

# Exploring the Changing Nature of U.S. Stock Market Participation, 1994-1999

Elena Gouskova, F. Thomas Juster and Frank P. Stafford

Economic Behavior Program

Survey Research Center

Institute for Social Research

University of Michigan, Ann Arbor

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## **1 Introduction**

The fact that a large portion of households does not participate in the stock market is empirically well established (King and Leape 1984, Mankiw and Zeldes 1991, Bertaut and Starr-McCluer 2002). This stands at odds with the classical theory of portfolio choice which predicts that agents should always have a non-zero position in risky assets (Samuelson 1969, Merton 1969, Merton 1971). To explain the non-participation puzzle, the focus of the recent research has been on relaxing or modifying the assumptions of portfolio choice theory.

One subset of the literature considers market frictions, such as entry and/or participation costs, as a possible explanation (Haliassos and Bertaut 1995, Bertaut 1998, Haliassos and Michaelides 2003, Paiella 2001, Vissing-Jorgensen 2002, Guiso, Haliassos and Jappelli 2003). The costs comprise a broad set of categories including real costs – brokerage commissions,

sign-up fees as well as costs of gathering information – and perceived costs related to overcoming investor inertia. In principle, even small costs could have a significant deterring effect on participation, suggesting cost as a promising research direction.

More specifically costs, notably fixed costs, may matter more for those with less education and fewer financial means, and we should expect to see that the participation in the stock market to be correlated with income and wealth. This implication is strongly supported by the literature.

As participation costs go down, the fraction of households participating in the stock market should go up and vice versa. Over the 1990's we observe a substantial increase in stock market participation (Poterba 2001)<sup>1</sup>. At the same time the spread of a "equity culture" coincided with a number of developments that contributed to a lowering of participation costs (Guiso et al. 2003). The observed coincidence of strong participation growth and a reduction in the stock market participation costs is in line with the cost perspective.

A further implication is that falling costs should diminish the importance of income and wealth in the participation decision. If costs indeed matter for stock market participation, their reduction should in the first place induce entry among those who were previously precluded from participation by the higher costs. Thus the new entrants should be more likely to be poorer and less educated than incumbents: as the stock market entry and participation costs go down, a household's decision to hold equities will become less dependent on its wealth and income.

During the 1990's was entry into the stock market stronger among the less well off? If so, during the period the wealth/income effect on the participation decision should have decreased. To the best of our knowledge, this question has not yet been explored. Using the Panel Data of Income Dynamics (PSID) we here study changes in the patterns of market participation between two periods 1989-1994 and 1994-1999. The analysis is important for further evidence of power of the costs thesis to explain the non-participation puzzle as well as for a better understanding of the households' portfolio allocation decision.

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<sup>1</sup>In the 1960's a parallel increase in participation rates occurred during the rise in stock market valuations. The share of families participating rose from 16% in 1962 to 21% in 1963 and 1964 (*Survey of Consumer Finances* 1964)

Beyond testing the relevance of the stock market participation costs for the portfolio allocation decision, the paper provides input to the study of factors behind the equity market boom. Did some particular group of households during the second half of the 90's increased its equity market activity and contributed to the unprecedented run-up in the stock market during the last decade? The S&P 500 index rose at rate of 22 percent a year from 1995 through 1999. Then, in March 2000, the longest bear market set up, and by the end of 2001 about 18% of financial wealth had been lost. With the benefit of hindsight, entering the market just prior to the slump was bad timing, creating greater exposure to risk for new entrants. Whether such families were concentrated among the less well off and less financially sophisticated families is important for better understanding of the welfare effects of such stock price turbulence.

Contrary to a cost perspective for the participation decision, the analysis reveals the importance of wealth/income has not diminished during the 1994-1999 period. Entry into the stock market does not appear to have been concentrated within the lower levels of the income and wealth distributions. Rather, participation increased broadly across all income and wealth groups with some indication that the participation rates among the households in the upper end of the distribution have been increased still further. Controlling for demographic factors and unobserved heterogeneity, the effects of income and wealth on stock market participation are shown to have increased between 1994 and 1999 with the increase of the income effect being statistically significant.

We offer a number of explanations for this result. First, our analysis assumes that the fixed participation costs are the same for different levels of income and wealth, which may not necessarily be true. For example, those with greater risk aversion may face higher perceived costs, as risk aversion may be correlated with wealth. If the wealthier households are less risk averse and face lower cost of participation then the effect of the cost decrease might induce higher rates of entry. At the same time, the new costs, though lower, can be still high enough to deter participation for the low wealth households.

Second, changes in other factors might "contaminate" the picture. For example, the 90's were marked by relatively low interest rates that spurred a home refinancing boom. As the

households that are better-off were more likely to refinance (Hurst and Stafford 2004), the extra cash might have provided an additional source for investment in the stock market. We find some evidence that those who reduced their monthly mortgage payments between 1994 and 1999 were also those who were more likely to buy stocks during the period.

Finally, our results may indicate that, while playing some role, costs are simply not a major consideration in the decision to participate in the stock market, and some behavioral or other explanation might be needed to account for the strong growth of stockholding rates during the 90's.

The remainder of the paper organized as follows. Section 2 introduces some literature related to the costs of stock market participation. The data used in the analysis are described in the section 3. Section 4 presents some descriptive evidence on changes in participation patterns during the 1990's. In section 5 we describe the statistical model used in the analysis and report the estimation results. Possible explanations are considered in section 6. Section 7 provides a summary.

## **2 Related literature**

The relevance of information problems as a source of market frictions in the household portfolio allocation decision has been stressed in Haliassos and Bertaut (1995). This study explores a number of reasons behind the non-participation in the framework of two period consumption model with random income, and in presence of risky and riskless assets. It concludes that risk aversion, heterogeneity of beliefs, habit persistence and borrowing constraints are not likely to explain the variation in portfolio choices. Costly information, in contrast, was found to have a strong influence on portfolio choice. The line of research was continued in Bertaut (1998) where portfolio allocation is studied with a discrete choice model and panel data from the Survey of Consumer Finances. The study finds support for the proposition that information costs, perceived and actual, can have a deterring effect in stockholding decision.

A theoretical simulation study by Polkovnichenko (2001) uses an equilibrium model to

explore the effect of nonparticipation on the equity premium. In order to generate limited participation behavior the author uses a fixed per-period cost. In the model households with lower income choose to stay out of the market, as the participation is not worthwhile to surmount the cost barrier.

As more studies have found a potential for cost to explain non-participation, it also became clearer that even a modest cost of participation could shape choices. Further, a number of empirical and numerical studies have attempted to quantify the economic significance of the costs.

Using numerical solution of stochastic portfolio choice model with an infinite horizon in the presence of liquidity constraints, Haliassos and Michaelides (2003) find that even a small entry cost can rationalize the non-participation puzzle. The estimate of cost in their study is an upper bound of fixed entry cost calculated for different values of model parameters such as risk aversion, time preference, equity premia, and correlation between stock returns and labor income shocks.

Two recent empirical studies exploring the deterring effect of the participation costs on the stockownership decision with micro data are Paiella (2001) and Vissing-Jorgensen (2002). The former study asks the question of what minimal cost can explain the choice of holding no equity - despite a premium. The focus is fixed per-period participation cost quantified in terms of forgone utility gains. It is found that the lower bound on a per-period participation cost is about \$31 for a consumer with log utility. The later study points out the state dependency in stock market participation as evidence of importance of fixed transaction costs for the stockholding decision. In the framework of a dynamic panel model of participation with unobserved heterogeneity, it was shown that those who participate in the stock market in one period have higher likelihood to be stockholders in the subsequent period. The study finds that cost of \$50 is enough to explain the choices of half of non-participants.

Using micro data from several countries Guiso et al. (2003) explore differences in stock market participation. The authors find that differences in entry and transaction costs might provide some explanation for the pattern of stock market participation across countries. The

study also discusses possible consequences and welfare concerns of the spread of the "equity culture". In particular, they argue that lowering the cost of participation brought the less sophisticated stockholders with lower level of wealth into the market <sup>2</sup>. These new participants are potentially more vulnerable to negative stock price shocks.

### 3 Data

In this analysis we have used observations from the Panel Study of Income and Dynamics (*PSID*), a longitudinal study of U.S. households starting in 1968. In 1984, 1989, 1994, 1999, and 2001 the PSID asked extensive questions about wealth holdings, including holdings of stocks. Using information in 1989, 1994, and 1999 we constructed two balanced panels corresponding to 1989-1994 and 1994-1999 time periods. We distinguish two samples by the end period year, i.e. the 1994 and 1999 samples. The samples were restricted to the households with the same head at the beginning and at the end of each period. The total number of observation in 1994 sample is 5,638 and in 1999 is 5,063. All money values excluding monthly mortgage payments are in 2001 dollars.

The primary variable of interest is a binary indicator of stockownership,  $S_t$ . Prior to 1999 questions on stock holdings were formulated to include both direct stock accounts and holdings in IRA's: "Do you or anyone in your family living there have any shares of stock in publicly held corporations, mutual funds, or investment trusts, including stocks in IRA's?" In the analysis  $S_t$  is 1 if household reports holding stocks either directly or through individual retirement plans. Starting in 1999, however, a new set of questions about assets held in IRA accounts was introduced with questions about stocks and transaction accounts had been reformulated to exclude IRA holdings. In our analysis we needed a comparable variable across 1989-1999 years. Using the question about proportion of stocks in IRA account, "Are they mostly in stocks, mostly in interest earning assets, split between the two, or what?", the comparable measure  $S_t$

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<sup>2</sup>The extent to which this is implied by the cost theory and the strength of the empirical relationship deserves further exploration.

for  $t = 1999$  was defined as follows

$$S_{1999} = I\{(Stock_{1999} + \alpha \times IRA_{1999}) \neq 0\}$$

where  $\alpha$  is equal to 1 if answer to the allocation question was "mostly in stocks", .5 if "split between the two", and 0 if response was "mostly in interest earning assets".  $Stock_{1999}$  and  $IRA_{1999}$  are amounts held in each asset category.

One limitation of our data is that it ignores participation through defined contribution pension plans. Such information is desirable in order to obtain the fuller picture of participation dynamics. However, as allocation choices in the defined contribution plans can be limited, this information may be less useful for our purposes of determining how cost reductions may have affected the participation decision.

## 4 Initial investigation

As the first approach to the question we looked at the 1994 and 1999 participation rates in the sample stratified by wealth deciles. Figure 1 plots the participation rates for each decile. To mitigate the potential problem of endogeneity of wealth and the decision to be in the stock market we used lagged values of wealth<sup>3</sup>. The solid and dotted lines indicate predictions from the linear model. The left panel reports unconditional participation rates. The right panel gives the participation rates conditionally on being non-stockowner at the beginning of the period, i.e. five years earlier. So, the right panel shows the entry rates among the previous non-participants.

From observing Figure 1 panel A it does not appear that participation in the stock market has become more democratic during the 1990's. The participation rates among the lower deciles are more often lower in 1999 than in 1994, while the participation in two upper deciles show considerable increases. To summarize the evidence we include the fitted regression line for reference. In 1999 the line has a steeper slope than in 1994, suggesting an increase in the marginal effect of wealth on the participation decision. The plot for non-stockowners, panel

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<sup>3</sup>In the analysis the lag is five years.

B, shows more mixed picture. Nevertheless, here too the entry among the lower two deciles groups decreased in 1999 and rose in the upper decile, producing the steeper fitted regression line for 1999 than for 1994. The observed evidence does not appear to be in line with the expectations based on the costs perspective on participation. Assuming other factors constant, the decrease in costs should have a relatively smaller effect on the participation among the upper range of the wealth distribution while encouraging participation among those who should had been previously excluded by such costs. Somewhat depressed participation among the poor with expansion in stocks participation in the upper range of wealth distribution in 1999 does not seem to be comparable with the approach.

To check the impression from Figure 1 we turn to another data source. Plots in Figure 2 are based on tabulations from the Survey of Consumer Finance (SCF) (Poterba 2001). They present participation rates in 1989, 1992, 1995 and 1998 years for different wealth groups, in the upper panels, and for different income groups, in the lower panel <sup>4</sup> One distinctive feature of Figure 2 is that, different from Figure 1 the rates are given separately for direct participation and through mutual funds, the left panels, and participation through individual retirement plans in the right panels. To compare Figure 2 with Figure 1 it is also important to keep in mind that the scales of the horizontal axes are different. Thus, in Figure 2, panel A, the first two groups represent at least 80% of population, which masks the dynamic of participation rates in the lower part of the wealth and income distribution. Nevertheless, from Figure 2 it appears that the richer segment of the population experienced higher absolute increases in the participation rates between 1989 and 1998 than the less well off. This evidence, as does Figure 1, lends little evidence in favor of the proposition that lower participation costs during the 90's should have made wealth and income less important factors for the participation decision.

As our next step we looked at how various characteristics of stockowners and those who recently entered the stock market compare between 1994 and 1999. Table 1 reports the mean values for wealth, income, age, race, marital status, probability of owning various assets, and total number asset types in household portfolio. It also provides the results of the t-test of

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<sup>4</sup>1992 and 1995 may be subject to measurement issues (Weicher, Kennickell, Juster, Smith and Stafford 1999).

difference between 1994 and 1999 mean levels of these variables.

The results show that the stockowners in 1999 are on average more affluent, older, and more educated which is not what one would expect in accordance with the costs thesis. While the above-mentioned variables do not suggest less financial sophistication among the 1999 stockowners, the variables related to portfolio composition allow further insight on what might drive the participation growth of the 1990's. On average the stockowners in 1999 own less of real estate excluding ownership of own housing, and less other valuable assets ( which include bond funds, cash value in a life insurance policy, a valuable collection for investment purposes, and rights in a trust or estate). They also have significantly fewer different asset types in their portfolios. Similar differences are also observed among those who entered the stock market more recently. The evidence from Table 1 might suggest a behavioral explanation for the increase in the stock market participation during the 90's to be a promising direction. The high returns on equity may have influenced the portfolio decision-making of households. Those who, probably, otherwise would have invested in other assets, now considered stocks as a major investment option. It is quite possible that investors were responding more to realized returns during the 1990's than to any decrease in costs of participation.

To summarize, the evidence in Figures 1-2 and Table 1 does not seem to support the costs perspective. A decrease in participation costs in the 90's seems not to have resulted in a higher probability of entry among the less sophisticated and less well off households. In the next section we develop more formal approach for evaluation of how the relationship between income/wealth and participation decisions changed between 1994 and 1999.

## **5 Main results**

### **5.1 Model**

In modeling stock market participation decision we use an approach similar to Bertaut (1998), which is based on the indirect utility function. We assume that household  $i$  at time  $t$  compares

the utility of owning stock ( $V_{it}^1$ ) to the utility of not owning stock ( $V_{it}^2$ ). The households holds stocks if  $V_{it}^1 > V_{it}^2$  and does not hold stocks otherwise. We further assume that indirect utility functions can be written as a linear function of observed characteristics,  $x_{it}$ , and error term,  $v_{it}$ .

$$V_{it}^j = x_{it}^j \beta + v_{it}^j \quad j = 1, 2 \quad (1)$$

So

$$P(S_{it} = 1) = P(V_{it}^1 > V_{it}^2) = P(x_{it}^1 \beta^1 + v_{it}^1 > x_{it}^2 \beta^2 + v_{it}^2) = P(v_{it} > x_{it} \beta)$$

Let error term  $v_{it}$  be a sum of unobserved individual characteristic,  $c_i$ , and error term,  $\epsilon_{it}$ :

$$v_{it} = c_i + \epsilon_{it}$$

When  $v_{it}$  is normally distributed and

$$c_i | x_i \sim \text{Normal}(0, \sigma_c^2)$$

we have the unobserved effect probit model (Wooldridge 2001).

$$P(S_{it} = 1 | x_t, c_i) = P(S_{it} = 1 | x_{it}, c_i) = \Phi(x_{it} \beta + c_i) \quad (2)$$

With the additional assumption of independence of  $S_{i1}, S_{i2} \dots S_{iT}$  conditionally on  $(x_i, c_i)$ , the model (2) can be consistently estimated with the maximum likelihood method. However, the task can be simplified (Wooldridge 2001). By averaging (2) over  $c_i$  we get

$$P(S_{it} = 1 | x_i) = P(S_{it} = 1 | x_{it}) = \Phi(x_{it} \beta_c) \quad (3)$$

where  $\beta_c = \beta / (1 + \sigma_c^2)^{1/2}$  are the population-averaged parameters. For the purposes of our analysis the knowledge of  $\beta_c$  suffices and we do not need estimates of  $\beta$  and  $\sigma_c^2$ .

As suggested in (Wooldridge 2001), the consistent estimation of the  $\beta_c$  parameters can be done in the framework of the Generalized Estimating Equations (GEE). The method was developed for dealing with correlated data in the generalized linear model. The advantage of

estimation  $\beta_c$  with the GEE methodology is that it is computationally easier than the maximum likelihood and does not require the restrictive assumption of independence. We need, however, to specify the correlation matrix for  $S_{it}$ . The following correlation matrix was used

$$\text{corr}(S_{it}, S_{i't'}) = \begin{cases} 1 & \text{if } i = i' \text{ and } t = t' \\ \rho & \text{if } i = i' \text{ and } t \neq t' \\ 0 & \text{if } i \neq i' \end{cases} \quad (4)$$

The estimate of  $\beta_c$  obtained with the GEE is a multivariate weighted nonlinear least squares estimator that is consistent and asymptotically normal, even if correlation matrix is misspecified.

## 5.2 Estimation results

For the investigation of how the effects of wealth and income on the participation decision have changed between 1994 and 1999, we started by observing how the participation decision itself might have changed over the period. The vector of explanatory variables  $x_{it}$  in the model (3)-(4) includes total family income and wealth, head's age, race, education and marital status. It is important to note that for estimates in the unobserved effect probit model (2) to be consistent, strong exogeneity of the explanatory variables is required. However, the wealth and income variable are clearly endogenous with the decision to participate in the stock market. To alleviate this problem we used the lagged values of these variables.

In order to gauge the change in the equation parameters between 1994 and 1999, a set of interaction terms between  $x_{it}$  and the indicator  $I(t = 1999)$  was included in the model. The resulting coefficient estimates of terms without interaction produce the 1994 estimates, while the estimates of interaction terms give the difference between 1994 and 1999. So, for example, to get the estimate of income effect for 1999 one needs to add the estimate of income coefficient to the estimate of the interaction term of  $I(t = 1999)$  and income. Table 2 provided the results. To save space the results are reported only for the SRC portion of the PSID sample as they are very similar to that based on the full sample.

The model estimates of the base 1994 equation have the expected signs and magnitudes. The decision to participate is strongly correlated with the wealth and income variables, education level, race, marital status and the life cycle period. The wealthy and more educated households are more likely to have stocks. As we discussed above these differentials are consistent with the existence of the costs of entry and/or participation in the financial market. The race effect points to significantly higher propensity of participation among white households than among the black households. This fact can also be attributed to the effect of the participation costs related to information gathering and overcoming cultural barriers (Vissing-Jorgensen 2002, Chiteji and Stafford 2000). Life cycle is an important predictor of the stock market participation. Those in their prime age, between 40 and 64, are more likely to be in the market than the young group, who are less than 40, and the less than 40 group is more likely than the 65 and older group. The magnitude of difference among the age groups becomes smaller in 1999 however. Here the older group shows slightly higher rates of participation. Possibly this is related to cohort effects which cannot be estimated in our model as it already includes age and time effects.

The differences in age coefficients between 1994 and 1999 are not significant, however, just as 1994/1999 differences not significant for education, race and marital status. The simultaneous test of the hypothesis that all these differences being equal to zero is not rejected. The same test, in contrast, strongly rejects the proposition that time effect of 1999 and changes in income and wealth effects are all zero.

Individually, the 1999 year effect is significantly negative, while estimates in change of income and wealth effects are both positive with the former being significant ( $p < .05$ ). The negative sign for the 1999 time effect is somewhat unexpected given the overall increase in the stock market participation rates between 1994 and 1999. One interpretation is that the observed increase is created by the distributional shift of the explanatory variables, such age, income and wealth. With the baby boom cohort at the peak of life cycle resources and with the majority of the population enjoying wealth increase during the 90's, the growth in overall participation rates is not surprising and is consistent with the life cycle asset allocation theory (Campbell and

Viceira 2002).

If the participation costs were a major obstacle to whether or not hold stocks then a decrease in such costs should allow more entry among those who were previously excluded. In particular, one might expect that the new entrants would be less well off than the incumbents. With the decrease of the participation costs the wealth and income should matter less for the participation decision that should in its turn result in lowering of income/wealth on the participation decision. That is, however, not what we see in the results. The coefficients of the interaction term of 1999 year with income and wealth are both positive.

The results of the Table 2 indicate that the participation equation has not changed during the period with exception of the constant term and the income effect. We therefore proceed by estimating the model excluding the time interactions with age, race, education and marital status. The estimation results are similar for the SRC subsample and the whole PSID sample, so only SRC results are reported (see Table 3). The parameter estimates from the new specification are similar to those in Table 2. In particular, the effect of income in 1999 is positive and significantly larger than in 1994. The change in the wealth effect, while not significant, is still positive.

Thus, analysis of the changing participation decision between 1994 and 1999 that controls for demographic variables and accounts for unobserved heterogeneity leads to the same conclusion as suggested by Figure 1. Namely, during the 90's the increase in participation rates was concentrated among the upper part of the wealth/income distribution rather than among the less well off.

Panel data allow us also to analyze the decision to enter the stock market among the non-stockowners and how the determinants of such a decision have changed between 1994 and 1999. We estimated the probability of becoming the stockowner at time  $t$  conditionally on not participation in the stock market at  $t - 1$  (see Figure 4). As with the participation equation, factors such as wealth, income, and education are important predictors for entry in the stock market. The directions of the effects are also the same. Looking at the differences among the parameter estimates between 1994 and 1999 years we observe that in both periods the equations

are virtually the same. None of the difference estimates are significantly different from zero with the exception of the age variables, which are weakly significant (10% ). Compared to the 1994 equation where entry was higher among the young and middle group and lower among the older group, the estimates for 1999 indicate the chances of entering the market among the older group has become quite similar to the other two age groups <sup>5</sup>. Despite the observed difference in the age parameters, the simultaneous test that both equations are the same is not rejected.

Similar to the previous analysis, the positive sign of the year 1999 interaction with income does not suggest a diminishing importance of income for the entry decision. The sign of time and wealth effects, by contrast, is negative. However, the fact that a) it is insignificant and b) it is no longer negative when the model is estimated for the whole PSID sample preclude considering it as a meaningful evidence.

Summarizing the results in Table 4 we conclude that, conditionally on being non-stockowner at the beginning of the period, the entry equation does not seem to have changed structurally between 1994 and 1999.

## 6 Possible explanations

There might be a number of reasons besides a simple cost approach to explain why the data do not show the decrease in income/wealth effect on the stock market participation equation during the second half of the 90's.

First of all, we assumed that the costs, real and/or perceived, are uncorrelated with income and wealth. This may not be true. For example, if risk aversion is correlated with wealth and the perceived part of the costs increases with risk aversion, there will be dependence between the wealth variable and the costs. Furthermore, if wealthier households are less risk averse than

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<sup>5</sup>It may be argued that this evidence also points against the deterring effect of the entry costs. A part of such costs is gathering information of how to be a stock market investor. As more information tends to be accumulated over the life course, the presumably easier access to the stock entry information, through increased advertisement on TV, participation in the stock market through employer sponsored retirement plans and by word of mouth due to broader participation, should have benefited more the younger group and not the older one.

the poor and face lower costs of participation then the effect of the cost reduction might produce the observed pattern. In particular, while those better off might decide to participate in the stock market in light of the new, lower costs, entry among the less wealthy might be limited because for them the costs are still high.

Second, focusing on the changes in the participation costs during the 90's we ignored the effect of other factors that might have also contributed to the decision to hold risky assets. If these factors encourage participation and are disproportionately more relevant to the rich, it may lead to the higher increases in participation rates at the upper range of the of wealth/income distribution. We looked at one possible candidate explanation. The 90's were a period of relatively low interest rates which triggered a strong mortgage refinancing activity. As the better off households were more likely to refinance compared to less affluent households (Hurst and Stafford 2004), the extra cash might have allowed them to invest in stocks. To check this proposition we investigated the possible effects of increased cash flow from the reduction in the monthly payments. Those who refinanced and preserved their mortgage balances were primarily those who exercised a 'financial option' rather than a consumption option. As such they normally realized a lower monthly mortgage payments.

While we do not find a significant effect of the reduction in the monthly mortgage payments on the decision to participate in the stock market, there is positive effect on buying more stock. Table 5 reports the results of an ordered logistic regression of household decision to buy, leave unchanged or sell the stocks between 1994 and 1999. The observations used include homeowners who lived in the same house from 1994 to 1999 and had a mortgage during the period. The outcome variable is trinomial indicator: whether the household added, left unchanged or reduced its equity holdings. The independent variable of interest is an indicator that monthly mortgage payments had been reduced between 1994 and 1999. The results show that controlling for income, wealth, education and marital status the reduction in monthly payments is positively correlated with the decision to buy more stocks. While not overwhelmingly strong, with the significance level of only 10%, the results, nevertheless, suggest a possibility that increase in liquidity from refinancing provided additional resources to be directed into the

stock market including those who already participated and had previously surmounted the cost barrier.

Finally, one can speculate that the increased participation in the 90's might have a behavioral interpretation. It is possible that investment behavior of households was affected by the prolonged period of high returns leading them to extrapolate these returns into the future and underestimate the risk. This "irrational exuberance" possibly induced some families to jump on the stock market bandwagon by committing more resources, something they would not have done under the more normal circumstances.

## **7 Summary**

In the paper we empirically investigated changes in the stock market participation decision of U.S. households between 1994 and 1999 with a primary focus on the wealth and income effects.

The longitudinal data from the PSID were used for the analysis. In the framework of the discrete probit model with correlated observations we were able to show that the wealth and income effects on the stock market participation increased during the period. Such evidence seems not to support the proposition that stock market entry and participation costs play a major deterring role in the household decision to participate in the stock market. A decrease in such costs during the 90's should have benefited the households with lower means resulting in relatively higher stock market entry rates among these households. In contrast, the observed increase in the wealth and income effects in the 1999 data suggest that rising participation rates during the 90's was not concentrated among the less affluent households.

We also discussed some ways to reconcile the observed evidence in the data and the idea that the stock market entry and/or participation costs are the major reason for equity market non-participation. In particular, we argued that during the period developments in factors other than the participation costs could have played an important role in boosting participation rates among the richer families. As an example of such factors we considered the mortgage refinancing activity during the period. The analysis suggests that refinancing activity during the 1990's

might have encouraged participation among the better off households by creating an additional source of liquidity and may have led those existing participants to allocate more funds to stocks.

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Table 1: Means differences between 1994 and 1999 for stockholders and new stockholders

Variable	Stockowners at $t$				New Stockowners at $t$				t-test
	1994	1999	[1994]-[1999]	t-test	1994	1999	[1994]-[1999]	t-test	
Total Fam Income (t-1)	85,866	94,531	-8,666	**	68,553	66,242	2,311		
Total Fam Income (t)	99,432	106,394	-6,962		85,472	83,338	2,133		
Total Wealth (t-1)	301,709	302,132	-424		202,364	130,076	72,288		
Total Wealth (t)	404,605	481,219	-76,615	**	288,387	231,574	56,813	*	
Age of head	46.313	47.366	-1.054	**	43.254	44.711	-1.457	*	
D Male	0.900	0.887	0.013		0.867	0.863	0.004		
D White	0.963	0.955	0.008		0.945	0.941	0.004		
D Black	0.024	0.018	0.005		0.038	0.027	0.011		
D Other	0.014	0.027	-0.014	**	0.018	0.032	-0.014		
D No High School Degree	0.073	0.053	0.020	**	0.098	0.077	0.021		
D High School Degree	0.228	0.216	0.013		0.269	0.286	-0.018		
D Some College	0.242	0.248	-0.006		0.275	0.269	0.007		
D College Degree or more	0.457	0.484	-0.027		0.358	0.368	-0.010		
D Married	0.812	0.796	0.015		0.777	0.758	0.019		
Whether Business	0.224	0.225	-0.002		0.210	0.210	0.000		
Whether Debt	0.542	0.511	0.031		0.580	0.602	-0.022		
Whether Real Estate	0.328	0.265	0.063	***	0.297	0.191	0.106	***	
Whether Other Valuable	0.382	0.324	0.059	***	0.350	0.267	0.083	***	
Whether Home Equity	0.872	0.895	-0.024	*	0.833	0.822	0.011		
Number of portfolio components	4.724	4.624	0.100	**	4.573	4.414	0.160	**	

Sample: SRC subsample of PSID, balanced panels 1989-1994 and 1994-1999

a) ( $t - 1$ ) corresponds to 1989 for 1994 sample and to 1994 for 1999 sample

b) New stockholders defined as those who report owning stocks at time  $t$  but did not have equities 5 years ago.

Table 2: Correlated Observation Probit Model 1 of Participation Decision in 1994 and 1999

	Parameter	Estim		stder	z-stat.
Intercept	$\beta_1$	-4.055	***	0.529	-7.66
Log income(t-1)	$\beta_2$	0.144	**	0.057	2.55
Log wealth(t-1)	$\beta_3$	0.184	***	0.023	8.19
age <= 40	$\beta_4$	0.074		0.083	0.89
40 < age <= 64	$\beta_5$	0.141	*	0.075	1.88
D White	$\beta_6$	0.559	***	0.127	4.41
D Other	$\beta_7$	0.382		0.249	1.53
D No High School Degree	$\beta_8$	-1.022	***	0.086	-11.84
D High School Degree	$\beta_9$	-0.674	***	0.066	-10.16
D Some College	$\beta_{10}$	-0.314	***	0.073	-4.31
D Married	$\beta_{11}$	0.140	**	0.065	2.15
D year1999	$\beta_{12}$	-1.880	***	0.625	-3.01
(Log income(t-1) )*( D year1999 )	$\beta_{13}$	0.162	**	0.064	2.54
(Log wealth(t-1) )*( D year1999 )	$\beta_{14}$	0.015		0.030	0.51
(age <= 40 )*( D year1999 )	$\beta_{15}$	-0.116		0.108	-1.08
(40 < age <= 64 )*( D year1999 )	$\beta_{16}$	-0.146		0.093	-1.56
(D White )*( D year1999 )	$\beta_{17}$	0.140		0.163	0.85
(D Other )*( D year1999 )	$\beta_{18}$	0.153		0.289	0.53
(D No High School Degree )*( D year1999 )	$\beta_{19}$	0.008		0.109	0.07
(D High School Degree )*( D year1999 )	$\beta_{20}$	0.010		0.081	0.13
(D Some College )*( D year1999 )	$\beta_{21}$	-0.010		0.088	-0.11
(D Married )*( D year1999 )	$\beta_{22}$	-0.102		0.082	-1.24
Tests					
$\beta_{12} = 0$	$\chi^2(1)$	9.066	***		
$\beta_{13} = \beta_{14} = 0$	$\chi^2(1)$	9.456	***		
$\beta_{12} = \beta_{13} = \beta_{14} = 0$	$\chi^2(1)$	8.928	***		
$\beta_{14} - -\beta_{22} = 0$	$\chi^2(1)$	0.015			
Correlation					
Correlation par.	$\rho$	0.27			
Summary statistics					
N		6,022			
Loglikelihood		-3,310			

Sample: Sample: SRC subsample of PSID, pooled sample of two balanced panels: 1989-1994 and 1994-1999

Dependent variable:  $S_t$  is 1 if the household reports owning stocks at  $t$  and 0 it does not hold equities.

a)  $(t - 1)$  corresponds to 1989 for 1994 sample and to 1994 for 1999 sample

b) Wealth and income variables expressed in 2001 dollars

Table 3: Correlated Obsevation Probit Model 2 of Participation Decision in 1994 and 1999

	Parameter	Estim		stder	z-stat.
Intercept	$\beta_1$	-4.176	***	0.551	-7.57
Log income(t-1)	$\beta_2$	0.163	***	0.060	2.72
Log wealth(t-1)	$\beta_3$	0.179	***	0.022	8.21
age <= 40	$\beta_4$	0.021		0.064	0.32
40 < age <= 64	$\beta_5$	0.068		0.056	1.20
D White	$\beta_6$	0.634	***	0.106	5.97
D Other	$\beta_7$	0.466	***	0.163	2.86
D No High School Degree	$\beta_8$	-1.022	***	0.067	-15.16
D High School Degree	$\beta_9$	-0.671	***	0.051	-13.27
D Some College	$\beta_{10}$	-0.321	***	0.054	-5.96
D Married	$\beta_{11}$	0.087	*	0.047	1.85
D year1999	$\beta_{12}$	-1.552	***	0.539	-2.88
(Log income(t-1) )*( D year1999 )	$\beta_{13}$	0.114	**	0.056	2.05
(Log wealth(t-1) )*( D year1999 )	$\beta_{14}$	0.028		0.026	1.08
Correlation					
Correlation par.	$\rho$	0.26			
Summary statistics					
N		6,022			
Loglikelihood		-3,313			

Sample: Sample: SRC subsample of PSID, pooled sample of two balanced panels: 1989-1994 and 1994-1999

Dependent variable:  $S_t$  is 1 if the household reports owning stocks at  $t$  and 0 if it does not hold equities.

a)  $(t - 1)$  corresponds to 1989 for 1994 sample and to 1994 for 1999 sample

b) Wealth and income variables expressed in 2001 dollars

Table 4: Correlated Obsevation Probit Model of Entry Decision in 1994 and 1999

	Parameter	Estim		stder	z-stat.
Intercept	$\beta_1$	-3.938	***	0.942	-4.18
Log income(t-1)	$\beta_2$	0.168		0.108	1.56
Log wealth(t-1)	$\beta_3$	0.109	***	0.031	3.53
age $\leq$ 40	$\beta_4$	0.275	**	0.124	2.23
40 < age $\leq$ 64	$\beta_5$	0.293	**	0.124	2.37
D White	$\beta_6$	0.466	***	0.146	3.20
D Other	$\beta_7$	0.649	**	0.288	2.26
D No High School Degree	$\beta_8$	-0.814	***	0.118	-6.89
D High School Degree	$\beta_9$	-0.554	***	0.094	-5.89
D Some College	$\beta_{10}$	-0.195	*	0.102	-1.93
D Married	$\beta_{11}$	0.107		0.089	1.20
D year1999	$\beta_{12}$	-1.497		1.120	-1.34
(Log income(t-1) )*( D year1999 )	$\beta_{13}$	0.172		0.122	1.41
(Log wealth(t-1) )*( D year1999 )	$\beta_{14}$	-0.014		0.041	-0.33
(age $\leq$ 40 )*( D year1999 )	$\beta_{15}$	-0.307	*	0.166	-1.85
(40 < age $\leq$ 64 )*( D year1999 )	$\beta_{16}$	-0.274	*	0.161	-1.70
(D White )*( D year1999 )	$\beta_{17}$	0.125		0.212	0.59
(D Other )*( D year1999 )	$\beta_{18}$	-0.321		0.377	-0.85
(D No High School Degree )*( D year1999 )	$\beta_{19}$	-0.103		0.165	-0.63
(D High School Degree )*( D year1999 )	$\beta_{20}$	-0.050		0.129	-0.39
(D Some College )*( D year1999 )	$\beta_{21}$	-0.093		0.140	-0.66
(D Married )*( D year1999 )	$\beta_{22}$	-0.049		0.119	-0.41
Tests					
$\beta_{12} = 0$	$\chi^2(1)$	1.787			
$\beta_{13} = \beta_{14} = 0$	$\chi^2(1)$	2.180			
$\beta_{12} = \beta_{13} = \beta_{14} = 0$	$\chi^2(1)$	1.736			
$\beta_{14} - -\beta_{22} = 0$	$\chi^2(1)$	2.300			
Correlation					
Correlation par.	$\rho$	0.05			
Summary statistics					
N		3,645			
Loglikelihood		-1,779			

Sample: SRC, New stockholders( those who report owning stocks at time  $t$  but did not have equities 5 years ago)

Dependent variable:  $S_t$  is 1 if the household reports owning stocks at  $t$  and 0 if it does not hold equities.

a)  $(t - 1)$  corresponds to 1989 for 1994 sample and to 1994 for 1999 sample

b) Wealth and income variables expressed in 2001 dollars

Table 5: Ordered logistic regression of change in equity holdings

	Estimate		StdErr	$\chi^2$
Intercept 1	-10.546	***	1.335	62.45
Intercept 2	-6.222	***	1.289	23.32
Mortgage pmt down b/w 1994 and 1999	0.306	*	0.163	3.51
Log( Total Fam Income)	0.372	***	0.121	9.53
Log( Total Wealth)	0.272	***	0.074	13.46
age <= 40	1.325	***	0.331	16.01
40 < age <= 64	0.847	***	0.285	8.86
D White	0.489	**	0.193	6.43
D Other	0.128		0.515	0.06
D No High School Degree	0.076		0.262	0.09
D Some College	0.319	*	0.194	2.71
D College Degree or more	0.702	***	0.188	13.91
Marital status the same 94-99	0.834	**	0.374	4.97
Summary statistics:				
N	930			
Likelihood Ratio:				
$\chi^2$	135.3			
DF	11			
P-value	0			

Sample: PSID sample of homeowners who lived in the same house from 1994 to 1999 and had mortgage during the period

Dependent variable: whether bought(1), did nothing (0), or sold (-1) some stocks during the 1994-1999 period.

a) Wealth and income variables expressed in 2001 dollars

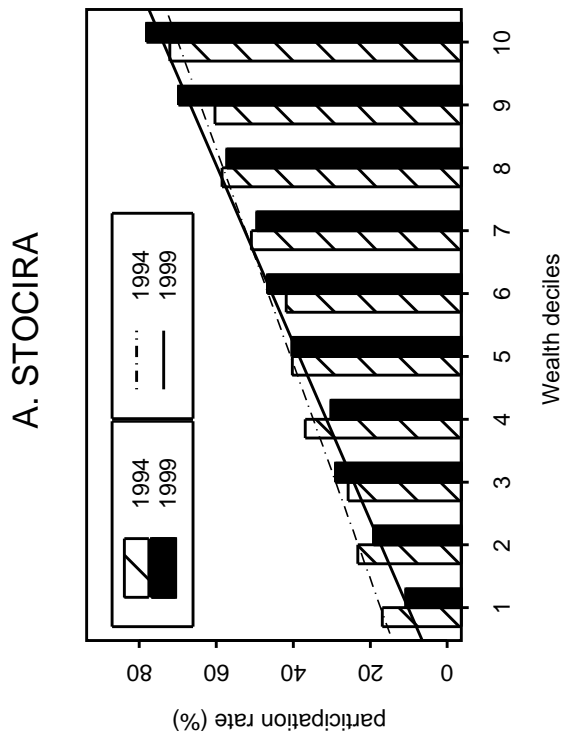
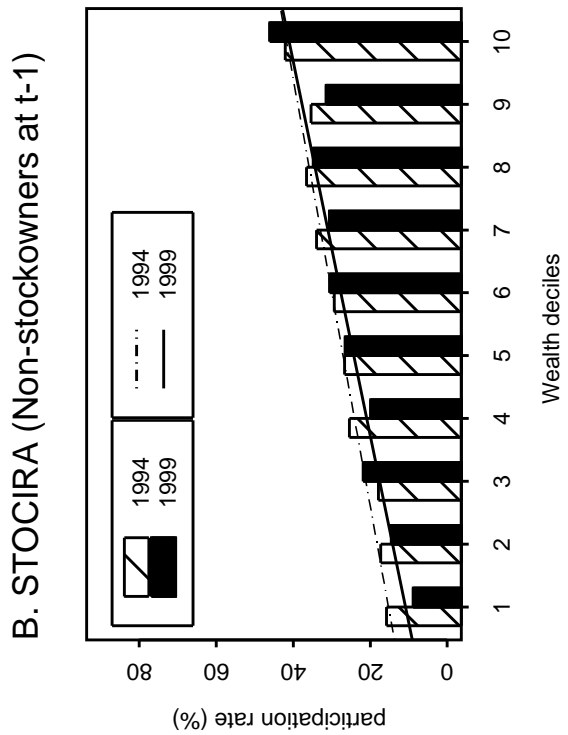
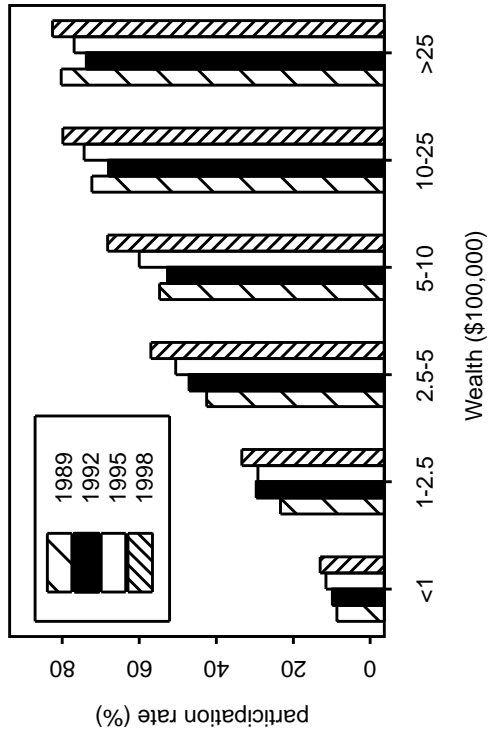
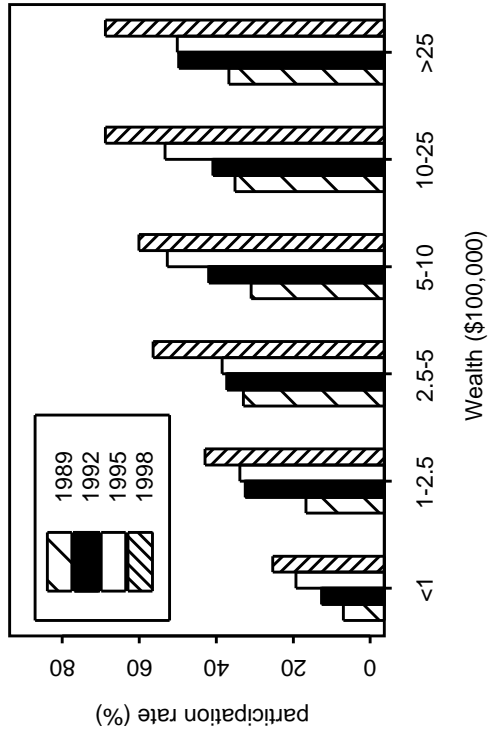


Figure 1: Stock market participation rates by wealth deciles (PSID)

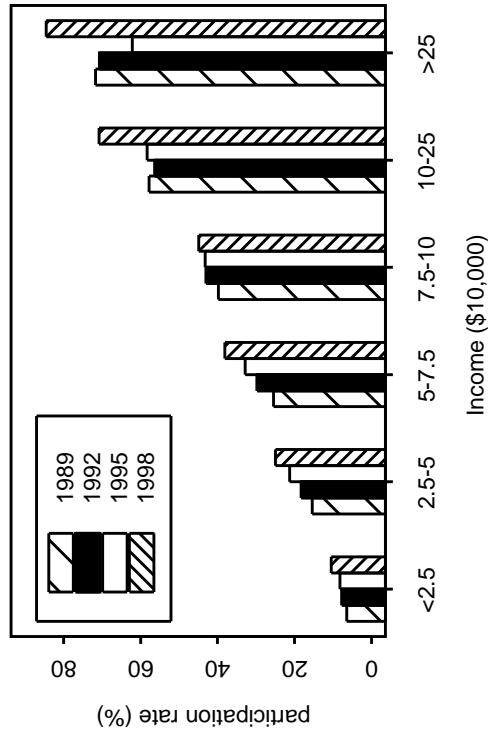
**A. Direct and Through Mutual Funds**



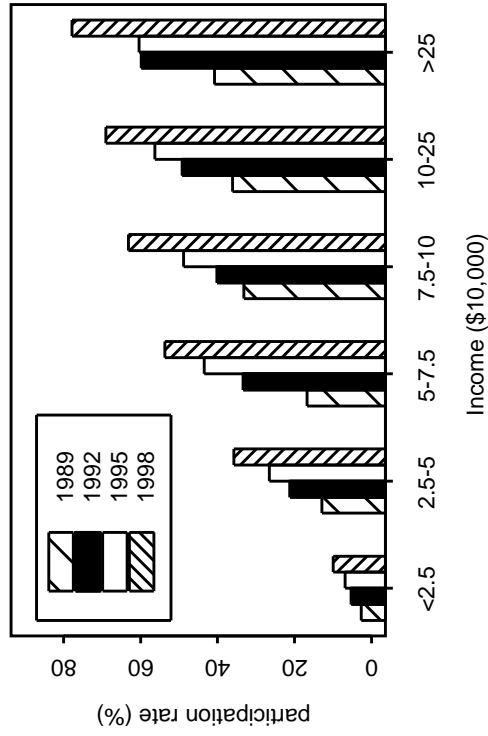
**B. Retirement Plans**



**C. Direct and Through Mutual Funds**



**D. Retirement Plans**



**Figure 2: Stock market participation rates by income and wealth deciles (SCF)**