Equity Culture and the Distribution of Wealth[#]

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Abstract

It is often presumed that wealth inequality is reduced by wider access to stockholding opportunities. We investigate changes in the US distribution of wealth between 1989 and 2001. We find inequality in equity holdings to be important for changes in net wealth inequality, despite equity's limited share. We estimate the contribution of household characteristics to inequality in equity holdings among stockholders. Counterfactual distributions separating the roles of changes in 'returns' to investor characteristics and of changes in characteristics of the stockholder pool imply a worsening of the stockholder pool between 1989 and 1998, but an improvement following the downswing. Most of the education effect is observed in the upper tail of the distribution of equity holdings, and higher education is associated with less inequality in stock wealth. Simulations of an intertemporal portfolio model show that this equalizing effect of education is unlikely to arise from differences in age-income profiles and income shock processes alone. Results from bivariate probits with selection suggest that making cumulative gains and avoiding losses are significantly influenced by length of investment horizon and portfolio breadth. Controlling for those, use of professional advice is either insignificant or counterproductive. If progressively less qualified marginal stockholders are drawn into the pool, spread of equity culture is unlikely to be accompanied by a reduction in wealth inequality.

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1. Introduction

Participation of households in risky assets, especially in direct and indirect holdings of stocks grew substantially over the 1990s.[1] The increase in household participation in stockholding over the past fifteen years has been so dramatic that its aggregate implications merit careful study. Such implications include effects of increased stockholding participation on the equity premium, stock market volatility, and the distribution of wealth. A small number of interesting theoretical papers on these issues serve to highlight several important conflicting considerations that need to be taken into account, but make obvious that we are still far from conclusive answers.[2]

This paper focuses on implications of the spread of equity culture for the distribution of wealth, using data from several Surveys of Consumer Finances. Wealth inequality is of interest not only in its own right, but also because households at different points in the wealth distribution exhibit different financial and entrepreneurial behavior. Hurst and Lusardi (2004) have recently documented that a positive relationship between wealth and entry into entrepreneurship can be found only at the top five percentiles of the wealth distribution. Carroll (2001) showed that the portfolio behavior of rich households is quite different from that of households lower in the distribution of wealth, and richer households are not simply blown-up versions of poorer households. Wolff (1998) shows that only the top 20 percent of households enjoys higher mean net worth and financial wealth levels between 1983 and 1995, while the other groups undergo real wealth or income losses, with the shortfall being more severe for the poor.[3]

There is theoretical justification for claims that increased stock market participation reduces wealth inequality. Arrow (1987) has stressed the inequality reducing effects of more households gaining access to financial instruments that bear an expected return premium. The findings of Guvenen (2002) support the notion that limited stock market participation can account for much of US wealth inequality. It would not be unreasonable to infer from these findings that expanding participation is likely to reduce wealth inequality, by reducing the departure from full participation in the stock market.

Theoretical ambiguities arise when full financial information and sophistication are not taken for granted among all participating households. Peress (2002) allowed investment in financial information to be costly and subject to the choice of market participants. In his model, greater participation could encourage more people to get informed about stock performance and sound practices of portfolio management. However, Peress also pointed to a conflicting effect on incentives to acquire information. With an expanded stockholder base, financial risk is spread among a greater number of investors, thus reducing incentives for each to invest in costly information acquisition, including incumbent stockholders.

The empirical stock market participation literature has already established that stockholders are not randomly drawn from the population. Having certain demographic and other characteristics, such as being income-rich, more educated, and less risk averse, has been found to make a household more likely to overcome entry costs and become a stockholder.[4] In this paper, we take the analysis a step further by asking whether and which stockholder characteristics contribute to inequality in equity holdings among stockholders and to gains or losses in stockholding. We examine both direct equity holdings, and indirect holdings through mutual funds and retirement accounts. The implications of such analysis are not confined to stockholding. We find that inequality in stock wealth has gained considerable importance as a source of overall net wealth inequality, despite the fact that equity represents a relatively small share of net wealth.

Our analysis starts with computation of alternative inequality measures and a decomposition of net total wealth inequality and financial wealth inequality into their various sources (sections 2 and 3). We find that the relative importance of equity holdings in generating inequality in total net wealth grew between 1989 and 1998, and remained high even in 2001, while the contribution from other sources fluctuated.

We then focus on equity. In Section 4, we provide estimates of the roles of household characteristics in generating equity holdings and inequality in such holdings, based on OLS and on quantile regression estimates. We use the latter estimates to construct counterfactual distributions of equity holdings that separate changes in the size of effects of investor characteristics from changes in the distribution of characteristics, as marginal investors are progressively brought into the market. We will sometimes refer to the former as 'returns' to investor characteristics, but this should not be confused with other frequent uses of the term 'returns'.

Section 5 focuses on education and household financial attitudes and practices. In 5.1, we estimate an important role for education in generating inequality of equity holdings. In 5.2, we present simulations of an intertemporal model of household portfolio choice showing that differences in inequality of equity holdings across education groups can be observed even under optimal behavior of all stockholders, similarity in all characteristics except for income processes, and a simple portfolio problem involving the same risky asset for all households. Still, simulations suggest that the empirically observed equalizing effect of higher education at the upper end of the distribution of equity holdings is unlikely to arise from income processes under optimal behavior. In Section 5.3, we present our results on the role of household financial attitudes and practices and other characteristics for the incidence of cumulative gains and losses, separately for direct and indirect stockholding, and for 1998 and 2001. Section 6 concludes.

2. Inequality Indices

We use data from the most comprehensive source on household portfolios, namely the United States Surveys of Consumer Finances, for 1989, 1998, and 2001. The data are particularly well suited for analysis of wealth holdings, since they over sample the rich and they are not subject to top-coding of wealthy households carried out in other surveys.[5] Definitions and details on the construction of the variables are provided in the Data Appendix.

Inequality indices often give different pictures of inequality, because they differ in their sensitivity to inequality in various parts of the distribution. We compute four measures of inequality. The first three belong to the so-called "generalized entropy class" (abbreviated as GE). Mean logarithmic deviation (MLD) of variable y with mean μ and n observations is defined as:

$$MLD \equiv GE(0) = \frac{1}{n}\sum_{i=1}^{n}\log\frac{\mu}{y_i} \tag{1}$$

The Theil index is given by

$$Theil \equiv GE(1) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\mu}\log\frac{y_i}{\mu} \tag{2}$$

while (half of the square of) the coefficient of variation (HSCV) is given by

$$HSCV \equiv GE(2) = \frac{1}{2n\mu^2}\sum_{i=1}^{n}(y_i - \mu)y_i = \frac{\text{var}(y)}{2\mu^2} \tag{3}$$

It can be shown that the more positive a is, the more sensitive GE(a) is to inequality at the top of the distribution. The fourth index is the Gini coefficient, which is most sensitive to income differences about the mode of the distribution:

$$Gini = \frac{2}{n^2\mu}\sum_{i=1}^{n}(i - \frac{n+1}{2})y_i \text{ , where } y_i\text{'s are in ascending order} \tag{4}$$

Table 1 shows that these four inequality indices for net overall wealth in 1989, 1998, and 2001 yield quite different pictures of the trend in net wealth inequality. MLD suggests a sizeable decrease in inequality between 1989 and 1998, followed by an increase to a level in 2001 that falls short of inequality at the starting point. The Theil and HSCV indices suggest increased inequality in 1998 compared to 1989, followed by a reduction in inequality between 1998 and 2001. The two indices differ in comparing the two end points in the period under consideration, with HSCV implying lower inequality in 2001 even compared to 1989. Finally, Gini suggests a slight increase in net wealth inequality over time.

Differences in implications of inequality indices reflect the difficulty of capturing changes in a whole distribution by a single number. Index differences can be traced to the different weights attached by each index to transfers from rich to poor at various points in the distribution.[6] Theil's index is influenced by the relative distance between the rich and the poor, attaching more weight to transfers *at the lower and at the upper end*. HSCV is very sensitive to changes in inequality at the *upper tail* of the distribution (Cowell, 1977; Shorrocks, 1980), where indeed most of total household wealth is held. The patterns we observe suggest that movements in HSCV and Theil are caused mainly by what happened at the upper end of the wealth distribution, with net wealth inequality increasing during the stock market upswing of the 1990s and diminishing during the subsequent downturn. The Gini coefficient tends to attach more weight to wealth transfers that occur around the *middle* of the distribution of net wealth, and so may miss and mask changes in inequality that arise from developments at the upper part of the distribution where most of the wealth is concentrated. Gini suggests a slight increase in inequality throughout the period under examination.

3. Inequality Decomposition by Sources

The literature of inequality decompositions by source shows that, we can express net total wealth inequality in a given year, I_W, as an exact sum of the contributions made by its various factor components:

$$I_W = \sum_f S_f \qquad (5)$$

A wealth factor component contributes to increasing (reducing) inequality if $S_f > 0$ (<0). The share of a particular factor *f*, s_f, in generating inequality is defined as: $s_f = \frac{S_f}{I_W}$, and thus: $\sum_f s_f = 1$.

HSCV seems an appropriate choice of index for wealth inequality decompositions, since it has desirable decomposability properties and it can handle the regular incidence of zero assets.[7] In what follows, we will focus on HSCV and on the often used Gini index.

3.1. Decomposition of HSCV by Sources

Shorrocks (1982) proved that, under certain axioms, there is a unique "decomposition rule", according to which the proportionate contribution of factor *f* can be derived – for a broad set of inequality measures – from:

$$s_f = \frac{\mathrm{cov}(f, W)}{\sigma_W^2} \qquad (6)$$

This is actually equivalent to the OLS estimated slope coefficient from the regression of wealth factor *f* on net total wealth *W*.

When inequality is summarized by HSCV,

$$s_f = \rho_{fW} \chi_f \sqrt{\frac{I_f}{I_W}} \tag{7}$$

This expresses the proportionate contribution of factor f in terms of factor correlation with total net wealth ρ_{fW}, the factor's share in net total wealth χ_f, net total wealth inequality I_W and the factor inequality I_f, both measured by the HSCV. Thus, the absolute contribution of factor f is: $S_f = \rho_{fW} \chi_f \sqrt{I_W I_f}$.

The percentage of factor owners n_f^+ and the inequality they exhibit among them I_f^+ have an indirect effect on the factor contribution to inequality, given by: $I_f = \left(\frac{1}{n_f^+}\right)(I_f^+ + 1) - 1$ (Jenkins, 1995). In our tables presenting wealth decompositions, we report along with factor correlations, factor shares, and factor inequalities, percentages of factor owners, and within factor inequalities.

Finally, we also report a measure of each factor's contribution to the evolution of inequality over time. A factor making an important contribution to total inequality in a given year does not necessarily play a prominent role in inequality changes over time. Following Jenkins (1995) we decompose HSCV trends over time as: $\%\Delta I = \frac{I_{t+1} - I_t}{I_t} = \sum_f s_f \%\Delta S_f$, where a large positive value of $s_f\%\Delta S_f$ suggests an important role for factor f in raising total inequality over time.

Table 2 shows decompositions of inequality, as measured by HSCV, by sources. Risky real assets are the dominant source of overall net wealth inequality, making a more than 50 percent contribution in all three years. Ownership of risky real assets (excluding primary residence) along with business equity is more prevalent among wealthier segments of the population, and ownership rates do not exhibit any strong trend between

1989 and 2001, hovering around 27 percent. Not surprisingly, risky real assets exhibit high degree of inequality and high correlation with overall net wealth. Yet in 1998, the year that overall inequality spikes by the HSCV measure, the absolute factor contribution of risky real assets and business equity increases only slightly (from 9.62 to 10.9). This is because the dropping factor share and correlation with net total wealth moderate the effects from the increase in this factor's inequality. Given the much higher increase in net total wealth inequality, the proportionate factor contribution actually drops (from 0.72 to 0.60).

Between 1989 and 1998, equity holdings exhibit a large increase in factor share, increased correlation with net total wealth, and increased inequality, all leading to a more than quadruple increase in their absolute factor contribution. In 1998, wealth in equity holdings records a more than 25 percent proportionate contribution towards total inequality from just 7 percent a decade ago. Directly and indirectly held equity plays the dominant role in the *increase* of overall net wealth inequality by 1998.

Between 1998 and 2001, reduction in inequality of equity holdings (attributable mainly to reduction in inequality among equity holders) more than outweighs the increase in their relative correlation and share, contributing to a fall in net total wealth inequality. It makes the second largest contribution to the observed reduction in net total wealth inequality over this sub-period, with reduced inequality in risky real assets and business equity playing the leading role. By contrast, wealth in primary residence, which represents the largest part of total net wealth throughout the period 1989-2001, has a much smaller effect on net wealth inequality, inconsistent with its overall trend.[8]

3.2. Decomposition of the Gini Index by Sources

Despite the different trend in inequality suggested by the Gini coefficient, results from Gini decompositions lend further support to the significant role of equity holdings for the distribution of households' net wealth. One of the most commonly used decompositions of the Gini index is that of Lerman and Yitzhaki (1985) According to this, the absolute contribution of wealth factor *f* to overall inequality can be expressed as:

$$S_f = G_f \ \chi_f \ R_{fW} \tag{8}$$

where G_f is the inequality of factor *f* measured by Gini, χ_f is the share of factor *f* in net total wealth, and R_{fW} is the "rank correlation ratio" defined as the ratio of the covariance of household's amount of wealth factor *f* with its ranking in the cumulative distribution of net total wealth, over the covariance of its amount of wealth factor *f* with its ranking in the cumulative distribution of factor *f*. Wealth in equity holdings displays one of the highest rank correlation ratios, that is also getting higher over time. This stresses the growing importance of risky financial assets for households' position in the overall net wealth distribution. Table 3 decomposes inequality of net total wealth as summarized by the Gini coefficient. In the period 1989-98, only equity exhibits an increase in its (absolute and proportionate) contributions to net wealth inequality. The main factor behind this increased contribution is the rise in its share of net total wealth over this period.[9]

3.3. Contributions of Direct and Indirect Stockholding to Financial Wealth Inequality

We now take a closer look at financial wealth and distinguish between the contributions of direct and indirect equity holdings to inequality (Table 4). Financial wealth inequality, as summarized by HSCV, follows a qualitatively similar pattern with net total wealth and equity holdings: 14.6 in 1989, rising to 21.9 in 1998, and then dropping to 16.6 in 2001. Key to the increase in financial wealth inequality in 1998 is the increase in inequality of directly held equity, from 66.6 in 1989 to 162.5 in 1998 (the latter can be mainly attributed to the fact that inequality among stockholders triples this year, reflecting the very different risky wealth levels they attain by the end of the stock market upswing). Directly held equity becomes the main source of inequality in financial wealth by 1998, with its percentage factor contribution rising from just 20 percent in 1989 to almost 52 percent in 1998.

Indirectly held equity also makes an important contribution to changes in financial wealth inequality. The HSCV of indirect stock holdings displays a dramatic reduction from 53.1 in 1989 to 26.7 in 1998. Since within inequality is almost unchanged, this results mostly from the significant increase in the percentage of owners. However, the increases in the factor share of indirect equity holdings and in their correlation with financial wealth dominate the drop in HSCV and produce a positive contribution to the increase in financial wealth inequality between 1989 and 1998.

Direct and indirect equity holdings contribute to lowering financial wealth inequality during the subsequent stock market downturn, as inequality among owners in both categories drops in 2001. Interestingly, participation rates in direct and indirect equity holdings keep increasing somewhat to 2001, despite the downturn.[10]

A closer look at participation can be provided by probit regressions for 1989, 1998, and 2001 data. In Table 5, we see that being affluent, more educated, and less risk averse contribute to the probability of entering the stock market, controlling for other factors. These results are consistent with standard findings in the stock market participation literature. They imply that stockholders are not drawn randomly from the population, but the composition of the stockholder pool changes as stock market participation spreads.

We now turn to an examination of the contribution of stockholder characteristics to generating inequality in equity holdings.

4. Regression-based Decomposition of Inequality in Equity Holdings

Regression-based decomposition of inequality in equity holdings allows us to isolate, in a multivariate setting, the inequality contributions of certain demographic characteristics. Such decomposition is conducted on the basis of OLS regressions of the logarithm of equity holdings on a set of covariates including household demographics and financial characteristics. The importance of each explanatory variable for inequality cannot be seen from estimated coefficients alone. Fields (2002, 2003) showed that, given a process for generating ln$Y$, under certain axioms, decomposition of inequality in variable ln$Y$ into the contributions of each of the J covariates (excluding the constant), Z_j with estimated coefficient a_j is given by:

$$s_j(\ln Y) = \frac{\mathrm{cov}[a_j Z_j, \ln Y]}{\sigma^2(\ln Y)} = \frac{a_j * \sigma(Z_j) * cor[Z_j, \ln Y]}{\sigma(\ln Y)} \qquad (9)$$

where $\sum_{j=1}^{J+2} s_j(\ln Y) = 100\%$ (including the constant and the error term) and $\sum_{j=1}^{J+1} s_j(\ln Y) = R^2(\ln Y)$ (including only the covariates and the constant) hold for any inequality index $I(\ln Y_1, ..., \ln Y_n)$ that is continuous and symmetric, and for which the index under complete equality is zero, i.e. $I(\mu, \mu, ..., \mu) = 0$.

We focus on contributions of various factors to inequality in equity holdings in each of the three years. We confine attention to holders of risky assets, i.e. those who have passed the participation threshold. Table 6 presents OLS coefficient estimates. Table 7 examines the total contribution of each variable and shows that, education, age, income, and reporting a bequest motive play the biggest role in generating inequality of equity holdings.[11] By contrast, some other variables that are statistically significant in the regression, such as self employment, marital status, and willingness to take above average financial risk, play a very limited role in inequality, if any.

In Figure 1, we plot risky wealth densities for 1989, 1998, and 2001. Kernel densities for the logarithm of equity holdings of stockholders in 1989 and 1998 suggest clearly a movement of the distribution to the right. Changes between 1998 and 2001 are less pronounced and more difficult to assess visually, but they still suggest some shift of the distribution to the right.

We next decompose the change in the distribution of equity holdings between two years into (i) a component due to the change in the distribution of *covariates*; and (ii) a component due to changes in the group-specific *returns* to these covariates at various quantiles.[12] To do so, we construct counterfactual densities that help distinguish between coefficient effects (sometimes called 'return' effects) and covariate effects. The methodology, a variant of a technique proposed by Machado and Mata (2003) described in Appendix A, uses results from quantile regressions to simulate appropriate distributions.

In our context, the counterfactual density is the density of the (logarithm of) equity holdings that stockholders in 1989 would have if, given their own characteristics, they experienced the same influence of characteristics on equity holdings ('return effects') as those experienced by stockholders in 1998.

The difference between the distributions of equity holdings in 1998 and 1989 can be decomposed into:

$$f(y^{98}) - f(y^{89}) = \{f(y^{98}) - f^*(y; X^{89}b^{98})\} + \{f^*(y; X^{89}b^{98}) - f(y^{89})\} \quad (10)$$

where y represents the log of equity wealth, X is the data matrix and b is a collection of estimated quantile regression coefficients at various percentiles. The term in the first curly brackets measures the contribution of the covariates to the overall difference between the 1998 and 1989 densities of equity holdings. The term in the second curly brackets measures the contribution of the quantile regression coefficients ('returns'). The coefficient (return) and covariate effects for 1998-1989 are presented in Figure 2. Differences in distributions of equity holdings over this period are mainly driven by 'return' effects, and these become progressively more important at higher quantiles of the distribution. This is consistent with the exceptionally strong upward movement of stock market indices over this period and it suggests that a given change in characteristics has more important effects, during upswings, on the equity wealth of households with sizeable equity holdings.

On the other hand, covariate effects are negative, suggesting that the combination of 1989 characteristics with 1998 returns would generate even higher equity holdings than what was actually achieved by the more heterogeneous group of 1998 stockholders. The shortfall is due to the 'dilution' of the stockholder base with marginal investors, who produced an overall distribution of shareholder characteristics that was not as conducive to high equity levels as the 1989 distribution. This underperformance was more evident among households with larger equity holdings.[13]

Figure 3 presents the same analysis for 1998 and 2001. Here the counterfactual distribution is derived by combining 1998 returns with 2001 characteristics:

$$f(y^{2001}) - f(y^{98}) = \{f(y^{2001}) - f^*(y; X^{2001}b^{98})\} + \{f^*(y; X^{2001}b^{98}) - f(y^{98})\} \qquad (11)$$

We find that covariate effects on equity holdings (displayed in the second curly brackets) are positive and increasing beyond the 40th percentile of the distribution of stock wealth. This implies that the distribution of characteristics of the stockholder pool improved between 1998 and 2001, in the sense that the stockholders of 2001 would have produced in 1998 better equity outcomes with the 1998 coefficients on characteristics compared to those actually produced by 1998 stockholders. This result is interesting, as it suggests the presence of a "cleansing effect" of stock market downswings that seem to have a disproportionate discouragement effect on the less qualified stockholders.[14] Beyond this cleansing effect, a look at the composition of the various quantiles of the wealth distribution suggests an improvement in the relative position of highly educated households who stayed in the market.[15]

The overall conclusion from this Section is that household characteristics contributed to generating inequality in equity holdings, with education being among the most prominent contributors, especially at the upper tail. Although the distribution of household characteristics in the expanded stockholder pool seems to have contributed negatively to equity holdings by 1998, the composition of stockholders appears to have improved by 2001, following the stock market downturn. This suggests a cleansing effect of downswings.

5. Exploring the Role of Education in Equity Wealth

5.1. Estimation of Education Effects on Inequality

Table 8 first computes various measures of inequality of equity holdings in 1998, considering observed holdings, and observed holdings after removing the estimated effect of education.[16] Then, the same exercise is repeated for each of three educational categories: high-school dropouts, high-school graduates, and households whose head has a college degree or more.

We find that inequality of observed equity holdings, as measured by HSCV, drops as we move to higher education categories. By contrast, the Gini coefficient increases with education. These findings combined suggest that higher education categories exhibit less inequality in the upper tail of the distribution of equity holdings, but more inequality in the middle of the distribution.[17]

Of course, this does not necessarily imply that education per se is the cause of those differences, as these may be partly due to different distribution of other characteristics in the three education categories. A first step towards isolating the education effect is presented in the second column of the table, which computes inequality measures after removing the estimated effect of years of education. The top panel shows that observed heterogeneity in years of education raises HSCV quite dramatically, while effects on Gini and Theil indices tend to be small. The remaining panels show that, in the absence of heterogeneity in years of schooling, differences in inequality across education categories using the HSCV measure would be almost ironed out, while the Gini would be hardly affected.[18] These findings suggest that most of the effect of heterogeneity in education on inequality of equity holdings is observed in the upper tail of the distribution, whether we speak about the population as a whole or about any of the three education categories.

Is lower inequality in equity holdings among households of higher education due to greater ability to handle the challenges of investing in stocks or does it arise from the "fundamentals" of education (age-income profiles and income shock processes) that produce less unequal levels of stock holdings in the upper tail of the distribution even under optimal behavior? In order to help answer this difficult question, we turn next to a simulation of optimal portfolio behavior using an intertemporal model of household portfolio choice, and to empirical tests of the role of education, financial attitudes and practices, and other factors contributing to cumulative gains and losses in stockholding.

5.2. Education Effects in Simulation of Optimal Behavior

We simulate optimal behavior of households that solve an intertemporal model of household portfolio choice, belong to different education categories, and differ only in terms of education-specific income processes (age-income profiles and income shock variances). Distributions of stock holdings within each education group are generated solely by different realizations of income shocks for households that face the same income processes ex ante and have the same remaining characteristics.

The portfolio model incorporates finite lifetimes of uncertain length, a retirement period, and income shocks, transitory and permanent (see Appendix B).[19] Consistent with empirical estimates, more educated categories are assumed to face better income prospects, both in terms of steeper income growth and higher expected future income levels compared to their counterparts with lower education; and typically lower variance of income shocks. We simulate stock holdings implied by the model using stochastic draws of transitory and permanent income shocks, and of stock returns.[20]

Results are reported in Table 9. Mean simulated stock holdings for each category display a life-cycle pattern of asset accumulation when young, followed by asset decumulation in retirement. Comparison of mean stock holdings across education categories suggests that, if all other household characteristics were the same and only income processes differed across households of different education categories, lower education households should be holding more stocks on average than more educated households. This is because they face greater future income variance and worse future income prospects. Put differently, higher observed stock holdings among college graduates participating in the stock market seem to be due to differences in their remaining characteristics and stockholding participation costs, and not to different income processes.

Comparison of HSCV indices across education groups at any given age shows that educational attainment matters for simulated inequality in stock holdings, even under optimal portfolio behavior. Controlling for age and for all other relevant household characteristics, we find a monotonic positive relationship between educational attainment and inequality in stock holdings, with college graduates typically experiencing greater inequality than the other two categories. This suggests that the equalizing effect of higher education at the upper end of the distribution of equity holdings is unlikely to arise from the "fundamental" features of educational attainment, such as age-income profiles and income shocks processes under optimal behavior. It seems worthwhile to explore whether there is a role for household financial attitudes and practices in producing successes and avoiding failures in stockholding that is distinct from these fundamentals and is assumed away in simulations of optimal behavior regardless of education. We empirically investigate this conjecture, along with the possible role of other factors, in what follows.

5.3. Who Gains and Who Loses in the Stock Market?

In this Section, we estimate the contribution of household characteristics to gains or losses in stockholding by 1998 and then by 2001, separately for direct and indirect stockholding. Responses in the SCF allow us to measure success or failure with reference to the cumulative experience of each stockholder by 1998 or 2001, though without knowledge of when stocks were initially acquired. Thus, we can see how each stockholder survived a period ending with a considerable stock market rally, as well as one that includes an important part of the subsequent downturn.

5.3.1. Descriptive analysis

The top two education categories almost share the pool of stockholders in both years, leaving only about 5% of the pool to high-school dropouts. Interestingly, there is a shift in the composition of the pool following the downturn, with the share of college graduates rising from 46.5% to more than 49%, at the expense of each of the lower two education categories (Table 10).

The proportion of stockholders who include professional advice among reported ways in which they make decisions about savings and investments is 59% in 1998 and drops slightly to 57% in 2001, despite the intervening stock market downturn. Under professionals, we include accountants, bankers, brokers, and financial planners. Slightly lower proportions of stockholders, but still the majority, declare that they are influenced by social interactions in decisions about savings and investments. Here we include households who report that they get advice from their spouse or partner, a friend or relative, or some work or business contact.

Table 11 shows how the three education categories fared in their direct stock holdings by the end of 1998 and 2001. By 1998, 80% of all direct stockholders were experiencing cumulative gains on their direct stock investments. Proportions increased with education, but the proportion for college graduates did not exceed 81%. Much less variation was observed in the percentages of those declaring cumulative losses, which also increased with education but very little, ranging between 11.4% and 12%.

By 2001, the percentage of equity holders declaring that they had survived the downturn with cumulative gains in their direct stock investments dropped to 53%. A steeper education gradient was observed, with percentages rising from 41% for high school dropouts to 56% of college graduates with direct holdings. Percentages of those declaring cumulative losses had risen to 35% in the population, ranging from 43% to 33% across education groups. Unlike in 1998, in 2001 more educated households reported smaller incidence of cumulative losses. Following the stock market downturn, outcomes were more differentiated across education categories, and the slope of the education gradient was greater for gains and a lot greater for losses than in 1998.

Mutual fund investments are generally considered as being less demanding for households, since portfolios are constructed by professional fund managers and diversification is possible for each individual investor participating in a large portfolio. However, even participation in mutual funds is far from being straightforward. One complicating factor is the proliferation of mutual funds, whose number is now of the same order as the number of individual stocks. The question of which stocks to hold seems to have been replaced by the equally pressing question of which mutual funds to hold, given a household's objectives and attitudes to risk. A further factor is the actual quality of professional advice given to shareholders of mutual funds and the potential of investors to pick qualified advisors and to monitor them.

Comparing cumulative outcomes for direct stockholding and for mutual funds among all holders, one does find greater incidence of cumulative gains and smaller incidence of cumulative losses for mutual funds in each of the two years, though marginally so for losses in 2001. Yet, Table 12 shows that, in both 1998 and 2001, cumulative success and failure rates for mutual funds were much more differentiated across education categories than the corresponding rates for direct holdings of stock. For example, in 1998 only 69% of high-school dropouts were reporting cumulative gains, compared to 89% of college graduates. By 2001, 52% of households in the least educated category were reporting cumulative losses, compared to less than 35% of the most educated households.

5.3.2. Regression Analysis

Although these statistics raise suspicions against the often voiced view that mutual fund investment is a much simpler alternative to direct stock holding for households with limited ability to process financial information, they are not sufficient to establish a role for education in determining gains or loss outcomes, or to clarify the sources of this role. Is education relevant because it encourages households to adopt a longer investment horizon, to diversify, and to seek professional advice? Or is education relevant because it determines fundamentals, such as future income and employment prospects, controlling for the degree of financially sound behavior? In order to probe further into these questions, we turn to regression analysis of the incidence of stockholding outcomes, conditional on participation.

We model the incidence of cumulative gains and losses as bivariate probits with selection. One outcome is direct holding of stocks (or mutual fund participation), and the second is observed only if the first outcome occurs, i.e. if households are direct stockholders (or mutual fund shareholders). We run two such estimations for 1998 (one for gains and one for losses), and two for 2001, separately for direct and indirect stockholding.

Bivariate probit estimation with selection allows for correlation among unobserved factors contributing to the probability of the cumulative outcome and to the probability of direct stock ownership. When the correlation is statistically significant, we report conditional marginal effects from bivariate probits that have taken into account selection bias. When it is statistically insignificant, we report marginal effects from standard probits for gains and for losses on the restricted subsamples of direct (or mutual fund) shareholders.

Results for direct stockholding in 1998 and 2001 are reported in Table 13. The period ending in 1998 includes the upsurge in stock prices without the subsequent downswing, and 80% of direct stockholders reported cumulative gains. In col. 2, we see that married status is the only factor with statistically significant positive contribution (at 5% significance level) to a cumulative gains outcome for direct stockholders in 1998.

We test for the significance of three indicators of financial attitudes and practices. The number of stocks held can be called ‘portfolio breadth’ and suggests an effort to achieve portfolio diversification, although the extent of diversification achieved cannot be assessed without information on which stocks were held and on their covariance properties. Portfolio breadth has a positive and statistically significant contribution to the probability of achieving cumulative gains in 1998. Having a long investment horizon (in excess of 10 years) indicates absence of excessive churning of stock holdings, but it is not found to make a statistically significant positive contribution to cumulative gains among stockholders in 1998. The same is true for reporting use of professional advice.

Interestingly, once we control for these three variables showing financial attitudes and practices and for other remaining characteristics, we no longer find that educational attainment played a statistically significant role in achieving cumulative gains in 1998, although point estimates of marginal effects on the probability of gains are positive and increasing with education. Thus, the observed variation in the incidence of gains across education categories in Table 11 seems to be largely explained by variation in portfolio breadth and possibly in other characteristics that correlate with education, namely marital and employment status.[21]

Cumulative gains were the most usual outcome in 1998. Column 3 examines the incidence of the less likely outcome of cumulative losses. Here we find that long investment horizon had a strongly significant effect in reducing the probability of suffering cumulative losses, by about 4 percentage points. Portfolio breadth is estimated to contribute with the correct sign (significant at 10%), while professional advice has a statistically insignificant effect, though the point estimate is negative. Again, once we control for these three variables and for other characteristics, education does not make a statistically significant contribution to avoiding cumulative losses in 1998.

Some of the factors that played no role in 1998 gain significance when the period over which cumulative outcomes are assessed is extended to encompass the downswing in the early 2000s (cols. 4 and 5). It should be stressed that results refer to households who chose to stay in or enter the market following the downswing and are observed as stockholders in 2001.[22] Portfolio breadth is now statistically significant in facilitating cumulative gains among direct stockholders and in reducing the probability of cumulative losses. The same is true for having an investment horizon longer than 10 years, with marginal effects of the order of 6 percentage points. However, estimated marginal effects of using professional advice are statistically insignificant and of the wrong sign for direct stockholders.

Even after controlling for these indicators of financial attitudes and practices, being a stockholder with a college degree has a remarkably large and significant positive effect on the probability of surviving the downswing with cumulative gains, raising it by 18 percentage points. Although it is also estimated to reduce the probability of losses, the effect is not statistically significant. Thus, a college degree is estimated to make a difference in producing good outcomes in bad times.

Having received an inheritance or been given substantial assets in a trust or in some other form also has a statistically significant and sizeable contribution to the incidence of making cumulative gains and to avoiding cumulative losses in bad times. It increases the probability of gains by 10 and reduces the probability of losses by 8 percentage points. This variable may be acting as a proxy for portfolios that were initiated earlier than the recent upswing and are therefore less likely to be suffering cumulative losses. Moreover, since wealthier households are more likely to be leaving bequests, households who have received an inheritance are likely to have also inherited a portfolio structure and some of the financial expertise that contributed to making the previous generation wealthy.

Table 14 presents results for indirectly held equity. In the period ending with the upswing of the late 1990s (cols. 2 and 3), the only notable statistically significant effect refers to breadth in mutual fund holdings, which reduces the probability of experiencing cumulative losses. The relevance of this factor suggests that the degree of diversification inherent in any given mutual fund, though greater than that typically observed among direct stockholders, can be further improved upon by combining a number of different mutual funds. It is also noteworthy that education, length of investment horizon, and use of professional advisors contributed neither to making cumulative gains nor to avoiding cumulative losses on mutual funds in the period that ends with the upswing of the late 1990s.

The period that includes the subsequent downswing stands in stark contrast to the period ending in 1998. A college degree is estimated to have increased the probability of cumulative gains among mutual fund holders by a staggering 30 percentage points, and to have reduced the probability of losses by 22 percentage points, controlling for income, length of investment horizon, receipt of inheritance, portfolio breadth, and other factors. College education appears as an important contributor to success, having even greater impact on the probabilities of gains and of losses for the arguably "softer" option of indirect stockholding than for direct holding of equity.

Portfolio breadth is found to have a strongly statistically significant marginal effect. Holding shares in greater number of mutual funds both increases the probability of cumulative gains and reduces the probability of losses in mutual funds by 2001. Having an investment horizon longer than 10 years contributes to gains and to avoidance of losses by 7 and 8 percentage points, respectively, which is somewhat larger than estimated marginal effects for direct stockholding.

Point estimates for use of professional advice imply a statistically significant (at 10% level) perverse effect of reducing the probability of cumulative gains and increasing the probability of losses, controlling for investment horizon and portfolio breadth. In all our previously reported regressions, use of professional advice failed to make a difference to the cumulative outcome beyond any influence it may have had in lengthening the horizon and in broadening the portfolio of the household. These findings question the overall quality or scope of professional advice given to households, as long as we view the use of such advice as being a function of exogenous factors, such as ignorance or lack of time on the part of the household to delve into the intricate details of financial decision making. They would be weakened by strong evidence that use of financial advice is actually due to the absence of cumulative gains, suggesting endogeneity. We doubt that such factors are dominant here, as the use of financial advisors is typically observed among households with limited knowledge of the market or by financially successful households who do not have the time to monitor their own portfolios.

Finally, being a male or white non-Hispanic mutual fund shareholder raises the probability of surviving the downswing with cumulative gains and lowers the probability of experiencing cumulative losses. Estimated conditional marginal effects are sizeable in both cases. Part of these effects may be due to these variables acting as proxies for future income prospects. At least the result for the race variable may be additionally suggesting that the mutual fund sector is targeting more aggressively households that do not belong to minorities.

All in all, results in this Section suggest that the incidence of cumulative gains or losses in direct stockholding or in mutual funds is not simply determined by overall stock market performance but also by demographic characteristics and practices of investing households. Education, portfolio breadth, and length of investor horizon seem important for making gains and avoiding losses, especially in the aftermath of stock market downswings. By contrast, use of professional advice is largely insignificant or even counterproductive, controlling for investment horizon and portfolio breadth.

6. Concluding Remarks

In this paper, we have applied a battery of approaches to measuring and decomposing wealth inequality, using high-quality household-level data on portfolios during a critical phase in the spread of equity culture. We found the pattern of inequality in equity holdings to be important for inequality in overall net wealth in the United States over the fifteen-year period under consideration, despite their limited share in net wealth. Inequality decompositions reveal that a significant part of the contribution of equity holdings has to do with changes in inequality within owners of equity. Counterfactual distributions of equity holdings separating the roles of changes in 'returns' to investor characteristics and of changes in characteristics of the stockholder pool imply a worsening of the stockholder pool between 1989 and 1998, but an improvement following the downswing.

We have explored the role of education in generating inequality in equity holdings among holders. Removing estimated education effects on inequality of equity holdings suggests that most of them are observed in the upper tail of the distribution, and higher education is associated with less unequal equity outcomes. Simulations of an intertemporal portfolio model suggest that the equalizing effect of higher education is unlikely to arise from differences in age-income profiles and income shock processes alone, as these seem to be producing opposite effects on inequality.

Results from bivariate probits with selection suggest that making cumulative gains and avoiding losses in stockholding, especially by 2001, are significantly influenced by exhibiting portfolio breadth and a long investor horizon. By contrast, after controlling for the above factors, use of professional advice tends to be insignificant or even counterproductive, raising some concerns about the quality of financial advice given to households.

All in all, our findings suggest that inequality in equity wealth is important for overall net wealth inequality, but reduced inequality is far from being an automatic outcome of the spread of equity culture. The incidence of gains and losses in equity investments were found to be influenced by household characteristics, including proxies for financial attitudes and practices. Thus, effects of increased participation on wealth inequality seem to depend on how characteristics of the expanding pool of stockholders evolve, including their ability to handle complicated and risky financial instruments. If progressively less qualified stockholders are drawn into the pool, spread of equity culture is unlikely to be accompanied by reduced wealth inequality.

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Appendix A: The Machado-Mata Algorithm

The algorithm for constructing counterfactual densities is a variant of Machado and Mata (2003) recently used by Nguyen et al. (2003):

1. Draw *m* random numbers from a uniform distribution on (0, 1): $\theta_1, \theta_2, ...\theta_m$; here we set *m*=1000.
2. For each θ_i where i = 1,2,…,*m*, use the 1998 data on stockholders to estimate the Quantile Regression coefficient, $b^{98}(\theta_i)$, from the model:
   $Q^{98}_{\theta_i}[y \mid X^{98}] = X^{98}\beta^{98}(\theta_i)$
3. Make *m* random draws of characteristics and corresponding weights with replacement from the 1989 stockholder pool. Denote the outcomes of these draws by x_i^{*89} for i = 1,2,….,*m*.
4. Generate counterfactual values (a random sample of size *m* from the desired distribution): $y_i^* = x_i^{*89} b^{98}(\theta_i)$, for i = 1,2,….,*m*. Use these values to generate $f^*(y; X^{89} b^{98})$.

Then, for each of the three sequences of variables (log equity holdings in 1989 and 1998 and counterfactual values), we calculate percentiles using population weights. The difference between percentiles of the distributions of the endogenous variable in 1998 and 1989 can be decomposed into:

$$f(y^{98}) - f(y^{89}) = \{f(y^{98}) - f^*(y; X^{89}b^{98})\} + \{f^*(y; X^{89}b^{98}) - f(y^{89})\}$$

The term in the first curly brackets represents the contribution of the covariates to the overall difference between the 1998 and 1989 densities. The term in the second curly brackets shows the contribution of the QR coefficients (‘returns’). The method is a generalization of Oaxaca (1973) to the whole distribution.

Appendix B: The Portfolio Model

This Appendix describes the main features of the model and calibration settings. More details on the model and its policy functions are to be found in Bilias and Haliassos (2004).

The household with access to stocks is assumed to have finite horizon but uncertain lifetime, and to maximize expected intertemporal utility faced with a menu of a risky and a riskless asset. The household's problem is given by:

$$Max_{\{C_t, \alpha_t\}_{t=0}^{T-2}} E_0 \sum_{t=0}^{T-1} \beta^t \left(\prod_{j=1}^{t} \hat{s}_j \right) U(C_t) \tag{12}$$

subject to

$$C_t + S_t + F_t \le X_t \tag{13}$$

$$X_{t+1} = S_t \left[R_f + \alpha_t \left(\widetilde{R}_{t+1} - R_f \right) \right] + Y_{t+1} \tag{14}$$

$$C_t \geq 0 \tag{15}$$

$$0 \leq \alpha_t \leq 1 \tag{16}$$

All variables are in real terms. S_t is the real amount of total saving between periods t and t+1, α_t is the portfolio share of the single risky asset (stocks), E_t denotes the expectation operator based on information in t, β is the discount factor, s_j is the probability that the household is alive in period j, conditional on being alive in period j-1. $U(C_t)$ is constant relative risk aversion felicity derived from consumption in t, X_t is cash on hand defined as the sum of net wealth and labor income, $\widetilde{R}_{t+1}$ is the risky gross return on stocks between t and t+1, R_f is the gross riskless rate, Y_t is non-interest income, and P_t refers to the permanent component of income, defined below. Income encompasses all after-tax income from transfers and wages, including pension income. $F_t \geq 0$ is a fixed per period real cost of access to the stock market. Per period access costs are somewhat broader than the usual notion of participation costs, because they also incorporate costs that a household would have to incur to decide its portfolio even if it ends up choosing not to hold any stocks. The presence of constraint (16**),** which precludes borrowing at the riskless or the risky rate, generates ranges of cash on hand in which it is optimal to hold no stocks.

Income of household i, Y_{it}, is assumed to entail non-diversifiable risk because of moral hazard and adverse selection considerations. Observed income follows $Y_{it}=P_{it}\,U_{it}$, where U_{it} is a transitory shock. During working life, the permanent component, P_{it}, follows

$$P_{it}=G_t\,P_{it-1}\,N_{it} \tag{17}$$

and is thus subject to shocks, N_{it}. Retirement income is assumed to be subject only to transitory shocks. Shocks are assumed i.i.d. lognormal. The growth factor, G_t, is assumed to be a function of household characteristics and is calibrated using empirical estimates for three different education categories (less than high-school education, high-school graduates, and college graduates), distinguishing between working life and retirement.

In calibrating income processes, we distinguish between three education categories, based on the educational attainment of the household head: less than high-school education, high-school graduates, and college graduates (or more). Income processes differ across education groups, both in terms of the (deterministic) age-income profiles and of the processes followed by stochastic shocks. The other difference is in the ratio of the fixed participation cost to the permanent component of income, which tends to be greater for lower-education households as a result of the assumption that all households face the same absolute real cost.

The growth factors of the permanent component of income are based on regressions using data from PSID 1983-1990 and are taken from Laibson et al. (2000, Tables 3 and 4). The retirement age for high-school dropouts is set to 61, for high-school graduates to 63, and for college graduates to 65, based on mean ages observed in the data. Estimated age income profiles are hump-shaped during working age for all education categories.

We calibrate variances for income shocks, (σ_u^2, σ_n^2), for the three education categories during working life using estimates of Carroll and Samwick (1997). For high-school dropouts, we use the Carroll-Samwick estimates for those who had completed between 9 and 12 grades: (0.0658, 0.0214); for high-school graduates, we use (0.0431, 0.0277); and for college graduates (0.0385, 0.0146).

We follow Laibson et al. (2000) in calibrating shocks to retirement income. They estimate variances of transitory shocks for high-school dropouts, high-school graduates, and college graduates at 0.077, 0.051, 0.042, respectively.

We use conditional probabilities of survival from the 1998 United States Life Tables (National Vital Statistics Report, 2001). We set the rate of time preference equal to 0.05. The expected rate of return on equity, μ_r, is set to 0.06 and the constant real interest rate, r, to 0.01. Understating the historical equity premium is an often used shortcut to introducing proportional transactions costs. The standard deviation of the equity premium is at its historical value of 18 percent. The benchmark value for risk aversion is $\rho=2$. Perceived access costs are unobservable. We use a real amount of 250 dollars, close to empirical estimates of implied participation costs. Assuming the same real cost of participation regardless of education is a useful benchmark, but also consistent with our purpose of focusing on the implications of income processes as distinct from any differences in the ability to process financial information across education groups.

The model is solved using a MATLAB algorithm recently developed by Haliassos and Mavridis, which incorporates some of the computational shortcuts proposed in Carroll (2002).

Table 1: Net Wealth Inequality Indices

	Generalized Entropy Class			
Year	GE(0) MLD	GE(1) Theil	GE(2) HSCV	Gini
1989	1.9961	1.5035	13.316	0.7668
1998	1.8391	1.6338	18.176	0.7741
2001	1.9438	1.6114	12.405	0.7874

Note: Weighted data from Surveys of Consumer Finances. The sample excludes households with negative net worth.

Table 2: Net Wealth Inequality Using HSCV: Decomposition by Sources

	Year	Net Total Wealth	Wealth in Safe Financial Assets	Wealth in Equity Holdings	Net Wealth in Risky Real & Business Equity	Other Wealth	Wealth in Primary Residence	Principal Residence Debt	Consumer Debts
Percentage with positive factor wealth (n_f^+)	1989	0.958	0.906	0.348	0.292	0.857	0.680	0.418	0.621
	1998	0.974	0.937	0.528	0.273	0.851	0.704	0.456	0.616
	2001	0.972	0.936	0.549	0.261	0.871	0.715	0.469	0.625
Factor Share	1989	1.000	0.251	0.099	0.355	0.061	0.354	-0.093	-0.029
	1998	1.000	0.219	0.254	0.299	0.053	0.318	-0.114	-0.028
	2001	1.000	0.212	0.268	0.288	0.048	0.305	-0.101	-0.022
Correlation with net total wealth (ρ_{fW})	1989	1.000	0.547	0.455	0.907	0.272	0.409	-0.171	-0.256
	1998	1.000	0.569	0.654	0.864	0.369	0.411	-0.165	-0.363
	2001	1.000	0.651	0.689	0.827	0.375	0.514	-0.186	-0.205
Factor Inequalities (I_f)	1989	13.316	15.476	33.437	66.965	31.989	1.336	2.441	12.586
	1998	18.177	14.024	44.072	98.888	7.749	1.364	1.680	25.979
	2001	12.405	17.175	23.341	60.632	7.921	1.549	1.822	22.849
Within Factor Inequality (I_f^+)	1989	12.740	13.981	11.309	18.961	26.834	0.749	0.731	7.626
	1998	17.686	13.113	23.020	26.667	6.517	0.812	0.494	15.808
	2001	12.039	16.041	12.600	15.438	6.832	0.966	0.590	14.091
Proportionate Factors contributions (s_f)	1989	1.000	0.148	0.072	0.723	0.026	0.046	-0.007	-0.007
	1998	1.000	0.109	0.258	0.602	0.013	0.036	-0.006	-0.012
	2001	1.000	0.163	0.254	0.527	0.014	0.056	-0.007	-0.006
Absolute Factors contributions (S_f)	1989	13.316	1.974	0.954	9.622	0.340	0.611	-0.090	-0.096
	1998	18.177	1.988	4.695	10.938	0.234	0.650	-0.104	-0.225
	2001	12.405	2.018	3.147	6.537	0.179	0.689	-0.089	-0.075
Percentage change in source contributions ($s_f\%\Delta S_f$)	1998-1989	0.365	0.001	0.281	0.099	-0.008	0.003	-0.001	-0.010
	2001-1998	-0.318	0.002	-0.085	-0.242	-0.003	0.002	0.001	0.008

Note: Weighted data from Surveys of Consumer Finances. The sample excludes households with negative net worth.

Table 3: Net Wealth Inequality Decomposition by Sources Using Gini

	Year	Net Total Wealth	Wealth in Safe Financial Assets	Wealth in Equity Holdings	Wealth in Risky Real Assets	Other Wealth	Wealth in Primary Residence	Mortgage Debts	Consumer Debts
Factor Share (χ_f)	1989	1.000	0.251	0.099	0.355	0.061	0.354	-0.093	-0.029
	1998	1.000	0.219	0.254	0.299	0.053	0.318	-0.114	-0.028
	2001	1.000	0.212	0.268	0.288	0.048	0.305	-0.101	-0.022
Rank correlation ratio (R_{fW})	1989	1.000	0.913	0.908	0.944	0.728	0.821	0.619	0.384
	1998	1.000	0.903	0.933	0.945	0.655	0.812	0.444	0.330
	2001	1.000	0.916	0.940	0.948	0.693	0.842	0.474	0.300
Gini Index (G_f)	1989	0.767	0.817	0.938	0.944	0.663	0.644	0.795	0.784
	1998	0.774	0.804	0.905	0.954	0.617	0.603	0.748	0.792
	2001	0.787	0.827	0.896	0.954	0.600	0.623	0.748	0.775
Proportionate Factors contributions (s_f)	1989	1.000	0.244	0.110	0.417	0.039	0.244	-0.043	-0.011
	1998	1.000	0.205	0.277	0.348	0.028	0.201	-0.050	-0.010
	2001	1.000	0.204	0.287	0.332	0.026	0.204	-0.046	-0.006
Absolute Factors contributions (S_f)	1989	0.767	0.187	0.085	0.320	0.030	0.187	-0.033	-0.009
	1998	0.774	0.159	0.214	0.269	0.022	0.156	-0.038	-0.007
	2001	0.787	0.161	0.226	0.261	0.020	0.160	-0.036	-0.005

Note: Weighted data from Surveys of Consumer Finances. The sample excludes households with negative net worth.

Table 4: Financial Wealth Inequality Decomposition by Sources

	Year	Total Financial Wealth	Wealth in Safe Financial Assets	Wealth in Stocks	Wealth in Indirectly held Equity
Percentage with positive factor wealth (n_f^+)	1989	0.889	0.889	0.170	0.242
	1998	0.931	0.930	0.197	0.458
	2001	0.933	0.929	0.216	0.489
Factor Share (χ_f)	1989	1.000	0.717	0.152	0.131
	1998	1.000	0.464	0.226	0.310
	2001	1.000	0.442	0.213	0.345
Correlation with financial wealth (ρ_{fF})	1989	1.000	0.908	0.606	0.442
	1998	1.000	0.678	0.840	0.651
	2001	1.000	0.804	0.809	0.646
Factor Inequalities (I_f)	1989	14.667	16.667	66.646	53.095
	1998	21.984	15.165	162.514	26.763
	2001	16.657	18.433	104.520	12.684
Within Factor Inequality (I_f^+)	1989	12.990	14.754	10.911	12.453
	1998	20.436	14.065	31.643	11.992
	2001	15.501	17.080	22.158	5.953
Proportionate Factors contributions (s_f)	1989	1.000	0.694	0.196	0.110
	1998	1.000	0.261	0.516	0.223
	2001	1.000	0.373	0.432	0.195
Absolute Factors contributions (S_f)	1989	14.667	10.173	2.878	1.617
	1998	21.984	5.743	11.337	4.903
	2001	16.657	6.221	7.195	3.241
Percentage change in source contributions ($s_f\%\Delta S_f$)	1998-1989	.498	-.302	.577	.224
	2001-1998	-.242	.022	-.188	-.076

Note: Weighted data from Surveys of Consumer Finances. The sample includes all households.

Table 5: Probit Regressions for Ownership of Equity Holdings

	1989		1998		2001	
	Pseudo R^2: 0.26	Obs: 3,143	Pseudo R^2: 0.30	Obs:4,305	Pseudo R^2: 0.31	Obs:4,442
	Log-likelihood: -1599.99		Log-likelihood: -2030.45		Log-likelihood: -2018.36	
	Marginal Effect (z-value)		Marginal Effect (z-value)		Marginal Effect (z-value)	
Age	.0303 *** (7.98)		.0298 *** (9.08)		.0170 *** (5.28)	
Age squared	-.0002 *** (-6.58)		-.0002 *** (-7.77)		-.0001 *** (-4.51)	
Male	.0179 (.5)		.0204 (.67)		.0561 * (1.9)	
High school Graduate	.2285 *** (7.97)		.2769 *** (8.76)		.2528 *** (8.4)	
College graduate	.4348 *** (13.61)		.4445 *** (14.37)		.4368 *** (14.97)	
Married	.1365 *** (4.45)		.1502 *** (5.43)		.1155 *** (4.34)	
Kids	-.0366 * (-1.69)		-.0163 (-.79)		.0068 (.32)	
White	.1806 *** (7.37)		.1950 *** (8.25)		.1654 *** (7.08)	
Self employed	-.0383 (-1.62)		-.0943 *** (-3.75)		-.0677 *** (-2.63)	
Retired	-.0876 *** (-2.8)		-.1343 *** (-4.25)		-.1218 *** (-3.67)	
Other non-working	-.1046 ** (-2.02)		-.2448 *** (-5.25)		-.2096 *** (-4.43)	
Save for "rainy days"	-.0031 (-.16)		-.0132 (-.64)		-.0016 (-.08)	
Financial Alertness	-.0279 (-1.35)		.0438 * (1.89)		-.0006 (-.03)	
Willingness to take above average financial risk	.1265 *** (4.79)		.2505 *** (11.86)		.2235 *** (10.34)	
Health poor	-.1756 *** (-4.34)		-.1282 ** (-2.53)		-.2605 *** (-5.57)	
Log Income	.0145 *** (4.46)		.0193 *** (6.13)		.0294 *** (6.34)	
Bequest	.1422 *** (7.06)		.1811 *** (9.3)		.1709 *** (8.97)	
Inherit	.0386 * (1.85)		.1074 *** (4.75)		.0783 *** (3.26)	
Credit constrained	-.0774 *** (-2.8)		-.0608 ** (-2.49)		-.1175 *** (-4.75)	

Note: *** significance at 1%, ** significance at 5%, * significance at 10%. The sample consists of all households from SCF 1989, 1998, 2001. Marginal effects refer to changes in the ownership probability associated with marginal changes in continuous variables (change in dummy variables from 0 to 1 is assumed), while the remaining covariates are fixed at their weighted means. The significance for each covariate has been computed using standard errors corrected for heteroscedasticity. The joint significance for the variable groups of age, labor market status, and labor income were tested on the basis of LR tests (not reported): In all three cases, for all survey years, the parameter estimates were found jointly significant.

Table 6: Equity Holdings: OLS Regression Results

	1989		1998		2001	
	log (equity)		log (equity)		log (equity)	
	R^2: 0.42	Obs: 1,481	R^2: 0.49	Obs:2,601	R^2: 0.54	Obs:2,822
	Estimated Coefficient (standard error)		Estimated Coefficient (standard error)		Estimated Coefficient (standard error)	
Age	.1439 *** (.0256)		.1521 *** (.0189)		.1506 *** (.0164)	
Age squared	-.00084 *** (.0002)		-.00086 *** (.00018)		-.00082 *** (.0002)	
Male	.5029 ** (.2349)		.2009 (.1508)		.4913 *** (.1537)	
High school Graduate	.7852 *** (.2219)		.7544 *** (.2227)		.9853 *** (.2099)	
College graduate	1.8507 *** (.2246)		1.7721 *** (.2221)		2.1423 *** (.2089)	
Married	.3278 * (.1935)		.4412 *** (.1260)		.3796 *** (.1324)	
Kids	-.0824 (.1212)		-.1549 * (.0887)		.1372 * (.0827)	
White	.8292 *** (.1995)		.6294 *** (.1318)		.7821 *** (.1100)	
Self employed	.5957 *** (.1203)		.6829 *** (.0997)		.7940 *** (.0950)	
Retired	-.0787 (.1829)		-.1444 (.1557)		.5574 *** (.1647)	
Other non-working	.8890 (.5854)		.7214 * (.4277)		1.2607 *** (.3223)	
Save for "rainy days"	-.0856 (.1061)		.1112 (.0882)		-.1133 (.0842)	
Financial Alertness	-.1241 (.1152)		.3286 *** (.0968)		.3252 *** (.0885)	
Willingness to take above average financial risk	.8052 *** (.1235)		.8601 *** (.0837)		.7371 *** (.0774)	
Health poor	-.6436 * (.3483)		-.3719 (.2695)		-.1310 (.2849)	
Log Income	.0386 ** (.0196)		.0703 *** (.0224)		.0981 *** (.0301)	
Bequest motive	1.1007 *** (.1043)		1.4179 *** (.0831)		1.1760 *** (.0799)	
Has received inheritance	.1041 (.1056)		.2801 *** (.0876)		.0771 (.0888)	
Credit constrained	-.8946 *** (.2070)		-.9272 *** (.1263)		-.9890 *** (.1184)	
Constant	1.5507 ** (.7578)		1.6365 *** (.5718)		.8273 (.5199)	

Note: *** significance at 1%, ** significance at 5%, * significance at 10%. The sample consists of households with positive equity. The standard errors have been corrected for heteroscedasticity.

Table 7: Contributions to Inequality of Equity Holdings

	s_j	s_j	s_j
	1989	**1998**	**2001**
Age	.3994 *	.3558 *	.4171 *
Age Squared	-.2336 *	-.1889 *	-.2177 *
Male	.0116 *	.0029	.0128 *
High school graduate	-.0336 *	-.0335 *	-.0561 *
College graduate	.0898 *	.0986 *	.1483 *
Married	.0061	.0104 *	.0132 *
Kids	.0033	.0024	-.0029
White	.0222 *	.0200 *	.0281 *
Self employed	.0155 *	.0174 *	.0213 *
Retired	-.0027	.0040	.0189 *
Other non-working	-.0005	0	-.0002 *
Save for "rainy days"	.0007	-.0003	.0012
Financial Alertness	.0003	.0031 *	.0026 *
Willingness to take above average financial risk	.0079 *	.0267 *	.0240 *
Health poor	.0018	-.0001	.0002
log Income	.0035 *	.0067 *	.0137 *
Bequest motive	.0625 *	.0657 *	.0512 *
Has received inheritance	.0047	.0100 *	.0029
Credit constrained	.0383 *	.0511 *	.0569 *
Constant	0	0	0
Residual	.5960 *	.5200 *	.4644 *

* Indicates statistical significance at the 95% level of confidence. Standard errors have been derived by a method described in Morduch and Sicular (2002).

Table 8: Contribution of Variation in Educational Attainment to Inequality

All households with positive equity (1998)		
	Risky wealth (actual)	Risky Wealth after removing the estimated effect of educational attainment*
HSCV	23.84	8.44
Gini	.83	.79
Theil	1.92	1.51
Less than High School Education (households with positive equity, 1998)		
HSCV	51.53	9.32
Gini	.70	.71
Theil	1.26	1.03
High School Graduates (households with positive equity, 1998)		
HSCV	23.44	9.80
Gini	.80	.79
Theil	1.80	1.57
College Graduates (households with positive equity, 1998)		
HSCV	17.95	7.02
Gini	.81	.79
Theil	1.77	1.51

* estimated coefficients derived from the quantile regression that produced the closest fitted value to the observed wealth level for each household.

Table 9: Simulated Inequality in Stock Holdings, by Education Category and Age

Less-than-high-school Education			High School Education		College Degree or More	
Age	**Mean**	**HSCV**	**Mean**	**HSCV**	**Mean**	**HSCV**
25	31778	0.02874	17643	0.02615	733	0.34827
35	71858	0.00811	64175	0.02353	5715	0.05691
45	75391	0.00701	83395	0.01204	22944	0.04725
55	64854	0.00725	75542	0.01407	56868	0.05972
65	46004	0.00925	56703	0.01844	47909	0.07666
75	22153	0.01129	24041	0.05999	17163	0.19092
85	7988	0.01353	2887	0.24062	2969	0.15131

Table 10: Characteristics of Direct and Indirect Stockholders (%)

	1998	**2001**
Education		
Less than high school education	5.51	4.95
High school graduates	48.04	45.94
College degree or more	46.45	49.11
Use of professional advice	58.7	56.8
Investment decisions influenced by social interactions	53.2	50.0
Mean income	75,766	84,585

Table 11: Incidence of Cumulative Gains or Losses in Stock Value since Purchased, by Education Group (%)

Direct Stockholding	All Holders	Holders by Educational Attainment		
1998		**Less than High School Education**	**High School Graduates**	**College Degree or More**
Cumulative Gains	79.7	73.19	78.67	80.92
No Gains or Losses	8.46	15.38	9.68	7.04
Cumulative Losses	11.86	11.43	11.66	12.05
2001				
Cumulative Gains	52.7	41.24	48.66	55.66
No Gains or Losses	12.03	15.92	13.41	11.39
Cumulative Losses	35.3	42.83	37.93	32.94

Table 12: Incidence of Cumulative Gains or Losses in Mutual Fund Value since Purchased, by education group (%)

Mutual Funds	All Holders	By Educational Attainment		
1998		**Less than High School Education**	**High School Graduates**	**College Degree or More**
Cumulative Gains	87.2	69.08	84.64	88.65
No Gains or Losses	6.7	17.38	7.29	7.21
Cumulative Losses	6.0	13.54	8.07	4.14
2001				
Cumulative Gains	54.1	27.8	49.98	56.12
No Gains or Losses	10.9	20.07	13.96	9.32
Cumulative Losses	35.1	52.11	36.06	34.57

Table 13: Determinants of Cumulative Gains or Losses in Direct Holdings of Stock, since Purchased, by Education Group

	1998		2001	
	Pr(Gains)[1]	Pr(Losses)[1]	Pr(Gains)[2]	Pr(Losses)[2]
	marginal effect (z value)	marginal effect (z value)	marginal effect (z value)	marginal effect (z value)
Age	-.0023389 (-.46)	.00231654 (.60)	-.0054361 (-1.20)	.0100793 (1.89)*
Age Sq.	.00002691 (.58)	-.0000341 (-.96)	.000084 (2.00)**	-.0001227 (-2.40)**
Male	-.07455393 (-1.78)	.04224038 (1.32)	.0135258 (.22)	-.0336025 (-0.58)
High school graduate	.03656977 (.48)	-.01240599 (-.20)	.101065 (1.18)	-.0197851 (-0.25)
College graduate	.09047864 (1.19)	-.00637648 (-.10)	.180919 (2.15)**	-.087737 (-1.12)
Married	.07909811 (2.14)**	-.0650072 (-2.25)**	.017898 (.39)	-.0145527 (-0.34)
Kids	-.01271558 (-.50)	-.00306919 (-.16)	.0354305 (1.10)	-.0392481 (-1.28)
White	.05635086 (1.26)	.00995091 (.29)	.1047763 (1.96)**	-.0790369 (-1.53)
Self employed	-.01745548 (-.65)	.00563342 (.26)	-.0845861 (-2.55)**	.0661579 (2.03)**
Retired	-.00539696 (-.14)	-.00120293 (-.04)	-.0651025 (-1.28)	.0207647 (.43)
Other non-working	.14539065 (1.84)*	-	-.026199 (.27)	.0025594 (.03)
Has received inheritance	.04484359 (1.94)*	-.02601489 (-1.40)	.1015051 (3.52)***	-.0798458 (-2.89)***
Log (income)	.00160171 (.54)	-.00162536 (-.67)	-.0009237 (-.28)	-.001092 (-.29)
Number of stocks held	.00163953 (2.38)**	-.00102856 (-1.72)*	.0012759 (2.68)***	-.0012624 (-2.17)**
Investment Horizon > 10 yrs	.02375873 (.96)	-.0390416 (-2.03)**	.0611743 (1.98)**	-.0661785 (-2.28)**
Use of professional advice	.03287112 (1.37)	-.02864962 (-1.48)	-.0463414 (-1.57)	.0119633 (.43)
Rho^	-	-	-.474 [se:.112]	.385 [se:.139]
p, predicted (at mean X of stockholders)	.82	.11	.54	.34

*** significance at 1%, ** significance at 5%, * significance at 10%

[1] marginal effects from the estimation of a probit over the sample of stockholders

[2] conditional marginal effects from the second step of a bivariate probit with selection which takes into account the unobserved correlation with the probability of stock ownership. All marginal effects refer to changes in the probability of the occurrence of the event with marginal changes in continuous variables (change in dummy variables from 0 to 1 is assumed) by fixing the other covariates at their weighted means.

Table 14: Determinants of Cumulative Gains or Losses in Stockholding through Mutual Funds, since Purchased, by education group

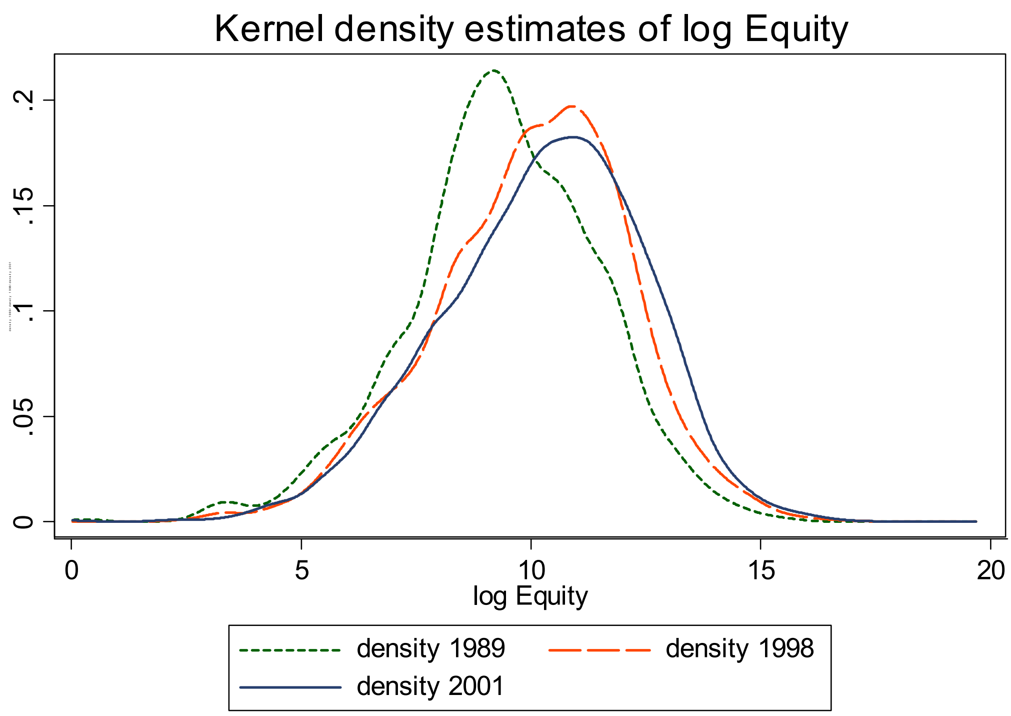
	1998		2001	
	Pr(Gains)[2]	Pr(Losses)[1]	Pr(Gains)[1]	Pr(Losses)[1]
	marginal effect (z value)	marginal effect (z value)	marginal effect (z value)	marginal effect (z value)
Age	.0029294 (.07)	-.0040627 (-1.19)	.00392612 (.51)	.00423176 (.59)
Age Sq.	-.0000225 (-.06)	.00003271 (1.04)	.00001153 (.16)	-.00007389 (-1.11)
Male	.0188069 (.38)	-.01930717 (-.60)	.17629088 (2.49)**	-.16330328 (-2.35)**
High school graduate	.0797791 (1.24)	.02507216 (.40)	.18129412 (1.47)	-.15512459 (-1.45)
College graduate	.1094941 (1.35)	.01078119 (.18)	.30004282 (2.46)**	-.21927268 (-2.00)**
Married	-.0264926 (-.69)	.01925676 (.76)	-.06791571 (-1.14)	.07520575 (1.33)
Kids	.0043038 (.16)	-.03388387 (-1.82)*	.04814517 (1.27)	-.03609304 (-1.01)
White	.0508445 (1.04)	.01353853 (.45)	.25100417 (3.82)***	-.16747345 (-2.66)***
Self employed	-.0157928 (-.56)	.00534963 (.27)	-.05594937 (-1.49)	.04199647 (1.17)
Retired	.0064329 (.16)	.00296968 (.12)	-.07304613 (-1.23)	.00820164 (.14)
Other non-working	.1454296 (8.56)***	-	-.06655252 (-.58)	.05902038 (.54)
Has received inheritance	.0413743 (1.72)*	-.00565956 (-.34)	-.00328647 (-.10)	-.02080618 (-.65)
Log (income)	-.0139016 (-.46)	-.00097149 (-.41)	.00226422 (.34)	-.0089859 (-1.46)
Number of shares in different mutual funds	.0386958 (.43)	-.00684199 (-2.67)***	.01472865 (4.05)***	-.015088 (-4.06)***
Investment Horizon > 10 yrs	.0281496 (1.12)	.00673717 (.37)	.07280991 (2.08)**	-.08425331 (-2.54)**
Use of professional advice	.0410372 (1.56)	-.00492573 (-.28)	-.05997609 (-1.73)*	.03653641 (1.11)
Rho^	-.643 [se:.177]	-	-	-
p, predicted (at mean X of stockholders)	.87	.06	.55	.35

*** significance at 1%, ** significance at 5%, * significance at 10%

[1] marginal effects from the estimation of a probit over the sample of stockholders

[2] conditional marginal effects from the second step of a bivariate probit with selection which takes into account the unobserved correlation with the probability of stock ownership. All marginal effects refer to changes in the probability of the occurrence of the event with marginal changes in continuous variables (change in dummy variables from 0 to 1 is assumed) by fixing the other covariates at their weighted means.

Figure 1: Directly and Indirectly Equity Wealth densities for 1998 and 1989



Note: The estimation procedure is a kernel-density smoother on weighted data with a Gaussian kernel and an optimal bandwidth provided by STATA algorithm.

Figure 2: Quantile Regression Decomposition 1998-1989

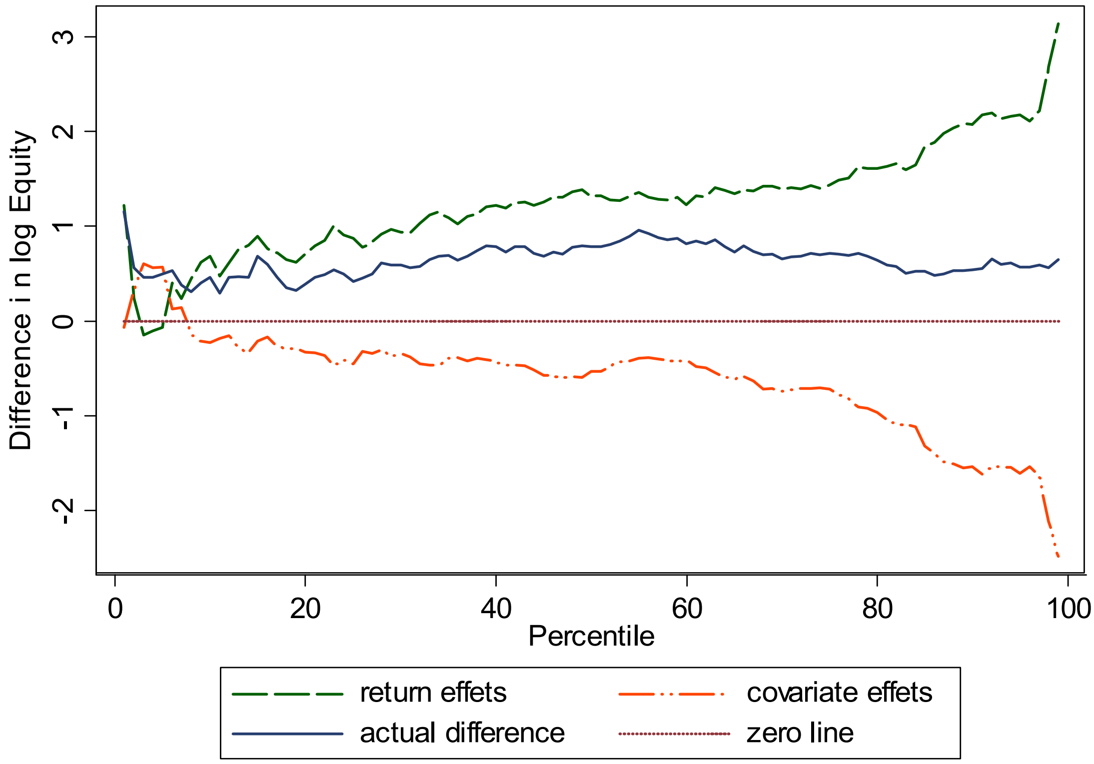
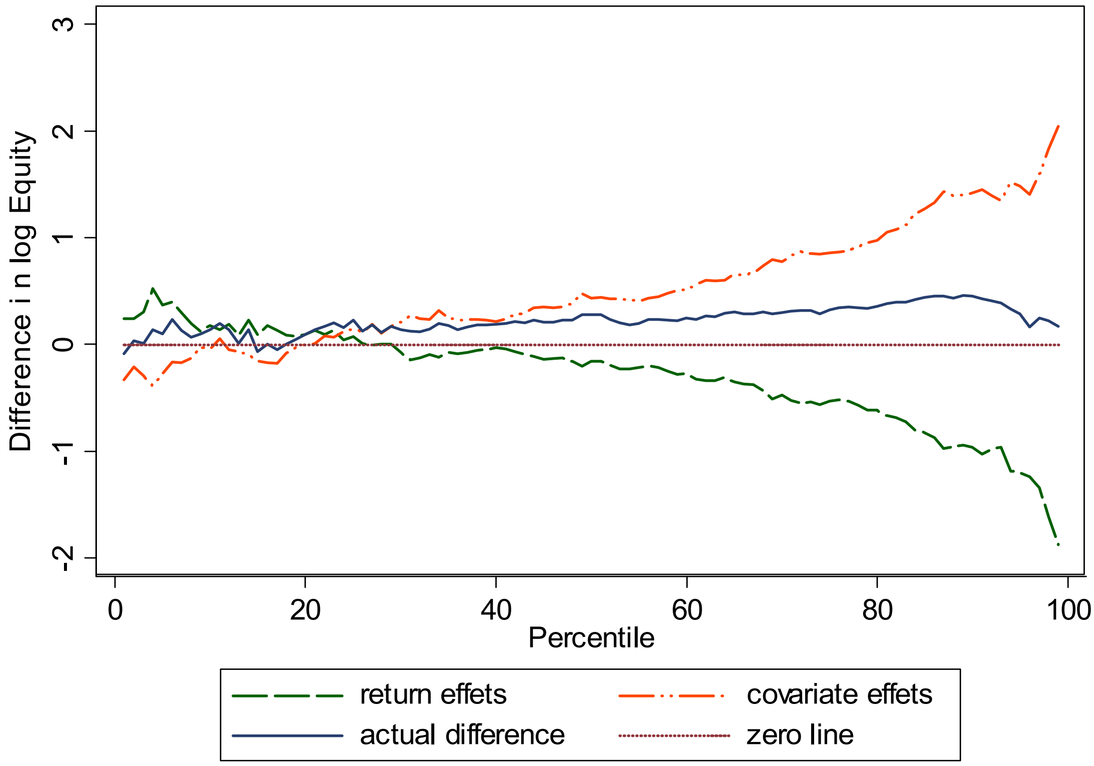


Figure 3: Quantile Regression Decomposition 2001-1998



Data Appendix

I. Asset Categories for Financial Wealth (Table 4)

Directly held stocks: [1]
[1] publicly traded stocks

Indirectly held equity: [2] + [3] + [4] + [5]
[2] stock mutual funds (full value if described as stock mutual fund, 1/2 value of combination mutual funds)
[3] IRAs/Keoghs invested in stock (full value if mostly invested in stock, 1/2 value if split between stocks/bonds or stocks/money market, 1/3 value if split between stocks/bonds/money market).
[4] Other managed assets w/equity interest: annuities, trusts, MIAs (full value if mostly invested in stock, 1/2 value if split between stocks/MFs & bonds/CDs, or "mixed/diversified", 1/3 value if "other")
[5] thrift-type retirement accounts invested in stock (full value if mostly invested in stock, 1/2 value if split between stocks and interest earning assets).

Safe Assets: Total Financial Assets – Directly held stocks – Indirectly held equity

II. Asset Categories for Net Total Wealth (Tables 2&3)

Risky Financial Assets: Directly held stocks + Indirectly held equity
Safe Financial Assets: Total Financial – Risky Financial

Net Wealth in Risky Real Assets & Business Equity: [1] + [2] + [3] – [4] – [5]
[1] Other Residential Real Estate (includes land contracts/notes household has made, properties - other than the principal residence - classified under certain codes for family residences, time shares and vacations homes)
[2] Gross equity in Non-residential Real Estate (real estate - other than the principal residence, properties classified under certain codes for family residences, time shares, and vacation homes)
[3] Business Equity (for businesses where the HH has an active interest, value is net equity if business were sold today, plus loans from HH to business, minus loans from business to HH not previously reported, plus value of personal assets used as collateral for business loans that were reported earlier; for businesses where the HH does not have an active interest, market value of the interest)
[4] Debt for Other Residential Property (includes land contracts, residential property other than the principal residence, misc. vacation, and installment debt reported for cottage/vacation home)
[5] Debt for non-residential real estate mortgages and other loans taken out for investment real estate

Other Wealth: value of vehicles + other non-financial miscellaneous assets
Wealth in Primary Residence: Gross value of primary residence

Principal Residence Debt: [6]
[6] Principal Residence Debt (mortgage, home equity loans and HELOCs --mopup LOCs divided between HE and other)

Consumer Debt: [7]+[8]+[9]+[10]
[7] Other lines of credit
[8] Credit Card Debt
[9] Installment loans
[10] Other Debt (loans against pensions, loans against life insurance, margin loans, miscellaneous)

III. Variable Definitions

No high school diploma (omitted variable)**:** Highest grade completed (X5901)<12 & No high school diploma or passed equivalent test (X5902=5)
High school graduate: Highest grade completed (X5901)<12 & Has got high school diploma (X5902=1) or passed equivalent test (X5902=2) OR Highest grade completed (X5901)=12 OR Highest grade completed (X5901)>12 & No college degree (X5904=5)
College graduate: Highest grade completed (X5901)>12 & Has got a college degree (X5904)=1

Save for "rainy days": The survey question is "Now I'd like to ask a few questions about your (family's) savings. People have different reasons for saving. What are your (family's) most important reasons for saving?" The dummy refers to those reporting one of the following reasons: Emergencies; "rainy days"; other unexpected needs; for "security"/independence (X3006=25 or X3007=25).

Financial alertness: The survey question is "When making major saving and investment decisions, some people shop around for the very best terms while others don't. What number would you be on the scale?"
The 5-number scale ranges from 1-"almost no shopping" up to 5-"a great deal of shopping". The dummy represents those declaring that they do a great deal of shopping (X7111=5).

Credit constrained: Indicates household response that it has been turned down for credit in the past five years or did not receive amount originally requested or did not apply for credit because it thought it might be turned down.

Willingness to take above average financial risk: The survey question is "Which of the following statements comes closest to the amount of financial risk that you and your (spouse/partner) are willing to take when you save or make investments?
1. take substantial financial risks expecting to earn substantial returns
2. take above average financial risks expecting to earn above average returns
3. take average financial risks expecting to earn average returns
4. not willing to take any financial risks"

The dummy represents those answering 1 or 2. (X3014=1 or X3014=2).

Health poor: The survey question is "Would you say your health is excellent, good, fair, or poor?" Those describing their health as being poor are represented by the dummy (X6030=4).

Income: income from wages, salaries, professional practice or business unemployment compensation, social security, annuity, or other pensions.

Bequest motive: Yes to "Do you expect to leave a sizable estate to others?" (X5825=1).
Has received inheritance: Yes to "Have you ever received an inheritance, or been given substantial assets in a trust or in some other form?" (X5801=1).

Cumulative gains/losses in direct holdings of stocks: The survey asks stock holders if there is a gain or loss in the value of the currently held stocks since they obtained them (X3916). The same information is available for mutual fund holders (X3831)

Number of stocks held: The survey asks stock holders in how many different companies they own stocks (X3914) and mutual fund holders in how many mutual funds they own shares (X3820)

Investment Horizon>10 years: The dummy represents those declaring that a period longer than 10 years is important when making their family's saving and spending plan (X3008)

Access to professional advice: "How do you make decisions about savings and investments?" (X7112-X7121 & X6865-X6869) The dummy comprises those asking advice from at least one of the following: accountant, banker, broker, financial planner

Endnotes

[1] For participation trends in the United States since the early 1980s, see Bertaut and Starr-McCluer (2001). International comparisons can be found in the volume edited by Guiso, Haliassos, and Jappelli (2001).

[2] For effects of stock market participation on the equity premium, see for example Heaton and Lucas (1999), Peress (2001), Calvet et al. (2001). For effects regarding market volatility, see Pagano (1989), Allen and Gale (1994), and Herrera (2001).

[3] Recently, Gale and Pence (2004) compared wealth performance of different age groups and found that older age groups exhibited higher wealth levels in 2001 compared to similarly aged households in 1989, but this was not true of young households.

[4] Limited stockholding participation in the early to mid 1980s was documented in US data by King and Leape (1984), Mankiw and Zeldes (1991), and Haliassos and Bertaut (1995). A number of authors have recently explored determinants of participation in stockholding. See, for example, Haliassos and Bertaut (1995), Cocco, Gomes and Maenhout (1997), Heaton and Lucas (2000), Gollier (2001), Campbell and Viceira (2002), Haliassos and Michaelides (2003), and Gomes and Michaelides (2004).

[5] The Survey excludes only households that belong to the Forbes 400. See also Kennickell (2001).

[6] As Atkinson (1983) points out, "[inequality indices] embody implicit judgements about the weight to be attached to the inequality at different points in the […] scale".

[7] A similar argument was made by Jenkins (1995) in favor of using HSCV for analysis of income inequality.

[8] The result mainly comes from the increasing factor correlation, implying a stronger association between housing value and total net wealth over time, which outweighs the decreasing factor shares. Factor shares decrease presumably due to movements in housing prices, since ownership rates move in the opposite direction.

[9] The higher risky shares result from increasing ownership rates and sizeable stock gains in a decade marked by a spread of equity culture and a stock market boom.

[10] The unconditional share of investments in directly held equity as a fraction of total financial wealth declines from 22.6 to 21.3, as increased participation is dominated by lower stock valuations. This is not the case for unconditional shares of indirect equity holdings, which rise from 31.0 to 34.5 between 1998 and 2001.

[11] The overall importance to inequality of a characteristic that is controlled for through a higher order polynomial or a string of dummy variables can be seen by adding up all the relevant coefficients (e.g. "age" in 2001 has a factor inequality weight of 20%= .41 -.21).

[12] Summary statistics suggest that by 1998 the stockholder pool became more heterogeneous. For instance, by the end of the decade in which equity culture spread, the share of college graduates among equity holders was actually somewhat reduced to 46.4%, while in the population it increased by almost 6 percentage points. In addition, both the mean and median non-investment income among equity holders is lower in 1998 compared to 1989, while in the population it is considerably higher, by 15% and 10%, respectively. The picture changes drastically when we look at the composition of 2001 stockholders. These consist mainly of those who persevered through the downswing and of those secure enough to enter the stock market at bad times. Within just three years, college graduates among equity holders reach 49.1%, an increase of almost 3 percentage points. They also show significant increases at all percentiles of their income distribution.

[13] Return and covariate effects deviate across higher percentiles, and both are significant in most percentiles, according to bootstrapped standard errors not reported here.

[14] This is reinforced by the negative return effects.

[15] In 2001 there are 6% more college graduates at the top 25% of the equity wealth distribution, and 4% less at the bottom 25%, compared to 1998.

[16] Households were assigned to percentiles of equity holdings by computing predicted equity holdings for each holder under all 19 sets of quantile regression coefficient estimates (evaluated at every five percentiles) and then finding the quantile for which the absolute distance between actual and estimated equity holdings is minimized. We use years of schooling instead of educational dummies, to retain more variation, especially in the small category of high-school dropouts that represents only 5% of the pool of stockholders.

[17] We have also experimented with the Machado Mata algorithm and have constructed several simulated counterfactual densities for 1998, raising the percentage of college graduates at the expense of the other two educational categories. By doing this, we progressively attach more weight to the group with the lowest within inequality. Indeed, the resulting counterfactuals display HSCVs that fall

more rapidly than the college graduates' share increases, lending further support to our finding that education has equalizing effects at the upper tail of the distribution.

[18] According to the standard inequality decomposition by subgroups, HSCV can be expressed as the sum of within group and between groups inequality. Given that, after removing the effect of education, HSCV is reduced within each education category, and that it reaches a similar level (lower between groups inequality), it is natural to expect a reduction in HSCV among stockholders. Indeed within and between inequalities drop from 23.7 and .135 to 8.44 and .00053 respectively, after removing the effect of education.

[19] A fuller description of the model, algorithm, and policy functions is in Bilias and Haliassos (2004).

[20] For each education group, we draw 15,000 life histories of such shocks (one triplet for each year in the lifetime of each household), and we use those and the policy functions for holdings of stocks and of the riskless asset to compute stock holdings over the life cycle of each household.

[21] Results in this Section are robust to controlling also for net total wealth excluding direct holdings of stocks and of stocks in mutual funds.

[22] Because of the cross-sectional nature of the SCF, there is no information on households who left the market because of losses.