates are weighted by a function of their relative statistical precision. While the SCF allows one to make estimates of the precision of point estimates, such a facility is not available for the FFA. The complexity and variety of the FFA input data and the nature of the accounting exercise make the prospect of computing standard errors daunting. Although some data used as input to the overall FFA are known almost exactly—for example, total bank deposits across all sectors—others must be estimated based on partial information. Moreover, the allocation of even precise totals to various sectors of the economy—for example, the separation of total deposits into the shares of the various FFA sectors—often relies on sometime fragmentary or sampled information; indeed, a large part of the allocation of wealth to the household sector in the FFA is determined as a residual in the accounting system. In so complex a pooling over many sources of data, there is no straightforward way of characterizing the statistical precision of the results. Thus, there is no

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19. Recently, the FFA has begun providing supplementary information that attempts to separate "true" households from nonprofits by using data from SOI. An important qualification to this separation is the fact that information on the holdings of some nonprofits—particularly religious organizations—is largely unknown.

objective measure of the potential gain from forcing exact alignment of the SCF with the FFA. Nonetheless, it is noteworthy that the SCF and the FFA appear to measure quite similar changes over time (for example, see Bertaut and Starr-McCluer, 2000).

B. Comparison of SCF and FFA estimates

Table 7 provides the estimates of the aggregate levels of various wealth items derived by Antoniewicz from the FFA averaged over the field period of the 1995 SCF. The table also shows the proportion of each wealth item captured in the point estimate of the closest approximation to the concept using the survey data.[20] Overall, the figures are in substantial agreement: The SCF point estimate of the net value of the assets and liabilities in the table is about 93 percent of the corresponding FFA figure.[21] However, there are many individual categories where the two estimates are notably different, and there are differences in both directions. As Antoniewicz has noted, there are compelling explanations for some of these differences, but others have no straightforward explanation. The fact that the two systems show similar difference over time suggests that there may be systematic differences in what each system measures.

The net worth concept that can be computed from the items in table 7 is, with one exception, narrower than the SCF wealth concepts used elsewhere in this paper (see notes to tables 6a-6d). Table 8 decomposes the difference between this limited FFA net worth concept and the SCF net worth concept. For each difference, the table also indicates the FFA category in table 7 that is assumed to be most similar to the items in the decomposition, a connection that will be used in the series of adjustments developed later in this section of the paper.

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20. See Antoniewicz (1996) for a precise definition of the concepts compared. The SCF calculations reported here may differ slightly from hers because of additional changes to the SCF data, revision of the survey weights, and other such factors. Data are not yet available for comparing the 1998 SCF and FFA data, but results for the 1989 and 1992 surveys have a similar pattern.

21. Adding an estimate of the wealth of the Forbes 400 to the survey aggregate in 1995 would increase the net worth accounted for to about 95 percent of the FFA estimate.

Table 7: Estimated 1995 FFA aggregates (billions of 1995 dollars), and percents of FFA aggregates captured in the conceptually approximately equivalent 1995 SCF estimates.

	Item	*FFA Estimate*	*SCF estimate as % of FFA*
	Assets		
1.	Checking accounts	243	109.5
2.	Time and savings accounts	2,346	64.1
3.	Money market mutual funds	380	93.2
4.	U.S. government securities	645	44.3
5.	Municipal securities	345	95.1
6.	Corporate bonds	315	21.3
7.	Mortgage assets	107	96.3
8.	Mutual fund shares	1,307	127.3
9.	Publicly traded corporate equity	1,845	76.1
10.	Closely held corporate equity	1,495	140.1
11.	Noncorporate business equity	3,526	75.4
12.	Defined contribution pension assets	1,317	115.3
13.	Owner-occupied real estate	7,166	100.1
14.	Sum of lines 1-13	21,037	92.3
	Liabilities		
15.	Home mortgages	3,310	93.7
16.	Consumer credit	1,099	82.7
17.	Other debt	235	40.9
18.	Sum of lines 14-16	4,644	89.1
	Assets minus liabilities		
19.	Line 14 minus line 18	16,393	93.2

Table 8: Reconciliation of SCF definition of net worth with FFA net worth as defined to approximate the SCF data.

The SCF net worth concept is defined as the quantities netted on line 19 of table 7	
Plus: Asset items in SCF net worth asset calculation, but not in FFA given by line 19 of table 7:	Line number of nearest FFA equivalent
Call accounts	2
All types of vehicles	None
Real estate other than 1-4 family units net of loans	11
Equity interest in trusts and annuities	2
IRAs and Keoghs held by employers or life insurance companies	2
Minus: Liability items in SCF net worth asset calculation, but not in FFA given by line 19 of table 7:	
Net liabilities to and from a personal business	10 and 11
Loans against pension accounts	12
Mortgages and loans associated with mobile homes and farms where the ownership is through a business	15
Plus: Item in FFA net worth estimate given in line 19 of table 7, but not in SCF definition	
Charges on credit cards in the month preceding the interview	16

C. A variety of adjustment strategies

For a given asset or liability i, a survey estimate of its implied aggregate level, s_i, is defined as the sum over all observations of the weight for each observation j, W_j, times the value of the item for that observation, $A_{i,j}$ (equation 1). Thus, if one wanted to force s_i to equal a corresponding FFA aggregate estimate, S_i, one could manipulate the weights, the value of the item, or some combination of the two. This analysis considers two variations on separate adjustments of the weights and values of the items under the assumption that the FFA estimates represent truth.

(1) $$s_i = \sum_j W_j A_{i,j}$$

Equations 2 and 3 specify the adjustments required at the observation level to constrain a survey estimate of aggregate *i* to equal the corresponding FFA estimate by operating on the item value or the weights respectively. For example, if for some observation k $\Phi_k=1$ and $\Phi_{i \neq k}=0$, then the entire difference between the FFA aggregate and the unadjusted survey aggregate is accounted for in the asset adjustment (equation 2) or weight adjustment (equation 3) for that observation. Clearly there are infinitely many other functions Φ that satisfy these equations, and potentially each has a different underlying behavioral interpretation.

(2) $$A(adjusted)_{i,j} = A_{i,j} + \frac{S_i - s_i}{W_j} \Phi_j, \text{ where } \sum_j \Phi_j = 1 \text{ and } W_j > 0$$

(3) $$W(adjusted)_j = W_j + \frac{S_i - s_i}{A_{i,j}} \Phi_j, \text{ where } \sum_{j \in [A_{i,j} \neq 0]} \Phi_j = 1 \text{ and } A_{i,j} \neq 0$$

The most natural hypothesis to support adjustments to the values of an item is that the survey respondents may systematically over- or under-reported their holdings of the item. For example, people might report the amount outstanding on their mortgage as of the last annual statement rather than the true amount at the time of the interview. In contrast, a straightforward hypothesis that would support weight adjustments might turn on over- or under-representation of different types of people in the final set of survey participants. For example, the people who have tax-exempt bonds might be less likely to agree to participate in the survey to a degree that is not captured by other adjustments to the weights. It may also be that the SCF totals differ from the FFA totals only by reason of sampling error, and if one believed the FFA totals were close to exact, one could improve estimation efficiency by using that information to adjust the survey weights.[22]

Both value and weight adjustments introduce potential analytical problems. With the adjustments to the data values, important relationships between different values within

22. This argument is one that is usually made for applying post-stratification to survey weights (see Little, 1993).

observations may be distorted. For example, in 1995 the SCF and FFA values of owner-occupied housing were virtually the same, but the survey understates the FFA mortgage estimate by about seven percentage points. Thus, adjusting the mortgage values to sum to the FFA estimate raises the possibility of "causing" some households to have negative equity in their homes. The effects of adjusting the weights are a little more subtle. By allowing the numbers of families accounted for by various observations to change, distributions that are not simultaneously controlled during the weight adjustment process—for example, the age distribution—may be distorted. Moreover, weight adjustments may create outliers, and additional weight variation will often add to the variances of survey estimates.

(4) $$\Phi_j = \frac{W_j A_{i,j}}{s_i}$$

(5) $$\Phi_j = \frac{W_j A_{i,j}^2}{ss_i}$$

For simplicity, this paper considers the two simple variations on the Φ function given by equations 4 and 5. The adjustment given by equation 4 reduces to a uniform proportional rescaling of either the value of the item or of the weights; this is the class of adjustment that Wolff has considered in adjusting data values. Such a uniform approach might be appropriate if one had no priors over the types of cases most likely to be responsible for the deviations between the SCF and FFA values. An alternative approach, given by equation 5, is to make an adjustment proportional to the squared value of the holdings, where ss_i is the weighted sum of squared holdings of all observations. If one believed that errors of reporting or representation were disproportionately more likely at the high end of the distribution of values, an approach of this sort might be appropriate.

D. Applying the adjustments

Applying the adjustments to the values of items is straightforward. Calculations of s_i and ss_i can be made in one pass through the data. Because there are no interdependencies in the value adjustments across either across items or observations, the adjustments given by

equations 4 and 5 can be imposed on a second pass. Because the SCF wealth measure includes items not present in the most closely comparable FFA measure (line 19 in table 7), level adjustments are also made to the items listed in the reconciliation of differences given in table 8; these additional items are adjusted using the same ratio applied to the most nearly comparable concept in the FFA variables.

The situation in adjusting the weights is more complicated. Because each observation has only one weight, an adjustment to the weights for the purpose of aligning one item has the effect of altering the implied aggregates for other items. In general, it is not practical to solve directly for a full set of adjustments that would cause all of the weighted SCF sums to equal the FFA totals. The weight adjustments are implemented here using a sequential and iterative procedure. Each of the assets and liabilities is addressed in turn, and given all earlier adjustments, the weights at each step are adjusted to equate the SCF estimate with the FFA aggregate; at the same time, the weights of the population that does not hold the item are adjusted by a uniform proportion in order to hold the total population constant. The adjustments continue iteratively until the values of the adjustments are close to one.[23]

A few constraints were imposed on the weight adjustments. First, to damp large movements in weights, no adjustment was allowed to alter the weights in either direction by more than a factor of 20. Second, in a straightforward application of the linear adjustment, it was not possible to obtain approximate convergence with uniformly positive weights. The underlying problem was that "too many" observations have time and savings accounts and consumer debt, two categories where relatively large adjustments were needed; in the adjustments required to hold the total population constant, often it was not possible to offset the increased population required to raise the SCF aggregate to the FFA total without setting the weights of the population of households without these items to a negative number. Because the number of observations with quite small values of these items is relatively large, restricting the adjustments to the weights of observations with $250 or more of these items allowed the procedure to reach convergence. At the end of the iterative weight adjustments, all

23. Note that the sequence in which the adjustments are applied will matter unless strong uniformity conditions hold. However, variations in the order of adjustments undertaken as a part of this work suggest that sequence effects are relatively unimportant in this case.

of the implied survey aggregates were within one percent of the FFA estimate under both schemes.

E. Effects of adjustments on the distribution of wealth

Each of the adjustments imposes a model on the data. To gauge the effects of the four types of adjustments across the full distribution of net worth, figures 4a-4d show quantile-difference plots of estimates based on the unadjusted data and weights minus estimates based on each of the adjusted calculations. The horizontal axis in each figure gives the (common) percentiles of the distributions of net worth. The vertical axis in each figure gives the value of the difference scaled using the inverse hyperbolic sine transformation used in figures 2a-2c (see footnote 13). Figures 5a-5d show the changes as a proportion of the absolute value of net worth in the baseline unadjusted distribution at each quantile.[24] No confidence intervals are provided for these figures because it is not obvious what an appropriate and conceptually feasible significance test would be. However, to provide an indication of the variability in the estimates attributable to sampling, figure 4a also gives an estimate of the 95 percent confidence interval for the unadjusted 1995 levels centered around the point estimates; figure 5a gives a comparable estimate of the 95 percent confidence interval for the unadjusted 1995 levels as a percent of the point estimate.

The adjustments have a markedly different effects. The proportional adjustments to the values of assets and liabilities (figure 4a) generally shift the distribution of net worth down for households below the median (because the difference takes the unadjusted data and weights as the baseline, the direction on the graph is positive) and up for those above the median; those at the bottom of the distribution are more affected by the inflation of the debt values than by the asset values. As a proportion of unadjusted wealth (figure 5b), the differences are exaggerated at the bottom of the distribution because the base values are relatively close to zero, and they are damped at the top end by the very large values of net worth in that region. As one might expect, the strongest effect of the asset and debt adjustments proportional to the square of the values (figure 4b) is at the top of the distribution—roughly the top 10 percent. However, the

24. The absolute value is used so that the direction of the change in dollar terms is preserved in the graphs of the percentage changes.

direction of change is not consistent. In proportional terms (figure 5b), the differences are relatively small except at the bottom end of the distribution.

The linear weight adjustments (figures 4c and 5c) push the part of the wealth distribution away from the two extremes, higher in absolute and proportional terms. In contrast to the outcome of linear adjustments to the values, the proportional gains are much higher in the bottom half of the distribution than in the top. The weight adjustments proportional to the squared values of the assets and liabilities show most change in the top of the net worth distribution (figure 4d), but unlike the otherwise similar results of the corresponding adjustment to the values of the assets and liabilities, the effect is consistently and sharply increasing in dollar terms at the top end of the distribution. In proportional terms (figure 5d), the changes are not much different from those in figure 4b.

Given the general distributional shifts implied by the data and weight adjustments, the effects of the adjustments on estimates of concentration ratios is not surprising. Relative to the unadjusted distribution, three of the adjustments have the effect of lowering the share of net worth held by the bottom 90 percent of the distribution (table 9). However, in the case of the proportional adjustments to the weights, the share rises.

Figure 4a: Net worth under unadjusted data and weights minus net worth under linear value adjustments and unadjusted weights, by percentiles of the distributions, 1995.

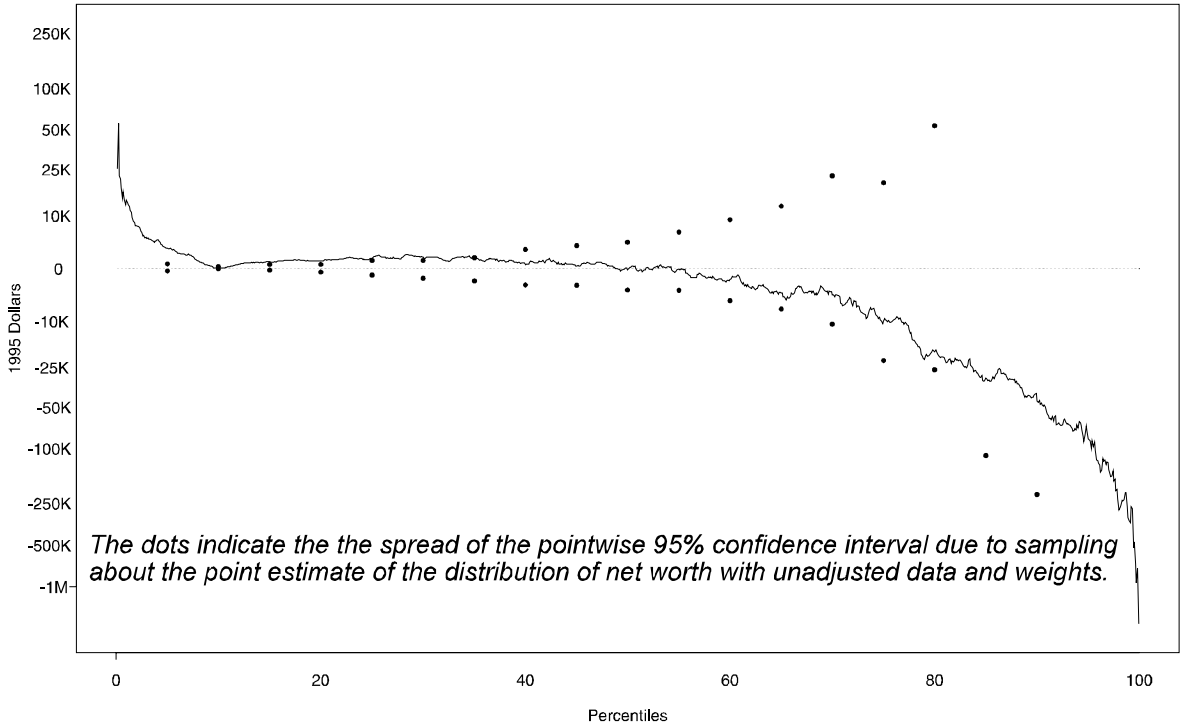

Figure 5a: Net worth under unadjusted data and weights minus net worth under linear value adjustments and unadjusted weights, as a percent of net worth under unadjusted data and weights, by percentiles of the distributions, 1995.

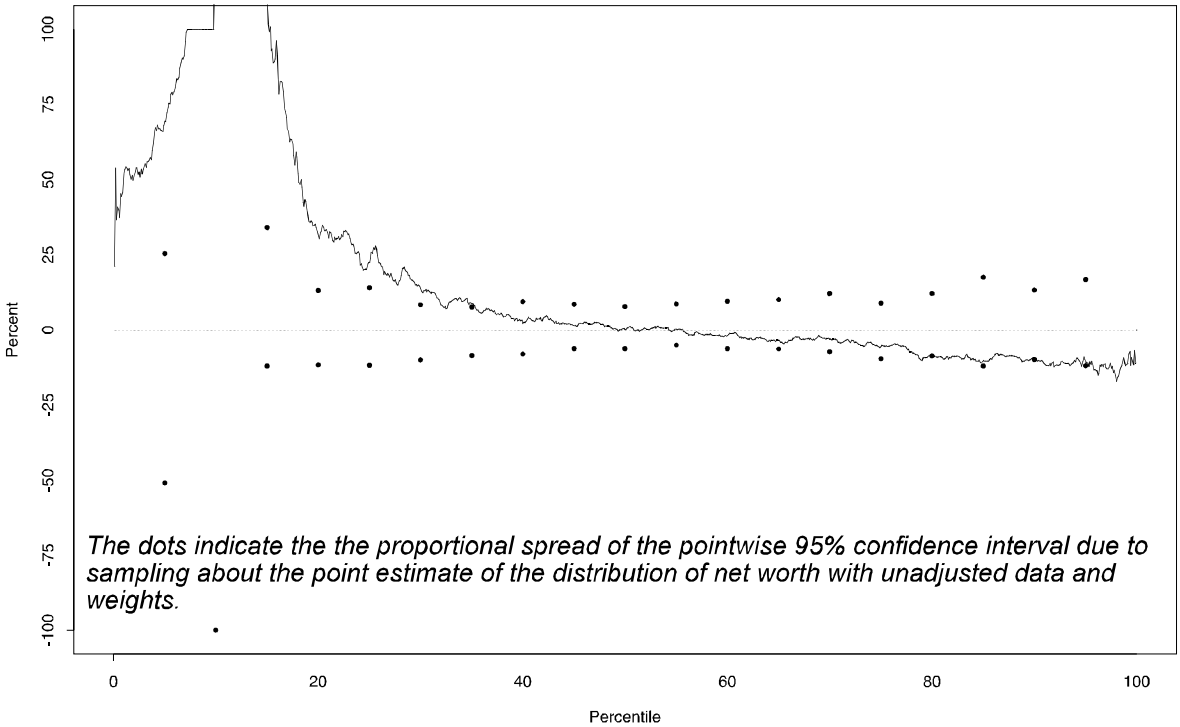

Figure 4b: Net worth under unadjusted data and weights minus net worth under value adjustments proportional to squared values and unadjusted weights, by percentiles of the distributions, 1995.

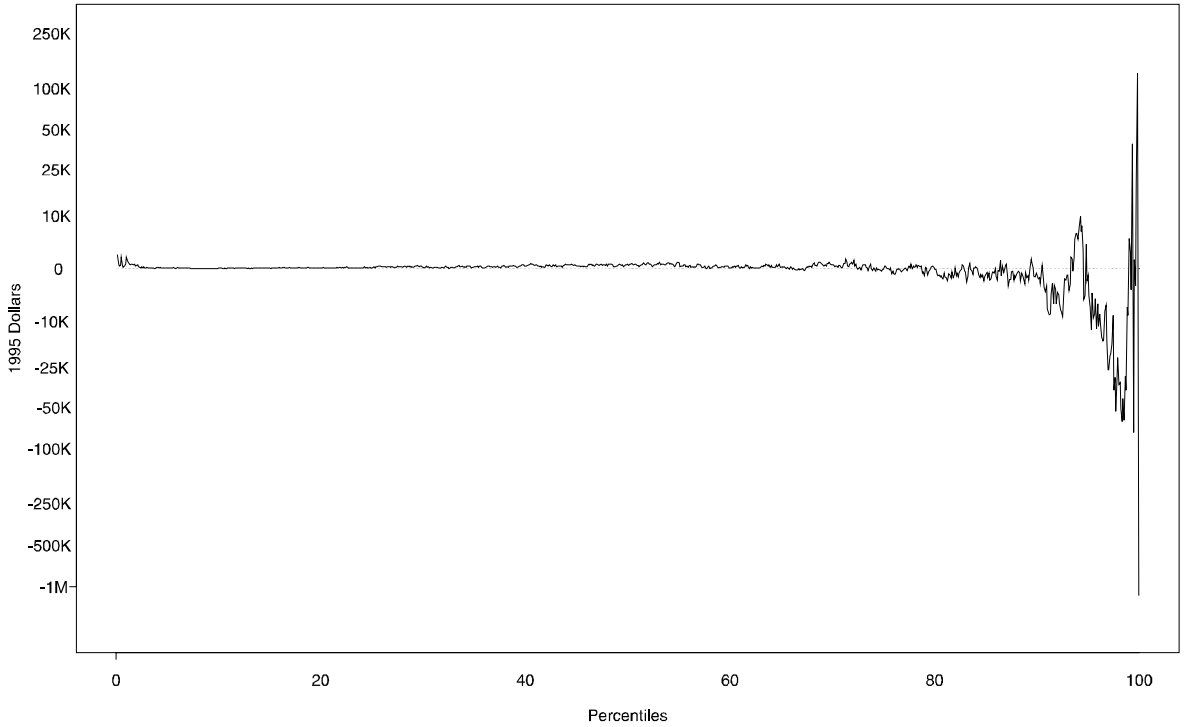

Figure 5b: Net worth under unadjusted data and weights minus net worth under value adjustments proportional to squared values and unadjusted weights, as a percent of net worth under unadjusted data and weights, by percentiles of the distributions, 1995.

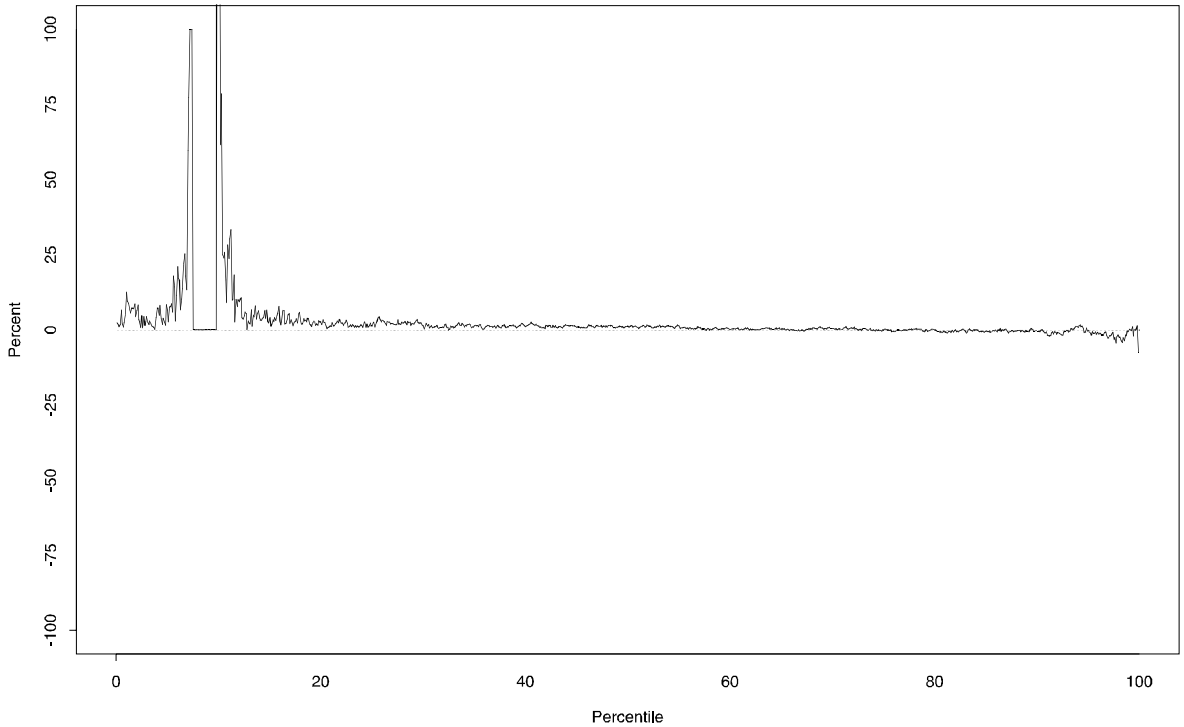

Figure 4c: Net worth under unadjusted data and weights minus net worth under unadjusted data and linearly adjusted weights, by percentiles of the distributions, 1995.

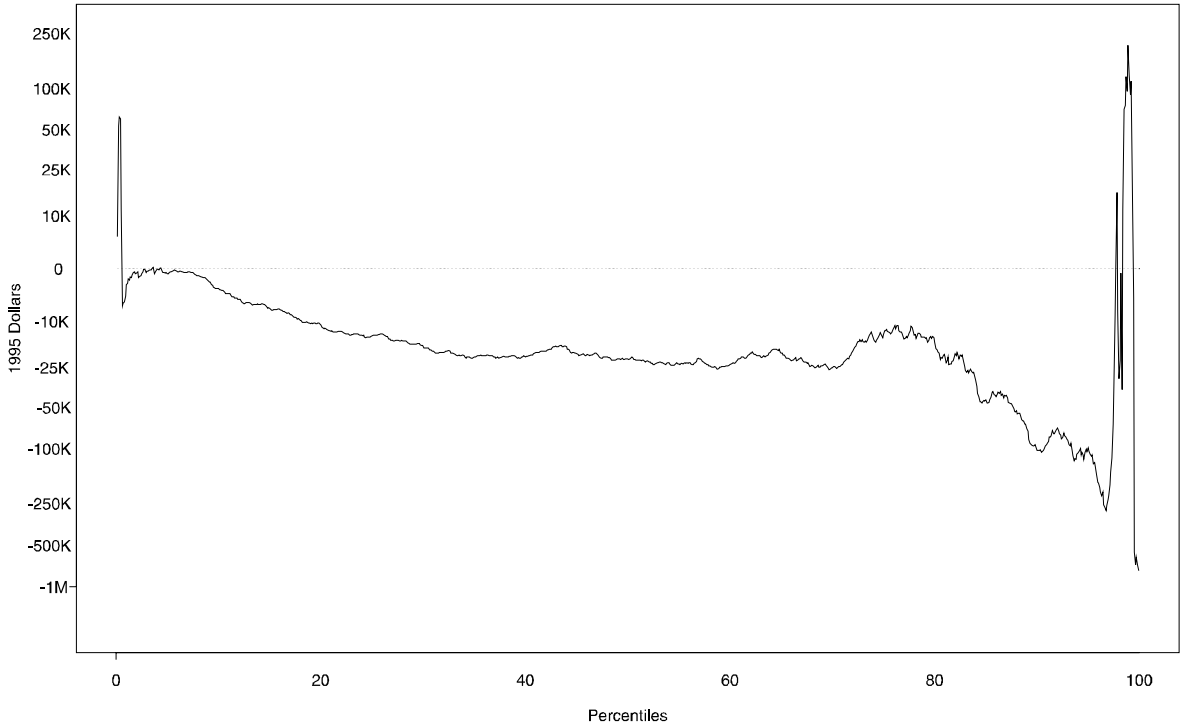

Figure 5c: Net worth under unadjusted data and weights minus net worth under unadjusted data and linearly adjusted weights, as a percent of net worth under unadjusted data and weights, by percentiles of the distributions, 1995.

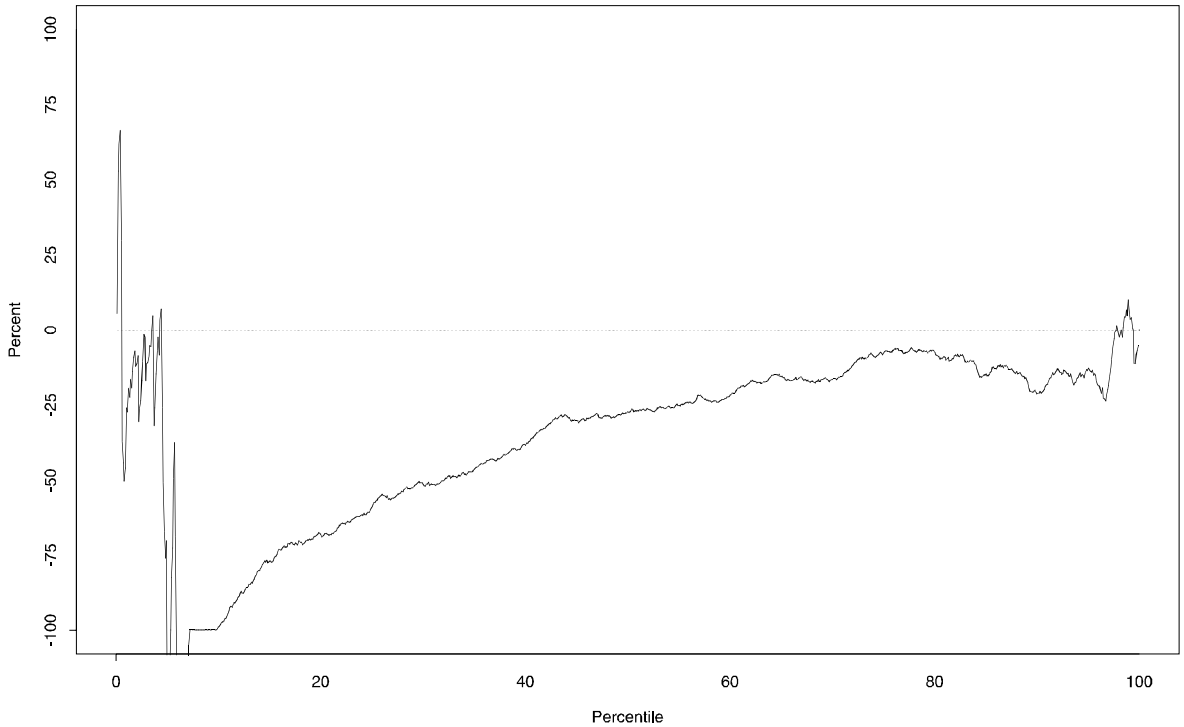

Figure 4d: Net worth under unadjusted data and weights minus net worth under unadjusted data and weights adjusted proportional to squared values, by percentiles of the distributions, 1995.

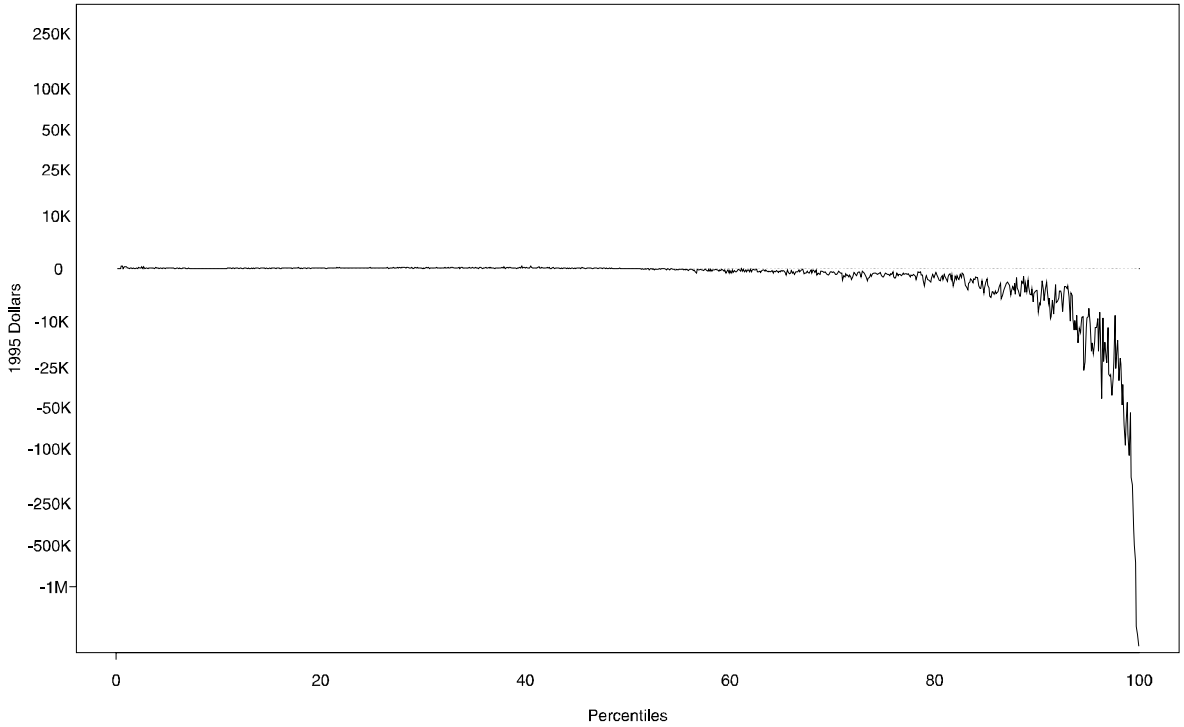

Figure 5d: Net worth under unadjusted data and weights minus net worth under unadjusted data and weights adjusted proportional to squared values, as a percent of net worth under unadjusted data and weights, by percentiles of the distributions, 1995.

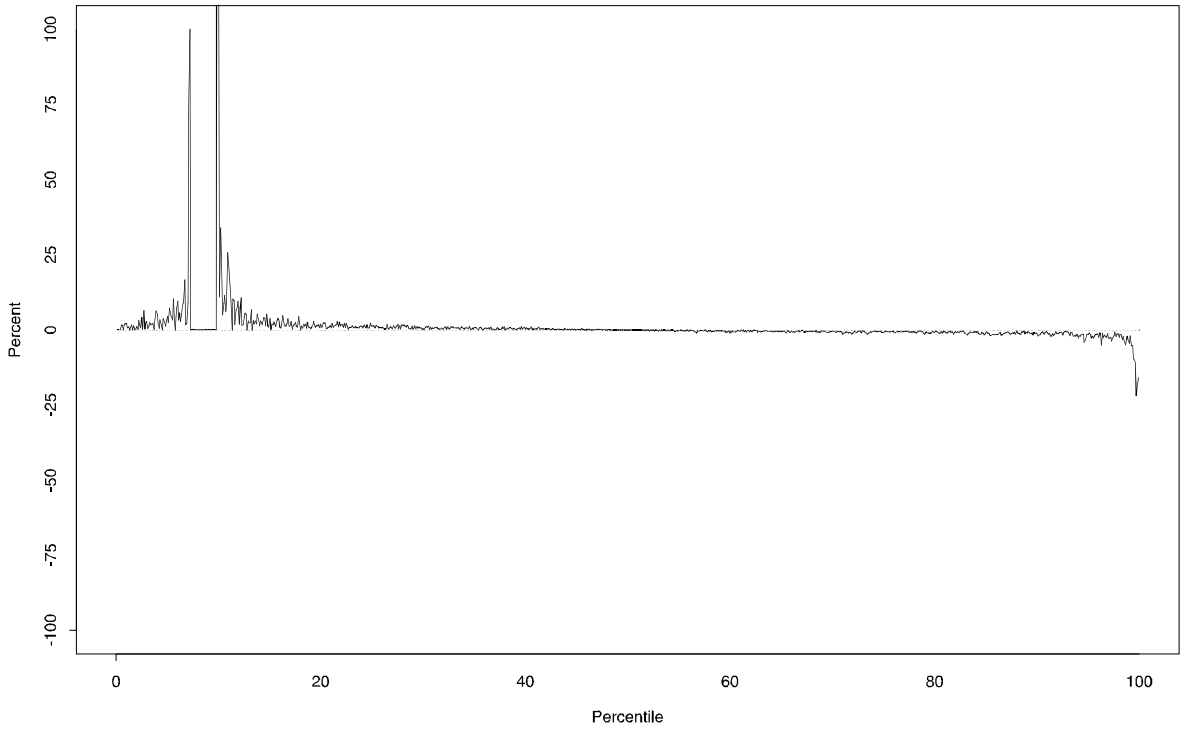

Table 9: Share of total net worth held by different groups, by percentile groups of the distribution of net worth, and by variations on adjustments to assets/liabilities and weights to align the SCF wealth measure with the FFA measure; 1995 SCF.

Net worth adjustment/ Weight adjustment	*Percentiles of the distribution of net worth*			
	0-90	*90-99*	*99-99.5*	*≥99.5*
Assets/debts adjusted proportionally/ Unadjusted main weight	30.4	34.1	7.6	27.9
Assets/debts adjusted proportionally to/ squared values of assets/debts Unadjusted main weight	29.6	31.1	7.0	32.3
Unadjusted NW/ Weights adjusted proportionally	35.2	32.8	6.8	25.2
Unadjusted NW/ Weight adjusted proportionally to squared values of assets/debts	29.7	31.0	7.4	31.8
Memo item: Unadjusted NW/ Unadjusted main weight	32.2	33.1	7.6	27.1
	1.8	*1.4*	*0.7*	*2.0*

Note: Standard errors due to sampling and imputation computed using the unadjusted data and weights are given in italics.

V. Summary

This paper provides information on changes in the distribution of net worth between 1989 and 1998 observed in the SCF. The most striking finding is that, despite quite large shifts in assets and liabilities of U.S. families over this period and quite large gains in the wealth of the very wealthiest families seen in the *Forbes* data, the SCF data show remarkably little change in the concentration of wealth below the *Forbes* 400 level. This result holds across a variety of different approaches to summarizing the distribution of wealth. A set of graphical devices that show changes across the entire wealth distribution give some indication of increased wealth around the very top of the distribution, but straightforward interpretation is clouded by offsetting movements nearby and fairly large confidence intervals. Ultimately,

what is most clear is that there have been substantial gains across most of the wealth distribution above about the 20th percentile of the distribution.

The second half of the paper examines the sensitivity of the survey wealth estimates to a variety of adjustments designed to "align" the aggregate value of assets and liabilities captured in the SCF with the values of the closest related concepts that can be constructed in the flow of funds data. Each adjustment is tied to a model of possible behavior by survey respondents. Although some of the adjustments considered have the effect of decreasing the estimated share of wealth held by the bottom 90 percent of the population, one equally plausible adjustment has the effect of raising that share substantially. An implication of this set of experiments is that the choice of "model" to explain the discrepancies between the SCF and the flow of funds accounts is important. Economists typically attempt to bring additional structure to bear on empirical problems, but when results are not robust to the choice of models, such an approach must be particularly strongly motivated on behavioral, theoretical, or empirical grounds. Let the reader beware, as usual, of hidden models.

A nagging technical limitation in the background in this paper is the estimated precision of the SCF estimates. For most of the concentration estimates, the confidence intervals estimated using the standard SCF methodology are large. The underlying variances are computed by combining estimates of variability due to missing data (imputation variance) and estimates of sampling variability. The latter estimates are computed by mimicing many times the original sample selection procedure in the actual data many times and calculating a survey weight for each pseudo-sample. Ongoing research (Kennickell 2000b) suggests that the estimates of sampling variability may be somewhat overstated, but not by enough to change the substantive conclusions of this paper.

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