# Is Wealth Becoming More Polarized in the United States?

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**Abstract**

Recent work has documented a rising degree of wealth inequality in the United States between 1983 and 1998. In this paper, we look at another dimension of the distribution, polarization. Using techniques developed by Esteban and Ray (1994) and further extended by D'Ambrosio (2001), we examine whether a similar pattern exists with regard to trends in wealth polarization over this period. The approach here followed provides a decomposition method, based on counterfactual distributions, which allows one to monitor what factors modified the entire distribution and where precisely on the distribution these factors had an effect. An index of polarization is provided as well as summary statistics of the observed movements and of distance and divergence among the estimated and the counterfactual distributions. The decomposition method is applied to US data on the distribution of wealth between 1983 and 1998. We find that polarization between homeowners and tenants, as well as among different educational groups, continuously increased from 1983 to 1998, while polarization by income classes groups continuously decreased. In contrast, polarization by racial group first increased from 1983 to 1989 and then declined from 1989 to 1998, while polarization by age groups followed the opposite pattern. We also find that most of the observed variation in the overall wealth density over the 1983-98 period can be attributed to changes of the within-group wealth densities rather than to changes in household characteristics over the period.

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# 1 Introduction

Recent work has documented a rising degree of wealth and income inequality in the United States during the 1980s and the 1990s. Regarding the distribution of income, some have reported that the increasing dispersion was due to the shrinkage of the middle class. In particular, Burkhauser et al. (1999) report that the effect of the business cycle during the 1980s was such that while economic growth benefited all groups, the gains were not evenly distributed and the great majority of the vanishing middle class became richer. In contrast, Blank and Card (1993) report an increase in the mass in the lower tail of the distribution with increasing poverty rates.

The aim of our paper is to investigate changes in the entire distribution of wealth and, at the same time, to look at another dimension of the distribution, polarization. Using techniques developed by Esteban and Ray (1994) and further extended by D'Ambrosio (2001), we examine whether rising wealth inequality is mirrored in an increase in polarization over the two decades.

Polarization refers to the formation of clusters around local poles. The distribution of wealth of the entire population is first decomposed into the distribution of wealth for different homogeneous groups within the population. We then examine the following issues: (1) Are the groups different so to actually constitute poles with regard to wealth levels? (2) How great are these differences? (3) How persistent are these differences over time? (4) What are the causes of the observed changes? The emergence of clusters in a distribution has political relevance, since it may lead to political conflict within a society (see, for example, Esteban and Ray, 1999).

The concept of polarization is used to compare the homogeneity of a group with the overall heterogeneity of a population. If the distribution of a variable such as wealth is very compressed within groups within a population (such as the racial groups of blacks and whites) but very diverse between groups, then we consider wealth "polarized" between the the groups. Polarization is fundamentally different from inequality and thus cannot be measured by a Lorenz consistent index. Suppose, for example, that the distribution of household wealth within a country is uniform over wealth levels 0 to 1000. Now imagine a transformation that causes the wealth of all the households with wealth between 0 and 500 to converge to 250, and the wealth of all the households in the interval 500 and 1000 to converge to 750. Any Lorenz consistent inequality measure will register an unambiguous decline of inequality from this transformation. However, clustering has nevertheless increased. This society loses its middle class and polarizes to the two-point distribution at 250 and at 750.

Similarly, polarization cannot be additively decomposed into within- and between-group components using classical techniques. A new decomposition method is applied here. The method provides an index that can be used

both to calculate the distance between social groups classified according to household characteristics and to track changes over time. The new method also reveals the factors that are reshaping the wealth distribution and allows us to identify precisely where these effects are having their greatest impact.

We examine polarization patterns and their change over time with regard to a number of household dimensions. The first is between home owners and renters; the second is by race and ethnicity, between non-Hispanic whites versus other groups; the third is by age class; the fourth is by family type - married couples, single males, and single females; the fifth is by household income class; and the last is by educational class. The polarization indices are computed for total household wealth. We also look at polarization patterns for stock ownership.

The estimates of the wealth distribution and of its evolution through time, for the whole population and for its subgroups, are obtained by applying the kernel density estimation method. The same method is used to estimate *counterfactual* densities, i.e. what the density of wealth would have been in one year if household characteristics (*between-group* component) or the distribution of wealth among households with the same characteristics (*within-group* component) had remained at the level of the previous year.

We find that wealth polarization followed different patterns depending on the household dimension. In particular, polarization between homeowners and tenants, as well as between different educational groups, continuously increased from 1983 to 1998, while polarization by income classes groups continuously decreased. In contrast, polarization by racial group first increased from 1983 to 1989 and then declined from 1989 to 1998, while polarization by age groups followed the opposite pattern.

The main finding of the decomposition method used to explain the observed changes in the wealth distribution is that changes in household characteristics did not have a large influence on the evolution of the wealth density during the period under examination. Instead, most of the observed variation in the overall wealth schedule can be attributed to the (dramatic) changes of the within-group wealth densities.

The rest of the paper is organized as follows: The next two sections (Sections 2 and 3) introduce the method used to estimate the wealth densities and the indices used to summarize the observed movements in the densities of wealth. Section 4 contains a description of the data sources. The application of the method to US data on household wealth is treated in Section 5. Conclusions are drawn in Section 6.

## 2 The estimation method

The estimated distributions are derived from a generalization of the kernel density estimator to take into account the sample weights attached to

each observation. The estimate of the density function, $\widehat{f}(y)$, is determined directly from the data of the sample, $y_1$, $y_2$, ..., $y_N$, without assuming its functional form a priori. The only assumption made is that there exists a density function $f(y)$ from which the sample is extracted. In detail:

$$\widehat{f}(y_j) = \sum_{i=1}^{N} \frac{\theta_i}{h_N} K\left(\frac{y_j - y_i}{h_N}\right) \quad \forall y_j \tag{1}$$

where $N$ is the number of observations of the sample, $h_N$ is the bandwidth parameter, $K(.)$ is the kernel function[1]. The sample weights are normalized to sum to one, $\sum_i \theta_i = 1$.

The counterfactual densities are obtained by applying the kernel method to appropriate samples. This technique has been derived from the one proposed by DiNardo, Fortin and Lemieux (1996).

Each observation is actually a vector $(y, z \mid t_y, t_z)$, composed of wealth $y$, a vector $z$ of household characteristics and a date $t$ at which respectively wealth and characteristics are observed, belonging to a joint distribution $F(y, z \mid t_y, t_z)$. The marginal density of wealth at one point in time, $f^t(y)$, can be obtained by integrating the density of wealth conditional on a set of household characteristics and on a date $t$, $f(y \mid z, t_y, t_z)$, over the distribution of household characteristics $F(z \mid t_y, t_z)$ at the date $t$:

$$\begin{aligned} f^t(y) &= \int_{z \in \ _z} dF(y, z \mid t_y = t, t_z = t) \\ &= \int_{z \in \ _z} f(y \mid z, t_y = t, t_z = t)\, dF(z \mid t_y = t, t_z = t) \\ &\equiv f(y \mid t_y = t, t_z = t) \end{aligned} \tag{2}$$

where $_z$ is the domain of definition of household characteristics.

If all the variables are observed at two different times, e.g. $t_1$ and $t_2$, then two counterfactual densities can be obtained form (2): the counterfactual density of wealth at $t_1$ and characteristics at $t_2$, represented by $f(y \mid t_y = t_1, t_z = t_2)$:

$$\begin{aligned} & f(y \mid t_y = t_1, t_z = t_2) \\ &= \int_{z \in \ _z} dF(y, z \mid t_y = t_1, t_z = t_2) \\ &= \int_{z \in \ _z} f(y \mid z, t_y = t_1, t_z = t_2)\, dF(z \mid t_y = t_1, t_z = t_2) \end{aligned} \tag{3}$$

and analogously the counterfactual density of wealth at $t_2$ and characteristics at $t_1$.

Under the assumption that the structure of wealth conditional on the distribution of household characteristics does not depend on the time of the household characteristics:

$$f(y \mid z, t_y = t_1, t_z = t_2) = f(y \mid z, t_y = t_1, t_z = t_1) \tag{4}$$

[1] In this paper the kernel function used is the triangular and the bandwidth parameter is chosen in order to match the sample value of the Gini coefficient.

and under the assumption that the distribution of household characteristics conditional on the time of the characteristics does not depend on the date when wealth is observed:

$$F\left(z \mid t_z = t_2, t_y = t_1\right) = F\left(z \mid t_z = t_2, t_y = t_2\right) \tag{5}$$

then the counterfactual density of wealth at $t_1$ and characteristics at $t_2$ is:

$$f\left(y \mid t_y = t_1, t_z = t_2\right) \quad = \int_{z \in \ _z} f\left(y \mid z, t_y = t_1\right) dF\left(z \mid t_z = t_2\right) \tag{6}$$

This counterfactual density indicates the density that would have prevailed if household characteristics had remained at their $t_2$ level and if the household wealth distribution had been the one observed in $t_1$ for households with those characteristics. General equilibrium effects are, indeed, excluded from the analysis, as the effects of changes in the distribution of $z$ on the structure of wealth are not taken into account. What we estimate is the effect of movements between groups on the total density of wealth under the assumption that the distributions within each group do not change over time.

Assuming instead that:

$$\begin{array}{c} f\left(y \mid z, t_y = t_2, t_z = t_1\right) = f\left(y \mid z, t_y = t_2, t_z = t_2\right) \\ F\left(z \mid t_z = t_1, t_y = t_1\right) = F\left(z \mid t_z = t_1, t_y = t_2\right) \end{array} \tag{7}$$

the counterfactual density of wealth at $t_2$ and characteristics at $t_1$ is:

$$f\left(y \mid t_y = t_2, t_z = t_1\right) \quad = \int_{z \in \ _z} f\left(y \mid z, t_y = t_2\right) dF\left(z \mid t_z = t_1\right) \tag{8}$$

This counterfactual density focuses on the within-group component of the observed movements by estimating the effect of changes in the distribution of wealth among households with the same characteristic on the distribution of wealth for the whole population, assuming that the household characteristics do not change over time.

The difference between the actual and the counterfactual density represents the effects, on the one hand, of changes in the distribution of the characteristics of the households (between-group component) and, on the other, of changes in the wealth structure of households with given characteristics (within-group component). In particular, for simplicity, we can rewrite equation (2) with $z$ as a discrete random variable:

$$\begin{array}{ll} f^t\left(y\right) & = \int_{z \in \ _z} dF\left(y, z \mid t_y = t, t_z = t\right) \\ & = \sum_z \pi_z^t\left(y\right) f_z^t\left(y\right) \end{array} \tag{9}$$

where $\pi_z^t\left(y\right) = F\left(z \mid t_y = t, t_z = t\right)$, the proportion of household in each group, and $f_z^t\left(y\right) = f\left(y \mid z, t_y = t, t_z = t\right)$, the density of wealth within each group. The total density of wealth, $f^t\left(y\right)$, can change over time both because

there is a movement of households between groups, i.e. the value of $\pi_z^t(y)$'s changes, and because the structure of wealth within each group changes, i.e. the value of $f_z^t(y)$'s vary. Hence the variation in $f(y)$ going from $t_1$ to $t_2$ is approximately given by:

$$\begin{aligned} & f^{t_2} - f^{t_1} \\ \simeq & \sum_z \left[\alpha_z(t_2) - \alpha_z(t_1)\right] f_z(t) \mid_{t=t_1} + \sum_z \alpha_z(t) \left[f_z(t_2) - f_z(t_1)\right] \mid_{t=t_1} \\ = & \underbrace{\left\{\sum_z \left[\alpha_z(t_2) f_z(t_1)\right] - \sum_z \left[\alpha_z(t_1) f_z(t_1)\right]\right\}}_{\text{between group}} + \\ & \underbrace{\left\{\sum_z \left[\alpha_z(t_1) f_z(t_2)\right] - \sum_z \left[\alpha_z(t_1) f_z(t_1)\right]\right\}}_{\text{within group}} \end{aligned} \tag{10}$$

It is clear from equations (6) and (8) that the counterfactual densities can be obtained by estimating[2] the component densities non-parametrically:

- $f(y \mid z, t_y = t_i)$ is estimated by applying the kernel method to the appropriate sample in year $t_i$;
- $F(z \mid t_z = t_i)$ is estimated non parametrically as proportion of households with given characteristics in year $t_i$.

# 3 Summary indices

To summarize the observed movements we use two kind of indices. First, an index to take into account the changes in the density of a given group over time, the coefficients of distance, i.e. an index that summarizes how much any two given densities differ. Second, an index to take into account the existing "distance" between given groups in which a society can be partitioned at one point in time, the polarization index, i.e. an index that tracks the moving apart of some densities classified according to some characteristic of the household.

Several coefficients have been suggested in the statistical literature for measuring distances between probability distributions.[3] In this work we use the Kolmogorov measure of distance, namely:

$$Ko = \frac{1}{2} \int \left(\sqrt{f_2(y)} - \sqrt{f_1(y)}\right)^2 dy \tag{11}$$

[2] An alternative estimation method for the counterfactual density of income at $t_1$ and characteristics at $t_2$ is proposed by DiNardo et al. (1996).

[3] For a detailed survey see, among others, Ali and Silvey (1966).

and the Kolmogorov measure of variation distance:

$$Kov = \frac{1}{2}\int |f_2(y) - f_1(y)|\, dy \tag{12}$$

The Kolmogorov measures of distance and of variation distance are measures of the lack of overlapping between groups. In particular, regarding the latter, $Kov = 0$ if the densities coincide for all values of $y$, it reaches the maximum, $Kov = 1$, if the densities do not overlap. The distance is sensitive to changes of the distributions only when both take positive values, being insensitive to changes whenever one of them is zero. It will not change if the distributions move apart, provided either that there is no overlapping between them or that the overlapping part remains unchanged.

For the second type of index, the index of polarization[4], we use that suggested by Esteban and Ray (1994) as well as a modification that D'Ambrosio (2001) proposed.

The intuition behind the polarization index is the following. Let's take agents $i$ and $j$ that own different levels of wealth in the society that we are analyzing. $i$ feels different from $j$, actually he is alienated from $j$, and from all the $j$'s that exist in the society: $S(i) = \sum_{j=1}^{n} |y_i - y_j|\, \pi_j$ represents the separation that $i$ feels from $j$, where $y_i$ is the wealth owned by agent $i$ and $\pi_i$ is the relative frequency of group $i$. The effective separation, however, depends on how many agents similar to $i$ are in the society. $E(i) = S(i)\, \pi_i^{\alpha}$ is the effective separation and $\alpha$ is the importance that we give to this phenomenon. Polarization in the society is the sum, over all the agents, of the effective separation that they are feeling: $P = \sum_{i=1}^{n} E(i)\, \pi_i = \sum_{i=1}^{n} \sum_{j=1}^{n} \pi_i \pi_i^{\alpha} |y_i - y_j|\, \pi_j$.[5]

Esteban and Ray introduce a model of individual attitudes in a society to formalize the above intuitions and use some axioms to narrow down the set of allowable measures. In particular, Esteban and Ray suppose that each individual is subject to two forces: on the one hand, he identifies with those he considers to be members of his own group, $I : \mathbf{R}_+ \to \mathbf{R}_+$ represents the identification function; and on the other hand, he feels alienated from those he considers to be members of other groups, $a : \mathbf{R}_+ \to \mathbf{R}_+$ is the alienation function. An individual with wealth $y_i$ feels alienated to a degree of $a(\delta(y_i, y_j))$ from an individual with wealth $y_j$. $\delta(y_i, y_j)$ is a measure of distance between the two wealth levels. For Esteban and Ray this is simply the absolute distance $|y_i - y_j|$. The joint effect of the two forces is given

[4] Wolfson's measure of polarization (1994) does not apply as it is a measure of bipolarization and we are here interested in monitoring the movements of the distributions of all numbers of groups.

[5] A similar interpretation can be given to the Gini coefficient but in Gini it does not matter how many agents are there similar to the one under analysis, in other words in the Gini coefficient the separation and the effective separation coincide. Hence the proportionality between $P$ and Gini (Gini defined over the logs) when $\alpha = 0$.

by the effective antagonism function, $T(I,a)$, and total polarization in the society is postulated to be the sum of all the effective antagonisms:

$$\mathbf{ER}(\boldsymbol{\eta},\mathbf{y}) = \sum_{i=1}^{N}\sum_{j=1}^{N} \eta_i^{1+\alpha}\eta_j T\left(I\left(\eta_i\right), a\left(\delta\left(y_i,y_j\right)\right)\right) \tag{13}$$

where $\eta_i$ represents the population share associated with $y_i$. The measure that satisfies the axioms introduced by Esteban and Ray has the following expression:

$$\mathbf{ER}(\boldsymbol{\eta},\mathbf{y}) = K\sum_{i=1}^{N}\sum_{j=1}^{N} \eta_i^{1+\alpha}\eta_j \delta\left(y_i,y_j\right) = K\sum_{i=1}^{N}\sum_{j=1}^{N} \eta_i^{1+\alpha}\eta_j \left|y_i - y_j\right| \tag{14}$$

for some constants $K>0$, $\alpha \in [1, 1.6]$ that indicates the degree of sensitivity to polarization.

This index of polarization is computed empirically as follows:

$$\mathbf{ER}(\boldsymbol{\alpha}) = \sum_{i=1}^{N}\sum_{j=1}^{N} \pi_i^{1+\alpha}\pi_j \left|\mu_i - \mu_j\right| \tag{15}$$

$\pi_i$ and $\mu_i$ represent respectively the relative frequency[6] and the conditional mean in group $i$ for a density of the logarithm of wealth $f(y)$, namely:

$$\begin{array}{ll} \pi_i = & \int_{y_{i-1}}^{y_i} f(y)\,dy \\ \mu_i = & \frac{1}{\pi_i}\int_{y_{i-1}}^{y_i} y f(y)\,dy \end{array} \tag{16}$$

In other words, what is computed empirically is the degree of polarization in a society, where it is assumed that everybody in each given group possesses a wealth equal to the mean of the group.[7]

Following D'Ambrosio (2001), we can use the proposed a modification[8]

[6] The population weights $\eta_i$, $i=1,...,N$ are replaced by the population frequencies. The constant $K$ is hence set to $K = \left[\sum_{i=1}^{N}\eta_i\right]^{-(2+\alpha)}$.

[7] The Esteban and Ray index involves some previous grouping since it assumes that the society is partitioned into a small number of significantly sized groups, and groups of insignificant size (e.g., isolated individuals) carry little weight (Esteban and Ray 1994, page 824).

[8] Esteban, Gradin and Ray (1998) have already proposed a modification of **ER** (**P**) to correct for not having included in the analysis the inequality within each group and the overlapping of the groups that has the effect of overestimating the level of observed polarization. In particular:

$$\mathbf{P}(\alpha,\beta) = \mathbf{ER}(\alpha) - \beta\varepsilon \tag{17}$$

where:

$$\varepsilon = G(f) - G(\mu) \tag{18}$$

the difference between the Gini coefficient computed on the ungrouped, $G(f)$, and grouped data, $G(\mu)$. $\beta$ is the parameter that indicates the importance given to the approximation error.

of **ER** to compute the level of polarization within a given society without assuming that everybody in each group has a wealth equal to the mean, and at the same time we can consider a characteristic, other than wealth, to generate the group partition, e.g. race, age, education. Wealth polarization is hence thought to be linked to specific characteristics of the population. The idea behind the modification is a direct application of the method previously described. The total density of wealth, $f^t(y)$, at any point in time, is given by the sum of the densities of each group, weighted by the relative frequency of each group:

$$\begin{array}{ll} f^t(y) & = \int_{z\in \ z} dF(y, z \mid t_{y,z} = t) \\ & = \int_{z\in \ z} f(y \mid z, t_y = t)\, dF(z \mid t_z = t) \end{array} \tag{19}$$

The polarization index has to register the moving apart of the densities classified according to some characteristics of the household that forms the groups and differences in the frequencies between the groups. Each individual identifies with those of his own group and feels alienated from those he considers to be members of other groups, as Esteban and Ray noted, but now the groups are identified by these other characteristics and not by levels of wealth. The index of polarization that Esteban and Ray proposed is modified in order to take into account the distance between the distributions of wealth of each group. The measure of distance between two distributions suggested is the Kolmogorov measure of variation distance and the following polarization index obtained from (14) can be computed:

$$\mathbf{PK}(\boldsymbol{\alpha}) = \sum_{i=1}^{N}\sum_{j=1}^{N} \pi_i^{1+\alpha}\pi_j Kov_{ij} \tag{20}$$

$\mathbf{PK}(\boldsymbol{\alpha})$ ranges between 0 and $\left(\frac{1}{2}\right)^{1+\alpha}$. The maximum is achieved when there are only two groups of the same size with no overlapping. The index can be normalized to take values between $[0, 1]$ by multiplying it by $2^{1+\alpha}$.

# 4 Data sources

The data sources used for this study are the 1983, 1989, 1992, 1995, and 1998 Survey of Consumer Finances (SCF) conducted by the Federal Reserve Board. Each survey consists of a core representative sample combined with a high-income supplement. The supplement is drawn from the Internal Revenue Service's Statistics of Income data file. For the 1983 SCF, for example, an income cut-off of \$100,000 of adjusted gross income is used as the criterion for inclusion in the supplemental sample. Individuals were randomly selected for the sample within pre-designated income strata. The advantage of the high-income supplement is that it provides a much "richer" sample of high income and therefore potentially very wealthy families. However, the

presence of a high-income supplement creates some complications, because weights must be constructed to meld the high-income supplement with the core sample[9].

The SCF also supplies alternative sets of weights. For the 1983 SCF, we have used the so-called "Full Sample 1983 Composite Weights" because this set of weights provides the closest correspondence between the national balance sheet totals derived from the sample and the those in the Federal Reserve Board Flow of Funds. For the same reason, results for the 1989 SCF are based on the average of SRC-Design-S1 series (X40131 in the database itself) and the SRC Designed Based weights (X40125); and results for the 1992, 1995, and 1998 SCF rely on the Designed-Base Weights (X42000) – a partially design-based weight constructed on the basis of original selection probabilities and frame information and adjusted for nonresponse[10]. In the case of the 1992 SCF, this set of weights produced major anomalies in the size distribution of income for 1991. As a result, the weights have been modified somewhat to conform to the size distribution of income as reported in the Internal Revenue Service's Statistics of Income (see Wolff, 1996, for details on the adjustments).

The Federal Reserve Board imputes information for missing items in the SCF. However, despite this procedure, there still remain discrepancies for several assets between the total balance sheet value computed from the survey sample and the Flow of Funds data. Consequently, the results presented below are based on Wolff's adjustments to the original asset and liability values in the surveys. This takes the form of the alignment of asset and liability totals from the survey data to the corresponding national balance sheet totals. In most cases, this entails a proportional adjustment of reported values of balance sheet items in the survey data (see Wolff, 1987,

[9] Three studies conducted by the Federal Reserve Board – Kennickell and Woodburn (1992) for the 1989 SCF; Kennickell, McManus, and Woodburn (1996) for the 1992 SCF; and Kennickell and Woodburn (1999) for the 1995 SCF – discuss some of the issues involved in developing these weights.

[10] The 1998 weights are actually partially Designed-Based weights (X42001), which account for the systematic deviation from the CPS estimates of homeownership rates by racial and ethnic groups.

1994, 1996, and 1998 for details)[11].

The principal wealth concept used here is marketable wealth (or net worth), which is defined as the current value of all marketable or fungible assets less the current value of debts. Net worth is thus the difference in value between total assets and total liabilities or debt. Total assets are defined as the sum of: (1) the gross value of owner-occupied housing; (2) other real estate owned by the household; (3) cash and demand deposits; (4) time and savings deposits, certificates of deposit, and money market accounts; (5) government bonds, corporate bonds, foreign bonds, and other financial securities; (6) the cash surrender value of life insurance plans; (7) the cash surrender value of pension plans, including IRAs, Keogh, and 401(k) plans; (8) corporate stock and mutual funds; (9) net equity in unincorporated businesses; and (10) equity in trust funds. Total liabilities are the sum of: (1) mortgage debt, (2) consumer debt, including auto loans, and (3) other debt.

This measure reflects wealth as a store of value and therefore a source of potential consumption. We believe that this is the concept that best reflects the level of well-being associated with a family's holdings. Thus, only assets that can be readily converted to cash (that is, "fungible" ones) are included. As a result, consumer durables such as automobiles, televisions, furniture, household appliances, and the like, are excluded here, since these items are not easily marketed or their resale value typically far understates the value of their consumption services to the household. Also excluded is the value of future social security benefits the family may receive upon retirement (usually referred to as "social security wealth"), as well as the value of retirement benefits from private pension plans ("pension wealth"). Even though these funds are a source of future income to families, they are not in their direct control and cannot be marketed[12].

[11] The adjustment factors by asset type and year are as follows:

| | 1983 SCF | 1989 SCF | 1992 SCF | 1995 SCF |
|---|---|---|---|---|
| Checking Accounts | 1.68 | | | |
| Savings and Time Deposits | 1.50 | | | |
| All Deposits | | 1.37 | 1.32 | |
| Financial Securities | 1.20 | | | |
| Stocks and Mutual Funds | 1.06 | | | |
| Trusts | | 1.66 | 1.41 | 1.45 |
| Stocks and bonds | | | | 1.23 |
| Non-Mortgage Debt | 1.16 | | | |

No adjustments were made to other asset and debt components.

It should be noted that the alignment has very little effect on the measurement of wealth inequality – both the Gini coefficient and the quantile shares. However, it is important to make these adjustments when comparing changes in mean wealth both overall and by asset type.

[12] See Burkhauser and Weathers (2000) for recent estimates of social security and pension wealth.

# 5 The results

Several studies have already analyzed the US distribution of wealth. The importance of monitoring its evolution through time and tracking where different groups of the population are located on the wealth scale is well recognized (Wolff, 1994, 1996, 1998, 1999).

The calculations, drawn from Wolff (2000) and contained in Table 1 show that wealth inequality, after rising steeply between 1983 and 1989, increased at a slower pace from 1989 to 1998. The share of wealth held by the top 1 percent rose by 3.6 percentage points from 1983 to 1989 and the Gini coefficient (a measure of overall inequality) increased from 0.80 to 0.83. Between 1989 and 1998, the share of the top percentile grew by a more moderate 0.7 percentage points but the share of the next 9 percentiles fell by 0.4 percentage points and that of the bottom two quintiles grew by 0.9 percentage points, so that overall, the Gini coefficient fell from 0.83 to 0.82.

The Addendum to Table 1 shows the absolute changes in wealth between 1983 and 1998. The results are even more striking. Over this period, the largest gains in relative terms were made by the wealthiest households. The top one percent saw their average wealth (in 1998 dollars) rise by 3.0 million dollars or by 42 percent. The remaining part of the top quintile, as well as the second quintile, experienced increases from 21 to 24 percent. While the middle quintile gained 10 percent, the poorest 40 percent lost 76 percent! By 1998, their average wealth had fallen to $1,100.

The reason for additional research on this topic is to investigate in detail the increasing dispersion in the aggregate distribution of wealth observed from 1983 to 1989 and from 1989 to 1998. In particular, we look at another dimension of the distribution, polarization. We examine whether a pattern similar to what has been observed regarding inequality exists for trends in wealth polarization over this period. The questions we are addressing are the following: Are the distributions of wealth of different racial, age, family type, income class, educational groups behaving in the same way over time? Have the densities of these groups the same shape and, if not, are the differences increasing or decreasing over time? Our aim is, furthermore, to understand what determined the changes observed at the aggregate level. In particular, we want to determine if the increasing dispersion of the aggregate distribution is due to changes in household characteristics or to changes in

the distribution of wealth within households with the same characteristics.

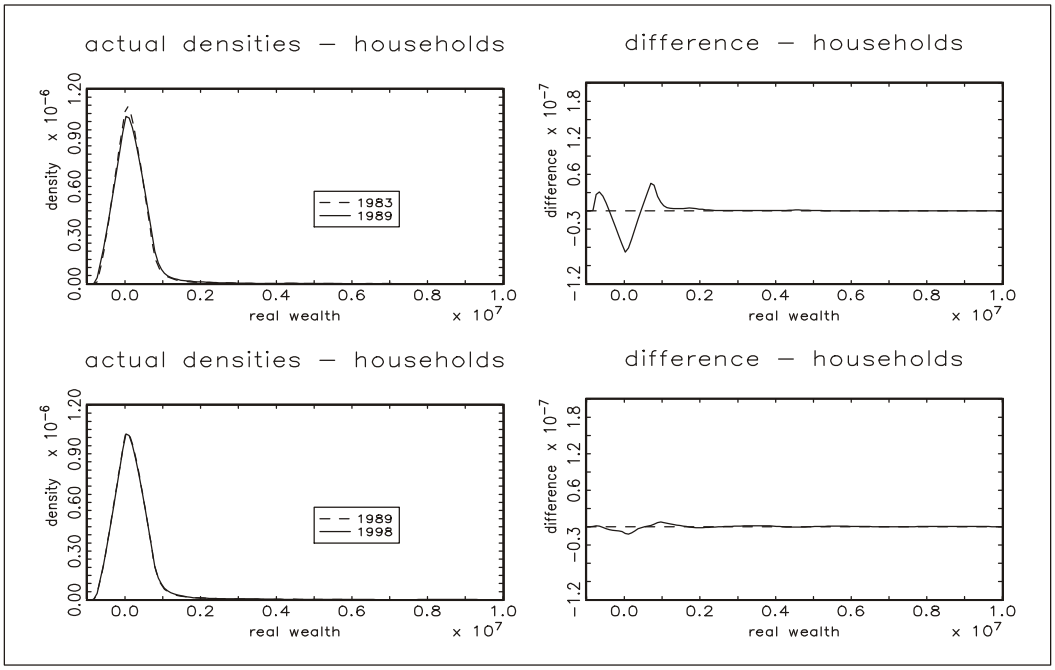


Figure 1: The distribution of household wealth. 1983-1998.

We examine polarization patterns and their change over time with regard to a number of household dimensions:

1. home owner status (home owners and renters);
2. race (non-Hispanic whites versus other groups);
3. age (head of the household is under 45 years old, between 45 and 69, older than 70);
4. family type (married couples, single males, single females);
5. income class (household income is under $25,000, between $25,000 and $74,999, over $75,000);
6. education (head of the household has under 16 years of education, 16 or above years of education).
7. stock and mutuals owner status (household does own stock and mutuals or does not).

The distribution of household wealth is characterized by a continuous increase in the dispersion over the years of analysis even if at a decreasing

pace, as shown in Figure 1 where the estimated densities and the differences among them are plotted. In particular, the movement of mass from the center of the distribution towards the tails is dramatic for the period 1983 - 1989 and not so sharp for the years 1989 - 1998.

By looking at the groups in which the total population can be partitioned according to household characteristics, we notice that wealth is not distributed in the same way at the same point in time nor the changes registered over time are common among different groups (Figures 2 to 5).

Household wealth by homeowner status, racial/ethnic group, educational group, and stock ownership was distributed very differently between the groups in all the years analyzed. In particular, the wealth density of renters, blacks and Hispanics, family heads with less than a college degree, and households not owning stock lay to the left (toward lower levels of wealth) compared to home owners, non-Hispanic whites, family heads with a college degree, and stock owners, respectively. The differences rose over time between home owners and renters, between college graduates and non-college graduates, and between stock owners and non-owners due to an increased mass of the wealth density at high levels of wealth for home owners, college graduates, and stock owners, respectively. The polarization indices partially confirm these observations (Tables 2 and 3). In particular the **EK** index shows a continuous increase over time by home owner, education, and stock ownership status. On the other hand, according to the **ER** index polarization by educational and stock ownership status increased over time, while polarization by home ownership status declined from 1983 to 1989 and increased from 1989 to 1998 since this index captures only the differences in the means and not changes in the whole distributions.

Regarding racial groups (Figure 2), the difference in wealth densities first increased and then decreased. Between 1983 and 1989 the wealth owned by non-Hispanic whites increased, causing more density to shift toward higher wealth levels, while the wealth density of non-Hispanic whites shifted upward during the 1989-1998 period. Polarization according to the **EK** index (Table 3) increased from 1983 to 1989 and then declined from 1989 to 1998, while according to the **ER** index polarization (Table 2) increased continuously over the three years.

The differences in the wealth ownership by age group (Figure 3) first declined, between 1983 and 1989, and then increased between 1989 and 1998 as a consequence of shifts in the wealth density of the oldest age group. The density of the oldest age group shifted toward that of the middle age group between 1983 and 1989, causing a decline in the level of polarization. Between 1989 and 1998, the wealth density of the oldest age group shifted away from that of the youngest, resulting in a rise in polarization.

With regard to family type, the results on polarization are sensitive to the index used. The modified Esteban and Ray index, **PK**, primarily shows an increase in polarization between households. From Figure 3, we can see

that this result is due to the fact that the wealth densities of single male and single female households almost overlap while the wealth density of married couples has put increasing distance between itself and the other two family type groups over time.

The wealth densities by income group show a close correspondence between income levels and wealth. The distances among the income groups decreased over time, as did the **EK** and **ER** polarization indices.

To determine if the flattening of the aggregate wealth distribution over time is due to changes in household characteristics or to changes in the distribution of wealth within households with the same characteristics we use the decomposition method described above. The results are shown in Figures 6 to 11. In the left hand side of the figures are plotted the distances among the estimated density of the first year and the counterfactual densities of the second year obtained by using the estimated densities of each group of the second year and the relative frequencies of the first year (between-group decomposition). In the right hand side of the figures are plotted the distances among the estimated density of the first year and the counterfactual densities of the second year obtained by using the estimated densities of each group of the first year and the relative frequencies of the second year (within-group decomposition). The main finding of the decomposition method is that changes in household characteristics did not have a large influence on the evolution of the US wealth density between 1983 and 1998. Instead, most of the observed variation can be attributed to shifts in the within-group wealth schedules, which underwent dramatic changes. During the 1983 - 1989 period, within-group shifts of the wealth densities by home ownership status, age, family type, race and educational groups account for most of the change in the overall wealth density over the period. During the 1989 - 1998 period, the same results are found by race, age and family income group. These results are confirmed by the measures of divergence and distance reported from Tables 4 to 10: decreasing values for all the within-group components in both periods except by income classes and stock ownership.

# 6 Conclusions

This paper has used a method that focuses on changes in the entire wealth distribution of the United States over the period from 1983 to 1998. We find, first, on the basis of the decomposition analysis, that changes in household characteristics had a minimal effect on the evolution of the overall wealth density between 1983 and 1998. Instead, most of the observed variation over time is attributable to shifts in within-group wealth schedules.

We find, second, that polarization between homeowners and tenants increased continuously over the period from 1983 to 1998. This finding is somewhat consistent with the results reported in Table 11, which show that

the ratio of median wealth between tenants and home owners declined continuously over the three years. However, the ratio of mean wealth between the two groups first rose between 1983 and 1989 and then declined from 1989 to 1998. By 1998, the gap in mean wealth between homeowners and tenants was greater than in 1983. The increasing wealth polarization between homeowners and renters also appears to be consistent with previous studies which have emphasized the importance of home ownership as a vehicle for wealth accumulation in general (see, for example, Oliver and Shapiro, 1997). Besides providing forced savings (through the amortization of mortgage debt), owning a home may also access to greater financial information and create a psychological disposition toward saving for the future.

Second, polarization between college graduates and non-graduates also increased continuously over the 1983-1998 period. The pattern is somewhat different than that reported in Table 11. Between 1983 and 1989, the ratio of mean net worth between the two groups rose from 3.85 to 4.12 but then declined to 3.87 in 1998. Likewise, the ratio of median wealth between the two groups, after rising from 3.26 in 1983 to 4.09 in 1989 fell off to 3.58 in 1998. The finding of enhanced wealth polarization between the college educated and less educated groups is consistent with numerous studies of the labor market which have found a rising return to a college education over the period in question (see, for example, Levy and Murnane, 1992).

Third, polarization by income classes groups continuously decreased over the same period. This finding reflects, in part, the fact that the relative wealth position of the top income class, both in terms of means and medians, declined over the period from 1983 to 1998 (see Table 11). However, the relative wealth holdings of the lowest income class also deteriorated over these years.

Fourth polarization by racial group first increased from 1983 to 1989 and then declined from 1989 to 1998 It is also trued that the ratio of median wealth between non-whites and non-Hispanic whites first declined from 0.09 in 1983 to 0.05 in 1989 and then rose to 0.12 in 1998. However, the ratio of mean wealth between the two racial groups actually increased from 0.24 in 1983 to 0.31 in 1989 before falling off a bit to 0.29 in 1998. The decreased racial polarization of the 1990s may partly reflect the rise of a black (and Hispanic) middle class in the United States (see, for example, Oliver and Shapiro, 1997).

Fifth, polarization by age groups declined from 1983 to 1989 and then rebounded in the 1990s. This pattern may reflect the fact that the average wealth of the poorest age group, those households headed by a person under 45 years of age, relative to the overall mean first rose from 1983 to 1989 and then declined in 1998. However, the median wealth of the under 45 age group relative to the overall median declined continuously over the three years.

Sixth, the time trends in polarization by family type were sensitive to the

index used. The results of Table 11 show that the relative wealth position of households headed by an unmarried female deteriorated over the period from 1983 to 1998 while the relative net worth position of single males improved. Female-headed households consist of both divorced and widowed women and those never married. The relative decline in the wealth of female-headed households as a group probably reflects the dramatic rise in the number of never married women with children.

Seventh, polarization between households that own and those that do not own stock or mutual funds, after changing very little between 1983 and 1989, skyrocketed in the 1990s. This pattern is also reflected in Table 11. The ratio of mean wealth between stock owners and those who do not hold stock fell somewhat from 5.7 in 1983 to 5.5 in 1989 and then climbed to 6.2 in 1998, while the ratio of median net worth rose continuously, from 5.6 in 1983 to 6.6 in 1989 and then to 9.1 in 1998. These results reflect, in part, the rapid rise of stock prices during the 1990s. However, it may also be attributable to greater access among stock owners to other financial instruments and financing possibilities.

On a final note, it is apparent that the polarization indices are a much more complex measure of group homogeneity relative to population-wide heterogeneity than a simple comparisons of group means and medians would suggest. Though trends in relative means and median generally parallel trends in the polarization indices, there are several incidences where the two set are at variance.

| | | Percentage Share of Wealth Held by | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Top | Next | Next | Next | Top | 2nd | 3rd | Bottom | |
| Year | Gini Coeff | 1.0% | 4.0% | 5.0% | 10.0% | 20.0% | 20.0% | 20.0% | 40.0% | All |
| 1983 | 0.80 | 33.8 | 22.3 | 12.1 | 13.1 | 81.3 | 12.6 | 5.2 | 0.9 | 100.0 |
| 1989 | 0.83 | 37.4 | 21.6 | 11.6 | 13.0 | 83.5 | 12.3 | 4.8 | -0.7 | 100.0 |
| 1992 | 0.82 | 37.2 | 22.8 | 11.8 | 12.0 | 83.8 | 11.5 | 4.4 | 0.4 | 100.0 |
| 1995 | 0.83 | 38.5 | 21.8 | 11.5 | 12.1 | 83.9 | 11.4 | 4.5 | 0.2 | 100.0 |
| 1998 | 0.82 | 38.1 | 21.3 | 11.5 | 12.5 | 83.4 | 11.9 | 4.5 | 0.2 | 100.0 |
| **Addendum: Mean Values by Quantile (in Thousands, 1998 Dollars):** | | | | | | | | | | |
| 1983 | | 7.175 | 1,187 | 516.2 | 278.7 | 864.5 | 133.6 | 55.5 | 4.7 | 212.6 |
| 1998 | | 10.204 | 1.441 | 623.5 | 344.9 | 1126.7 | 161.3 | 61.0 | 1.1 | 270.3 |
| % Change | | 42.2 | 21.4 | 20.8 | 23.7 | 30.3 | 20.7 | 10.0 | -76.3 | 27.1 |

Table 1: The size distribution of net worth. 1983-1998.

| **ER** | **alfa=1** | **alfa=1.3** | **alfa=1.6** |
|---|---|---|---|
| homeownership (1983) | 0.2505 | 0.2064 | 0.1710 |
| homeownership (1989) | 0.2321 | 0.1909 | 0.1580 |
| homeownership (1998) | 0.2510 | 0.2081 | 0.1741 |
| race (1983) | 0.1667 | 0.1460 | 0.1306 |
| race (1989) | 0.1861 | 0.1587 | 0.1377 |
| race (1998) | 0.1943 | 0.1676 | 0.1474 |
| age (1983) | 0.2176 | 0.1689 | 0.1318 |
| age (1989) | 0.1765 | 0.1363 | 0.1058 |
| age (1998) | 0.1814 | 0.1387 | 0.1066 |
| family type (1983) | 0.1514 | 0.1225 | 0.1002 |
| family type (1989) | 0.1605 | 0.1242 | 0.0974 |
| family type (1998) | 0.1440 | 0.1140 | 0.0915 |
| income class (1983) | 0.3030 | 0.2439 | 0.1998 |
| income class (1989) | 0.2872 | 0.2191 | 0.1700 |
| income class (1998) | 0.2814 | 0.2048 | 0.1511 |
| education (1983) | 0.2474 | 0.2144 | 0.1897 |
| education (1989) | 0.2610 | 0.2285 | 0.2043 |
| education (1998) | 0.2784 | 0.2348 | 0.2008 |
| stock and mutuals (1983) | 0.3255 | 0.2828 | 0.2509 |
| stock and mutuals (1989) | 0.3250 | 0.2835 | 0.2525 |
| stock and mutuals (1998) | 0.3670 | 0.3091 | 0.2638 |

Table 2: Esteban and Ray polarization index among the distributions of 1983, 1989 and 1998.

| **EK** | **alfa=1** | **alfa=1.3** | **alfa=1.6** |
|---|---|---|---|
| homeownership (1983) | 0.1570 | 0.1592 | 0.1625 |
| homeownership (1989) | 0.1620 | 0.1640 | 0.1671 |
| homeownership (1998) | 0.1636 | 0.1670 | 0.1719 |
| race (1983) | 0.0639 | 0.0689 | 0.0759 |
| race (1989) | 0.0849 | 0.0892 | 0.0953 |
| race (1998) | 0.0741 | 0.0787 | 0.0852 |
| age (1983) | 0.1036 | 0.0991 | 0.0952 |
| age (1989) | 0.0922 | 0.0876 | 0.0838 |
| age (1998) | 0.1022 | 0.0961 | 0.0908 |
| family type (1983) | 0.0749 | 0.0745 | 0.0749 |
| family type (1989) | 0.0835 | 0.0794 | 0.0766 |
| family type (1998) | 0.0825 | 0.0805 | 0.0796 |
| income class (1983) | 0.1536 | 0.1532 | 0.1546 |
| income class (1989) | 0.1552 | 0.1480 | 0.1427 |
| income class (1998) | 0.1411 | 0.1280 | 0.1174 |
| education (1983) | 0.0869 | 0.0928 | 0.1010 |
| education (1989) | 0.1088 | 0.1172 | 0.1291 |
| education (1998) | 0.1233 | 0.1281 | 0.1349 |
| stock and mutuals (1983) | 0.1418 | 0.1514 | 0.1649 |
| stock and mutuals (1989) | 0.1504 | 0.1621 | 0.1784 |
| stock and mutuals (1998) | 0.1886 | 0.1959 | 0.2063 |

Table 3: Esteban and Ray modified polarization index (normalized) among the distributions of 1983, 1989 and 1998.

| Home ownership | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0000 (–99.9380) | 0.0011 (-96.6273) |
| 1989 - 1998 within | 0.0000 (-94.9386) | 0.0060 (-31.0677) |
| 1983 - 1989 between | 0.0018 (+1.5948) | 0.0318 (+2.1175) |
| 1989 - 1998 between | 0.0006 (-10.0644) | 0.0079 (-9.7833) |

Table 4: Summary indices computed between the actual distribution of 1983 and the homeownership counterfactuals distribution of 1989.

| Race | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0001 (-92.2421) | 0.0121 (-61.2548) |
| 1989 - 1998 within | 0.0000 (-97.7607) | 0.0030 (-65.4437) |
| 1983 - 1989 between | 0.0020 (+13.5814) | 0.0356 (+14.0644) |
| 1989 - 1998 between | 0.0006 (-7.2379) | 0.0071 (-18.0430) |

Table 5: Summary indices computed between the actual distribution of 1983 and the race counterfactual distributions of 1989.

| Age | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0000 (-99.9572) | 0.0003 (-98.9063) |
| 1989 - 1998 within | 0.0000 (-97.6537) | 0.0036 (-58.5463) |
| 1983 - 1989 between | 0.0017 (+0.6049) | 0.0313 (+0.2554) |
| 1989 - 1998 between | 0.0006 (-8.4850) | 0.0068 (-22.0644) |

Table 6: Summary indices computed between the actual distribution of 1983 and the age counterfactual distributions of 1989.

| Family type | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0001 (-92.7618) | 0.0108 (-65.5048) |
| 1989 - 1998 within | 0.0000 (-98.3791) | 0.0015 (-82.8675) |
| 1983 - 1989 between | 0.0017 (+0.9233) | 0.0309 (-0.9839) |
| 1989 - 1998 between | 0.0006 (-2.3740) | 0.0084 (-3.6220) |

Table 7: Summary indices computed between the actual distribution of 1983 and the family type counterfactuals distribution of 1989.

| Income class | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0014 (-20.3469) | 0.0292 (-6.2786) |
| 1989 - 1998 within | 0.0025 (+290.9630) | 0.0433 (+396.0372) |
| 1983 - 1989 between | 0.0015 (-14.4303) | 0.0225 (-27.9846) |
| 1989 - 1998 between | 0.0014 (+113.4153) | 0.0253 (+189.6472) |

Table 8: Summary indices computed between the actual distribution of 1983 and the income class counterfactuals distribution of 1989.

| Education | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0000 (-99.2663) | 0.0026 (-91.5612) |
| 1989 - 1998 within | 0.0003 (-46.4220) | 0.0156 (+78.6130) |
| 1983 - 1989 between | 0.0019 (+11.0982) | 0.0341 (+9.2447) |
| 1989 - 1998 between | 0.0006 (-13.4091) | 0.0091 (+4.6699) |

Table 9: Summary indices computed between the actual distribution of 1983 and the education counterfactuals distribution of 1989.

| Stock mutuals | Kolmogorov distance | Kolmogorov variation distance |
|---|---|---|
| 1983 - 1989 within | 0.0000 (-99.7756) | 0.0017 (-94.6250) |
| 1989 - 1998 within | 0.0006 (-10.1995) | 0.0210 (+140.6749) |
| 1983 - 1989 between | 0.0471 (+2620.7987) | 0.2933 (+840.8016) |
| 1989 - 1998 between | 0.0407 (+6204.1112) | 0.3015 (+3357.2995) |

Table 10: Summary indices computed between the actual distribution of 1983 and the stock and mutuals counterfactuals distribution of 1989.

| | Mean Net Worth | | | Median Net Worth | | |
|---|---|---|---|---|---|---|
| Group | 1983 | 1989 | 1998 | 1983 | 1989 | 1998 |
| **A. Home owner status** | | | | | | |
| Home owner | 1.47 | 1.43 | 1.44 | 1.96 | 2.09 | 1.96 |
| Renter | 0.18 | 0.27 | 0.14 | 0.02 | 0.01 | 0.00 |
| **B. Race** | | | | | | |
| Non-Hispanic whites | 1.17 | 1.21 | 1.19 | 1.29 | 1.44 | 1.35 |
| Other races | 0.29 | 0.37 | 0.35 | 0.12 | 0.07 | 0.17 |
| **C. Age** | | | | | | |
| Under 45 | 0.40 | 0.49 | 0.45 | 0.38 | 0.33 | 0.26 |
| Ages 45-69 | 1.73 | 1.58 | 1.56 | 1.92 | 1.86 | 1.75 |
| Age 70 and over | 1.21 | 1.32 | 1.30 | 1.51 | 1.89 | 2.08 |
| **D. Family type** | | | | | | |
| Married couples | 1.34 | 1.42 | 1.34 | 1.46 | 1.70 | 1.51 |
| Single males | 0.34 | 0.63 | 0.67 | 0.15 | 0.56 | 0.35 |
| Single females | 0.50 | 0.29 | 0.44 | 0.45 | 0.36 | 0.42 |
| **E. Income Class [1998$]** | | | | | | |
| Less than $25,000 | 0.28 | 0.26 | 0.24 | 0.22 | 0.12 | 0.13 |
| $25,000-$74.999 | 0.65 | 0.65 | 0.60 | 1.26 | 1.29 | 1.20 |
| $75,000 or more | 4.79 | 4.15 | 3.91 | 5.50 | 5.55 | 5.19 |
| **F. Education** | | | | | | |
| Less then College grad. | 0.62 | 0.63 | 0.55 | 0.76 | 0.78 | 0.68 |
| College graduate | 2.40 | 2.58 | 2.14 | 2.49 | 3.20 | 2.43 |
| **G. Stock ownership** | | | | | | |
| Owns stocks or mutual funds | 2.89 | 2.90 | 2.49 | 3.57 | 4.11 | 3.85 |
| Non-owner | 0.51 | 0.53 | 0.40 | 0.64 | 0.62 | 0.42 |

Table 11: Ratio of mean to median net worth to the overall mean by household characteristic.

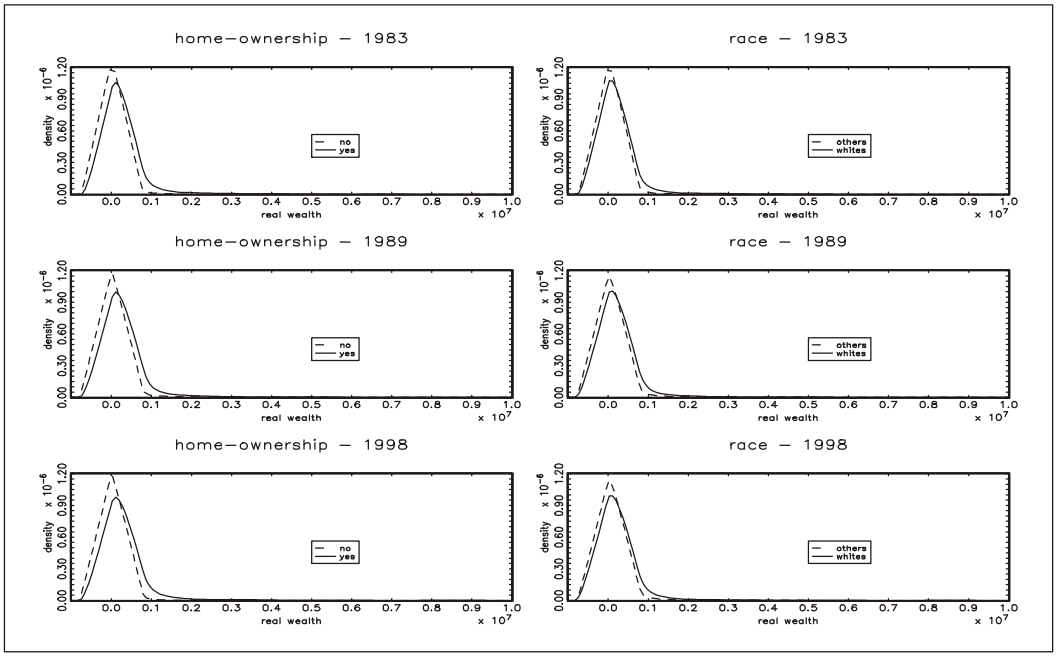


Figure 2: The distribution of household wealth by homeownership status and racial groups.

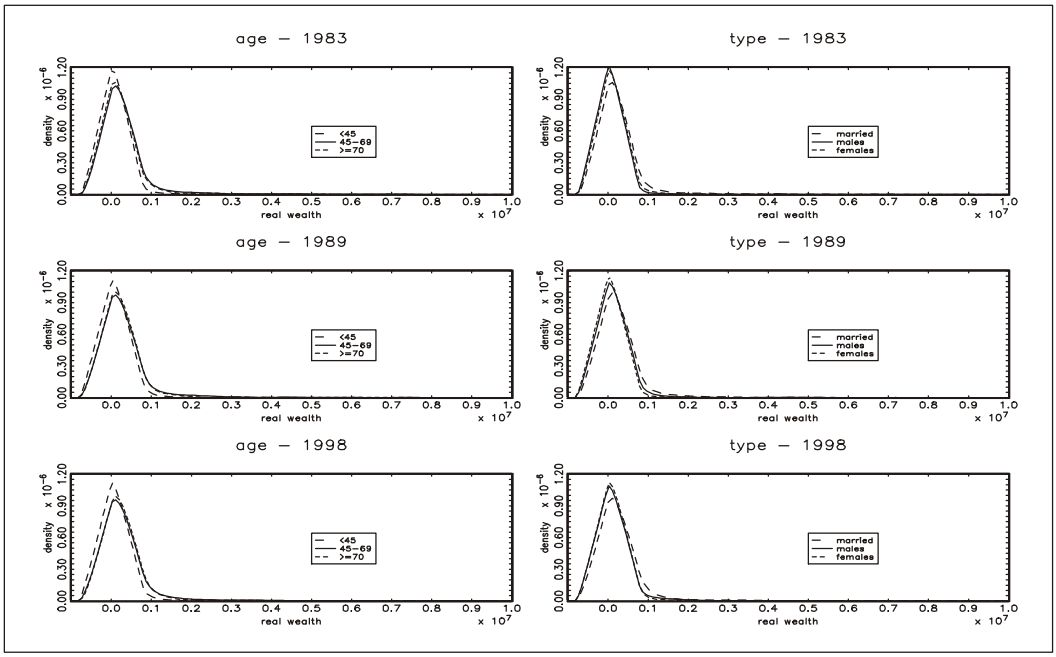


Figure 3: The distribution of household wealth by age and family type groups.

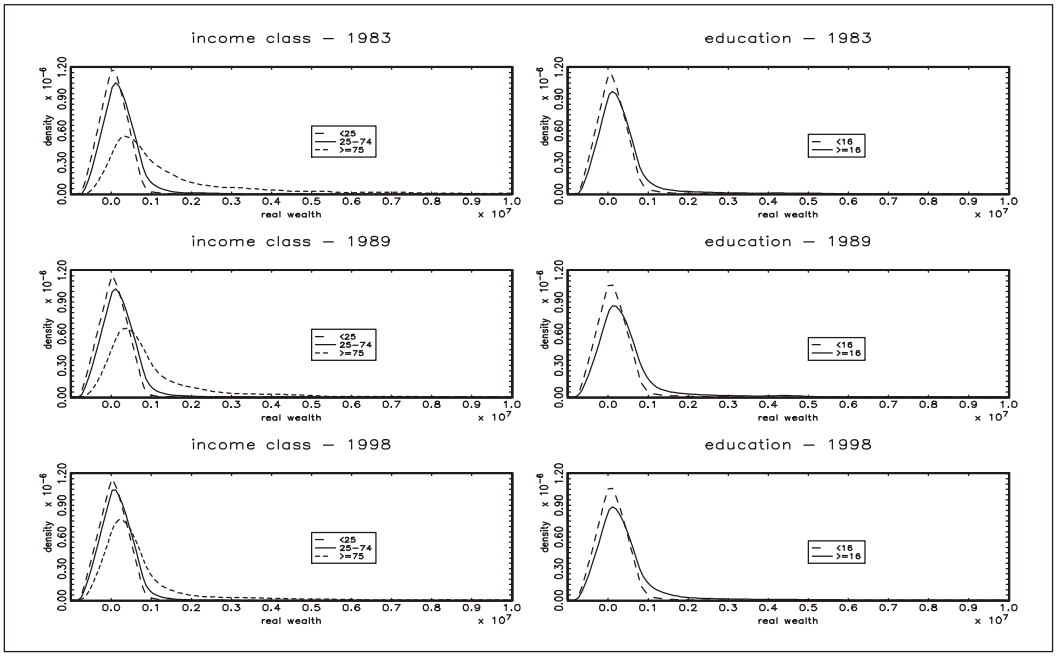


Figure 4: The distribution of household wealth by income class and educational groups.

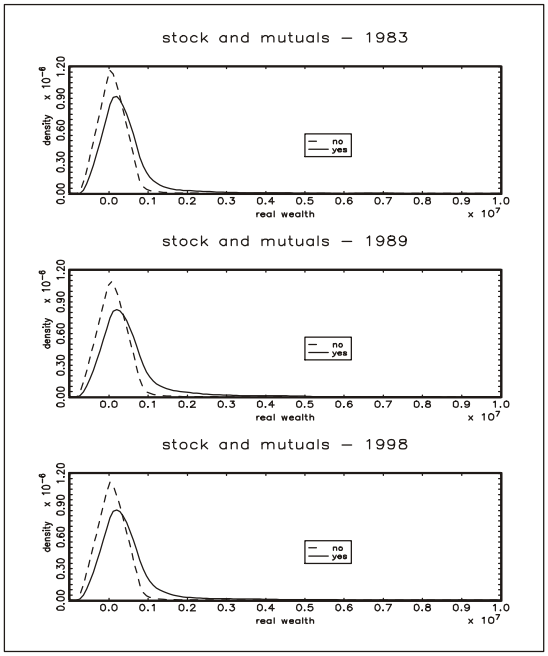


Figure 5: The distribution of household wealth by stock ownership groups.

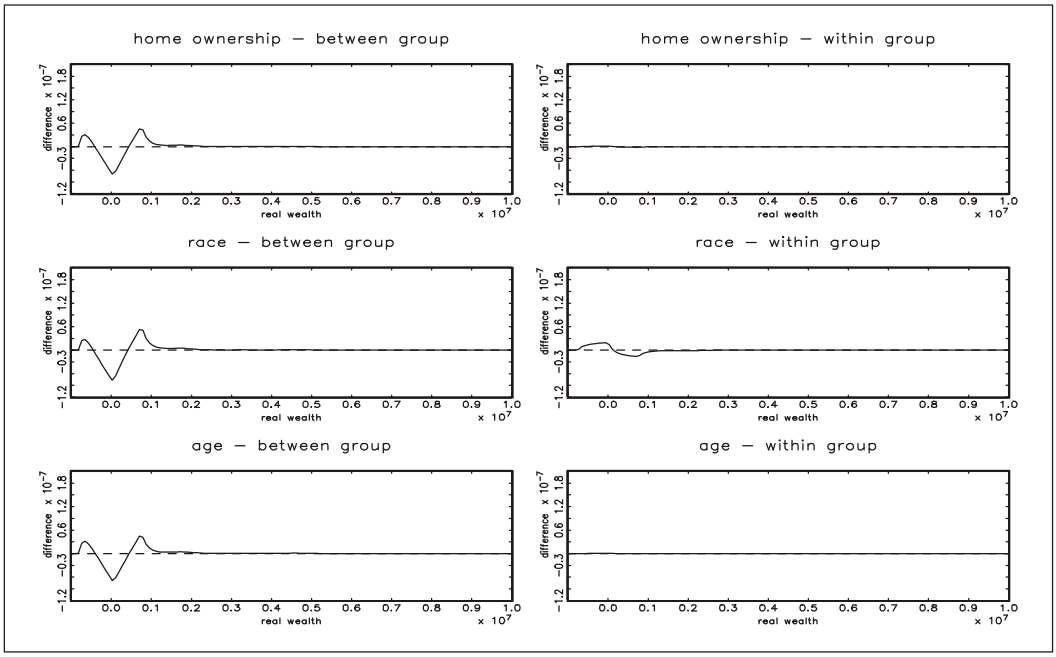


Figure 6: Distance among the 1983 estimated density and 1989 countefactual densities obtained applying the between- and within-group decomposition.

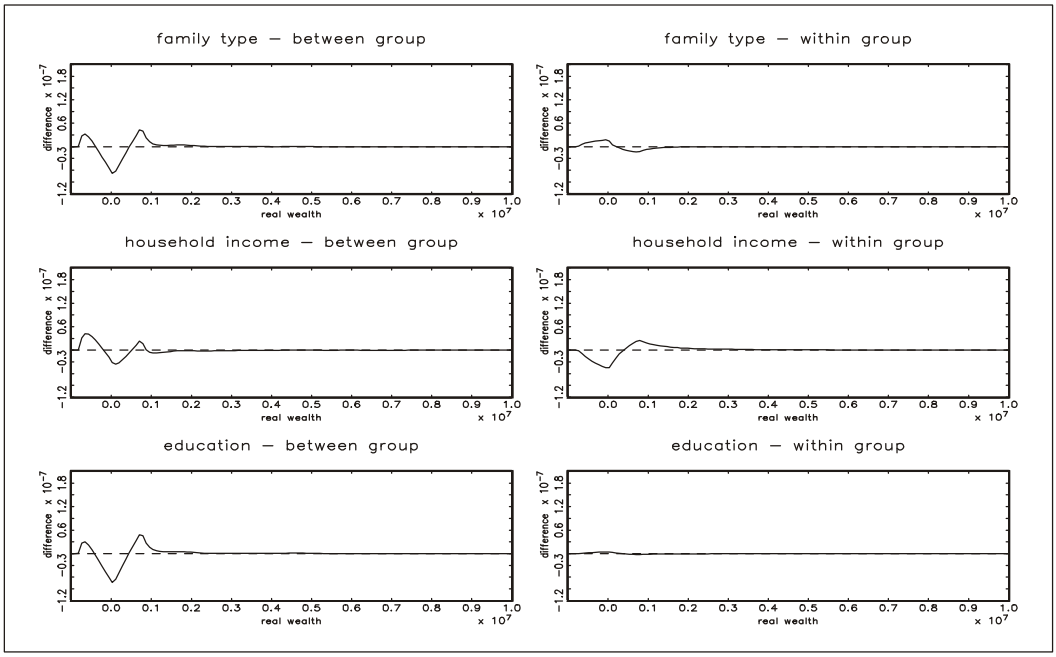


Figure 7: Distance among the 1983 estimated density and 1989 countefactual densities obtained applying the between- and within-group decomposition.

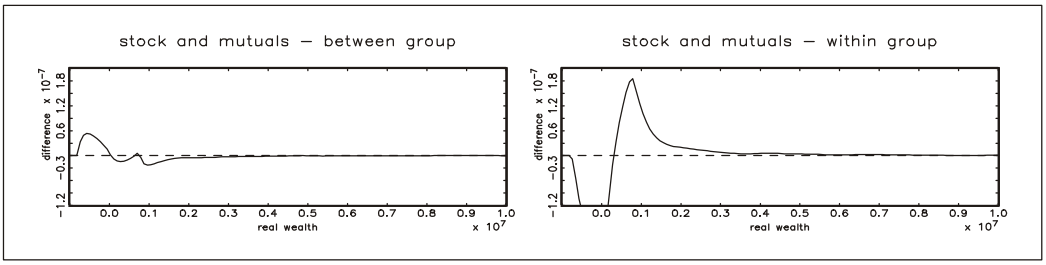


Figure 8: Distance among the 1983 estimated density and 1989 countefactual densities obtained applying the between- and within-group decomposition.

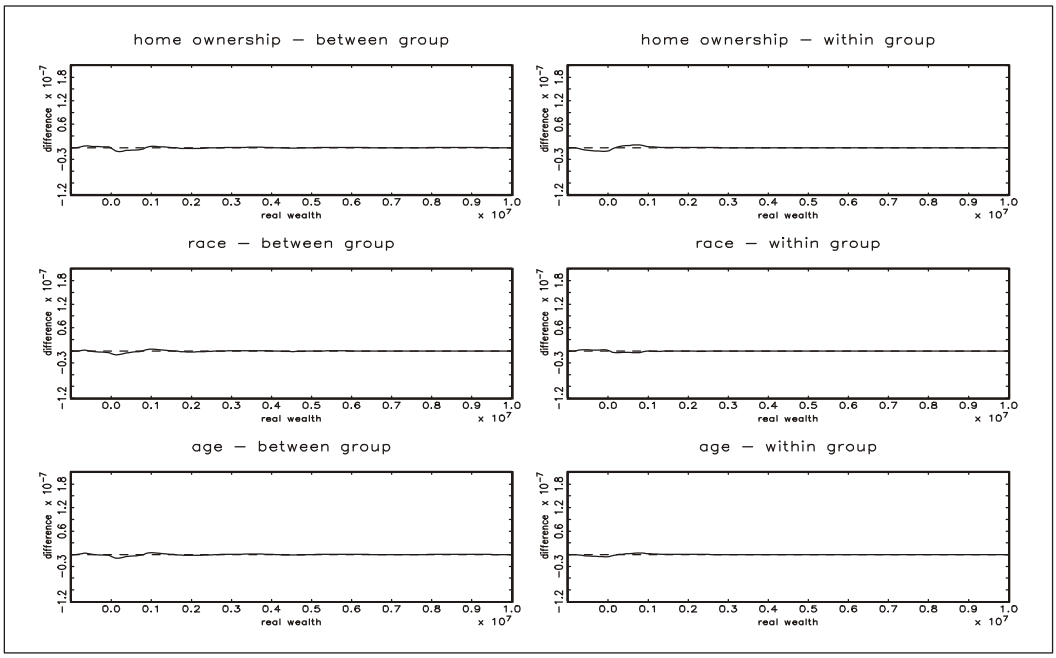


Figure 9: Distance among the 1989 estimated density and 1998 countefactual densities obtained applying the between- and within-group decomposition.

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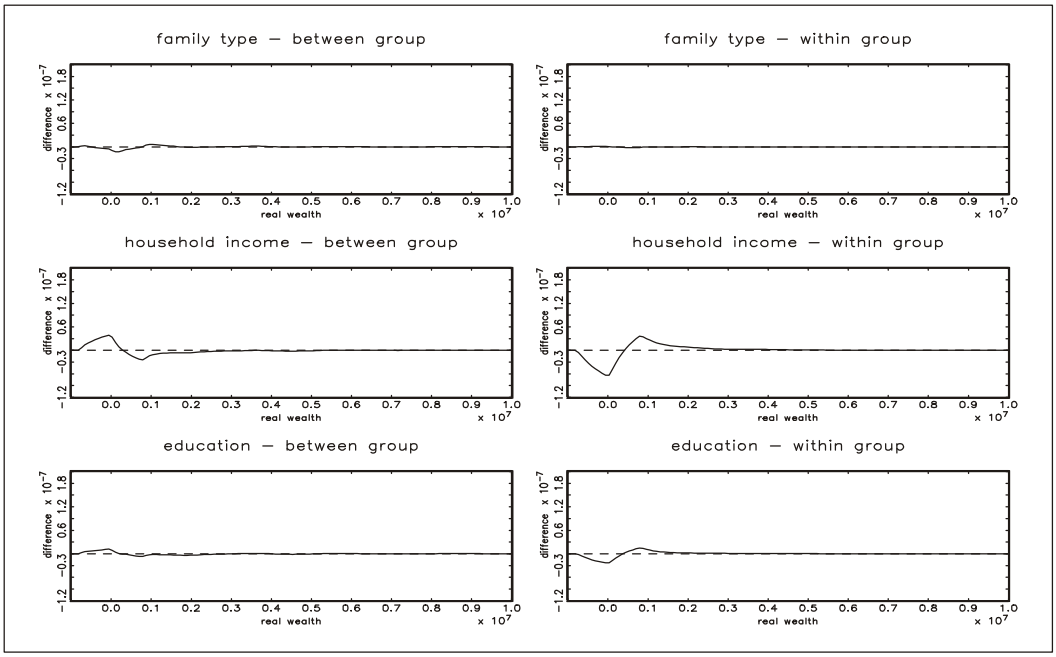


Figure 10: Distance among the 1989 estimated density and 1998 countefactual densities obtained applying the between- and within-group decomposition.

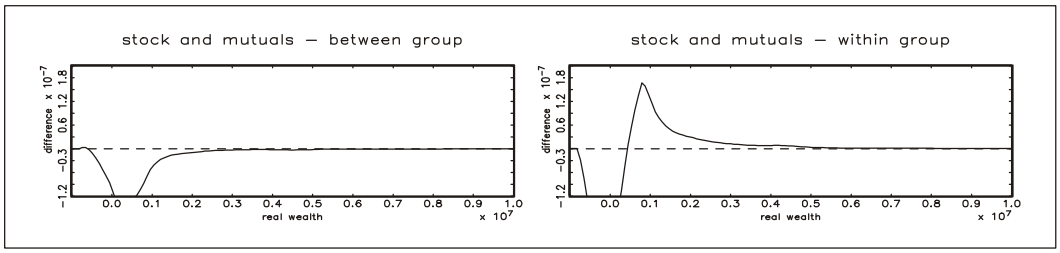


Figure 11: Distance among the 1989 estimated density and 1998 countefactual densities obtained applying the between- and within-group decomposition.