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A Discrete Choice Analysis of the Household Shares of Risky Assets

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Abstract

This paper studies household decisions about participation and investment in risky …nancial markets, using a unique panel dataset of Italian households. Micro data show that households are enormously heterogeneous in their …nancial decisions. Most of this heterogeneity is associated with the choice of participating in risky …nancial markets, and with time persistence in this decision. We postulate a model of portfolio choice with two types of …nancial assets, risky and riskless, and costs of participation. We use a ‡exible approach to estimate the conditional probability distribution function of the household shares of risky assets. We …nd that both household the cash-on-hand/non-…nancial-income ratio and non-…nancial-income have a positive e¤ect on the household shares of risky …nancial assets, mainly due their in‡uence on the household likelihood of participating in the risky …nancial assets. The evidence also shows that the lagged household share of risky asset is an important determinant of the household choice. Nevertheless, we …nd that the age of the household's head has not statistical relevance.

JEL: G11, E21, C25, D12

Keywords: household portfolio, longitudinal data, discrete choice.

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1 Introduction

During the past decade, …nancial markets have experienced important changes towards greater internationalization, integration and coordination, …nancial liberalization, and product innovation. Macro and micro data show that the structure of household wealth has changed substantially in that decade. If we take into account the real assets, residential property is still the single most important item in the aggregate household wealth. Nevertheless, its share has been decreasing while the relative importance of …nancial asset has increased substantially. Furthermore, there has been a rapid increase in the fraction of households owning equities, from 33 to 49 percent and from 12 to 22 percent in the U.S. and Italy respectively between 1989 and 1998 (Guiso, Haliassos and Jappelli, 2001). Similar patterns of increased ownership of equities and other risky …nancial assets have occurred in many nations around the world, suggesting that the quality of …nancial investment decisions made by households will be of increasing importance to their future living standards (Ameriks and Zeldes, 2000).

This paper provides an empirical analysis of household …nancial decisions about participation and investment in the risky …nancial markets. We postulate a model of portfolio choice with two types of …nancial assets, risky and safe and costs of participation. Based upon a very general speci…cation for the agent decision rule, we develop a ‡exible econometric approach that allows us to estimate the probability distribution function of the household shares of risky assets conditional on some observable characteristics that are related with the main state variables of the economic model (the cash-on-hand/non-…nancial-income ratio, non-…nancial-income, age and previous investment in the risky assets).

The dependent variable, the household shares of risky assets, belongs to the unit interval and accumulates some positive mass of probability at the (zero) corner solution. We make use of these features and proceed to discretize the dependent variable in order to approximate its conditional probability distribution function. The main discretization criterion we apply is to include one discrete choice for the (zero) corner solution and to divide the remaining space of the dependent variable among equal probability intervals. We determine how many intervals to use by applying Likelihood Ratio Tests.

The data come from the Italian "Survey of Households Income and Wealth", a unique data set which offers longitudinal data on household wealth, income and consumption and also includes detailed information about financial holdings and demographic characteristics of households members. Moreover, its quality has proved to be good enough for our purposes.

Our findings suggest that household's likelihood of participating in the risky asset markets is an increasing function of both the cash-on-hand/non-financial-income ratio and non-financial-income. Furthemore, the age of the agent is not statistically relevant. Conditional on participation, the expected value of household shares of risky assets is slightly increasing with the cash-on-hand/non-financial-income ratio and non-financial-income but is not affected by age. Finally, previous participation in the risky asset markets increases significatively the probability of participation and the expected value of the household shares of the risky assets.

The paper is organized as follows. Section 2 describes the theoretical economic background and Section 3 briefly presents the empirical antecedents of this study. Section 4 explains our econometric methodology and main characteristics of the data. Section 5 analyzes results and Section 6 concludes.

2 Economic background

2.1 Theoretical literature on the policy rule

In the late sixties the seminal paper of Samuelson (1969) addressed the problem of consumption and portfolio choice over the life cycle by establishing a very simple rule in order to select the optimal portfolio. Assuming complete markets, independent and identically distributed returns, that household preferences can be represented by a power utility function and there are no other sources of income except financial returns, Samuelson showed that the sequence of portfolio structures that is statically optimal is also dynamically optimal. The optimal share of risky assets is constant, independent of wealth and age, and could be described as $\alpha^* = \frac{\mu}{\gamma\sigma^2}$, where α is the risky asset share of household´s portfolio, μ and σ^2 are, respectively, the expectation and variance of the excess return, and γ is the coefficient of relative risk aversion of the agent. Selection rule depends only on risk aversion, and the moments of the asset´s excess return distribution; that is to say that myopia is optimal and consequently life cycle patterns do not matter (Gollier, 2001).

Bodie, Merton and Samuelson (1992) introduce the presence of labor income into the picture and conclude that human capital could affect the decision about investment in the risky financial assets for two reasons: the uncertain and uninsurable nature of future labor income streams and the ability of households to vary their labor supply in the future.

This issue appear to be also very important from an empirical point of view because most of the observed volatility of households earnings comes from variations in labor incomes and typically risks related to human capital cannot be traded. Cocco, Gomes and Maenhout (1997) show that the optimality of myopia disappears as the complete markets assumption is relaxed. These authors claim that the ratio of current wealth to expected future labor income is a crucial determinant of consumption and portfolio choice. To the extent that this ratio changes over the life cycle, the optimal portfolio allocation should not be expected to be age invariant and myopia could not be optimal. Other effects of labor income on portfolio choice appear if labor income and asset returns are correlated, or if we allow for the existence of time variation in the set of investment opportunities (Viceira, 2001).

Unfortunately, there is no known analytical solution to a portfolio life-cycle model that includes a stochastic stream of labor income. In a seminal paper, Merton developed an optimal rule allowing for the existence of a constant labor income profile. Cocco, Gomes and Maenhout (1999) describe Merton's rule and generalize it by allowing for variation in the future labor income realization. This rule could be described as $\alpha = \frac{\mu}{\gamma\sigma^2}\frac{W_t + PDV(FY_t)}{W_t}$ where W_t is financial wealth and $PDV(FY_t)$ is the expected present discounted value of the future labor income stream.

Viceira (2001) and Cocco, Gomes and Maenhout (1999) solve numerically a life cycle model using calibration techniques, this method allows them to simulate the individual optimal path for consumption and risky asset holdings under the assumption that household receives an exogenous, uncertain and uninsurable stream of labor income. These authors conclude that the demand for the risky asset increases in the presence of labor income and that, conditional on a given future labor income stream, the optimal fraction to invest in the risky asset is a decreasing function of current wealth. They also find that the shape of the labor income profile over the life time ought to induce the investor to reduce the risky asset share when aging.

Finally, there are some professional financial planners who often advise that the fraction of wealth that people ought to hold in the risky asset markets should decline with age. A typical rule of thumb is that the percentage on an investor's portfolio of …nancial assets that is held in equities should equal 100 minus her age (Ameriks and Zeldes, 2000).

Note that the analyses brie‡y referred above focus on the interior solutions of the household investment problem. In order to …nd a theoretical explanation of the (zero) corner solution in the demand for the risky assets we can refer to Deaton (1991). Deaton …nds that in the presence of borrowing constraints, saving and asset accumulation is quite sensitive to what consumers believe about the stochastic process generating their income. The author also shows that when income follows a random walk, it turns out that those who wish to borrow but cannot do so typically can do no better than consume their incomes, but he also points out that this "rule of thumb" is not generally optimal in the presence of borrowing constraints.

Borrowing restrictions could explain why some households do not accumulate wealth. Moreover, we could expect that agents' preferences and beliefs about both future non-…nancial-income and future returns on …nancial investment play a crucial role in their demand for the risky assets. Nevertheless, the combined e¤ect of borrowing restrictions and …xed costs of participation in the risky asset markets is needed if we want to explain why some households that own …nancial holdings decide not to participate in these markets.

2.2 The agent's problem

The model considers the problem of a risk averse agent who derives utility from consumption, that is to say, her goal is to maximize expected discounted utility over her remaining lifetime. There are only two types of assets in the economy: human capital and …nancial assets. The agent's life horizon is in…nite but a positive probability of death makes her expected lifetime to be …nite. There are no bequest motives.

At the beginning of period t the agent receives a liquid endowment. This endowment consists of …nancial wealth (W_t) and non-…nancial-income (Y_t).[1] In the initial period of her life, the agent receives certain amount of …nancial wealth as a present. That amount could be greater than or equal to zero but unfortunately we cannot observe it. During the consecutive periods …nancial wealth comes from the realized gross return of the investment made in the

[1] Non-…nancial-income could include labor income, pensions, returns of real assets and transfers.

previous period. Non-financial-income follows a stochastic process that is determined by agent's human capital. We assume that both human capital and the respective labor supply are exogenously given. Consequently the non-financial-income is also exogenous. In spite of the fact there is no moral hazard in that context, we assume there are no insurance markets for non-financial-income, thus the agent is not allowed to borrow.

At each period t; the agent simultaneously decides (i) how to allocate resources among consumption and savings; and (ii) the demand for the risky asset as a fraction of her financial holdings. There are two different financial assets in the economy. The expected return and the volatility are greater for the risky asset than for the riskless one. Participation in the riskless asset market is free but the agent has to pay some costs in order to participate in the risky asset market. We assume a general costs function, that depends on both current and previous household shares of risky assets.

The problem can be briefly described as follows. At each time period t; the agent observes her income sources, the composition of her portfolio in the previous period and the set of investment opportunities available in the market. Then, based on her preferences and beliefs about future non-financial-income and asset returns, and taking into account the fact that she is not permitted to borrow, the agent chooses her consumption expenditure (which also determines financial holdings) and the proportion of financial holdings to allocate into the risky asset. In order to select the optimal alternative the agent brings the future into the picture and builds contingent plans of consumption and investment for her remaining lifetime. We assume agent's preferences are described by a standard, time separable, utility function over consumption ($u(C)$).

Thus, agent's problem in period t is to choose c_t, the proportion of cash-on-hand to spend on consumption (likewise, A_t wealth transferred to the next period) and α_t; the portion of the financial wealth to be allocated in the risky asset. The problem can be summarized as:

$$\max_{\{C_{t+j};\alpha_{t+j}\}} E_t \left\{ \sum_{j=0} \beta^j \lambda_j (a_t)\, u(C_{t+j}) \right\} \tag{P1}$$

$$
\begin{aligned}
s{:}t{:} \quad W_{t+j+1}(\alpha) &= [A_{t+j} - G(\alpha_{t+j};\alpha_{t+j-1})] \times R(\alpha)_{t+j+1} \\
A_{t+j} &= [(W_{t+j} + Y_{t+j})(1 - c_{t+j})] \\
C_{t+j} &= (W_{t+j} + Y_{t+j})\, c_{t+j} \\
R(\alpha)_{t+j+1} &= R_{t+j+1;} + \alpha_{t+j} R^{e}_{t+j+1} \\
R_{t+j+1} &= R^{safe}_{t+j+1} \\
R^{e}_{t+j+1} &= R^{risky}_{t+j+1} - R_{t+j+1} \\
0 &\leq A_{t+j} - G(\alpha_{t+j};\alpha_{t+j-1}) \\
0 &\leq \alpha_{t+j} \leq 1 \\
u' &> 0\,,\ u'' < 0
\end{aligned}
$$

Recall that W_t is accumulated financial wealth at the beginning of period t, Y_t is non-financial-income, a_t is the age of the agent, c_t, is the proportion of cash on hand spent on consumption, C_t is consumption expenditure, A_t is gross savings and α_t is the portion of the financial wealth allocated in the risky asset. The agent is not allowed to borrow, thus both the consumption rate and the risky asset share belong to the interval $[0;1]$. We assume that the felicity function $u()$ satisfies Inada conditions preventing the consumption rate to equal zero. The subjective discount rate equals β; ($\beta \in (0;1)$) and $\lambda_j(a_t) \in (0;1)$ is a hazard function that gives the probability of the agent to be alive at time $t+j$ conditional on the fact that she is alive and a_t years old at the beginning of period t. At the beginning of period t the agent observes the amount of her financial wealth and non-financial-income, her age and the previous pattern of participation in the risky asset market: There is uncertainty on her future life status, on the future stream of non-financial-income $\{Y_{t+j}\}; j > 0$ and on the future returns of the financial assets $\{R_{t+j}\}; j > 0$. Finally, $G(\alpha_{t+j};\alpha_{t+j-1})$ captures the costs that the agent should pay in order to participate in the risky asset market.

The solution to the problem can be described through Bellman's principle of optimality,

$$V(s_t) = \max_{(c_t;\,\alpha_t)} u[(W_t + Y_t)\, c_t] + \beta\, \lambda(a_t) E\, [V(s_{t+1}) | s_t; c_t;\ \alpha_t] \tag{1}$$

with,

$$E\, [V(s_{t+1}) | s_t; c_t;\ \alpha_t] = \int V(s_{t+1}) p(s_{t+1} | s_t; c_t;\ \alpha_t)$$

$$s_t = [W_t + Y_t; Y_t; a_t; \alpha_{t-1}; OTHER_t].$$

Under the additional assumption that the felicity function $u(.)$ is homogenous we can re-arrange the state variable vector,

$$s_{t+j} = \left[\frac{W_{t+j} + Y_{t+j}}{Y_t}; Y_{t+j}; a_{t+j}; \alpha_{t+j-1}; OTHER_t\right].$$

and, under the assumption that the non-financial-income process is exogenously given it is possible to factorize the probability transitions,

$$\Pr(s_{t+1} \mid s_t; c_t; \alpha_t) = \Pr(\frac{W_{t+1} + Y_{t+1}}{Y_t} \mid s_t; c_t; \alpha_t; Y_{t+1}) \times \Pr(Y_{t+1} \mid Y_t; a_t; OTHER_t).$$

Note that the well defined state variables represent also a subset of the agent's current information that affect her expectation about her remaining life-span, future non-financial earnings, participation costs and asset returns and $OTHER$ are the remaining variables that influence either probability transitions $p(s_{t+1} | s_t; c_t; \alpha_t)$ or participation cost $G(\alpha_t; \alpha_{t-1})$. Given her expectations, at each period t; the agent's sequential decision problem is to choose values for the control variables $(c_t; \alpha_t)$ that maximize the expected discounted value of utility over her remaining lifetime, where her expectations are conditioned on the current values of the state variables s_t.

The solution of the problem could be described by the following implicit policy functions.[2]

$$c_t^* = c^*\left[\frac{W_t + Y_t}{Y_t}; Y_t; a_t; \alpha_{t-1}; OTHER_t\right] \quad (2)$$

$$\alpha_t^* = \alpha^*\left[\frac{W_t + Y_t}{Y_t}; Y_t; a_t; \alpha_{t-1}; OTHER_t\right] \quad (3)$$

3 Empirical literature

3.1 Econometric issues

Several econometric issues arise in the empirical study of the household shares of risky assets. First, the household shares of risky assets behaves like a limited dependent variable in the sense that it belongs to the unit interval and accumulates a positive mass of probability at zero. In order to deal with this issue most of the previous empirical analysis use models

[2] We are working on the solution of this model using numerical techniques (to our knowledge, there is not any available analytical solution).

that rely on the statistical structure of the Heckman selection model.[3] A problem with this approach is that the modelling of the probability distribution of the data is motivated by assumptions about latent variables that lack of a natural interpretation in our context (c.f. Aguirregabiria (1997) and Pakes (1994) for a discussion of the structural estimation of mixed continuous discrete control variables).

Second, the expected relationship between the state variables and the dependent variable is highly non-linear suggesting that a flexible framework is needed in order to capture the true influence of these variables over the household choice. Third, persistence could be due to true state dependence or serial correlation in shocks. In principle, panel data allows one to distinguish limited participation due to true state dependence from unobserved heterogeneity as well as to handle serial correlation in shocks (see Arellano and Honoré (2001) for a general survey and Miniaci and Weber (2001) for a specific discussion of modelling individual effect in the demand of risky financial assets). Finally, there is an identification problem that prevents unrestricted estimation of age, time and cohort effects in longitudinal data.

3.2 Previous empirical findings

Micro data show that households are extraordinarily diverse in their financial portfolio choices and that most of this heterogeneity is associated with the choice of whether to participate in risky financial markets. Guiso, Haliassos and Jappelli (2001) report that the proportion of stockholders is lower than 50 percent in all countries (the highest proportion is 49 percent and corresponds to the U.S.). On the other hand, well documented evidence demonstrates that the expected returns on stocks and bonds are higher than that on bank deposits (Kocherlakota, 1996). In addition, there is evidence about time persistence in the decision to participate in the risky financial asset markets. Data also show that many of those households that own risky assets do not diversify these holdings. Life cycle patterns are also present when analyzing actual data. In most countries, while there is a hump-shaped profile of the share of ownership of the risky asset, conditional on owning them, the age profile of the share of the risky asset in household financial portfolio is relatively flat (Guiso, Haliassos and Jappelli, 2001).

Differences in stockholding across countries are essentially due to differences in the propen-

[3] See for example, the contributed chapters in Guiso, Haliassos and Jappelli (ed.), 2001.

sity to hold stocks in the wealthier segments of the population. In the U.S. and the Netherlands the vast majority of households in the top 5 percent of the wealth distribution hold some risky asset, while in Italy and Germany about a half of this class of investors has no direct nor indirect stock holdings. This di¤erence is puzzling and could partly be attributed to some combination of di¤erences in background risk and in informational and other entry costs faced by these households. Heaton and Lucas (2000) stress that wealthy households face considerable background risk through holdings of business wealth.

Guiso and Jappelli (2001) …nd that Italian household portfolio allocations depends basically on wealth. These authors show that the relative weight of …nancial assets in total asset holdings declines with wealth, while that of investments into real estate and business equity increases. They also show that wealthier households tend to invest a much larger share of their wealth in risky assets and that there is a strong association between participation in risky asset markets and wealth.

Ameriks and Zeldes (2000), Guiso, Haliassos and Jappelli (2001) …nd that the proportion of households participating in the risky asset markets exhibit a hump-shaped pro…le with age, while equity shares conditional on ownership are nearly constant across age groups, when they include only age and time e¤ects (excluding cohort e¤ects). Besides, Ameriks and Zeldes (2000) address the identi…cation problem that prevents unrestricted estimation of age, time and cohort e¤ects by showing that based on a speci…cation that includes age e¤ects and cohort e¤ects (excluding time e¤ects) the risky asset share increases strongly with age.

Haliassos and Michaelidis (2001), Miniaci and Weber (2001), Perraudin and Sorensen (2001) and Vissing-Jorgensen (1999) propose di¤erent approaches in order to introduce participation costs in the …nancial risky assets demand. Vissing-Jorgensen (1999) …nds that the lagged participation is a very strong predictor of the conditional probability of participating, and concludes that the presence of …xed costs induces households to do nothing most of the time and, occasionally, to make large portfolio adjustments.

4 Empirical analysis

The goal of the empirical analysis is to specify a reduced-form model for the conditional probability distribution of the household shares of risky assets implicitly given by:

$$\alpha_t^* = \alpha^*\left(\frac{W_t + Y_t}{Y_t}; Y_t; a_t; \alpha_{t-1}; OTHER_t\right)$$

The choice of the set of conditional variables is determined taking into account both the expected sources of individual heterogeneity and the availability of information. The economic model described in Section 2 implies that the cross-section variation of the vector of the state variables is the primary source of heterogeneity on the household shares of risky assets. Furthermore, other sources of individual heterogeneity could emerge from costs, probability transitions and preferences.

Notice that financial wealth one period ahead is a linear transformation of the rate of financial assets returns ($W_{t+1} = [A_t - G(\alpha_t; \alpha_{t-1})] \times R(\alpha)_{t+1}$). We could assume that the probability distribution function of returns varies over time but is the same for all people; however, for a given α; its transformation may exhibit heterogeneity if participation costs $G(\alpha_t; \alpha_{t-1})$ vary among individuals. On the other hand, non-financial-income probability transitions and parameters that characterize the felicity function are also expected to vary with individual characteristics.

4.1 The data

The data are drawn from the Italian "Survey of Households' Income and Wealth" (SHIW), which is conducted by the Bank of Italy since 1965. From 1987, this unique dataset have a panel structure, follows a biannual frequency and includes extensive information on household income, consumption and savings, asset holdings, real assets and other characteristics of the household and its members. The data used in the estimation cover the years 1987 to 1998.[4]

The SHIW collects detailed information on the composition of Italian households financial portfolio allowing constructing the dependent variable of the empirical model (α_t). Since the 1995 wave, portfolio data are collected using a frame that distinguishes 26 different financial assets. Previously (through 1989 and 1993) financial assets were split into only 13 types. This fact reduces the freedom to define the financial assets categories. Taking into account this fact and the characteristics of each type of financial asset we decided to classify financial asset into four categories. We denominate the first one Deposits and it includes

[4] The SHIW has followed a biannual frequency since 1987 but the latest wave available (1998) took place three years later than the previous one.

bank current accounts, personal savings books, postal accounts and postal deposits. The second category is called Stocks and comprehends investment funds shares, stocks of listed companies, estate management and foreign assets. Bonds is the third category, containing non-government bonds, certi…cates of deposit, repurchase agreements, postal saving certi…-cates, interest bearing bonds, treasury bills, treasury certi…cates, long-term treasury bonds, zero-coupon bonds and other government bonds. The last category is named Private Ownership and includes shareholding-limited companies, shareholding-partnership and lending to cooperatives. We distinguish the latest category from the other ones because we think that the investment decision on this type of holdings follows very di¤erent rules than those on the tradable …nancial assets.

The dependent variable is computed as the ratio of Stocks plus Bond over the sum of the four categories. The panel structure of the SHIW allows us to construct the state variable $®_{t ¡ 1}$ for those households with at least two observations. Household's consumption and …nancial holdings at the end of the year are also available and thus, we can evaluate the cash on hand as the sum $A_t + C_t$. The SHIW includes information on labor income, real assets yields, pensions and other transfers received by household's members during the year, these data allow us to obtain the aggregated non-…nancial-income of the household, which corresponds to the state variable Y_t: Finally, the age of the household head is also collected by the Survey.

There are other observable characteristics that are expected to generate heterogeneity on the households' shares of the risky assets through their in‡uence over the cost of participation in the risky asset markets, the non-…nancial-income probability transitions or the preferences parameters. Thus, we complete the set of explanatory variables by adding the following ones: the education level, the job and the industry of the head of the household head, the city and the area of the household's residence, the number of labor income earners, the family size and a second order polynomial in time.

In addition, we avoid some other sources of heterogeneity by selecting those households for which the head is male, older than 25 years old and married. We also eliminate those observations with negative non-…nancial-income and improve the quality of the data by excluding those households with out of proportion changes on their asset holdings (more than four deciles between two consecutive waves or two opposite sign changes greater than two deciles).

The sample contains 7823 observations. The proportion of household with risky financial holding in the sample is 37 percent and attains 43 percent of the population with financial holdings.

Table 1.b shows that the mean values of both financial wealth and non-financial-income are greater for those households that own risky financial assets. Moreover, we observe substantial differences on the proportion of households that have participated in the risky asset markets in the previous period: the percent of participants in the previous period attains to 10, 17 and 66 percent for households without financial holdings, without risky financial holdings and with risky financial holdings, respectively. On the contrary, small differences are found on the age of the household's head between these groups. Finally, the family size is slightly smaller for the group of risky asset owners while the number of labor income earners is greater.

Table 1.b also illustrates some other characteristics of the sample and shows that households with risky financial assets are highly educated and the majority of them reside in the North of Italy. We also notice that independent workers are under represented within the group of households who participate in the risky financial asset markets.

4.2 Econometric methodology

Taking advantage of the fact that the dependent variable belongs to the unit interval and accumulates a positive mass of probability at zero, we propose to study its conditional probability distribution by using a discretization of the variable. As it will be shown below, this approach allows us to capture potential non-linear effects of the explanatory variables in a relatively parsimonious way.

We proceed to discretize the dependent variable into $J+1$ values as follows:

$$\alpha_{it} = \begin{cases} 0 & \text{if } \alpha^*_{it} = 0 \\ \alpha_1 & \text{if } \alpha^*_{it} \in (0; \overline{\alpha}_1] \\ \alpha_2 & \text{if } \alpha^*_{it} \in (\underline{\alpha}_2; \overline{\alpha}_2] \\ \dots & \dots. \\ \alpha_J & \text{if } \alpha^*_{it} \in (\underline{\alpha}_J; 1] \end{cases}$$

With $0 \leq \underline{\alpha}_j < \overline{\alpha}_j = \underline{\alpha}_{j+1} \leq 1; \forall j = 1; 2; \dots; J - 1.$

Let us define $d_{jit} = 1(\alpha_{it} = \alpha_j) = 1(\alpha^*_{it} \in (\underline{\alpha}_j; \overline{\alpha}_j])$.

We have a sample $(\alpha_{it}; X_{1it}; X_{2it}; \ldots; X_{Kit})$; $i = 1; 2; ..N$; $t = 1; \ldots T_i$ thus we can estimate the log-likelihood of this model defined by,

$$L(\theta; J) = \sum_{t=1} \sum_{i=1} \log l_{it}(\theta; J); \quad \log l_{it}(\theta; J) = \sum_{j=0} d_{jit} \log F_{jit}$$

$$F_{jit} = \Pr(d_{jit} = 1 \mid X_{it}):$$

We complete the model by selecting a multinomial logit specification for F_j, and thus,

$$F_{jit} = \Pr(d_{jit} \mid X_{it}) = p_{jit} = \frac{\exp(\delta_j + X_{it}'\beta_j)}{\sum_{s=0}^{J} \exp(\delta_s + X_{it}'\beta_s)}$$

and normalize the model by fixing $\exp(\delta_0 + X_{it}'\beta_0) = 1$.

It is important to notice that this specification allows coefficients to vary with the different discrete values of the dependent variable, and thus it captures the local effect of the explanatory variables on α_{it} in a flexible way.

Given the availability of panel data, the multinomial logit specification allows us to deal with the presence of individual specific effects, provided we treat the X's as strictly exogenous variables and use the multinomial version of the conditional logit panel model discused by Chamberlain (1980). In order to assess the relevance of correlated individual effects in the determination of α^*_{it} we first estimated simplier linear models and found that the presence of correlated individual effects is not relevant in our case. These results are similar to those of Guiso and Japelli (2001). Note that the conditional multinomial logit model restricts the sample to the observations for which d_{ij} changes over time and identification relies on the time variation of the explanatory variables (Arellano and Honoré, 2001), which implies that much information is lost (i.e., the effect of characteristics that do not vary over time, such as education) and other potential sources of estimation bias are amplified (i.e., measurement errors). Moreover, we are also interested in including lagged dependent variables among the regressors and possibly treating other X's as predetermined variables (i.e., the cash-on-hand/non-financial-income ratio), which rule out strict exogeneity. Thus, we proceed on the assumption that there are not correlated unobservable individual effects in our model.

Furthermore, we have to decide which pair among age, time and cohort effects must be considered in the empirical specification. Age influences both the agent's life horizon and expectations on her future labour income stream. We also expect relevant variation on the participation costs and on the probability distribution of returns over time. On the other hand, cohort effects could be related with differences on both preferences and the expected duration of life. It seems a-priori that the size of these latest changes over a short period is less important than those related with the age and time effects. Thus, we disregard the presence of cohort effects and assume that there are only age and time effects in our model .

In order to estimate the model we should decide both on the discretization criterion and on the number of intervals to be used. Note that we define α_j including one discrete choice for the (zero) corner solution and dividing the remaining space of the dependent variable among J intervals. In order to split this semi-open interval we consider two different criteria, one is to produce equal probability grids and another is to generate equally spaced grids. Below we present the log-Likelihood Ratio Test that allows us to decide about the number of intervals of the discretization grid.

4.2.1 Likelihood Ratio Test for the selection of J

Consider the test on the choice of $J = 2$ with $\alpha_j \subset \{\alpha_0; \alpha_1; \alpha_2\}$ against $J = 1$ with $\alpha \subset \{\alpha_0; \alpha_1 \cup \alpha_2\}$: If J equals 2 the choice probabilities are given by:

$$
\begin{aligned}
p_0 &= \Pr(d_0 = 1 \mid X) = \frac{1}{1 + \exp(\delta_1 + X'\beta_1) + \exp(\delta_2 + X'\beta_2)} \\
p_j &= \Pr(d_j = 1 \mid X) = \frac{\exp(\delta_j + X'\beta_j)}{1 + \exp(\delta_1 + X'\beta_1) + \exp(\delta_2 + X'\beta_2)}; \; j = 1; 2
\end{aligned}
$$

while if J equals 1;

$$
\begin{aligned}
p_0 &= \Pr(d_0 = 1 \mid X) = \frac{1}{1 + \exp(\delta_{12} + X'\beta_{12})} \\
p_{1+2} &= \Pr(d_1 + d_2 = 1 \mid X) = \frac{\exp(\delta_{12} + X'\beta_{12})}{1 + \exp(\delta_{12} + X'\beta_{12})}
\end{aligned}
$$

Let us consider the hypothesis $H_0 : \beta_2 = \beta_1 (= \beta_{12})$; under H_0 $p_j = \frac{\exp(\delta_j + X'\beta_1)}{1+\exp(\gamma + X'\beta_1)}$; $j = 1; 2$ and $p_1 + p_2 = \frac{\exp(\gamma + X'\beta_1)}{1+\exp(\gamma + X'\beta_1)}$ with $\exp(\gamma) = \exp(\delta_1) + \exp(\delta_2)$:

The log-likelihood of the unrestricted model ($J = 2$) is given by:

$$
\begin{aligned}
L(2) &= L(\delta_1; \beta_1; \delta_2; \beta_2; 2) = \sum_i l_i(\delta_1; \beta_1; \delta_2; \beta_2; 2) = \sum_i l_i(2) \\
l_i(2) &= d_{0i} \log p_0 + d_{1i} \log p_1 + d_{2i} \log p_2
\end{aligned}
$$

while if $J = 1$ the log-likelihood equals,

$$L(1) = L(\delta_{12};\beta_{12};1) = \sum_i l_i(\delta_{12};\beta_{12};1) = \sum_i l_i(1)$$

$$l_i(1) = d_{0i}\log p_0 + (d_{1i} + d_{2i})\log p_{1+2}$$

Thus, under H_0, $l_i(2) = l_i(1) + l_{ie}(1;2)$; where $l_{ie}(1;2) = d_{1i}\log\frac{p_{1i}}{p_{2+1;i}} + d_{2i}\log\frac{p_{2i}}{p_{2+1;i}}.$ It is easy to notice that under the hypothesis $\beta_1 = \beta_2$ the odd ratios $\frac{p_1}{p_{2+1}};\frac{p_2}{p_{2+1}}$ do not depend on X and that we can evaluate, $\frac{p_{1i}}{p_{2+1;i}} = \frac{\sum_i d_{1i}}{\sum_i d_{1i}+d_{2i}}.$ Finally, the correspondent LR Test statistic is defined by $-2(L(1) + L_e(1;2) - L(2)) \sim \chi_K.$

It is easy to generalize to the analogue discretization problem of the dependent variable but now testing a grid $\alpha_j \subset \{0;\alpha_1;\alpha_2;\ldots\alpha_J\}$ against another one $\alpha_j' \subset \{0;\alpha_1\cup\alpha_2;\alpha_3\cup\alpha_4;\ldots;\alpha_{J-1}\cup\alpha_J\}$

$$L(J) = \sum_i l_{iJ}(\delta;\beta);\quad l_i(J) = d_{0i}\log p_{0i} + \sum_{s=1}^{J} d_{si}\log p_{si}$$

and

$$L(\frac{J}{2}) = \sum_i l_i(\frac{J}{2});\ l_i(\frac{J}{2}) = d_{0i}\log p_0 + \sum_{s=1}^{\frac{J}{2}}(d_{2s-1;i} + d_{2s;i})\log p_{(2s-1\cup 2s)}$$

Let us consider the hypothesis $H_0 : \beta_{2s-1} = \beta_{2s}\ \ \forall s = 1;\ldots;\frac{J}{2}$; under Ho $L(J) = L(\frac{J}{2}) + L_E(\frac{J}{2};J)$ where $L_E(\frac{J}{2};J) = \sum_i\sum_{s=1}^{\frac{J}{2}} d_{2s-1;i}\log\hat{b}_s + d_{2s;i}\log(1-\hat{b}_s)$; $\hat{b}_s = \frac{\sum_i d_{2s-1}}{\sum_i d_{2s-1}+d_{2s}}$ and thus, the LRT statistic is given by $-2(L(\frac{J}{2}) + L_E(\frac{J}{2};J) - L(J)) \sim \chi_{K\times\frac{J}{2}}$

4.2.2 Parameters of interest

The main parameters of interest of our model are measures of the change in the conditional probabilities of the household shares of risky assets to belong to a specific interval, $\Pr(\alpha_{it} = \alpha_j \mid X_{it})$; $j = 0;1;\ldots J$. Moreover, the model allows us to obtain $\Pr(\alpha^*_{it} > 0 \mid X_{it})$ the household's probability of participating in the risky financial markets; $E(\alpha^*_{it} \mid X_{it})$; the expected value of the household shares of risky assets and $E(\alpha^*_{it} \mid X_{it};\alpha^*_{it} > 0)$; the expected value conditional on participation.

The conditional expected value of α^* equals $\sum_{j=1}^{J} E(\alpha^*_{it} \mid X_{it};\alpha_{it} = \alpha_j)\Pr(\alpha_{it} = \alpha_j \mid X_{it})$. Besides, the LR Test applied in order to decide the size of the grid has an appealing interpretation: it implies that for the $J-$ grid suggested by this procedure $E(\alpha^*_{it} \mid X_{it};\alpha_{it} = \alpha_j) = E(\alpha^*_{it} \mid \alpha_{it} = \alpha_j) = E(\alpha^*_{it} \mid \alpha^*_{it} \in (\underline{\alpha}_j;\overline{\alpha}_j])$, that is to say, the observable characteristics of the agent have no explanatory power within each particular interval of the grid. Thus we can predict:

$$E(\alpha^*_{it} \mid X_{it}) = \sum_{j=1}^{J} \alpha_j \times \Pr(\alpha_{it} = \alpha_j \mid X_{it});$$

where α_j could be $\frac{\sum_i d_{ij} \times \alpha_i}{\sum_i d_{ij}}$; the sample mean of α_j within the interval $(\underline{\alpha}_j; \overline{\alpha}_j]$.[5] Finally, we can obtain

$$E(\alpha^*_{it} \mid X_{it}; \alpha^*_{it} > 0) = \frac{E(\alpha \mid X_{it})}{1 - \Pr(\alpha^*_j = 0 \mid X_{it})}.$$

Furthermore, we are interested in the evaluation of elasticities with respect to the cash-on-hand/non-financial-income ratio and non-financial-income and the model allow us to obtain them as the avg $\left[\frac{\partial \log f(\alpha^*_{it}; X_{it})}{\partial \log X_{itk}}\right] = \frac{1}{NT} \sum_{t=1}^{T} \sum_{i=1}^{N} \frac{\partial \log f(\alpha^*_{it}; X_{it})}{\partial \log X_{itk}}$ where $f(\alpha^*_{it}; X_{it})$ is $\Pr(\alpha^*_{it} = 0 \mid X_{it})$; $E(\alpha^*_{it} \mid X_{it})$ and $E(\alpha^*_{it} \mid X_{it}; \alpha^*_{it} > 0)$. Similarly, we can obtain the proportional effect with respect to age through avg $\left[\frac{f(\alpha^*_{it}; X_{it}; Age_{it}) - f(\alpha^*_{it}; X_{it}; Age_{it-1})}{f(\alpha^*_{it}; X_{it}; Age_{it-1})}\right]$.

5 Empirical results

The LR Test proposed above in order to select the size of the grid suggests the discretization of $\alpha \in (0; 1]$ into 4 values if we use an equal probability grid, and into 8 values if the grid is equally spaced. Thus, we decide to use an equal probability grid that splits the $(0; 1]$ interval among the empirical quartiles of $\alpha^* \mid \alpha^* > 0$. Table 2 reports the values the tests under equal probability grids.

Afterwards, we obtain the unconditional correlations between the observed dependent variable (α^*_{it}) and the discretized one (α_{it}), which attains 0.99, and between the first differences of each of these two variables ($\Delta\alpha^*_{it}$ and $\Delta\alpha_{it}$); that is 0.98. These high correlations suggest that the amount of information we lose in the discretization procedure is actually not of relevance.

Table 3 reports coefficients and standard errors of the multinomial estimation of the model. It is important to note that in order to apply the previous tests we do not include the lagged dependent variable within the X-vector. This is because its definition changes

[5] Note that the model allows us to use other predictors of α: The most obvious is to predict the conditional median of α: Furthermore, predictions of the expected value can be computed using a two step procedure; in the first step the value of α is fixed at zero for household with p_0 greater than certain threshold and in the second step the value of α for the remaining sample is obtained as $\sum_j \alpha_j \frac{p_j}{1 - p_0}$.

with the size of the grid introducing unnecessary complexity to the problem. Instead we use an indicator variable that assumes the value of 1 whenever the lagged dependent variable is di¤erent than zero. Once we have selected the size of the grid, we use a log-likelihood ratio test for the hypothesis of including only the indicator variable against the alternative of introducing the already properly de…ned lagged dependent variable. The result of the test suggests us to consider this latter variable. Except for this fact, we use the same X-vector for the LR tests on the size of the grid and for the estimation reported in Table 3.

The interpretation of the multinomial coe¢ cients is not straightforward. However, there are some conclusions that arise when we analyze them. First, we observe that the coe¢ cients on both the cash-on-hand/non-…nancial-income ratio and non-…nancial-income are positive, signi…cant and higher the higher are the intervals of ®. Moreover, the coe¢ cients of the square of the former variable are negative and signi…cant, suggesting that its positive in‡uence is decreasing. Secondly, we observe that age coe¢ cients are not signi…cant.[6] Moreover, the coe¢ cients of the indicator variables that capture the value of the lagged dependent variable are positive and signi…cant, showing that the probability of participating exhibit a relevant increase if the household has participated in the risky asset markets in the previous period. This fact could be thought as evidence of the existence of entry cost in the risky …nancial asset markets. Besides, the coe¢ cients of the second order polynomial in time show a positive and concave trend over time. Finally, the estimation suggest that the amount of household real wealth, the family size, the fact that the head was an independent worker and the localization of the household in the South of Italy in‡uence negatively household's probability of participating in the risky …nancial markets.

In order obtain further results, we obtain the elasticity with respect to the cash-on-hand/non-…nancial-income ratio, non-…nancial-income and the proportional e¤ect of the age of the household's head, evaluating the X ¡ vector on each sample individual value. Tables 4, 5 and 6 report the averages of these measures. We compute averages for the whole sample and within di¤erent household groups, in order to investigate if the empirical elasticity´s function is constant with respect to the variable it is referred to.

We …nd evidence that the probability of household to participate in the risky asset markets is positively in‡uenced by both the cash-on-hand/non-…nancial-income ratio and non-

[6] The square of income and age were included at …rst but they resulted not to be signi…cant.

financial-income, but exhibits a negative slope with respect to the age of the household's head. The average elasticity with respect to the cash-on-hand/non-financial income ratio attains 2.04; however, this effect decreases as this variable increases and it is very low within the top deciles of the cash-on-hand/non-financial-income distribution (Table 4). The elasticity with respect to non-financial-income is also positive and decreasing with non-financial income level, and its sample average equals 1.25 (Table 5). Besides, the model predicts that the age of the household affects negatively the probability of participating, although the average of its proportional effect is very small (-0.0031, see Table 6).

The expected value of the households shares of risky asset conditional on participation is increasing with respect to the state variables previously referred, but elasticities are significatively lower. The average elasticities with respect to the cash-on-hand/non-financial-income ratio and non-financial-income are 0.20 and 0.10 respectively, and the average of the proportional effect of age is 0.0005, showing that the relevance of age is also weak in this case. Moreover, elasticity with respect to the cash-on-hand/non-financial-income ratio is decreasing but seems to be invariant with respect to non-financial-income (Tables 4,5 and 6).

Finally, the influence of these variables on the expected value of the household shares of risky asset is dominated by their effect on the probability of participating. The size of the effect is slightly enforced (w.r.t. the effect on probability of participating) if the variables of interest are cash-on-hand/non-financial-income ratio and non-financial income but it is reduced in the case of age.

6 Concluding remarks

This paper proposes a flexible approach in order to estimate the probability distribution function of the household shares of risky assets conditional on some households observable characteristics that are related with the state variables of the model (the cash-on-hand/non-financial-income ratio, non-financial-income, age and lagged shares of risky assets).

We postulate a model of portfolio choice with two financial assets, risky and safe, and costs of participation. Using a unique panel data set of Italian households and a very general specification for the agent's preferences and decision rules, we estimate this probability function and use the predictions of the model in order to study the effect of each of the state variables of the model on the probability distribution function of the risky asset share.

Our empirical approach relies on the discretization of the dependent variable taking advantage of the fact that it belongs to the unit interval and accumulate some positive mass of probability at zero. This approach allows us to capture non-linear effects of the explanatory variables in a relatively parsimonious way. We apply Likelihood Ratio Tests in order to decide both the discretization criterion and the number of intervals of the grid. This methodology, suggests us to include one discrete choice for the (zero) corner solution and to divide the remaining space of the dependent variable among four equal probability intervals. That grid seems to capture most of the influence of the explanatory variables on the households shares of risky assets (and also a very high proportion of the unconditional cross-section variation of this variable).

The main parameters of interest of our model are measures of the change in the conditional probabilities of the household shares of risky assets. We evaluate the elasticity of both the probability of participation and the expected value of the houshold shares of risky assets with respect to the cash-on-hand/non-financial-income ratio and non-financial-income. Our results show that both variables influence positively the household shares of risky financial assets. That influence comes mainly from the positive effect that both variables have on the household probability of participating. Moreover, both variables tend to increase the expected value of the shares of risky assets conditional on participation.

The effect of the age of the household´s head is negative on the probability of participation and positive on the expected value conditional on participation. The combination of these two effects seems to affects negatively the expected value of the household shares of risky assets. However, none of these effects is statistically relevant.

Finally, the probability of participating exhibits a relevant increase if the household has participated in the risky asset markets in the previous period. This fact could be thought as evidence of the existence of entry costs in the risky financial markets.

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Table 1: Sample Statistics

1.a Sample size

		No. Obs.	Proportion
Group I	Households with zero ...nancial holdings	1083	14
Group II	Households with zero risky asset holdings	3823	49
Group III	Households with positive risky asset holdings	2917	37
Total Sample		7823	100

1.b. Households' characteristics

Variable	Group I	Group II	Group III	Total
Risky asset share (per unit)				
Mean	0.00	0.00	0.64	0.24
Stand. dev.	0.00	0.00	0.25	0.35
Median	0.00	0.00	0.69	0.00
Financial Wealth at the end of the period (euros)				
Mean	0	9392	46096	21777
Stand. dev.	0	37467	76842	56995
Median	0	4652	24359	6940
Non Financial Income (euros)				
Mean	16604	23324	31870	25580
Stand. dev.	11431	13527	18866	16388
Median	14022	20340	28430	22207
Real Wealth at the end of the period (euros)				
Mean	63905	113014	191742	135571
Stand. dev.	133074	192769	293323	234132
Median	32279	72336	127941	83149
Consumption (euros)				
Mean	13563	17594	22882	19008
Stand. dev.	7599	9069	12853	10975
Median	11893	15605	20355	16512

Table 1: (continuation)

Variable	Group I	Group II	Group III	Total
Age of household's head (years)				
Mean	53.7	52.1	53.2	52.7
Stand. dev.	13.7	13.1	12.5	13.0
Median	54.0	51.0	53.0	52.0
Previous participation in the risky asset markets				
% of hh that participated	10.2	17.1	66.3	35.2
Family Size (# of members)				
Mean	3.6	3.6	3.4	3.5
Stand. dev.	1.3	1.2	1.0	1.1
Median	4.0	4.0	3.0	4.0
Number of labour income earners				
Mean	1.0	1.3	1.4	1.3
Stand. dev.	0.8	0.9	0.9	0.9
Median	1.0	1.0	1.0	1.0
Education (% of hh by education of the head)				
Less than elementary	13.1	5.7	1.7	5.3
Elementary school	45.5	32.2	22.7	30.4
Middle school	27.5	32.6	28.9	30.5
High school	11.3	23.5	33.1	25.4
More than high school	2.7	6.0	13.5	8.4
Independent Worker (% of hh by head´s job)	14.4	17.7	15.6	16.5
Resident in the South (% of hh by localization)	71.0	45.6	25.0	41.4
City size (% of hh by city of residence)				
5.000 to 20.000	15.6	14.3	13.8	14.3
20.000 to 50.000	26.9	28.7	27.4	28.0
50.000 to 200.000	33.8	34.6	34.1	34.3
More than 200.000	15.8	13.6	16.8	15.1

Table 2: LR Test on the Size of the Grid

	Statistic value	D. of freedom	p-value
2 versus 1 cells	280.6	20	0.00
4 versus 2 cells	179.7	40	0.00
8 versus 4 cells	97.6	80	0.09

Table 3: Multinomial Logit Estimation

	®$_1$	®$_2$	®$_3$	®$_4$
Age	-0.008 (0.005)	0.000 (0.004)	-0.005 (0.005)	-0.005 (0.005)
Non-…nancial Income (log)	1.717 (0.140)	2.051 (0.139)	2.172 (0.143)	2.510 (0.162)
Cash on Hand/NFI (log)	2.773 (0.153)	3.300 (0.177)	4.091 (0.188)	4.296 (0.209)
CoH/NFI (log) Square	-5.961 (0.836)	-8.071 (1.078)	-10.850 (1.131)	-8.768 (0.905)
I(®$_{t¡1}$ = ®$_1$)	1.726 (0.133)	1.845 (0.143)	1.259 (0.170)	1.298 (0.187)
I(®$_{t¡1}$ = ®$_2$)	1.133 (0.150)	1.593 (0.139)	1.814 (0.143)	1.433 (0.167)
I(®$_{t¡1}$ = ®$_3$)	1.338 (0.161)	1.833 (0.153)	2.181 (0.153)	2.014 (0.164)
I(®$_{t¡1}$ = ®$_4$)	1.103 (0.171)	1.580 (0.169)	2.002 (0.158)	2.456 (0.159)
Real Wealth	-0.254 (0.151)	-0.485 (0.156)	-0.379 (0.162)	-0.504 (0.165)
Family Size	-0.422 (0.162)	-0.498 (0.173)	-0.385 (0.171)	-0.377 (0.192)
No. labour income earners	0.159 (0.068)	-0.005 (0.072)	-0.038 (0.076)	-0.160 (0.082)
Independent Worker	-0.103 (0.123)	-0.486 (0.140)	-0.502 (0.144)	-0.993 (0.175)
Time	0.415 (0.240)	1.161 (0.251)	1.579 (0.281)	2.432 (0.322)
Time Square	-0.044 (0.028)	-0.139 (0.030)	-0.192 (0.033)	-0.281 (0.037)
Resident in the South	0.002 (0.103)	-0.150 (0.108)	-0.344 (0.119)	-0.319 (0.126)
Constant	-20.061 (1.482)	-26.081 (1.480)	-27.634 (1.558)	-32.448 (1.781)

Notes:
1) Dummies on the education of the head and the city of residence were also considered.
2) Number in parentheses are standard errors.

Table 4: Elasticities w.r.t. the ratio Cash on Hand-Non-…nancial Income
Sample Averages, by percentil of CoH/NFI ratio

	Pr(® j X_i)	E(® j X_i)	E(® j X_i; ® > 0)
Total			
Mean	2.04	2.24	0.20
Stdan. dev.	1.26	1.32	0.07
Quintil 1			
Mean	3.41	3.70	0.28
Stdan. dev.	0.57	0.58	0.04
Quintil 2			
Mean	2.78	3.03	0.25
Stdan. dev.	0.67	0.68	0.03
Quintil 3			
Mean	2.26	2.48	0.22
Stdan. dev.	0.77	0.79	0.03
Quintil 4			
Mean	1.49	1.67	0.18
Stdan. dev.	0.85	0.87	0.03
Decil 9			
Mean	0.74	0.87	0.13
Stdan. dev.	0.65	0.67	0.03
Decil 10			
Mean	0.21	0.29	0.07
Stdan. dev.	0.38	0.40	0.04

Table 5: Elasticities w.r.t. Non-…nancial Income
Sample Averages, by percentil of NFI

	Pr(® > 0 j X_i)	E(® j X_i)	E(® j X_i; ® > 0)
Total			
Mean	1.25	1.35	0.10
Stdan. dev.	0.65	0.66	0.02
Quintil 1			
Mean	1.73	1.84	0.11
Stdan. dev.	0.33	0.34	0.02
Quintil 2			
Mean	1.49	1.59	0.10
Stdan. dev.	0.53	0.54	0.02
Quintil 3			
Mean	1.27	1.37	0.10
Stdan. dev.	0.60	0.61	0.02
Quintil 4			
Mean	1.08	1.18	0.10
Stdan. dev.	0.64	0.65	0.02
Decil 9			
Mean	0.91	1.01	0.10
Stdan. dev.	0.64	0.66	0.02
Decil 10			
Mean	0.67	0.76	0.10
Stdan. dev.	0.63	0.64	0.02

Table 6: Proportional effects w.r.t. Age of HH's Head
Sample Averages, by Age Groups

	$\Pr(\alpha > 0 \mid X_i)$	$E(\alpha \mid X_i)$	$E(\alpha \mid X_i; \alpha > 0)$
Total			
Mean	-0.0031	-0.0025	0.0005
Stdan. dev.	0.0018	0.0015	0.0003
Less than 40 years old			
Mean	-0.0034	-0.0028	0.0006
Stdan. dev.	0.0017	0.0015	0.0003
40-50 years old			
Mean	-0.0032	-0.0026	0.0006
Stdan. dev.	0.0017	0.0015	0.0003
50-60 years old			
Mean	-0.0029	-0.0024	0.0005
Stdan. dev.	0.0018	0.0016	0.0003
60-70 years old			
Mean	-0.0029	-0.0024	0.0004
Stdan. dev.	0.0018	0.0016	0.0003
More than 80 years old			
Mean	-0.0030	-0.0026	0.0004
Stdan. dev.	0.0018	0.0015	0.0003