University of Michigan Retirement Research Center

Working Paper

WP 2003-056

Labor Supply Flexibility and Portfolio Choice: An Empirical Analysis

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Project #: UM03-09

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June 2003

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Acknowledgements

This work was supported by a grant from the Social Security Administration through the Michigan Retirement Research Center (Grant # 10-P-98358-5). The opinions and conclusions are solely those of the authors and should not be considered as representing the opinions or policy of the Social Security Administration or any agency of the Federal Government.

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Abstract

This paper uses panel data from the Health and Retirement Study to estimate the relationship between measures of labor supply flexibility and portfolio-choice decisions by utility-maximizing individuals. Seminal research on portfolio decisions over the life-cycle, and recent research on stochastic dynamic programming models with endogenous labor supply and savings decisions suggest that, other things equal, individuals with more labor supply flexibility are likely to invest more in risky assets, regardless of their age, because of the insurance component that flexible labor supply provides. After controlling for panel sample selection and unobserved heterogeneity I find that labor supply flexibility leads to holding between 12% and 14% more wealth in stocks.

Authors' Acknowledgements

I am grateful to Sofia Cheidvasser, Thomas Knaus, Lorenzo Forni, Michael Hurd, Arie Kapteyn, Deb Dwyer, Mark Montgomery, Kevin Austin, Joseph Tracy, Bart Hobijn, Katja Seim, Caroline Austin, and Anna Vellv´e-Torras for their comments, and the participants of the RAND Aging Workshop, the University of Colorado at Boulder Seminar Series, the North American Meetings of the Econometric Society at UCLA, the 2002 Meetings of the Society for Economic Dynamics at NYU, the SOLE 2001 Meetings in Austin, and the Yale Summer Microeconomics Seminars, for insightful discussions. Frank Heiland, Wayne-Roy Gayle, and Huan Ni provided superb research assistance. I am also grateful for the financial support of the TIAA-CREF Institute (2002-2003) and the Michigan Retirement Research Center (UM03-09). The Cowles Foundation for Research in Economics through a Carl Arvid Anderson Dissertation Fellowship, and the John Perry Miller Fund supported me during the early stages of this project. I also want to thank the Department of Economics at Universitat Aut`onoma de Barcelona, and the Economics Department at the University of Maryland for their hospitality during the Summer of 2002. I bear sole responsibility for any remaining errors.

1 Introduction

In this paper I empirically analyze the relationship between measures of labor supply flexibility and portfolio-choice decisions by utility-maximizing individuals using panel data from the Health and Retirement Study (HRS). Once I control for unobserved heterogeneity and selection into the panel, I find that individuals with labor supply flexibility hold on average between 12% and 14% more wealth in the form of stocks in their portfolios. The selection into the market for stocks is of independent interest but also a key ingredient of the overall analysis. This is one of the first empirical studies that follows the work of Nijman and Verbeek (1992), Verbeek and Nijman (1992), Vella (1998), Vella and Verbeek (1999), and the recommendations in Jensen, Rosholm and Verner (2001) to control for sample selection in panel data models. I find that the additional computational burden of estimating these more sophisticated specifications is justified by the results that show that selection into the market for stocks has an individual specific component (which reflects stock ownership differences across individuals) which positively affects stock holdings, but also an idiosyncratic component (which reflects the stock ownership differences over time for a given individual) which negatively affects stock holdings. Traditional cross-sectional based selection models seem to only capture the latter.

The connection between labor supply flexibility and portfolio choice has been largely overlooked by labor and financial economists. The labor literature has focused its attention on participation decisions and on consumption/saving behavior, and only seldom has modeled both together. On the finance side, labor income has been acknowledged as an important source of balances, and sometimes even included in the models, but labor supply has almost always been taken as exogenous.[1] One possible reason for the lack of attention on this issue is the absence of models that show the importance of this connection. Without theoretical models to guide researchers, empirical work on the issue has also been limited.

However, it is difficult to ignore the interactions between these two issues. Most individuals would acknowledge a relationship between the amount of work they decide to do and their financial wealth and its evolution. It is logical to think of labor income as a type of insurance against bad investment outcomes, and it is also reasonable to believe that labor flexibility ex-post can have an effect in the investment decisions ex-ante. At the end of the day whether there is a relationship between labor supply flexibility and portfolio allocation becomes an empirical question, but before I test this relationship it makes sense to mention some models that have emphasized this connection.

Bodie and Samuelson (1989) and Bodie, Merton, and Samuelson (1992) make the connection using numerical examples using a two period model and also the continuous time portfolio theory popularized

[1] See Killingsworth (1983) for a classical treatment of labor supply models, Heckman (1974) for a model of consumption/saving with endogenous labor supply, and Merton (1990) for an overview of models of portfolio allocation.

by Merton (1969, 1990). They show that if labor supply flexibility is allowed in a continuous-time life cycle model of consumption/saving and leisure choices, the holdings of risky assets would be positively affected. In other words, individuals with more labor supply flexibility are predicted to hold more risky assets. Their models emphasize the importance of considering human capital along with traditional financial wealth as part of an individual's portfolio. The authors, in an illuminating concluding section, conjecture that the relationship between labor supply flexibility and holdings of risky assets is likely to be positive in an empirical study that could adequately measure the relevant variables in the model.

More recently, a number of studies have approached the problem of solving a stochastic dynamic life-cycle model of consumption-saving allowing for endogenous choices of labor supply.[2] Among these studies, Benítez-Silva (2002) also endogenizes the annuity decision over the life cycle. His results show that when labor supply is endogenous individuals prefer to invest more in the risky asset than in the less risky annuity. He relaxes several assumptions made in the continuous-time framework, allowing for lifetime and capital uncertainty, bequests, non-separability between consumption and leisure in the utility function, endogenous retirement, and the presence of Social Security.[3]

My research complements the empirical efforts to disentangle what has been called the "equity premium puzzle at the micro level," the question as to why individuals' portfolios are relatively low on risky assets.[4] The puzzle at the macro level has received an impressive amount of attention. The task of explaining the large gap between the historical returns of risky and riskless assets has been a much more challenging enterprise than anyone could have expected, and as Kocherlakota (1996) explains, it shows the large gaps in our understanding of the macroeconomy.[5] The microeconomic side of the puzzle also brings home our difficulties in explaining the behavior of economic agents without resorting to implausible assumptions or the substantial modification of theories widely believed to be supported by microeconomic and macroeconomic empirical evidence.[6]

Many explanations have been put forth to understand why individuals do not hold risky assets or they hold small amounts of them on average. A relatively new literature has focused on the presence of uninsurable (labor) income risk and it presents a precautionary argument to justify the low holdings of risky

[2] See for example Flodén (1998), Low (1998, and 1999), French (2000), Rust, Buchinsky, and Benítez-Silva (2002), and Benítez-Silva (2002).

[3] This model complements and extends the work of Yaari (1965), Friedman and Warshawsky (1990), and Mitchell et al. (1999).

[4] The proportion of stocks on the average portfolio of American households has increased from around 5% to almost 12% during the 1990s, but researchers have mostly blamed the impressive returns on stocks (more than twice the historical average) that investors enjoyed during the last decade. See Tracy and Schneider (2001) for an overview. See Guiso, Haliassos, and Jappelli (2002) for an up-to-date overview of research on household portfolios.

[5] See also Cochrane (1997) for an interesting presentation of the facts and theories.

[6] Campbell et al. (2001) also emphasize the importance of understanding the microeconomic problem. They solve an infinite horizon portfolio choice problem with a time-varying equity premium. In their model labor supply does not play any role and there is no risky labor income.

assets. Koo (1999), in a finite horizon discrete time setting, shows that liquidity constraints and uninsurable income risk reduce consumption and investment in the risky asset. Heaton and Lucas (2000a) calibrate a infinitely-lived agent dynamic portfolio choice model where background risk is shown to have an effect on portfolio allocations, and Campbell and Cocco (2002) solve a finite horizon model that allows for risky labor income and borrowing constraints, in order to analyze the optimal mortgage choice. In all these models labor supply does not play any role.[7] On the empirical side, most studies find some support for this argument, but the evidence seems to be weak. For example, Guiso et al. (1996), using Italian data, find some evidence to support the conjecture that higher labor income risk is associated with lower holdings of risky assets, Arrondel (2000) using French data finds weak support for the importance of labor income risk, and Hochguertel (2003) and Alessie, Hochguertel, and van Soest (2002) using panel data from the Netherlands find that after controlling for unobserved heterogeneity, the link between labor income risk and the holdings of risky assets is very weak.

Other authors have emphasized other explanations: Vissing-Jorgenson (1999), and Bertaut and Starr-McCluer (2002) point out the importance of transaction and participation costs, and Lusardi (1999) focuses on the importance of information costs. Yet others, like Fratantoni (1998), using the Survey of Consumer Finances, and Robst et al. (1999) using the PSID, introduce the issue of housing, given that it can be considered a risky investment, affected by labor income uncertainty, and that affects the holding of other potentially risky assets. On the other hand, Heaton and Lucas (2000b) have presented evidence that among self-employed individuals exposure to entrepreneurial risk can be associated with lower holdings of risky assets. Less formally, some of these authors have suggested that habits and procrastination can also be part of the story.

The research presented here is further connected with a recent literature, and even a popular debate, that tries to understand the labor supply responses to the up and downs of the financial markets. Coronado and Perozek (2001) and Hurd and Reti (2001) analyze this connection, but due to lack of data on the downturn the evidence is mixed. My results can be interpreted as suggesting that if flexibility affects portfolio decisions it should not be surprising to observe some portion of the population exercising that flexibility if the (negative) results of the financial markets forced them to.

My research complements all this literature building upon the strong theoretical predictions of structural models that endogenize the investment decision, the consumption decision, and the labor supply decision of agents. Whether labor supply flexibility has an effect on portfolio choice is an empirical question, and a very important one. This is especially true among populations, like the one I am analyzing, that hold a large

[7] Svensson (1988), and Svensson and Werner (1993) solve the portfolio problem in a continuous time model with exogenous stochastic income from non-traded assets, for example wages. Davis and Willen (2000) provide empirical estimates of the correlation between labor income and investment innovations.

amount of the economy's assets, and among which labor supply flexibility is an important consideration in all labor force related decisions.

In order to study this issue I use the HRS. This panel data set of older Americans provides good measures of individuals' portfolio allocations, as well as excellent direct measures of labor supply flexibility, such as indicators of the possibility of increasing or decreasing hours of work in the current job, or whether individuals already hold second jobs.[8]

A potential problem in using the HRS is that this data set was devised to analyze the behavior of older individuals as they move into retirement. Although the predictions from the theoretical models are independent of age, Bodie, Merton, and Samuelson (1992) emphasize the role of age in their theoretical model, stating that the relationship between labor supply flexibility and portfolio allocation is likely to be much weaker among older individuals. In that spirit, our results can be considered lower bounds for the influence of flexibility measures on the holdings of risky assets by individuals.[9]

The main result of the paper shows that individuals who have access to more flexibility in their jobs are predicted to hold around 14% more risky assets than otherwise identical individuals, and those that have used up their flexibility are predicted to hold 23% less wealth in stocks, confirming the qualitative predictions of the dynamic models of consumption and leisure choices. These findings are obtained in a model that controls for the selection bias caused by the asset ownership decision, and for unobserved heterogeneity using the panel structure of the survey. Selection is a key component of the analysis. I contribute to the literature by being one of the first empirical studies to show the advantages of using Two-Step panel data selection models.

In the next section I present the data used for the empirical tests, and show some cross-tabulations of the main variables and samples of interest. Section 3 presents the econometric models I use to analyze the empirical relationship between holdings of risky assets and labor supply flexibility. Section 4 provides the empirical results, and section 5 concludes.

[8] Hurd (2002) studies the portfolio holdings of the very old, using the AHEAD data set. He focuses on asset ownership, and transitions between ownership states.

[9] It is also true, as the authors also acknowledge, that if wages become less risky over time (something very reasonable) it is perfectly possible that we would observe increasing risk taking over the life cycle. In fact, Poterba and Samwick (1997) find, using the Survey of Consumer Finances, that older households are more likely to hold corporate stock. Ameriks and Zeldes (2001) using the same data set, and also administrative panel data from TIAA-CREF find that, if anything, age has a positive effect on stock holdings. However, both sets of authors emphasize the differences across cohorts, which I cannot take into account with the data I am using.

2 Data and Summary Statistics

The data I use in this research is from the Health and Retirement Study, a nationally representative longitudinal survey of 7,700 households headed by an individual aged 51 to 61 as of the first round of interviews in 1992-93. The primary purpose of the HRS is to study the labor force transitions between work and retirement with particular emphasis on sources of retirement income and health care needs. It is a survey conducted by the Survey Research Center (SRC) at the University of Michigan and funded by the National Institute on Aging.[10] Up to now data from the first five waves of the survey are available. The last four waves of the data were conducted by phone using the computer assisted technology (CATI) which allows for much better control of the skip patterns and reduces recall errors.

Death and attrition have reduced the number of participants in the survey. This can create some selectivity issues that I will mention later on. Additional individuals, who have been included, have entered the survey later on mainly as spouses of previous respondents. The data for the respondents is being merged from wave 5 backward to waves 4, 3, 2 and 1, and I construct a set of consistent variables on different sources of income, financial and non-financial wealth, health, socio-economic characteristics, labor supply, and labor supply flexibility, that will be assigned to each decision maker appropriately. In the empirical work I use all available waves of the HRS.

Bodie and Samuelson (1989), and Bodie, Merton, and Samuelson (1992) conjecture that a possible good measure of flexibility could be the individual's occupation. However, using occupation as a regressor to explain asset holdings is likely to be subject to severe endogeneity problems, given that individuals optimally choose their occupation, and those more likely to choose occupations that offer more flexibility are likely to make portfolio decisions very differently, leading to a spurious correlation between occupations and risky asset holdings. They also conjecture that marital status could be a good measure, since the holdings at the household level can be affected by the flexibility given by the possibility of having two income earners in the household. I will test for the use of the latter variable, and instead of using occupational measures, I choose to use more direct questions regarding flexibility, which are less likely to be the object of endogeneity problems.

Direct labor supply flexibility questions were only asked to those working for someone else at the time of the interview. This, however, might not represent a big weakness of our analysis, after all self-employed individuals have, at least potentially, access to a lot of labor supply flexibility. I also believe that those not working are probably not the best sample to use if we are to test for an effect regarding flexibility on the job. In any case, one of the sub-samples that I will use to test the hypothesis of a positive effect of labor supply

[10] See Juster and Suzman (1995), also Gustman, Mitchell and Steinmeier (1994, and 1995) or the HRS web page.

flexibility on the holdings of risky assets includes those self-employed, and controls for them. This strategy is obviously not free of potentially important endogeneity problems, and I will consider it a weak test of the hypothesis of interest. Even among those employed by someone else, I will construct a sub-sample of respondents that consider themselves as the financially knowledgeable person of the interviewed household. I proceed in such a way because the reported amounts of financial (risky) assets are not individual specific but for the household, therefore having both members of a given household in the sample can create problems in the estimation of the models. Also, it is necessary to control for the household's position on the wealth distribution, given its strong correlation with the holdings of risky assets, as shown, for example, in Tracy and Schneider (2001).

It is important at this point to be more precise in describing the main variables of interest in our analysis. The labor supply flexibility variables are dummies that take the value one if the respondent can change the amount of hours he or she works in the regular work schedule, and zero otherwise. The definition that I choose to focus on takes the value one if the respondent reported that he or she can *increase* the number of hours in the regular work schedule, and zero otherwise.[11] I also create several other dummies that take the value one if the person can *decrease* hours of work, or if the person can only *decrease*, or *increase* the hours of work.

Another potentially interesting variable regards multiple job holding. The ideal variable would identify those individuals that can potentially hold a second job without losing their current job. However, the only available variable reports whether someone was holding a second job at that time. But holding a second job at the present time can be considered a measure of lack of flexibility; if you already have a second job you are committed to a very high number of working hours, and it is relatively difficult to increase or decrease them. More importantly, those that choose to work a second job are probably a very different population that are likely to invest very differently (probably much less) in the financial market.

Regarding the variables representing financial assets, there are five potentially useful variables. Individuals report the amount of money they have invested in stocks, bonds (corporate, municipal, foreign), treasury bills and U.S. Bonds, real estate, individual retirement accounts, and other saving instruments. Stocks represent the market value of all stock in publicly held corporations, mutual funds, or investment trusts, not held in retirement accounts. Bonds represent the market value of the sum of all those types of bonds. Treasury bills include T-bills, certificates of deposit, and government savings bonds. Real estate include land, rental real estate, a partnership, or money owed to the respondent on a land contract or mortgage, and exclude the main home and second home of the respondent. Individuals' retirement accounts are

[11] Given the evidence from Coronado and Perozek (2001), and Hurd and Reti (2001) that labor supply did not strongly respond to the upturn, meaning that they did not use the flexibility to reduce hours of work, this seems like an appropriate choice.

recorded at their current values. Finally, other savings are a default category for any other investments not recorded in the previous categories. I construct three variables out of these different categories. The first one only includes stocks. The second adds bonds, and the third adds real estate to those two. I choose not to focus on other savings and individual retirement accounts, due to the absence of consistent information across waves regarding the type and breakdown of the value of assets held in those investments.[12]

One of the most serious drawbacks of these calculations is that we cannot assess how risky these different financial assets are. Within each category assets with different risk properties are added together, and then in some cases I total categories that again can have very different risk characteristics. This is not a drawback specific to the HRS, just about any survey that tries to measure wealth and especially financial wealth, would run into this problem. Considering all this, I have decided to consider our right hand side variable(s) as the sum of these financial assets, and try to explain the variation in the holdings of these assets.

Summary Statistics

Using all available waves of the HRS, and exploratory descriptive statistics, we can observe in Table 1, panels A and B, that self-employed individuals represent a very different sample of individuals from the full sample of workers. They are more likely to be married, males, and more educated. They have more income, a lot more net wealth, non-risky wealth (which here and in the estimations includes only vehicles, checking accounts and savings accounts), and much more invested in risky assets. One interesting question that arises at this time is how I can control among this population for whether the individual is more or less invested in his or her business. One possibility is to use the response to the question as to whether the person pays himself or herself a salary. One conjecture would be that those that pay themselves salaries are less invested in their businesses (maybe because they have joint partnerships), and therefore invest more on risky assets. Most self-employed respondents do not pay themselves a salary.

If in Table 1 we concentrate on those that answered the labor supply flexibility questions, that is, those that work for someone else, around a third of them have flexibility to increase their hours of work in their current job, and essentially the same proportion can decrease their hours of work, and around 11% holds a second job. More than half of them can be considered hourly workers, and more than 80% of them have health insurance through their employers.

From Tables 1 and 2, comparing stock owners with those that do not own stocks (either among all employed individuals or only among employees) reveals marked differences along just about every dimension. Stock owners are more likely to be white, male, married, and more educated. They also have higher earnings, non-risky wealth, are less likely to be hourly workers, have more flexible labor supply, and self-report themselves to be in better health.

[12] Ameriks and Zeldes (2001) analyze portfolio holdings over the life-cycle using administrative data from retirement accounts.

The sub-population that holds second jobs at the time of the interview has comparatively lower levels of risky assets. This seems to support the conjecture that holding a second job can be considered a measure of lack of flexibility, and probably correlated with unobservables (financial problems that force the individual to search for a second job) that if anything reduce the likelihood of holding risky assets. This last observation is supported by the fact that this sub-group is substantially more educated than any other group (except for stock-owners), a characteristic, that other things equal, I would expect to have a positive effect on holdings of risky assets.

Finally, in Table 2 the sub-population that can increase their hours of work holds substantially more risky assets. These individuals are more likely to be white, male, and married. They worked a bit less in the year before the interview, but earned more than the full sample of financially knowledgeable employees. They also self-report themselves to be in better health.

The conclusions from this exploratory analysis is that stock-owners are a very different sample, and the ownership decision, which selects our sample, deserves separate analysis. There is some evidence of a positive effect of labor supply flexibility, and a negative effect of holding a second job, but the unconditional differences in observables dominate the analysis at this stage.

3 Cross-Section and Panel Data Models

Using the data presented in the previous section the empirical problem is to find whether there is a statistically significant relationship between labor supply flexibility and the asset allocation decisions of the individuals in our sample. The dynamic models I discussed in the introduction indicate that more labor supply flexibility should translate into more investments in risky assets.

To satisfactorily answer this question a number of econometric questions need to be tackled. First of all, we want to appropriately control for observed heterogeneity. This is not a trivial task since omitted variable biases can be an important problem regarding portfolio allocations. For example, an important issue in this research is to control for the position of individuals in the wealth distribution, but we want to accomplish this without including as independent variables (possibly) endogenous measures of the dependent variable.

Second, and probably more important, sample selection issues are potentially very problematic. I am interested both in understanding financial the ownership and the distribution of financial assets. But we have to take into account that to estimate the latter we have to do it conditional on ownership and this can bias the coefficients as if we were incurring a specification error (Heckman 1979). It is not very difficult to control for this selection problem in cross-sections, but it becomes a more involved problem in panel data models, as is the case in my sample. In fact few empirical applications tackle this issue appropriately.

Third, we want to take into account the unobserved heterogeneity potentially present in our characteriza-

tion of the econometric model. If we do not control for the unobserved components we will be confounding partial and total effects of our variables of interest. Panel data sets allows us to model explicitly how those unobserved components enter the econometric specification, and we can choose to include them as a fix effect or as a random variable, and test the different specifications. Notice, however, that the panel data structure complicates the sample selection and the attrition problems. Appropriately controlling for these biases in the panel models presents the researcher with interesting methodological challenges. I will not directly account for attrition biases in the estimations, but the use of a panel data selection correction model will ameliorate this problem.

Once we have decided which variable to use as the dependent variable (I will use total net investments in stocks), and which indicator of flexibility we want to use as the main independent variable of interest (I will use an indicator of whether individuals can increase their hours of work in their jobs), we can start by estimating in a given cross-section or the pooled sample of observations (controlling for clustering, see Deaton 1997) the following model

$$\ln A_i = \alpha_1 + X_i'\beta + u_{1i}, \tag{1}$$

and

$$AO_i = \alpha_2 + Z_i'\gamma + u_{2i}, \tag{2}$$

where in (1) the set of individual characteristics X_i consists of various socio-economic and demographic variables, and other variables I will describe below, one or more labor supply flexibility indicators, and A_i represents a measure of the risky asset(s) currently held by the individual. In (2) AO_i is an indicator of whether the individual owns a risky asset(s), and u_{1i} and u_{2i} are not independent, and where Z_i can be equal to X_i but will be larger in the empirical application, which will help in identifying the model. In this setting the selection rule is potentially not independent of the behavioral function being estimated. However, I argue, following Blundell and Meghir (1987, p. 180-181), and Maddala (1988, p. 286), that the Tobit characterization, which is a common alternative to this set up, is not the preferred framework to estimate this type of model since it does not seem appropriate to assume that the selection rule, the probability of owning the asset, and the process that leads to own more or less stocks (or other financial assets) are the same. Also, we cannot forget that the lack of observability of all the values of the dependent variable in the main equation is the result of a choice by individuals, not the result of censoring. The empirical results will make clear that this more general structure of the problem provides for a better understanding of the underlying decisions of individuals.

It is fairly straightforward to estimate the full model by Maximum Likelihood or by standard Two-Step procedures. It is important to emphasize that the study of financial asset ownership is important on its own, and the HRS allows us to perform both a cross-section and a panel data analysis of this issue to complement

the study of the levels of the portfolios of risky assets in the HRS sample.

The HRS provides us with repeated observations of the same individuals. This allows us to control for potential unobserved components that could enter our econometric model. Our main equation of interest can now be written as

$$\ln A_{it} = \alpha_1 + X_{it}'\beta_1 + \mu_i + \nu_{it}, \tag{3}$$

where μ_i represents the unobserved heterogeneity component, and the ν_{it} are the idiosyncratic disturbances. This model can be estimated assuming either no correlation between observed explanatory variables and the unobserved effect (random effects), or allowing for arbitrary correlation between the unobserved effect and the observed explanatory variables (fixed effects). We can then test whether the random effects specification or the fixed effect specification is more appropriate, and whether the former is more appropriate than the pooled OLS regression.[13]

We have, therefore, an unbalanced panel of respondents, and individuals are selected into the sample, and non-randomly drop from the panel of individuals that own financial assets. One possibility to take this selection problem into account is to simply extend the classic Heckman (1979) sample selection correction approach where the first stage is a probit specification with no individual component and the second stage accounts for the individual component. This is suggested by Hsiao (1986), and it is fairly straightforward, but misses the interesting (and potentially important) issue of selection into the panel. Also, it is tough to justify why there is an individual component in the equation of interest but not in the selection equation.

It is, therefore, natural to think that we can allow both the equation of interest and the selection equation to have individual specific components, on top of the usual error component, which will allow us to take into account unobserved heterogeneity. This will result in obtaining two correction terms, which I will be able to trace back to different reasons for the selection into the sample.[14]

In this case I am especially interested in estimating the effect of a number of time invariant regressors both on the selection equation and the equation of interest, so it can be natural to model the individual components as random effects. Also, following the suggestions of Jensen, Rosholm, and Verner (2001), and the work of Mundlak (1978) and Zabel (1992), it is possible to account for some correlation structure between exogenous variables and unobserved components within the random effects model. On the other hand, Jensen, Rosholm, and Verner (2001) indicate that estimating a fixed effect of the main equation after

[13] See Wooldridge (2002) for an up to date and illuminating presentation of these issues.

[14] There are surprisingly few empirical papers using these techniques, with the exception of the examples in Vella (1998), and the work of D'Addio, De Greef, and Rosholm (2002) who study unemployment traps in Belgium, but choose to estimate the model by Maximum Likelihood, which, although fairly well behaved in Monte Carlo experiments, is comparatively less robust than Two-Step estimators and imposes additional distributional assumptions. A recent edition of an econometric software package, Limdep 8.0, has some code that in principle can estimate this model by Maximum Likelihood. However, after experimenting with it I had problems of convergence, which force me to simplify the correlation structure of the problem, and even under those simplifications some of the problems seem to persist.

the correction can result in better behavior in terms of consistency and efficiency even in the presence of correlation between the exogenous variables and the effects, and with both logistic and normal errors.[15]

The presentation of the model below follows mainly Vella and Verbeek (1999), Jensen, Rosholm, and Verner (2001), and Vella (1998), and in part Verbeek and Nijman (1992), and Nijman and Verbeek (1992, 1996). Miniaci and Weber (2002) also provide a nice characterization of some of these issues in portfolio analysis.

Consider the equation of interest (3) where the usual error component structure is considered where

$$\mu_i \sim iid(0,\sigma_\mu^2),\ and\ \ \nu_{it} \sim IIN(0,\sigma_\nu^2).$$

The selection equation can be written

$$AO_{it} = \alpha_2 + Z_{it}^{'}\gamma + \varepsilon_i + \eta_{it}, \tag{4}$$

where ε_i and $\eta_{i,t}$ are independent of each other and also of X_{it}, and we have

$$\varepsilon_i \sim IIN(0,\sigma_\varepsilon^2),\ and\ \ \eta_{it} \sim IIN(0,\sigma_\eta^2).$$

This structures allows us to consider the case where the individual effects in both equations are correlated, and that is also true of the two error terms. So I can write

$$\begin{array}{l} cov(\varepsilon_i,\mu_i) = \sigma_{\varepsilon\mu} \\ cov(\eta_{it},\nu_{it}) = \sigma_{\eta\nu} \end{array}.$$

In a Two-Step procedure I will be estimating these covariances once I construct the appropriate correction terms. The selection correction terms correspond to:

$$E\{\mu_i|\bar{AO}_i\} = \sigma_{\varepsilon\mu}A_1,$$

$$E\{\nu_{it}|\bar{AO}_i\} = \sigma_{\eta\nu}A_2.$$

It is possible to write separate expressions for A_1 and A_2, but I can also follow Vella and Verbeek (1999) to write from (3)

$$\alpha_{it} = \mu_i + \nu_{it},$$

and from (4)

$$\upsilon_{it} = \varepsilon_i + \eta_{it},$$

[15] See Dustmann and Rochina-Barrachina (2000) for an empirical comparison of models where the selection equation is assumed to have fixed effects. See also Kyriazidou (1997), and Kyriazidou (2001). Jensen, Rosholm, and Verner (2001) find that the latter approaches behave less robustly than the one followed in this paper.

and υ_i is the T vector of υ_{it}'s

$$\upsilon_i | X_i \sim NID(0, \sigma_\varepsilon^2 \upsilon' + \sigma_\eta^2 I),$$

$$E\{\alpha_{it} | X_i, \upsilon_i\} = \tau_1 \upsilon_{it} + \tau_2 \bar{\upsilon}_i, \tag{5}$$

$$\bar{\upsilon}_i = T^{-1} \sum_{t=1}^{T} \upsilon_{it} \text{ (individual specific average)}.$$

(5) has the form of the former correction terms, where τ_1 and τ_2 would be the additional parameters to be estimated. Notice that (5) is an assumption that holds for normal distributions.

Now, I want to compute υ_{it}.

$$\begin{aligned} \upsilon_{it} &= E[\varepsilon_i + \eta_{it} | \bar{AO}_i] \\ &= \int [\varepsilon_i + E[\eta_{it} | \bar{AO}_i, \varepsilon_i]] f(\varepsilon_i | \bar{AO}_i) d\varepsilon_i, \end{aligned} \tag{6}$$

where $E[\eta_{it} | \bar{AO}_i, \varepsilon_i]$ is the cross-sectional generalized residual (Gourieroux et al. 1987)

$$E[\eta_{it} | \bar{AO}_i, \varepsilon_i] = \frac{\phi(Z_{it}' \hat{\gamma} + \varepsilon_i)}{\Phi(Z_{it}' \hat{\gamma} + \varepsilon_i)} AO_{it} - \frac{\phi(Z_{it}' \hat{\gamma} + \varepsilon_i)}{1 - \Phi(Z_{it}' \hat{\gamma} + \varepsilon_i)} (1 - AO_{it}). \tag{7}$$

And

$$f(\varepsilon_i | \bar{AO}_i) = \frac{f(AO_{it}, \varepsilon_i | Z_{it})}{f(AO_{it} | Z_{it})}, \tag{8}$$

is the density of ε_i given selection and where the denominator is the likelihood contribution in the Random Effects Probit for an individual:

$$f(AO_{it} | Z_{it}) = \int f(AO_{it} | Z_{it}, \varepsilon_i) f(\varepsilon_i) d\varepsilon_i,$$

and

$$f(AO_{it}, \varepsilon_i | Z_{it}) = f(AO_{it} | Z_{it}, \varepsilon_i) f(\varepsilon_i),$$

here the likelihood contribution in the cross-sectional case is:

$$f(AO_{it} | Z_{it}, \varepsilon_i) = \Pi_{t=1}^{T} f(AO_{it} | Z_{it}, \varepsilon_i),$$

Once I obtain υ_{it}, I compute the individual specific average $\bar{\upsilon}_i$ and estimate

$$\ln A_{it} = \alpha_1 + X_{it}' \beta_1 + \upsilon_{it} \theta_1 + \bar{\upsilon}_i \theta_2 + u_i, \tag{9}$$

by OLS or Random Effects, depending on whether we think u_i, an additional individual component which is uncorrelated with the individual component in the selection equation, should be added.[16]

Notice that estimating (7) is fairly straightforward, and then to estimate (8) I only need to integrate out the distribution of the unobserved component and can follow the arguments in Hewett and Montgomery (2003) that present a related problem as an application of Bayes Rule. After that, only a one dimensional integral is needed to calculate (6) to obtain the correction terms.[17]

Finally, as I mentioned above, and as Jensen, Rosholm, and Verner (2001) emphasize, including in (4) the individual specific averages over time of the exogenous variables as additional regressors we provide a correction for the possible correlation between the exogenous variables and the individual effects. There is no guarantee that this will work in a non-linear estimation problem, but the Monte Carlo results of the authors above suggest that it can improve the consistency and the efficiency of the Two-Step estimator.

4 Empirical Results

In this section I present the results of several types of models. First, I estimate equation (1) by OLS using the pooled sample of individuals that own stocks. Second, I use Heckman (1979) Two-Step selectivity correction technique to incorporate equation (2) into the estimation. Third, I estimate panel data sample selection models, (3) and (4), and (9), allowing for unobserved heterogeneity.

I estimate these models for two different sub-samples. The first sub-sample includes both self-employed and employed individuals, the second sample only includes those working for someone else. The latter sample is the one that incorporates the flexibility indicator and where I ultimately test whether labor supply flexibility, as I define it, matters. As part of the process I also estimate for both sub-samples cross-section and panel data binary choice models of the ownership indicator.

A non-trivial task in the empirical work has been to decide the right combination of observed controls. I have followed the literature that analyzes risky assets ownership and levels, but I encountered several problematic decisions. For example, deciding how to control for socio-economic status is complex. Income and wealth are the obvious candidates, but the latter has to be handled with extreme care since we do not want to include proxies for our dependent variable among our regressors. This is why I construct a series of indicators of wealth that do not include any assets that could be considered risky. Also, on top of the traditional demographic controls, I include self-reported health measures, which seem to have a significant

[16] Notice that if there is no individual component in the selection equation then (6) reduces to the Inverse Mills' ratio in Heckman (1979), assuming, as I have done above, that the individual component of the main equation is either absent or uncorrelated with the idiosyncratic component of the selection equation.

[17] I have estimated the Random Effects Probit model and constructed the correction terms using Fortran 90. Special thanks to Mark Montgomery for his help with the code.

effect on ownership but little on the level of asset holdings.[18] I also include a variable that takes the value one if the person plans to work full-time by age 62. This variable has been shown to have considerable predictive power in other contexts, and as we will see, also plays a significant role in our estimations. Finally, I also include an indicator of whether the individual is an hourly worker.

4.1 Self-employed and employees sub-sample

Table 3 provides pooled cross-sectional and panel regression estimates of (1) and (3), where the dependent variable is the logarithm of the value of stocks in the portfolio, using the sub-sample of employed and self-employed individuals that are also the financially knowledgeable persons in their households. As I explained in Section 2, flexibility measures are not available for all these individuals, and in this case the main proxies for flexibility are dummies that take the value 1 if the person is self-employed and receiving a wage or self-employed and receiving profits, and zero otherwise. The hypothesis is that self-employed individuals receiving a wage would invest more in risky assets since they have flexibility but are likely to be less invested in their businesses. Those that pay themselves a profit are likely to be more invested in the business, and in line with the results of Heaton and Lucas (2000b), we would expect a lower exposure to risky assets.

The first column shows the estimation of a standard pooled OLS regression, the second one a fixed effect panel estimation, and the last column provides a random effects panel estimation. The specification tests indicate that the random effects specification is preferred to the OLS, thus the classical one-constant model is soundly rejected. Also the Hausman test rejects the Random Effects in favor of the Fixed effects, however, the fixed effects estimates are noisy, and following the intuition in Wooldridge (2002) I consider the Random Effects our preferred specification. Notice that the identification of the coefficients of the self-employment indicator comes from the variation over time of this coefficient for each cross-sectional unit (individual). This is not very common in this sample, therefore it is not surprising that the Fixed Effects performs poorly. Also the Random Effects specification allows us to estimate the effects of interesting non time-varying characteristics. In the Random Effects specification the estimates indicate that self-employed individuals who receive wages hold higher levels of risky assets after controlling for observed and unobserved heterogeneity, and those that receive profits accumulate less risky assets. However, in all cases the indicators are not significant, suggesting that compared with employed individuals these effects are not strong enough. More encouraging results come from including an indicator of whether the individual already holds a second job. As mentioned earlier this is a proxy for lack of flexibility.[19] In this case the effect is significant, and negative,

[18] Rosen and Wu (2003) focus on the effect of health status on portfolio decisions. Our results are in line with theirs regarding participation in the market of risky assets, but rather different regarding total accumulation. The differences come from the fact that they estimate a pooled Tobit model without a separate characterization of the process of ownership and level of investment.

[19] Holding a second job can also proxy, for example, for limited future earnings power, or lower wage growth expectations, interpretations that are consistent with the results reported throughout the paper.

confirming the hypothesis. We will see later that this is a clear result in all the specifications I report in this paper.

Being white, more educated, and married have positive effects on the amount of risky assets the household owns. Where the married dummy could again be proxying for some labor supply flexibility if we take a household perspective (See Bodie, Merton, and Samuelson 1992), however, this latter indicator is not significant. Individuals in better health are likely to hold more financial assets, interestingly this result will be reversed once we take into account selection, but in all cases the level of significance is very marginal. Another interesting result that seems to be general to all the specifications I have tried, in this and other sub-samples, is that a variable that measures the self-reported probability of working full-time past age 62 is strongly negative correlated with the holdings of risky assets, other things equal. One possible explanation for this result could be that those individuals who expect to work full time past age 62, the Early Retirement Age, are probably those that will need to, due to some bad shock to their wealth or to past income and employment. They simply cannot afford to retire early.[20]

Of course all these results are exposed to selection bias. Therefore, I need to estimate the selection equation and make the appropriate econometric corrections. Table 4 provides estimates of a pooled probit and a Random Effects panel data Probit of the stock ownership indicator.[21] These results show that on top of the variables we used in Table 3, the effect of smoking, which is negative, and moderate drinking, which is positive, and non-risky wealth, also positive, are very significant. Furthermore, individuals without health insurance are much less likely to hold stocks and the same is true of hourly workers. Those in better health are more likely to hold stocks and, rather surprisingly, time indicators for the beginning of the 1990s indicate a higher probability of owning stocks. This last result is quite robust across samples and specifications. My interpretation of this is that although the level of stocks clearly grew strongly during the 1990s (due mainly to the impressive returns of the bull market), other things equal, the same is not necessarily true of ownership among this population. In fact if I include dummies for waves 3 to 5 they are estimated to have negative and significant coefficients. These results are in line with the aggregate results of Tracy, Schneider, and Chan (1999), and Tracy and Schneider (2001).

This first test of the relationship between labor supply flexibility and portfolio choice is, however, mixed. Self-employment is a measure of flexibility but it can also be a measure of many other things that are potentially correlated with financial asset holdings. It seems that endogeneity problems are very difficult to avoid given that is virtually impossible to find an appropriate instrument for the self-employment status. This is true even after controlling for unobserved heterogeneity. However, the second job indicator provides

[20] See Benítez-Silva and Dwyer (2003) for a study of retirement expectations formation using the same data set.

[21] These estimates include as covariates the same variables as in Table 3 plus the variables labeled 2 to 6. Therefore, the correction term(s) will be identified on more than just functional form.

a result in favor of the hypothesis that flexibility matters.

The next step is to take into account the selection process to estimate (3). Table 5 provides four different specifications of the selection corrected results. The first two columns correct the selection bias by estimating (2) in the first stage, and then in the second stage estimate either a OLS or a Random Effects specification. The last two columns estimate (4) in the first stage, and therefore require the inclusion of two additional terms in the estimation of the equation of interest, which can then be estimated by OLS or by Random Effects, depending on whether we think there is an additional individual component uncorrelated with the individual component of the selection equation.[22]

In all cases the selection correction terms are extremely significant suggesting that the unmeasured factors related to the probability of owning stocks are correlated with the unmeasured factors that affect the level of stocks owned by individuals. Even more interesting, it is rather surprising to see in the first two columns of the table that the Inverse Mills' Ratio is actually negative. This means that the unmeasured factors that make an individual more likely to own stocks make them more likely to own less stocks. The reason for this is the skewed distribution of stock holdings, with most individuals owning a relatively small portfolio, and with some others owning literally millions in the stock market.

In clarifying this further it is important to implement the Two-Step estimator for panel data selection that breaks down the selection into two components. Columns three and four show the estimates of the two separate selection terms, υ_{it} and $\overline{\upsilon}_i$. Selection into the market for stocks has an individual specific component, $\overline{\upsilon}_i$ (which reflects stock ownership differences across individuals) which is positive, but an idiosyncratic component, υ_{it} (which reflects the stock ownership differences over time for a given individual) which is negative. This means that if we compare those that own with those that do not own across individuals, the unmeasured factors that make you more likely to own have a positive effect on the level of holdings, but if we compare ownership and non-ownership for a given individual over time the factors that increase the probability of participation actually make you likely to own less stocks. In essence these two terms allow us to separate the effect of being an "opportunistic stock market participant", and the effect of being a "true stock holder". This is the first study to obtain this surprisingly intuitive result regarding participation in the stock market in the 1990s. We will see below that when we concentrate on employees this powerful result is also present.

Looking at the effects of the other variables selection also matters. The only demographic variable that is still significant is having a professional degree, which increases the stock holdings significantly. On the other hand having more non-risky wealth still affects stock holdings in a significant and positive way,

[22] The specifications in columns 2 and 4 are preferred to the ones in columns 1 and 3, respectively, given the results of Breusch-Pagan Lagrange Multiplier tests (not shown). I also estimated the second stage by fixed effects following the suggestions of Jensen, Rosholm, and Verner (2001), the main results were essentially unchanged.

and surprisingly the same is true for those that do not have health insurance. This latter result reverses the findings of the uncorrected regressions, suggesting that once I control for the negative effect that lack of insurance has on participation in the market, those "risk lovers" in terms of health insurance are also more invested in the stock market. Considering the proxies for labor supply flexibility, there is still a mixed picture. The self-employed indicators are not significant, although have the right signs, but the second job indicators is still significant and related to lower holdings of stocks. Finally, notice that after I control for sample selection into the panel and unobserved heterogeneity, health variables are no longer significant, and in some cases have the opposite sign compared with the uncorrected results. This suggests that health effects come mainly through the participation decision.

Table A.1. in the appendix provides some sensitivity analysis for the previous results. All the results provided are the product of estimating a Random Effects Probit model of the selection, and then estimating a random effects of the equation of interest, as in equation (9). In specification 1 I substitute the two self-employment indicators for a single indicator, the results are essentially unchanged. Specification 2 changes one of the more significant variables, the probability of working past age 62, to the same type of probability to working past age 65. The number of observations decreases, but the results do not change. Finally, specifications 3 and 4 change the dependent variable, with specification 3 adding bonds and real estate to stocks, and specification 4 adding only bonds. The main difference appears in specification 3 where the self-employment indicators are highly positive and significant. This is due to the large accumulation of investments in real estate by self-employed individuals compared with employees.

4.2 Employees sub-sample

The HRS provides better measures of labor supply flexibility than the ones I have used for the full sample of workers above, but the price we have to pay is the dropping of self-employed individuals from the sample. Given how different they are from respondents that work for someone else, and our objectives, this might not be an important drawback. In the tables that follow we concentrate on employees that work for someone else and who are also the financially knowledgeable persons in their households.

In Table 6 I use as the dependent variable the sum of stock holdings, and an indicator of labor supply flexibility a dummy that takes the value one if the respondent self-reports that they can *increase* the hours of work in their current job. I also include the indicator for holding a second job. In the first set of columns, I run the OLS regression without the selectivity correction, the second set shows the fixed-effects estimates and the third set of columns the random effects estimates. In the pooled uncorrected OLS the effect of the flexibility variable is large and significant, predicting that those with flexible labor supply would hold almost 17% more wealth in stocks, but those that already hold a second job would hold around 34% less

stocks. The specification test rejects the OLS model in favor of the Random Effect specification, and the Hausman test rejects the hypothesis that the regressors and the unobserved components are uncorrelated. However, as in the previous tables, the Fixed Effect estimates are quite noisy. The flexibility indicator does not change much but it is more imprecisely estimated, something not surprising considering that this is not a variable that changes a lot overtime for a given individual. All this, and the ability to estimate the effect of time-invariant variables, convinces me into choosing the Random Effects as our preferred specification. In this specification the effect of Labor Supply flexibility on the amount of stocks held by the household is again almost 17%.

All these estimates are affected by possible selection bias. I therefore proceed to estimate the selection equation and then make the appropriate corrections. The ownership estimations in Table 7 do not present big surprises. Notice, however, that the flexibility indicators play a small and insignificant role in these equations, suggesting that once we correct for selectivity in the panel estimates, we are likely to see relatively little movement in these coefficients. Again notice the expected positive effect of having a college education in the participation decision, and the powerful effect of socio-demographic variables, the negative effect of being hourly paid, and the negative effect of self-reporting a higher probability of working full-time past age 62. Also, those that work a higher proportion of months in the previous year are more likely to hold assets. I again find here the interesting presence of time effects that indicate that participation among this aging population was actually on its way down, other things equal, during the 1990s. This is not to be confounded with the very positive effect that the late 1990s have on total holdings of stocks, which is clear in the uncorrected and the corrected results.

Following the same structure as Table 5, Table 8 provides five specifications of selection corrected results. The first two specifications estimate a pooled probit model in the first stage, and then a standard Heckman correction of the second stage using either OLS or a Random Effects model. The last three specifications estimate a Random Effects Probit model in the first stage, and then follow Vella and Verbeek (1999) to construct the two correction terms to account for the panel sample selection. The third specification estimates an OLS model in the second stage and the fourth specification a Random Effects model in the second stage which means that I allow for an individual component that might not be correlated with the individual component in the selection equation. The fifth follows the recommendations in Jensen, Rosholm, and Verner (2001), and the earlier contributions of Mundlak (1978) by including in (4) the individual specific averages over time of the exogenous variables as additional regressors, to provide a correction for the possible correlation between the exogenous variables and the individual effects. In Monte Carlo experiments this has been shown to improve the consistency of the estimator. In this case results do not change much, and in the first stage simple F-tests show that not all additional regressors are significant suggesting that the Mundlak

correction is not necessarily appropriate.[23]

Although the message from all specifications is essentially the same, I concentrate on the fourth specification, which estimates equation (9), which I believe better captures the underlying structural model of stock ownership and stock holdings. The main reason is because it allows me to separate two different selection effects present in the panel, and also because it is realistic to think that there is an additional individual component in the main equation which is not correlated with the individual component of the selection equation.[24] The main result is that the flexibility indicators are sizable and statistically significant at the 5% level. Individuals with the flexibility to increase their hours of work hold on average 14% more wealth in stocks, while those that already have a second job hold around 23% less stocks. Notice that we are conditioning on a large array of variables, which in some cases see their effects reversed from the ones they had in the uncorrected estimations. Having a professional degree has a large positive and significant effect and so does having higher non-risky wealth, and not having health insurance. As in Table 5 I believe this latter result captures the fact that the health insurance effect works mainly through the participation decision, and conditional on it, those that hold more stocks are individuals who are likely to behave riskily in other markets, like the health insurance market. The probability of working full time past age 62 affects stock holdings negatively, proxying for individuals that cannot afford to retire early maybe due to previous bad shocks to wealth or income. Those with a health limitation are likely to hold significantly less stocks, but other self-reported health measures are not significant. This comes to reflect the fact that most of the action of health measures goes through the participation decision. Notice also the highly negative effect of the time indicators for the early part of the 1990s, which again captures the impressive growth that stocks had in the last part of the decade. The contrast with the declining participation during the decade is a rather unexpected result.

Finally, the two selection terms are very significant, and have opposite signs, reflecting a very insightful finding regarding the nature of the panel selection into owning stocks for our sample. Selection into the market for stocks has a positive individual specific component, $\overline{\upsilon}_i$ in Table 8, which reflects stock ownership differences across individuals, and a negative idiosyncratic component, υ_{it} in Table 8, which reflects the stock ownership differences over time for a given individual. This means that if we compare those that own stocks with those that do not own stocks across individuals, the unmeasured factors that make those more likely to own have a positive effect on the level of holdings, but if we compare ownership and non-ownership for a given individual over time, the factors that increase the probability of participation actually make those likely to own less stocks. This suggests that some unmeasured factors that influenced the decision to enter

[23] The last three specifications do not adjust, for the moment, the standard errors to account for the added generated regressors.

[24] As with the full sample of employed individuals the Breusch-Pagan Lagrange Multiplier tests always reject the specification that estimates an OLS in the second stage in favor of one that estimates a Random Effects model.

the market in light of the performance of the financial assets in the late 1990s make an individual more likely to own a small portfolio during the period of analysis (opportunistic buyers), while the unmeasured factors that make an individual more likely to participate all through the panel (true market participants), make those more likely to own a larger amount of wealth in stocks. As far as I know this is the first study to obtain this intuitive result regarding participation in the stock market in the 1990s.

Table A.2. in the appendix provides some sensitivity analysis of the results for the sub-sample of employees, using the panel sample selection and estimating a random effects specification in the second stage. In the first specification where I change the covariate that reflects the probability of working full time past age 62 to the probability of working past age 65, we lose some observations, the flexibility indicators are a bit larger, but the main results are unchanged. In the second specification I change the covariate non-risky wealth to a broader definition that includes assets from businesses and other savings. The results are again basically unchanged. Specification 3 in the Table provides sensitivity analysis on changing the dependent variable to a broader definition of risky assets, that on top of stocks include bonds and real estate holdings. This time the results are a bit less strong, but still significant in the case of the flexibility to increase hours indicator, in favor of the importance of labor supply flexibility in the level of holdings of these assets. The last specification changes the dependent variable to include only stocks and bonds, the results are essentially the same as in the preferred specification in Table 8.

From all these results, I conclude that there is empirical evidence that labor supply flexibility has a positive and significant effect on holdings of risky assets (especially stock holdings), as the work of Bodie, Merton and Samuelson (1992) predicted. The estimation results predict an increase of around 14% in the holdings of risky assets if flexibility to *increase* hours of work is present, and a decrease of 23% if that flexibility has been used up, once I control for panel sample selection and unobserved heterogeneity. These results provide one of the first empirical evidences of a strong connection between labor supply flexibility and portfolio choice decisions. It seems that individuals who have more opportunities to increase their labor supply are more likely to have more risky investments given that the labor supply flexibility provides some insurance to their riskier capital investments. The Two-Step panel selection estimation strategy also provides interesting results regarding the nature of the selection into stock ownership during the 1990s among this population, and shows the usefulness of the the more sophisticated estimation technique used in this paper.

5 Conclusions

In this paper I have presented one of the first empirical tests of the relationship between labor supply flexibility and portfolio choice. I have tested the theoretical predictions of two different but related dynamic models of labor supply and consumption/saving decisions, using the Health and Retirement Study.

The empirical results show that individuals that have more labor supply flexibility are likely to hold higher levels of risky assets (around 14% more), and those that can be considered to have exhausted that flexibility own around 23% less wealth in stocks. These results are the product of correcting for panel sample selection into asset ownership and unobserved heterogeneity following the work of Vella and Verbeek (1999), the recommendations of Jensen, Rosholm, and Verner (2001), and the earlier work of a number of authors. The Two-Step panel data model allows us to separate the selection effect on assets holdings of two types of stock owners, the "opportunistic buyers", and the "true stock owners". The first effect reduces stock holdings, the second increases it.

I also contribute to the growing literature that tries to understand the relatively low participation in financial markets by American households. Part of the explanation (although still a lot remains unexplained) is that we cannot forget that labor supply can be an insurance device, and that the decision to participate and the decision to hold more or less wealth in stocks are connected but remain fairly different processes. I also find that even during a period of unprecedented growth in stock values, participation in the stock market (not including the participation through private pensions) among older Americans is not necessarily positively affected, other things equal. This suggests that the decline in stock market values that started in the second part of 2000 might have affected the non-pension wealth of this population less than generally believed.

The connection between labor supply and portfolio allocation has been studied less than each of these topics separately, and until recently very few models tried to tie these two types of decisions together. Bodie and Samuelson (1989), and Bodie, Merton and Samuelson (1992) emphasized this relationship and show how ex-post labor supply flexibility has an effect on the ex-ante portfolio allocation of utility maximizing individuals. In a different context, Benítez-Silva (2002) shows that a stochastic dynamic life cycle model with endogenous labor supply, consumption/saving and annuity decisions, predicts that risky assets are also preferred by utility maximizers.

The data that I use provides excellent measures of wealth, and a set of rarely available direct measures of labor supply flexibility. Using several definitions of risky assets, and different measures of flexibility, I am able to provide empirical backing to the dynamic theories. An extension outside the scope of this paper, and one that would require the use of an alternative data set, would be to check how robust these results are to the use of a data set that was devised to focus on older individuals. Bodie, Merton, and Samuelson (1992) conjecture that their predictions should hold more strongly among young individuals, given that they have more opportunities to insure against adverse portfolio outcomes through their future labor supply. However, the lack of appropriate measures of labor supply flexibility and good measures of financial wealth make this extension of the project a challenging one.

The fact that I have been able to find a relationship between labor supply flexibility and portfolio choice

makes even more interesting the project of exploring how this translates at the macroeconomic level. Is it the case (as Bodie and Samuelson 1989 conjecture and some recent research and debate suggests) that we would expect to see stabilizing labor market responses to shocks in securities markets? If so we need to understand better the connection between labor supply and asset allocation decisions.

Also, it might be interesting to explore more in depth the relationship between human capital formation and labor supply flexibility. Flexibility is potentially valuable for individuals, given that it allows them to have some insurance against bad investment outcomes. Additional flexibility can be acquired through the career opportunities that more education and training give to individuals. However, very few models of human capital investment have tried to incorporate this connection.

Finally, we can not ignore how important labor supply flexibility is for older individuals. Some recent evidence seems to indicate that older workers are likely to extend their labor force participation beyond traditional retirement ages. However, flexibility emerges as a decisive characteristic which older workers take into account when making labor supply decisions. Interestingly, this flexibility will not only have an effect on labor supply, but also on wealth accumulation and de-accumulation decisions of individuals that hold most of the financial assets in the economy.[25] The study of the links between labor economics and finance (both at the micro and macro level) is likely to be one of the fastest growing research topics that both fields will be tackling in the next years.

[25] See Davies (1981), Bernheim (1987), Alessie, Lusardi, and Kapteyn (1999), Banks et al. (1998), and Moore and Mitchell (2000) for a discussion of savings around the time of retirement.

Table 1. Panel A: Means and Standard Deviations. Employed and Self-Employed Respondents.

Variable	Employee Sub-Sample	Self-Employed Sub-Sample	Stock Owners	Don't Own Stocks	Second-Job Sub-Sample
# of Observations	15,700	3,795	5,372	14,123	2,167
Age	57.92	59.16	58.20	58.15	57.10
	5.08	5.38	5.12	5.18	5.03
White	0.71	0.82	0.90	0.67	0.76
	0.45	0.38	0.30	0.47	0.42
Male	0.50	0.66	0.64	0.49	0.58
	0.50	0.47	0.48	0.50	0.49
Married	0.66	0.77	0.78	0.65	0.69
	0.47	0.42	0.42	0.48	0.46
Bachelor Degree	0.26	0.33	0.45	0.21	0.38
	0.44	0.47	0.50	0.41	0.49
Professional Degree	0.10	0.13	0.19	0.08	0.17
	0.30	0.34	0.39	0.26	0.37
Respondent Income	28.72	49.87	48.46	26.26	36.51
(in $1,000 of 1992)	32.35	134.74	97.02	45.13	61.97
Net Worth	165.51	521.94	485.64	135.88	286.68
(in $ 1,000)	319.56	1159.89	996.39	286.56	635.33
Non-Risky NW	33.65	166.42	118.13	37.19	82.61
(in $ 1,000)	123.74	440.80	353.97	153.55	323.79
Stocks	75.29	168.31	98.54	—	71.52
(in $ 1,000)	260.92	839.43	478.27	0.00	228.77
Bonds	5.38	25.72	28.86	1.76	16.88
(in $ 1,000)	31.28	153.04	136.65	17.62	102.45
Real Estate	93.18	289.61	200.42	118.50	192.45
(in $ 1,000)	216.20	515.13	430.50	267.22	429.38
Stock Ownership	0.26	0.35	1.00	0.00	0.31
	0.44	0.48	0.00	0.00	0.46
Hourly Worker	0.56	0.00	0.30	0.50	0.41
	0.50	0.00	0.46	0.50	0.49
Self-Empl. with Wages	0.00	0.36	0.09	0.06	0.07
	0.00	0.48	0.28	0.24	0.26
Self-Empl. with Profits	0.00	0.79	0.20	0.14	0.16
	0.00	0.41	0.40	0.34	0.37
% Months Worked	0.94	0.94	0.96	0.94	0.95
	0.20	0.20	0.17	0.21	0.18
Flexible to Increase Hwk.	0.33	—	0.35	0.33	0.33
	0.47	0.00	0.48	0.47	0.47
Flexible to Decrease Hwk.	0.32	—	0.34	0.31	0.35
	0.47	0.00	0.47	0.46	0.48
Second Job	0.11	0.12	0.12	0.11	1.00
	0.31	0.32	0.33	0.31	0.00

Table 1. Panel B: Means and Standard Deviations. Employed and Self-Employed Respondents.

Variable	Employee Sub-Sample	Self-Employed Sub-Sample	Stock Owners	Don't Own Stocks	Second-Job Sub-Sample
# of Observations	15,700	3,795	5,372	14,123	2,167
Employer Health Insurance	0.81	0.35	0.77	0.76	0.77
	0.39	0.48	0.42	0.43	0.42
Private Health Insurance	0.17	0.34	0.23	0.19	0.21
	0.37	0.47	0.42	0.39	0.41
No Health Insurance	0.08	0.17	0.03	0.12	0.08
	0.27	0.37	0.16	0.33	0.28
Have thought about retirement	0.48	0.41	0.51	0.45	0.48
	0.50	0.49	0.50	0.50	0.50
Prob. Working after 62	0.48	0.59	0.48	0.50	0.56
	0.40	0.39	0.40	0.40	0.39
Prob. Living to 75	0.67	0.70	0.70	0.66	0.69
	0.28	0.26	0.25	0.29	0.26
Health Limitation	0.18	0.23	0.18	0.20	0.20
	0.39	0.42	0.39	0.40	0.40
Excellent Health	0.21	0.26	0.28	0.19	0.27
	0.40	0.44	0.45	0.39	0.44
Very Good Health	0.34	0.34	0.40	0.32	0.38
	0.47	0.47	0.49	0.47	0.48
Good Health	0.31	0.27	0.24	0.33	0.27
	0.46	0.44	0.43	0.47	0.44
Smoker	0.23	0.19	0.17	0.24	0.18
	0.42	0.40	0.37	0.43	0.39
Drinker	0.58	0.64	0.74	0.54	0.62
	0.49	0.48	0.44	0.50	0.49
wave1	0.27	0.25	0.28	0.26	0.31
	0.44	0.43	0.45	0.44	0.46
wave2	0.22	0.22	0.27	0.20	0.23
	0.41	0.41	0.44	0.40	0.42
wave3	0.19	0.20	0.17	0.20	0.19
	0.40	0.40	0.38	0.40	0.39

Table 2. Panel A: Means and Standard Deviations. Employed Respondents.

Variable	Employed Sample	Stock Owners	Don't Own Stocks	Flexible Labor Supply	Second-Job Sub-Sample
# of Observations	15,701	4,029	11,672	5,185	1,722
Age	57.92	57.83	57.95	58.07	56.87
	5.08	5.00	5.11	5.34	4.96
White	0.71	0.89	0.65	0.74	0.73
	0.45	0.31	0.48	0.44	0.45
Male	0.50	0.60	0.47	0.54	0.55
	0.50	0.49	0.50	0.50	0.50
Married	0.66	0.76	0.63	0.69	0.67
	0.47	0.43	0.48	0.46	0.47
Bachelor Degree	0.26	0.43	0.20	0.25	0.38
	0.44	0.50	0.40	0.43	0.49
Professional Degree	0.10	0.18	0.07	0.08	0.16
	0.30	0.39	0.26	0.28	0.37
Respondent Income	28.72	40.88	24.35	29.05	33.08
(in $1,000 of 1992)	32.35	47.03	23.57	39.92	36.60
Net Worth	165.50	336.69	103.35	185.84	196.60
(in $ 1,000)	319.55	513.17	170.57	382.69	358.96
Non-Risky NW	33.65	64.11	23.13	42.57	52.47
(in $ 1,000)	123.73	206.57	73.73	185.22	214.93
Stocks	75.29	75.29	—	79.66	56.25
(in $ 1,000)	260.92	260.92	0.00	217.85	123.90
Bonds	5.38	16.07	1.40	6.32	7.63
(in $ 1,000)	31.27	53.77	14.41	36.90	34.15
Real Estate	93.18	119.03	74.24	105.59	103.37
(in $ 1,000)	216.20	280.28	150.39	276.82	186.79
Stock Ownership	0.26	1.00	0.00	0.27	0.29
	0.44	0.00	0.00	0.44	0.45
Hourly Worker	0.56	0.40	0.61	0.59	0.51
	0.50	0.49	0.49	0.49	0.50
% Months Worked	0.94	0.96	0.94	0.94	0.95
	0.20	0.17	0.21	0.20	0.18
Flexible to Increase Hwk.	0.33	0.35	0.33	1.00	0.33
	0.47	0.48	0.47	0.00	0.47
Flexible to Decrease Hwk.	0.32	0.34	0.31	0.49	0.35
	0.47	0.47	0.46	0.50	0.48
Second Job	0.11	0.12	0.10	0.11	1.00
	0.31	0.33	0.31	0.31	0.00

Table 2. Panel B: Means and Standard Deviations. Employed Respondents.

Variable	Employed Sample	Stock Owners	Don't Own Stocks	Flexible Labor Supply	Second-Job Sub-Sample
# of Observations	15,701	4,029	11,672	5,185	1,722
Employer Health Insurance	0.81	0.83	0.80	0.76	0.81
	0.39	0.38	0.40	0.42	0.39
Retiree Health Insurance	0.79	0.82	0.77	0.80	0.80
	0.41	0.39	0.42	0.40	0.40
Private Health Insurance	0.17	0.19	0.16	0.19	0.18
	0.37	0.39	0.37	0.39	0.38
No Health Insurance	0.08	0.02	0.10	0.08	0.07
	0.27	0.13	0.30	0.28	0.26
Have thought about retirement	0.48	0.53	0.46	0.46	0.48
	0.50	0.50	0.50	0.50	0.50
Prob. Working after 62	0.48	0.46	0.49	0.48	0.54
	0.40	0.39	0.40	0.40	0.39
Prob. Living to 75	0.67	0.69	0.66	0.67	0.69
	0.28	0.25	0.29	0.28	0.27
Health Limitation	0.18	0.17	0.19	0.19	0.19
	0.39	0.38	0.39	0.39	0.39
Excellent Health	0.21	0.28	0.18	0.22	0.27
	0.40	0.44	0.39	0.41	0.44
Very Good Health	0.34	0.41	0.32	0.34	0.37
	0.47	0.49	0.47	0.47	0.48
Good Health	0.31	0.25	0.33	0.31	0.27
	0.46	0.43	0.47	0.46	0.45
Smoker	0.23	0.17	0.25	0.24	0.19
	0.42	0.38	0.43	0.43	0.39
Drinker	0.58	0.73	0.53	0.60	0.60
	0.49	0.44	0.50	0.49	0.49
wave1	0.27	0.28	0.26	0.32	0.31
	0.44	0.45	0.44	0.47	0.46
wave2	0.22	0.27	0.20	0.19	0.23
	0.41	0.44	0.40	0.39	0.42
wave3	0.19	0.18	0.20	0.18	0.19
	0.40	0.38	0.40	0.38	0.40

Table 3: Employed and Self-Employed Respondents. The Logarithm of the stock holdings is the dependent variable

		OLS Estimates		Fixed Effects		Random Effects	
No.	Variable	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
1	Constant	7.6428	3.6298	8.7862	6.6631	8.2947	3.5146
2	White	0.3942	0.1322	—	—	0.3897	0.1296
3	Male	0.1124	0.0823	—	—	0.0962	0.0876
4	Married	0.1094	0.0941	-0.0287	0.1850	0.1198	0.0895
5	Bachelor D.	0.5437	0.0939	—	—	0.5715	0.0993
6	Graduate D.	0.2760	0.1226	—	—	0.3262	0.1282
7	Age	-0.0045	0.1324	-0.0522	0.2171	-0.0279	0.1277
8	Age Sq.	0.0005	0.0012	0.0013	0.0019	0.0007	0.0012
9	Self-Emp. W/Wages	0.1479	0.1355	-0.2778	0.1969	0.0583	0.1284
10	Self-Emp. W/Profits	-0.0583	0.1099	-0.0445	0.1503	-0.0153	0.0965
11	Second Job	-0.2857	0.1041	-0.0140	0.1102	-0.1663	0.0855
12	Hourly Worker	-0.2604	0.0889	-0.0058	0.1274	-0.2646	0.0800
13	Earnings	0.0026	0.0004	0.0009	0.0004	0.0017	0.0003
14	Non risky wealth	0.7758	0.0699	0.2118	0.0712	0.5347	0.0580
15	Non risky wlt. Sq.	-0.0346	0.0043	-0.0092	0.0033	-0.0227	0.0028
16	% Months Worked	0.1150	0.2259	-0.1073	0.1872	0.0299	0.1611
17	No Health Ins.	-0.4166	0.2877	0.2648	0.2527	-0.1503	0.1775
18	Private Hlt. Ins.	0.1801	0.0811	0.2299	0.0867	0.2005	0.0698
19	PWFT62	-0.5712	0.0918	-0.1175	0.1124	-0.4327	0.0801
20	Health Limitation	-0.2161	0.0908	-0.0171	0.0972	-0.1403	0.0767
21	Excellent Health	0.1997	0.0942	-0.0404	0.1174	0.0922	0.0837
22	Very Good Health	0.0957	0.0819	-0.0155	0.0923	0.0564	0.0706
23	First Wave	-0.5503	0.0907	-0.2956	0.3266	-0.5184	0.0878
24	Second Wave	-0.3379	0.0866	-0.1540	0.2321	-0.3232	0.0784
25	Third Wave	-0.3631	0.0916	-0.2094	0.1446	-0.3315	0.0771
26	New England	0.3547	0.1588	—	—	0.3124	0.1826
27	Mid-Atlantic	0.1628	0.1123	—	—	0.2043	0.1250
28	East N-C.	0.0523	0.1033	—	—	0.0777	0.1098
29	West N-C.	0.2360	0.1280	—	—	0.1992	0.1328
	# Obs.	3,967		3,967		3,967	
	$\overline{R}^2$	0.1766		0.0543		0.1706	

Breusch-Pagan Test Statistic: 480.29. P-value: 0.0000.
Hausman Specification Test Statistic: 119.83. P-value: 0.0000.

Table 4: Employed and Self-Employed Respondents. An Indicator of stock ownership is the dependent variable

		Probit			Random Effects Probit		
No.	Variable	Estimate	St. Error	Marg. Effect	Est.	St. Error	Marg. Effect
1	Constant	-0.8332	1.6049	—	-0.7476	2.2638	—
2	Thougt about Retirement.	0.0318	0.0272	0.0102	0.0662	0.0387	0.0140
3	Prob. Living to 75	0.0570	0.0591	0.0183	0.0940	0.0837	0.0199
4	Smoker	-0.1468	0.0410	-0.0460	-0.2570	0.0607	-0.0505
5	Drinker	0.3178	0.0349	0.0995	0.4117	0.0504	0.0829
6	Weight	-0.0009	0.0005	-0.0003	-0.0013	0.0008	-0.0003
7	White	0.5993	0.0477	0.1723	1.0894	0.0775	0.1721
8	Male	0.1132	0.0418	0.0364	0.1812	0.0655	0.0384
9	Married	0.1269	0.0395	0.0402	0.2500	0.0608	0.0503
10	Bachelor D.	0.3680	0.0465	0.1240	0.7431	0.0758	0.1867
11	Graduate D.	-0.0077	0.0640	-0.0025	0.0044	0.1020	0.0009
12	Age	-0.0317	0.0590	-0.0102	-0.0844	0.0828	-0.0179
13	Age Sq.	0.0003	0.0005	0.0001	0.0008	0.0008	0.0002
14	Self-Emp. W/Wages	-0.0612	0.0659	-0.0193	-0.0723	0.0943	-0.0148
15	Self-Emp. W/Profits	0.0391	0.0511	0.0127	0.0830	0.0731	0.0182
16	Second Job	0.0199	0.0446	0.0064	0.0121	0.0613	0.0026
17	Hourly Worker	-0.2222	0.0372	-0.0709	-0.3125	0.0540	-0.0652
18	Earnings	0.0009	0.0005	0.0003	0.0010	0.0004	0.0002
19	Non risky wealth	0.5412	0.0578	0.1740	0.6199	0.0612	0.1313
20	Non risky wlt. Sq.	-0.0228	0.0028	-0.0073	-0.0223	0.0038	-0.0047
21	% Months Worked	0.1053	0.0750	0.0339	0.1735	0.1106	0.0368
22	No Health Ins.	-0.5849	0.0672	-0.1561	-0.7600	0.0975	-0.1113
23	Private Hlt. Ins.	0.0437	0.0371	0.0142	0.0573	0.0508	0.0124
24	PWFT62	-0.1782	0.0387	-0.0573	-0.2394	0.0561	-0.0507
25	Health Limitation	-0.0017	0.0388	-0.0006	-0.0148	0.0548	-0.0031
26	Excellent Health	0.1977	0.0414	0.0657	0.2715	0.0598	0.0624
27	Very Good Health	0.1631	0.0345	0.0533	0.2235	0.0489	0.0492
28	First Wave	0.0579	0.0396	0.0187	0.1398	0.0602	0.0304
29	Second Wave	0.1691	0.0369	0.0558	0.3315	0.0559	0.0768
30	Third Wave	-0.0332	0.0349	-0.0106	-0.0547	0.0546	-0.0114
31	New England	-0.0552	0.0809	-0.0174	0.0322	0.1356	0.0069
32	Mid-Atlantic	-0.0388	0.0520	-0.0124	-0.0222	0.0837	-0.0047
33	East N-C.	0.1703	0.0482	0.0568	0.3151	0.0773	0.0748
34	West N-C.	0.0575	0.0591	0.0188	0.1511	0.0931	0.0342
	# Obs./Avg. Prob./Log Lik.	13,528	0.2557	-6910.76	13,528	0.1303	-6093.32
	Pseudo-$\overline{R}^2$	0.1558			0.1054		

Table 5: Selection Corrected Results. Employed and Self-Employed Respondents. The Logarithm of the stock holdings is the dependent variable

		Corrected OLS		Cross-Section Corrected RE		Panel Corrected OLS		Panel Corrected RE	
No.	Variable	Estimate	Standard Error	Est.	Stand. Error	Est.	Stand. Error	Est.	Stand. Error
1	constant	10.5117	3.5686	10.6435	3.5169	9.6692	3.4819	9.2777	3.4976
2	White	-0.4409	0.1827	-0.3392	0.1742	-0.4196	0.1895	-0.2103	0.1820
3	Male	-0.0208	0.0831	-0.0277	0.0892	-0.0160	0.0828	0.0026	0.0886
4	Married	-0.0708	0.0968	-0.0334	0.0924	-0.0847	0.0979	-0.0266	0.0937
5	Bachelor D.	0.0496	0.1221	0.1336	0.1212	-0.0396	0.1364	0.1391	0.1322
6	Graduate D.	0.2707	0.1217	0.3212	0.1273	0.2811	0.1202	0.3335	0.1263
7	Age	0.0204	0.1290	-0.0013	0.1271	0.0537	0.1268	0.0410	0.1270
8	Age Sq.	0.0002	0.0012	0.0004	0.0012	-0.0002	0.0012	0.0000	0.0012
9	Self-Emp. W/Wages	0.2271	0.1325	0.1206	0.1281	0.2223	0.1320	0.1057	0.1276
10	Self-Emp. W/Profits	-0.1025	0.1100	-0.0559	0.0962	-0.0574	0.1086	-0.0136	0.0958
11	Second Job	-0.3042	0.1036	-0.1853	0.0852	-0.2874	0.1021	-0.1749	0.0851
12	Hourly Worker	0.0768	0.1002	0.0236	0.0921	0.0671	0.0988	-0.0115	0.0917
13	Earnings	0.0021	0.0003	0.0014	0.0003	0.0022	0.0004	0.0015	0.0003
14	Non risky wealth	0.3079	0.0943	0.1545	0.0843	0.4060	0.0827	0.2632	0.0740
15	Non risky wlt. Sq.	-0.0149	0.0046	-0.0072	0.0038	-0.0191	0.0038	-0.0119	0.0033
16	% Months Worked	0.0180	0.2253	-0.0519	0.1611	0.0319	0.2236	-0.0543	0.1616
17	No Health Ins.	0.4254	0.3084	0.5533	0.2100	0.3258	0.3072	0.4230	0.2037
18	Private Hlt. Ins.	0.1388	0.0805	0.1606	0.0698	0.1349	0.0795	0.1581	0.0698
19	PWFT62	-0.3156	0.1020	-0.2197	0.0868	-0.3280	0.0986	-0.2414	0.0857
20	Health Limitation	-0.1964	0.0897	-0.1306	0.0764	-0.1957	0.0894	-0.1342	0.0764
21	Excellent Health	-0.1261	0.1046	-0.1655	0.0931	-0.0909	0.1026	-0.1250	0.0924
22	Very Good Health	-0.1497	0.0887	-0.1438	0.0774	-0.1215	0.0876	-0.1194	0.0770
23	First Wave	-0.6516	0.0916	-0.6122	0.0887	-0.7953	0.0955	-0.7283	0.0917
24	Second Wave	-0.5772	0.0946	-0.5346	0.0851	-0.7325	0.1030	-0.6527	0.0910
25	Third Wave	-0.3300	0.0908	-0.3070	0.0769	-0.3553	0.0916	-0.3265	0.0774
26	New England	0.3698	0.1548	0.3167	0.1814	0.3375	0.1498	0.2934	0.1805
27	Mid-Atlantic	0.1722	0.1120	0.2089	0.1242	0.1491	0.1102	0.1841	0.1232
28	East N-C.	-0.1493	0.1072	-0.1033	0.1128	-0.1800	0.1083	-0.1059	0.1138
29	West N-C.	0.1520	0.1266	0.1243	0.1324	0.1131	0.1261	0.0999	0.1322
30	Inverse Mills' Ratio	-1.8332	0.2930	-1.5899	0.2558	—	—	—	—
31	υ_{it}	—	—	—	—	-1.1500	0.1571	-0.8581	0.1348
32	$\overline{\upsilon}_i$	—	—	—	—	0.3441	0.0518	0.2591	0.0513
	# Obs.	3,967		3,967		3,967		3,967	
	$\overline{R}^2$	0.1882		0.1832		0.1997		0.1931	

Table 6: Employed Respondents. The Logarithm of the stock holdings is the dependent variable

		OLS Estimates		Fixed Effects		Random Effects	
No.	Variable	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
1	Constant	5.5932	3.9801	7.8838	8.6100	5.7022	4.0135
2	White	0.3430	0.1372	—	—	0.3671	0.1397
3	Male	0.0888	0.0944	—	—	0.0780	0.0990
4	Married	0.1156	0.1040	-0.1072	0.2442	0.1287	0.1028
5	Bachelor D.	0.4629	0.1072	—	—	0.4783	0.1118
6	Graduate D.	0.3154	0.1330	—	—	0.3937	0.1429
7	Age	0.0786	0.1459	0.0655	0.2831	0.0816	0.1465
8	Age Sq.	-0.0003	0.0013	-0.0003	0.0025	-0.0003	0.0013
9	Flexible Labor Supply	0.1688	0.0796	0.1457	0.0892	0.1698	0.0700
10	Second Job	-0.3347	0.1292	-0.0453	0.1568	-0.2299	0.1069
11	Hourly Worker	-0.2076	0.0956	-0.0380	0.1588	-0.2323	0.0887
12	Earnings	0.0062	0.0011	-0.0004	0.0016	0.0044	0.0010
13	Non risky wealth	1.0679	0.0963	0.3497	0.2231	0.7665	0.0976
14	Non risky wlt. Sq.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	% Months Worked	-0.0754	0.2291	-0.2912	0.2589	-0.2020	0.2087
16	No Health Ins.	0.0425	0.3586	1.0986	0.5809	0.3201	0.3739
17	Private Hlt. Ins.	-0.0752	0.0968	-0.1876	0.1091	-0.1024	0.0884
18	PWFT62	-0.5662	0.1032	-0.0775	0.1473	-0.4809	0.0958
19	Health Limitation	-0.1788	0.1053	-0.1433	0.1262	-0.1831	0.0931
20	Excellent Health	0.1348	0.1105	-0.1445	0.1522	0.0544	0.1000
21	Very Good Health	0.0741	0.0935	-0.0747	0.1187	0.0569	0.0842
22	First Wave	-0.5424	0.1103	-0.6342	0.4347	-0.5209	0.1081
23	Second Wave	-0.3207	0.1066	-0.3372	0.3126	-0.2897	0.0992
24	Third Wave	-0.3878	0.1165	-0.3326	0.1938	-0.3330	0.0992
25	New England	0.2777	0.1797	—	—	0.2277	0.2144
26	Mid-Atlantic	0.0890	0.1244	—	—	0.1454	0.1381
27	East N-C.	-0.0244	0.1122	—	—	-0.0452	0.1209
28	West N-C.	0.1394	0.1490	—	—	0.1176	0.1473
	# Obs.	2,769		2,769		2,769	
	$\overline{R}^2$	0.1638		0.0031		0.1592	

Breusch-Pagan Test Statistic: 210.45. P-value: 0.0000.
Hausman Specification Test Statistic: 90.29. P-value: 0.0000.

Table 7: Employed Respondents. An Indicator of stock ownership is the dependent variable

		Probit			Random Effects Probit		
No.	Variable	Estimate	St. Error	Marg. Effect	Est.	St. Error	Marg. Effect
1	Constant	-1.4556	1.9831	—	-2.3298	2.7019	—
2	Thought about Retirement.	0.0254	0.0329	0.0083	0.0813	0.0466	0.0184
3	Prob. Living to 75	0.0924	0.0692	0.0304	0.1340	0.0992	0.0304
4	Smoker	-0.1248	0.0472	-0.0402	-0.2468	0.0715	-0.0523
5	Drinker	0.3081	0.0407	0.0990	0.4087	0.0592	0.0885
6	Weight	-0.0011	0.0006	-0.0004	-0.0018	0.0010	-0.0004
7	White	0.5702	0.0539	0.1695	1.0278	0.0871	0.1787
8	Male	0.0739	0.0517	0.0243	0.1062	0.0760	0.0241
9	Married	0.1228	0.0455	0.0398	0.2459	0.0713	0.0533
10	Bachelor D.	0.3112	0.0550	0.1062	0.6409	0.0870	0.1664
11	Graduate D.	-0.0348	0.0754	-0.0114	-0.0268	0.1157	-0.0060
12	Age	-0.0101	0.0726	-0.0033	-0.0254	0.0987	-0.0058
13	Age Sq.	0.0001	0.0007	0.0000	0.0003	0.0009	0.0001
14	Flexible Labor Supply	0.0396	0.0348	0.0131	0.0359	0.0497	0.0082
15	Second Job	0.0046	0.0536	0.0015	0.0071	0.0758	0.0016
16	Hourly Worker	-0.1815	0.0434	-0.0598	-0.2645	0.0614	-0.0605
17	Earnings	0.0045	0.0015	0.0015	0.0057	0.0009	0.0013
18	Non risky wealth	0.6271	0.0772	0.2063	0.7611	0.0856	0.1729
19	Non risky wlt. Sq.	-0.0334	0.0043	-0.0110	-0.0406	0.0059	-0.0092
20	% Months Worked	0.0789	0.0954	0.0260	0.2275	0.1424	0.0517
21	No Health Ins.	-0.5290	0.1200	-0.1441	-0.8398	0.2065	-0.1196
22	Retiree Health Ins.	0.0905	0.0418	0.0293	0.0788	0.0597	0.0175
23	PWFT62	-0.2052	0.0456	-0.0675	-0.2891	0.0673	-0.0657
24	Health Limitation	0.0549	0.0455	0.0183	0.0596	0.0658	0.0138
25	Excellent Health	0.1378	0.0490	0.0464	0.2141	0.0721	0.0517
26	Very Good Health	0.1349	0.0401	0.0449	0.2028	0.0582	0.0475
27	First Wave	0.0455	0.0482	0.0150	0.1005	0.0739	0.0233
28	Second Wave	0.1415	0.0461	0.0473	0.2942	0.0692	0.0709
29	Third Wave	-0.0321	0.0439	-0.0105	-0.0525	0.0685	-0.0117
30	New England	-0.0789	0.0929	-0.0254	-0.0369	0.1549	-0.0082
31	Mid-Atlantic	-0.0803	0.0605	-0.0259	-0.1046	0.0959	-0.0228
32	East N-C.	0.1318	0.0547	0.0445	0.2611	0.0880	0.0648
33	West N-C.	0.1024	0.0693	0.0345	0.1999	0.1083	0.0493
	# Obs./Avg. Prob/Log Lik.	9,274	0.2673	-4848.13	9.274	0.1442	-4334.30
	Pseudo-$\overline{R}^2$	0.1425			0.1018		

Table 8: Selection Corrected Results. Employed Respondents. The Logarithm of the stock holdings is the dependent variable

		Corrected OLS		Cross-Section Corrected RE		Panel Corrected OLS		Panel Corr. RE		Mdlk. Panel Corr. RE	
No.	Variable	Estimate	St. Error	Estimate	Stand. Error	Est.	St. Error	Est.	St. Error	Est.	St. Error
1	Constant	9.2477	3.9430	8.7456	4.0363	8.7687	3.9060	7.9463	4.0283	8.6242	3.9515
2	White	-0.4402	0.1939	-0.3646	0.1984	-0.4084	0.1994	-0.2628	0.2029	-0.5571	0.1711
3	Male	0.0044	0.0935	-0.0092	0.0998	0.0185	0.0931	0.0204	0.0992	-0.0043	0.0971
4	Married	-0.0336	0.1045	-0.0108	0.1057	-0.0598	0.1054	-0.0172	0.1076	-0.1018	0.1036
5	Bachelor D.	0.0404	0.1334	0.0794	0.1353	-0.0458	0.1464	0.0598	0.1458	-0.1464	0.1278
6	Graduate D.	0.3300	0.1323	0.4087	0.1420	0.3186	0.1315	0.3962	0.1416	0.3884	0.1395
7	Age	0.0748	0.1430	0.0914	0.1457	0.0878	0.1425	0.1061	0.1458	0.1357	0.1439
8	Age Sq.	-0.0003	0.0013	-0.0004	0.0013	-0.0005	0.0013	-0.0006	0.0013	-0.0009	0.0013
9	**Flexible Labor Supply**	**0.1158**	**0.0795**	**0.1216**	**0.0702**	**0.1308**	**0.0784**	**0.1417**	**0.0699**	**0.1224**	**0.0690**
10	**Second Job**	**-0.3363**	**0.1278**	**-0.2345**	**0.1064**	**-0.3232**	**0.1274**	**-0.2311**	**0.1064**	**-0.2304**	**0.1050**
11	Hourly Worker	0.0723	0.1049	0.0289	0.1017	0.0511	0.1035	-0.0135	0.1001	0.0491	0.0921
12	Earnings	0.0023	0.0012	0.0010	0.0011	0.0035	0.0012	0.0022	0.0011	0.0014	0.0010
13	Non risky wealth	0.4116	0.1591	0.1488	0.1545	0.5425	0.1387	0.3156	0.1350	0.0281	0.1250
14	Non risky wlt. Sq.	-0.0219	0.0078	-0.0086	0.0082	-2.93e-07	6.75e-08	-1.75e-07	7.33e-08	5.41e-07	1.19e-07
15	% Months Worked	-0.1591	0.2287	-0.2786	0.2084	-0.2366	0.2331	-0.3497	0.2109	-0.4694	0.2074
16	No Health Ins.	0.7598	0.3494	0.9756	0.3934	0.7049	0.3657	0.9165	0.3977	1.0770	0.3783
17	Retiree Health Ins.	-0.1782	0.0996	-0.2079	0.0904	-0.1557	0.0969	-0.1755	0.0893	-0.1887	0.0875
18	PWFT62	-0.2892	0.1146	-0.2320	0.1069	-0.3063	0.1123	-0.2657	0.1055	-0.1917	0.0988
19	Health Limitation	-0.2197	0.1041	-0.2295	0.0931	-0.2025	0.1037	-0.2162	0.0929	-0.2108	0.0916
20	Excellent Health	-0.1179	0.1172	-0.1650	0.1082	-0.1024	0.1170	-0.1369	0.1085	-0.1924	0.1022
21	Very Good Health	-0.1260	0.0989	-0.1219	0.0907	-0.1012	0.0979	-0.0973	0.0907	-0.1299	0.0856
22	First Wave	-0.6304	0.1099	-0.6057	0.1088	-0.7045	0.1136	-0.6569	0.1114	-0.7171	0.1095
23	Second Wave	-0.5325	0.1108	-0.4865	0.1058	-0.6352	0.1181	-0.5605	0.1113	-0.7055	0.1063
24	Third Wave	-0.3681	0.1157	-0.3136	0.0989	-0.3746	0.1161	-0.3187	0.0995	-0.3307	0.0981
25	New England	0.2982	0.1757	0.2332	0.2130	0.2801	0.1738	0.2025	0.2129	0.2063	0.2096
26	Mid-Atlantic	0.1414	0.1249	0.1919	0.1374	0.1307	0.1234	0.1750	0.1370	0.1865	0.1349
27	East N-C.	-0.2070	0.1149	-0.2189	0.1247	-0.2236	0.1158	-0.2191	0.1263	-0.3060	0.1215
28	West N-C.	0.0065	0.1493	-0.0147	0.1485	-0.0119	0.1488	-0.0228	0.1490	-0.0832	0.1453
29	Inverse Mills' Ratio	-1.8044	0.3384	-1.6875	0.3272	—	—	—	—	—	—
30	υ_{it}	—	—	—	—	-1.0483	0.1768	-0.8408	0.1661	-1.2700	0.1262
31	$\overline{\upsilon}_i$	—	—	—	—	0.2443	0.0579	0.1588	0.0579	0.2484	0.0567
	# Obs.	2,769		2,769		2,769		2,769		2,769	
	$\overline{R}^2$	0.1745		0.1701		0.1803		0.1746		0.1942	

Table A.1.: Sensitivity Analysis. Employed and Self-Employed Respondents. The Logarithm of the stock holdings is the dependent variable, except in columns (3) and (4).

		(1)		(2)		(3)		(4)	
No.	Variable	Estimate	Standard Error	Est.	Stand. Error	Est.	Stand. Error	Est.	Stand. Error
1	Constant	9.2959	3.4980	9.4193	3.5675	6.3389	2.7647	11.6458	3.4333
2	White	-0.2076	0.1820	-0.3540	0.1862	-0.1589	0.1305	-0.1428	0.1768
3	Male	0.0058	0.0885	-0.0218	0.0938	-0.0579	0.0710	0.0258	0.0863
4	Married	-0.0239	0.0936	-0.0089	0.0992	0.1828	0.0829	-0.0125	0.0907
5	Bachelor D.	0.1411	0.1327	0.0520	0.1381	0.1077	0.1018	0.1343	0.1289
6	Graduate D.	0.3298	0.1263	0.2711	0.1303	0.3267	0.1079	0.3813	0.1246
7	Age	0.0401	0.1270	0.0551	0.1288	0.1501	0.0992	-0.0458	0.1234
8	Age Sq.	0.0000	0.0012	-0.0002	0.0012	-0.0011	0.0009	0.0008	0.0011
9	Self-Emp. Indicator	0.0059	0.0951	—	—	—	—	—	—
10	Self-Emp. w/Wages	—	—	0.1620	0.1373	0.2293	0.0966	0.1025	0.1230
11	Self-Emp. w/Profits	—	—	0.0363	0.1028	0.3683	0.0741	-0.0175	0.0924
12	Second Job	-0.1760	0.0851	-0.2193	0.0940	0.0690	0.0654	-0.1340	0.0817
13	Hourly Worker	-0.0199	0.0916	-0.0189	0.1046	-0.0949	0.0733	-0.0278	0.0877
14	Earnings	0.0015	0.0003	0.0010	0.0003	0.0012	0.0003	0.0015	0.0003
15	Non risky wealth	0.2682	0.0735	0.2662	0.0806	0.3338	0.0611	0.2649	0.0702
16	Non risky wlt. Sq.	-0.0121	0.0033	-0.0112	0.0036	-0.0136	0.0028	-0.0116	0.0032
17	% Months Worked	-0.0539	0.1617	-0.2054	0.2050	-0.1230	0.1221	-0.0431	0.1534
18	No Health Ins.	0.4253	0.2051	0.4584	0.2233	0.3041	0.1404	0.4662	0.1950
19	Private Hlt. Ins.	0.1599	0.0697	0.1313	0.0776	0.1275	0.0547	0.1951	0.0668
20	PWFT62	-0.2416	0.0858	—	—	-0.1937	0.0665	-0.2546	0.0821
21	PWFT65	—	—	-0.1725	0.1113	—	—	—	—
22	Health Limitation	-0.1338	0.0764	-0.1638	0.0855	-0.1867	0.0590	-0.1507	0.0732
23	Excellent Health	-0.1245	0.0925	-0.0892	0.1021	-0.0543	0.0698	-0.0679	0.0869
24	Very Good Health	-0.1186	0.0770	-0.1449	0.0865	-0.0761	0.0557	-0.0981	0.0721
25	First Wave	-0.7300	0.0917	-0.7318	0.0980	-0.5415	0.0737	-0.8132	0.0878
26	Second Wave	-0.6526	0.0911	-0.6546	0.0995	-0.4236	0.0723	-0.6951	0.0858
27	Third Wave	-0.3267	0.0774	-0.3955	0.0895	-0.1962	0.0597	-0.3651	0.0736
28	New England	0.2990	0.1804	0.3687	0.1881	-0.0152	0.1535	0.2069	0.1776
29	Mid-Atlantic	0.1867	0.1232	0.2306	0.1286	0.0729	0.1021	0.0976	0.1207
30	East N-C.	-0.1031	0.1137	-0.1427	0.1187	-0.1651	0.0902	-0.1347	0.1122
31	West N-C.	0.1021	0.1322	0.1069	0.1390	0.0542	0.1065	0.0613	0.1296
32	υ_{it}	-0.8544	0.1350	-1.0022	0.1488	-0.8415	0.1254	-0.9105	0.1294
33	$\overline{\upsilon}_i$	0.2589	0.0514	0.2959	0.0551	0.4091	0.0449	0.3088	0.0507
	# Obs.	3,967		3,394		5,801		4,165	
	$\overline{R}^2$	0.1927		0.1877		0.2096		0.2192	

Table A.2.: Sensitivity Analysis. Employed Respondents. The Logarithm of the stock holdings is the dependent variable, except in columns (3) and (4).

		(1)		(2)		(3)		(4)	
No.	Variable	Estimate	Standard Error	Est.	St. Error	Est.	St. Error	Est.	St. Error
1	Constant	7.7348	4.1814	8.5397	4.0613	4.1925	3.2748	9.5902	3.9447
2	White	-0.3084	0.2166	-0.2782	0.2004	-0.1752	0.1506	-0.1782	0.1938
3	Male	0.0125	0.1085	0.0419	0.1006	-0.1398	0.0812	0.0107	0.0965
4	Married	0.0285	0.1168	-0.0079	0.1100	0.2197	0.0979	-0.0051	0.1032
5	Bachelor D.	0.0294	0.1612	0.0588	0.1458	0.1199	0.1255	0.0455	0.1393
6	Graduate D.	0.3106	0.1492	0.4046	0.1441	0.3521	0.1207	0.3938	0.1389
7	Age	0.1225	0.1493	0.0924	0.1472	0.2338	0.1169	0.0440	0.1414
8	Age Sq.	-0.0008	0.0014	-0.0005	0.0013	-0.0018	0.0011	0.0000	0.0013
9	Labor Supply Flexibility	0.1606	0.0782	0.1462	0.0702	0.1057	0.0546	0.1298	0.0664
10	Second Job	-0.2859	0.1180	-0.2442	0.1075	0.0470	0.0821	-0.2114	0.1013
11	Hourly Worker	-0.0979	0.1156	-0.0192	0.1011	-0.1068	0.0789	-0.0657	0.0947
12	Earnings	0.0031	0.0013	0.0012	0.0009	0.0029	0.0009	0.0024	0.0011
13	Non risky Wealth	0.4725	0.1467	0.0341	0.0405	0.4321	0.1107	0.3300	0.1273
14	Non risky Wlt. Sq.	-0.0255	0.0081	-0.0003	0.0010	-0.0239	0.0062	-0.0184	0.0070
15	% Months Worked	-0.6314	0.2763	-0.3925	0.2111	-0.2974	0.1587	-0.2337	0.1979
16	No Health Ins.	0.5461	0.6659	1.0748	0.3984	0.1834	0.3023	0.7685	0.3785
17	Retiree Health Ins.	-0.2465	0.1017	-0.1769	0.0892	-0.0590	0.0672	-0.1990	0.0851
18	PWFT62	—	—	-0.2730	0.1066	-0.2159	0.0866	-0.2798	0.0996
19	PWFT65	-0.2360	0.1448	—	—	—	—	—	—
20	Health Limitation	-0.2292	0.1050	-0.2340	0.0932	-0.2029	0.0723	-0.2300	0.0883
21	Excellent Health	-0.0502	0.1206	-0.1399	0.1092	-0.0407	0.0838	-0.0767	0.1014
22	Very Good Health	-0.0601	0.1029	-0.1019	0.0916	-0.0546	0.0674	-0.0874	0.0843
23	First Wave	-0.6396	0.1224	-0.6801	0.1125	-0.6381	0.0924	-0.7813	0.1068
24	Second Wave	-0.4858	0.1246	-0.5763	0.1122	-0.4553	0.0924	-0.6179	0.1047
25	Third Wave	-0.4006	0.1161	-0.3238	0.0995	-0.2513	0.0764	-0.4089	0.0934
26	New England	0.2417	0.2260	0.1560	0.2155	-0.0842	0.1824	0.1526	0.2089
27	Mid-Atlantic	0.1991	0.1470	0.1782	0.1394	0.0985	0.1170	0.1004	0.1334
28	East N-C.	-0.2494	0.1357	-0.2459	0.1266	-0.2420	0.1007	-0.2584	0.1235
29	West N-C.	-0.0162	0.1630	-0.0628	0.1504	-0.0016	0.1218	-0.0612	0.1454
30	υ_{it}	-0.8254	0.1931	-0.8822	0.1550	-0.7958	0.1708	-0.9004	0.1578
31	$\overline{\upsilon}_i$	0.2304	0.0648	0.1918	0.0580	0.3772	0.0509	0.2109	0.0569
	# Obs.	2,314		2,769		3,930		2,902	
	$\overline{R}^2$	0.1727		0.1541		0.1723		0.2001	

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