Household participation in international financial markets: Empirical evidence from Italy

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Abstract

This work develops a simple methodology to make some contribution to current thinking about household participation in international financial markets. I combine standard microeconometrics with a latent model (multivariate statistics). This type of model is usually applied in the social sciences, but here it helps us to identify the gap between actual international investor and potential international investor. The heterogeneity of agents can be useful to explain the behaviour of Italian families and its related economic problems, like equity home bias and equity premium puzzle.

Jel classification D01, D14, C25, C42, F36.
Keywords: Latent Class Model, Equity Home Bias, Heterogeneous Agents.

1 Introduction

In this paper we contribute to the growing literature on households finance providing a measurement of international household investors in Italy. The main aim of the paper is to introduce a method to apply a comparative analysis of the most important European countries and the USA based on micro data.

Micro data provides details of the specific characteristics of families and helps to better understand the type of policies that might be implemented. This work seeks, through the use of micro data on individuals and households, to evaluate the household participation in international financial markets. The Bank of Italy Survey on Household Income and

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Wealth (SHIW), similarly to the household surveys carried out in other countries, is a social survey that focuses on economic questions. I use the latent class model can be used to capture and reduce the complexity of the data set so as to identify the classes of the families surveyed.

The paper presents indicators at household-level can be applied in different economic surveys for international comparison. Empirical work could be developed by analysing European panel data at family level.

A basic facts about the determinants of (domestic) household participation in the stock market are already know, for example documented by Calvet, Campbell and Sodini (2006), Campbell (2006), Grinblatt and Keloharju (2001) Vissing-Jorgensen (2002), Bertaut and Starr-McCluer (2000). Fist, participation is strongly increasing in wealth, and has also been found to be increasing in household education.

Guiso, Haliassos and Jappelli (2003) presents a comparative analysis and finds (1) an increase in stock-market participation; (2) persistent differences across countries; (3) considerably more participation on the part of households in the United States, the United Kingdom and Sweden than those in France, Germany and Italy; (4) a robust correlation between the decision to participate, on the one hand, and wealth and education, on the other; and (5) a relatively small effect of education and wealth on the share of assets invested in stocks, conditional on participation. International differences in stock-market participation remain significant even when we control for household characteristics.

The work by Hong, Kubik and Stein (2004) focuses on stock-market participation. Interestingly, they find that "sociable" households, defined as households that tend to interact with their neighbours, are more likely to invest in the financial market.

Usually the equity home bias is testing by macroeconomics data. The investor prefer to hold domestic asset[1]. Standard portfolio theory would suggest to investor to buy more foreign asset, because a proportion of no domestic asset in portfolio needed a better diversification.

The paper of French and Poterba (1991) in only 5 page introduce the problem and analyse data the G5 countries. Their explanations are: fist, the institutional factor (for example explicit legal limits on cross-border investment). Second, they focus on investor behavior, in particular, the investor impute extra risk to foreign investments.

The remainder of this paper is organised as follows. Section 2 presents a detailed portrait of the foreign stock-market participation of families. Section 3 presents a detailed portrait of foreign stock-market participation by Italian families. Section 4, *Empirical motivation*, introduces the latent model. Section 5 presents the empirical results and the emerging characteristics of the households, applying the latent model to the Bank of Italy data set, the information on household choices with international financial services and household potentiality will be combined in an effort to understand household participation in international financial markets and the equity home bias and by the emerging conclusions, Section 6.

[1]Cf., for example, see empirical works Solnik (1974), Levy and Sarnat (1970), Obstfeld and Rogoff (2000), , a review is in Lewis (1999).

2 Household participation in international financial markets

This section introduces a theoretical microeconomics-based definition of potential international investors and a microeconomic indicators. I consider the aggregation of the data compiled in the Bank of Italy (2002) Survey on Household Income and Wealth (SHIW).

First, I define the *total* (t), *direct*(d), *indirect* (i) and *other* (o) investments made by families in financial services and on the financial market, $t = d, i, o$. This aggregation – direct, indirect and other – is necessary so as to create a homogeneous and comparable set of domestic and foreign data from the data compiled by the Bank of Italy. *Direct* investment means the families concerned have bought shares directly on the stock market or have bought stock from firms that are not quoted on the stock market, that is, without the intermediation of institutional investors. *Indirect* investments are bonds, government bonds and mutual funds that were not bought directly on the stock market, that is, they were bought with the intermediation of institutional investors.[2] *Other* indicates deposits and asset management funds. *Total* means in at least one of the three forms – direct, indirect and other, so that $t = d, i, o$.

Second, I distinguish between two classes of investors in financial services and on financial markets: (1) domestic investors, upper-case D_j^t, and (2) international investors, upper-case F_j^t, with $j \in N$. And I consider two types of households that are potential investors in financial services and on financial market: international investors, lower-case $f_j^t(x_{j,s})$ and domestic investors, lower-case $d_j^t(x_{j,s})$, with $j \in N$. The functions d, f depend on vector $x_{j,s}$, which represents the *s-th* socioeconomic characteristics of the *j-th* household. For example, in the Bank of Italy (2002) data set, some of these socioeconomic characteristics are: age of head of household, gender of head of household, household size, geographical area of residence, education of head of household, number of banks used by household, income, and wealth, where $j \in N$ is a finite set. In our case, Bank of Italy (2002), we have 8,011 families, so that $N = 8011$. In this context, the investors, or decision-makers, are families, but we could equally use firms, banks or financial institutions. We want to know the attitude of individuals towards being or becoming international investors, that is, of people who invest abroad or might invest abroad, or who even believe that they live in an integrated global financial market. Amongst these individuals we distinguish between those who actually invest abroad – the investors – and those who could invest abroad but do not actually do so – the potential investors.

Third, I consider *total* (t) *participation* of a domestic or international *investor* or of a domestic or international *potential investor* in financial services and on financial markets: respectively $\sum_j^N D_j^t$, $\sum_j^N F_j^t$, $\sum_j^N d_j^t(x_{j,s})$ and $\sum_j^N f_j^t(x_{j,s})$, where $t = d, i, o$. I consider the percentage value, in others words, how many people, in percent, are *investors* or *potential investors* in the sense defined above. We can elucidate the percentage of international investors, $\sum_j^N F_j^t$, directly from the data set. Total international participation in financial markets means that a household participates in at least one of this foreign country's investments, whether bonds, government bonds, mutual funds, shares and holdings, deposits or asset management.

[2]Following Guiso, Haliassos and Jappelli (2003, page 136).

At this point I can state a microeconomic indicator, ∇, for household participation in international financial markets and equity home bias. Analysing the different possibilities, we can consider a mixture between actual investors and potential investors-the difference between *total* (t) *participation* of international investors and potential international investors, respectively $\sum_j^N F_j^t$ and $\sum_j^N f_j^t(x_{j,s})$. This definition can also be presented in more rigorous terms. I refer to the set of economic agents and investors $j \epsilon N$ (instead of economic agents one could also consider firms or some other type of financial investor).

$$\nabla = \sum_j^N F_j^t - \sum_j^N f_j^t(x_{j,s}) \tag{1}$$

or

$$\sum_j^N F_j^t = \sum_j^N f_j^t(x_{j,s}) + \nabla \tag{2}$$

where: Under Formula 1, $F_j^t, f(x_{j,s})$ determines whether a household belongs to the class of international investors, F_j^t, or that of potential international investors, $f(x_{j,s})$; $x_{j,s}$ is the vector that represents the socioeconomic characteristics of the j-th $j-th$ household; The parameters F_j^t and $f_j^t(x_{j,s})$ are theoretically comparable (see in further sections).

The indicator ∇ can be considered a measure of the behaviour of families with respect to the possibility of investing abroad. There are households that potentially could invest abroad, but do not do so. This heterogeneous household behaviour can be caused by a negative financial "environment" (different types of barrier) and/or different degrees of risk aversion across the families. Computing the gap between the actual investors and the potential investors can be a realistic way to understand the barriers to entry into financial markets and to financial integration in general. Formula 1 could be considered a measure of financial integration at the microeconomic level. Moreover, analysing financial integration at household level means giving more importance to the impact of financial policy on the daily lives of families than to its impact on the profits of large firms.

The indicator ∇ can be equal or different to zero: When $\nabla = 0$ in (2), this means: $\sum_j^N F_j^t = \sum_j^N f_j^t(x_{j,s})$

In other words, if the result is zero, then there is no difference between potential international investors and actual international investors. Then there are no (international) barriers at the microeconomic level to investing abroad, such as asymmetric information, risk aversion or entry costs (see the following sections). Every agent that can invest abroad really does invest abroad. An appropriate specification at family level might be the percentage of foreign investment carried out by families.

If, on the other hand, $\nabla > 0$ $\sum_j^N F_j^t > \sum_j^N f_j^t(x_{j,s})$ This means that there are more actual international investors than potential international investors, which is an unlikely situation. Moreover, some of the potential *domestic* investors would be able to invest abroad - a situation which is not allowed.

When $\nabla < 0$, this means:

$$\sum_j^N F_j^t < \sum_j^N f_j^t(x_{j,s}) \tag{3}$$

In other words, there are more potential investors than actual investors. The phenomenon of equity home bias leads us to expect $\nabla < 0$, as we will see in the following sections. Note that in more rigorous terms we can refer to the equity home bias only if we indicate *direct* foreign stock-market participation, $\sum_j^N F_j^d$, and *direct* domestic stock-market participation, $\sum_j^N D_j^d$. Then we have a special indicator for the equity home bias ∇^{EHB}:

$$\nabla^{EHB} = \sum_j^N F_j^d - \sum_j^N D_j^d \tag{4}$$

The indicator ∇^{EHB} can be equal or different to zero, but under the equity home bias we expect $\nabla^{EHB} < 0$. If the indicator equity home bias is zero, $\nabla^{EHB} = 0$, $\sum_j^N F_j^d = \sum_j^N D_j^d$ then this means that every household invests both on the domestic stock market and on a foreign stock market. There is therefore international diversification in the stock markets. The following section presents the data on *direct* foreign stock-market participation and *direct* domestic stock-market participation for Italian families.

3 Financial international participation: Evidence from Italy

This Section represents an empirical proposal for analysing equity home bias on the basis of micro data. The empirical contribution is represented by an analysis of the participation and the potentiality of Italian households on foreign stock markets.

Micro data enable direct measurement of real foreign investment at family level and enable us to focus on the individual characteristics of families and perhaps even to understand the motivations behind certain decisions. In other words, with micro data we can directly observe the portfolio choices of families and can then attempt to relate them to family characteristics. Most of the considerations are based on data taken from Bank of Italy (2002).[3]

Figure 1 illustrates domestic and international (foreign) financial and stock-market participation in 2002 (unless otherwise specified, the remainder of the paper refers only to the 2002 Bank of Italy survey). The figure is quite straightforward: the tall columns represent domestic participation in financial services and in financial market, while short columns indicate investment on foreign financial services and financial market.

The first column on the left indicates *direct* foreign stock-market participation, $\sum_j^N F_j^d = 0.4\%$, while the second column represents *direct* domestic stock-market participation, $\sum_j^N D_j^d = 8.4\%$. *Direct* investment

[3]As explained on the Bank of Italy's web site, the data set cited here is freely available: http://www.bancaditalia.it/statistiche/ibf. The Bank of Italy Survey on Household Income and Wealth (SHIW) covers 8,011 families, i.e. 22,148 individuals, of whom 13,536 earn an income. Only 3,605 of the families were already on the survey panel in 2000, that is, they were also interviewed that year or in previous years. In other words, 4,406 of the families were interviewed for the first time in the 2002 survey. The SHIW was launched in the 1960s with the aim of gathering data on the incomes and savings of Italian households. Over the years, the scope of the survey has grown and it now includes wealth and other aspects of households' economic and financial behaviour, for example, payment methods. For more details, cf. Brandolini (1999) or Bank of Italy (2002a), Bank of Italy (2002), *Supplements to the Statistical Bulletin*, and the Bank of Italy's official web site.

Figure 1: Domestic and foreign stock-market participation in 2002. Data from Bank of Italy (2002). **Ind** (Indirect): bonds, government bonds and mutual funds; **Dir** (Direct): shares and holdings; **Oth** (Other): deposits and asset management.

means the families concerned have bought shares directly on the stock market or have bought stock from firms that are not quoted on the market. In rigorous terms, only the first two columns regard the equity home bias. For the remainder we can refer to the equity premium puzzle. As the figure shows, direct domestic stock-market participation is much more substantial than direct foreign stock-market participation. And this applies to an even greater extent to other financial products. In fact, the third and fourth columns refer to *indirect* investment: bonds, government bonds and mutual funds (not bought directly on the stock market). *Other* in the fifth and sixth columns indicates deposits and asset management funds. The last two columns illustrate total participation in foreign and domestic financial markets.

In all cases, domestic financial market participation is greater than foreign participation. Only $\sum_j^N F_j^t = 1\%$ of Italian families invest in foreign stock markets in one of the three forms – direct, indirect and other.

This aggregation – direct, indirect and other – is necessary so as to create a homogeneous and comparable set of domestic and foreign data from the data compiled by the Bank of Italy.

The next step is to identify the characteristics of families that invest abroad. It emerges that the families that invest in foreign stock markets account for 1% of all the families surveyed, that they belong to the top 25% of Italian families with respect to wealth, that they own 4.5% of the total financial wealth of Italian families, that they invest 1% of this total financial wealth in foreign stock markets, that they belong to the top 25% of Italian families with respect to income, that they are highly educated and that they are less averse than other families to risky investments.

Figure 2: Portfolio choice of families investing abroad. Data from Bank of Italy (2002). **Ind** (Indirect): bonds, government bonds and mutual funds; **Dir** (Direct): shares and holdings; **Oth** (Other): deposits and asset management.

Now we compare the portfolio choices of foreign investor families (Figure 2) and domestic investor families (Figure 3). Each figure shows the total investment of each type of family. The first portfolio consists of the total invested share of financial wealth of the families that also invest abroad; the second consists of the total investments of the families that invest only in Italy.

Families that invest on international financial markets are less averse to risks than those that invest only domestically.[4] In fact, a substantial share of their domestic portfolios consists of direct investment. Given that investment abroad must be considered a risky undertaking, then the portfolios of families that invest on international financial markets contain one third risky investments. The families that invest only on the Italian stock market have two thirds of their investments in *Other*, i.e. deposits and asset management funds.

Moreover, if we compare only the domestic investment of the two types of family, we see a greater propensity to take risks amongst the foreign investors.

To help with the probit regression, we simultaneously test all the variables considered thus far: financial wealth, income, age and level of education. Table 1 presents the results of the probit analysis, showing the standard error in small brackets. The age variables do not deviate significantly from 0. Financial wealth and level of education are the most significant variables, confirming the results already obtained above.

The most significant characteristics of families that can explain foreign stock-market participation are financial wealth and level of education, as illustrated by the above tables and, in particular, by the probit regression

[4]The study by Guiso and Paiella (2003) estimates the risk aversion of Italian families on the basis of an ad hoc question posed in the Bank of Italy survey.

Figure 3: Portfolio choices of families investing in Italy. Data from Bank of Italy (2002). **Ind** (Indirect): bonds, government bonds and mutual funds; **Dir** (Direct): shares and holdings; **Oth** (Other): deposits and asset management.

in Table 1. Information and cost are the main problems for a family that is considering investing on a foreign stock market.

According to the ranking presented in the *World Competitiveness Yearbook*, the Italian business and financial markets are amongst the least transparent in the European Union and amongst the G7 countries, but financial information[5] and its related costs are crucial in portfolio choice.[6]

The strong correlation between foreign investment and level of education is evidence of the importance of investors' ability to access and comprehend financial information. The access to reserved information enjoyed by some investors creates a situation of asymmetric information between people who are informed and people who are not.[7] In some cases the cost of buying information exceeds the possible gain, and in some cases this represents an entry cost.

Another problem is the language barrier, especially in the case of Italy.[8] Moreover, computers and Internet connections are not widespread amongst Italian families.[9]

Our empirical results are consistent with the theoretical approaches

[5] Brunnermeier (2001) presents a method for classifying financial information, distinguishing between investor interpretation of consistent information and investor interpretation of inconsistent information.

[6] Cf. Peress (2004).

[7] When we speak of asymmetric information the first work that comes to mind is *On the Impossibility of Informationally Efficient Markets*, Grossman and Stiglitz (1980), although only exogenous information is considered here. Litvinova and Ou-Yang (2003), by contrast, consider endogenous information. At any rate, economic agents must pay for their information.

[8] See Grinblatt and Keloharju (2001) on Finland case. In a recent survey on language skills in the European Union, it emerged that less than 30% of Italians can converse in English.

[9] According to *Computer Industry Almanac*, 2001, Italy has 347 computers and 307 Internet connections, respectively, per 1,000 residents.

Probit regressions for foreign stock-market participation

	Total	Indirect
Income II	0.46 (0.37)	0.17 (0.40)
Income III	0.38 (0.37)	0.13 (0.39)
Income IV	0.53 (0.37)	0.36 (0.38)
Fin. wealth II	3.91 (0.25)	3.48 (0.31)
Fin. wealth III	4.41 (0.21)	4.14 (0.25)
Fin. wealth IV	4.79 (0.21)	4.41 (0.14)
Age 31-40	-0.03 (0.22)	0.36 (0.38)
Age 41-50	0.04 (0.21)	0.52 (0.37)
Age 51-60	0.20 (0.21)	0.45 (0.37)
Age 61-70	0.14 (0.23)	0.69 (0.37)
Age 70+	-0.09 (0.26)	0.45 (0.40)
Middle school	0.63 (0.25)	4.05 (0.17)
High school	0.80 (0.25)	4.25 (0.14)
Third level	1.17 (0.25)	4.60 (0.25)
Constant	-8.00 (0.48)	-11.51 (0.53)

Table 1: Probit regressions for total foreign and indirect stock-market participation. The standard error is presented in small brackets. Data from Bank of Italy (2002). **Ind** (Indirect): bonds, government bonds and mutual funds; **Dir** (Direct): shares and holdings; **Oth** (Other): deposits and asset management.

of Litvinova and Ou-Yang (2003) and Peress (2004), where the cost of information determines its quality and also has an effect on income distribution.

4 Latent class model: Empirical motivation

A latent model can be used to capture and reduce the complexity of the Bank of Italy data set so as to identify the classes of the families surveyed.[10] In analysing the data gleaned from such surveys, a substantial amount of information is generally provided by the tabulation of response percentages with respect to individual questions and the subsequent cross-tabulation of these responses. In fact, most analyses of social science surveys exclusively use this particular tool. But there are methods with which even more information on relationship patterns can be extracted. In addition, it must be remembered that large-scale statistical enquiries generate much more information than can be easily understood without drastic condensation.

Unobserved heterogeneity lies at the heart of numerous empirical and theoretical puzzles and conundrums. There is a large assortment of eco-

[10]Multivariate analyses and, in particular, latent class models for missing data, have been used by Hausman and Wise (1979) and by Diggle and Kenward (1994) for economic surveys, but in different ways to that which will be proposed here. Some social researchers use multivariate analysis, in particular factor analysis or latent class models. These are based on the idea that expressions of attitudes can be explained by assuming that they depend on a few basic dimensions or categories.

nomics and econometrics literature on this topic. While observed heterogeneity refers to individual differences that are measured (usually by regressors), unobserved heterogeneity refers to all other differences.

Unobserved heterogeneity plays an important role in our analysis; in fact, we want to identify it. Sometimes we cannot observe relevant covariates. Statistical methods help to explain unobserved heterogeneity in terms of variability in observed covariates.

When the data is disaggregated, this increases the importance of controlling for heterogeneity between individuals. Many variables reflect household heterogeneity: gender, and educational, social and demographic characteristics are directly observed. By contrast, differences in individual and household motivations, abilities and potentialities are not observed or are imperfectly observed, and these represent the latent classes.

There are different possibilities for tackling the problem of unobserved heterogeneity.[11] One is to ignore such heterogeneity, but this increases the unexplained part of the variability.

For example, let us consider the variable "education" to be the source of variability in "stock market participation". But other variables such as "financial capacity" or "potentiality to invest" or "risk aversion" do not appear in the model. So a part of total heterogeneity that is attributable to the second variable may be incorrectly attributed to the first variable. The covariates do not include a measure of ability, and giving an entirely causal interpretation becomes questionable. For example, let us consider two types of households, identical in all relevant characteristics except that one exhibits a systematic difference in foreign stock-market participation. One could control for this by allowing individual utility functions to include a heterogeneity parameter that reflects their different preferences. Suppose now that there is a theory of investment that advocates international portfolio diversification by households, in the sense of "don't put all your eggs in the same basket". This theory could provide another explanation or not of persistent differences.

Our analysis focuses on unobserved heterogeneity in an attempt to identify the unobserved characteristics of families that invest abroad and those that do not. We are able to identify the characteristics of families that do actually invest abroad. The data from the Bank of Italy SHIW survey indicate a clear link between foreign financial-market participation and the wealth and education levels of families.

Unfortunately, sometimes we cannot observe relevant covariates, and so then we want to know what is the unobserved heterogeneity.[12] Statistical modelling helps to explain variability or observed heterogeneity in terms of variability in observed covariates.

Why do some families invest abroad? And why do some families with similar socioeconomic characteristics not invest abroad? To reply to the second question we use the latent model to identify different classes of investors. Probit analysis does not provide an answer in this direction, though it is useful for identifying the characteristics of actual investors (for example, see Table 1, p. 9). We assume that the observed families belong to several latent classes. We can refer to a true or spurious state dependence in the sense of Heckman (1978, 1982). True state dependence explains the phenomenon on the basis of causality. But we can also refer to unobserved heterogeneity. The observed and unobserved heterogeneity

[11] See Cameron and Trivedi (2005).
[12] See Costa, Gardini and Iezzi (2005).

discussed here can explain part of some economic phenomena.[13]

The potentiality to invest in a foreign country or the degree of risk aversion to investing in a foreign country could be considered one characteristic not observed in a household. Latent models can help us to answer the above questions in an interesting way: we can study several observations for the same individuals, for example using the Bank of Italy's SHIW, and try to identify different classes of investor.

The heterogeneity of agents can be useful to explain the behaviour of Italian families and to highlight the related economic problems, like equity home bias and the equity premium puzzle.

5 Results

We use the following dummy variables: age of head of household (less than or equal to 40, between 40 and 60, over 60); gender of head of household (male, female); household size (less than or equal to two members, over two members); geographical area of residence (north, centre, south and islands); education of head of household (middle school or less, high school, university degree, more than university degree); number of banks used by household (one bank, more than one bank); income (less than the 85th percentile, more than the 85th percentile); wealth (less than or equal to the 75th percentile, between the 75th and the 95th percentile, more than the 95th percentile).

The estimation was carried out using local dependence and independence hypotheses supposing interaction between two sets: sociodemographic variables and economic variables. The sociodemographic variables are: age of head of household, gender of head of household, household size, geographical area of residence and education of head of household. The economic variables are: number of banks used, total real assets (income) and total financial assets (wealth), see Figure 4. The arrows indicate that response probabilities for the variable depend on the latent class.[14]

The estimation is carried out using iterative numerical methods optimised by the criterion of maximum likelihood. Goodman (1974) showed how iterative proportional fitting could be used to find ML parameter values on the basis of a type of Expectation Maximization (EM) algorithm (Dempster, Laird and Rubin, 1977).

In Table 2 we present the results of the estimation for the two types of model (the model with interaction and the one without interaction) and

[13]Normally the literature proceeds on the basis of the representative agent hypothesis. A study by Paiella (2003) uses micro data to examine the limits of the representative agent assumption. Under this hypothesis, a study first defines just one economic agent who is intended to represent the entire population, and then it considers identical economic agents. Thus, an infinite number of households may be represented by a single economic agent. Identical households have the same properties. The preferences of each household are assumed to be representable by a (time-separable) utility function (under some conditions the preferences can be represented by a continuous utility function).

[14]The basic latent class model assumes that the manifest classes are independent of the latent classes. Local independence can be stated both as an assumption and as an axiom. For example, Langeheine and Rost (1988) consider local independence as the defining characteristic of latent structure analysis. This assumption is often untrue, however, and when it is, the latent class model must be modified so as to become a "locally dependent" latent class model. There are several ways to relax local independence assumptions in latent class models. The three main methods: the joint-item (variable) method, the multiple-indicator method and the log-linear formulation of latent class analysis. When there are only pairs of locally dependent dichotomous variables, all three methods discussed here give the same results.

Figure 4: Interaction between variables: age of head of household, gender of head of household, household size, education of head of household, number of banks used by household, total real assets, total financial assets. Data from Bank of Italy (2002).

follow the hypotheses used by the LEM software. Introducing local dependence (interaction), the specification test confirms two latent classes. The specification tests are not satisfactory in the model with local independence (no interaction).

Latent model and interaction

Method	L
Local independence	5735.28 (0.00)
Local dependence	2362.36 (0.94)

Table 2: Latent model with interaction and without interaction. The p-value is presented in brackets. Software: LEM. Data from Bank of Italy (2002).

We can focus on the two main sets: potential international investors and domestic investors. The first class – potential international investors – are individuals who could invest abroad (and actually do so or not for a variety of reasons, such as asymmetric information, risk aversion and entry costs, or exogenous liability).

The two types of household are described by the two functions d, f, which depend on the vector $x_{j,s}$, which in turn represents the *s-th* socioe-

conomic characteristics of the *j-th* household.[15]

For Italian families it emerges that in the model with interaction, $\sum_j^N f_j^t(x_{j,s}) = 11\%$. In other words, 11% of the families surveyed are potentially international investors (posterior probability of latent classes), and these belong to the top 5% of families with respect to wealth, as can be seen in Table 3.

Posterior probability of international investors

Wealth	Prob.	Education	Prob.	Area	Prob.
$\leq$ 75th perc.	0.05	Middle s. or less	0.08	South	0.05
75th–95th perc.	0.16	High school,	0.16	Centre	0.11
$\geq$ 95th perc.	0.65	Univ. or more	0.22	North	0.15

Table 3: Posterior probability of international investors. Software: LEM. Data from Bank of Italy (2002). *Wealth*: less than or equal to the 75th percentile, between the 75th and the 95th percentile, more than the 95th percentile; *Education* of head of household: middle school or less, high school, university degree or more; Geographical *Area* of residence: north, centre, south and islands (Italy).

Only a small percentage of the households that prefer to invest abroad live in the South of Italy, or have low incomes or low levels of education.

As we saw in Figures 2 and 3 (pp. 7-8) the families that invest on international financial markets are less averse to risks than those that invest only domestically. Another way to interpret latent classes is that the class of potential international investors is a class where the households have a greater propensity to take risks with respect to other classes. In other words, the 11% of families are less averse to risks than those that potentially invest only on the domestic market.[16]

Let us consider for a moment a different economic context where latent classes are highly interpretable: the marketing context, and, in particular, the practice of segmentation, that is, dividing customers into groups, each with common attributes. The aim of market segmentation is to divide the target population into segments or clusters so that each can be targeted in the manner most likely to achieve a positive response. In our context, we can view the family as a consumer of financial services (see Bijmolt, Paas and Vermunt, 2004).

Consumer heterogeneity is fundamental to marketing, providing the basis for market segmentation, targeting and positioning, as well as micro-marketing. The paper by Bijmolt, Paas and Vermunt (2004) presents a latent class analysis for obtaining consumer segments. The date set used is available for 15 European countries, with a sample size of about 1,000 consumers per country. The authors find consumer segments are highly interpretable. And the consumer segmentation is related to demographic variables such as age and income.

I use the latent model for estimating household participation in international financial markets. Specifically, I used the latent model to

[15]Potential investors in financial markets: international investors, $f_j^t(x_{j,s})$, and domestic investors, $d_j^t(x_{j,s})$, with $j \in N$. See Section 2, p. 3.

[16]The work of Pålsson (1996) estimates risk aversion of household, using Swedish cross-sectional data based on tax returns from more than 7000 households for 1985. It was found to be very large but not systematically correlated with any of the included variables, with the exception of age. The estimated age coefficient suggests that risk aversion increases with age.

estimate the potentiality of households. This method enables us to individuate people's attitudes without asking them directly for the information we want. For example, carrying out a household survey on a specific problem such as financial integration is difficult because it is not easy to formulate the question directly (and such an approach would also be expensive). However, it would be a huge step forward if the socioeconomic household surveys conducted around the world could contain questions relative to financial integration.

To sum up we observe a very low level of participation by Italian families on foreign stock markets $\sum_j^N F_j^t = 1\%$. But the potential international investors are $\sum_j^N f_j^t(x_{j,s}) = 11\%$. Following Formula 3, we have:

$$\nabla = \sum_j^N F_j^t - \sum_j^N f_j^t(x_{j,s}) = 1\% - 11\% = -10 \tag{5}$$

As we saw in Formula 3, p. 4, the indicator is $\nabla < 0$, $\sum_j^N F_j^t < \sum_j^N f_j^t(x_{j,s})$.[17] So there are more potential investors than investors. According to the equity home bias, we expect $\nabla < 0$. In more rigorous terms we can refer to the equity home bias only if we indicate *direct* foreign stock-market participation. Then $\sum_j^N F_j^d = 0.4\%$, while *direct* domestic stock-market participation is $\sum_j^N D_j^d = 8.4\%$.[18] Then we have, as in 4 on p. 5:

$$\nabla^{EHB} = \sum_j^N F_j^d - \sum_j^N D_j^d = 0.4\% - 8.4\% = -8\% \tag{6}$$

The indicator ∇^{EHB} is negative according to the equity home bias. There is absence of international diversification. Both indicators, 5 and 6, point in the same direction: $\nabla = -10\%$ and $\nabla^{EHB} = -8\%$. In other words, the households do not invest abroad. Also at household level there is a discrepancy between the theory of portfolio choice and the empirical results. In the following section I present my conclusions.

6 Conclusions

In the context of equity premium puzzle own empirical results of latent model indicate two heterogeneous investors: international investor and not. The 11% of families is a potential international investor. Only the 1% of families invest abroad: we can generally affirm that the households do not invest abroad and do not buy foreign financial services. Both for direct stock market participation and total financial market participation results (a micro-level) the equity home bias is confirmed. The difference

[17] I underline that the parameters F_j^t and $f_j^t(x_{j,s})$ are, both theoretically and empirically, comparable. In fact the parameters are two variables of the same data set. F_j^t is a variable observed directly in the data set that obtains to the foreign investment of the families surveyed. And $f_j^t(x_{j,s})$ is a latent variable of the same data set. Specifically, these are two dummy variables. And, for each household, the first variable is 1 if the household invests abroad (and otherwise is 0) and the second variable is 1 if the household could invest abroad (and otherwise is 0).

[18] Direct investment means the families concerned have bought shares directly on the stock market or have bought stock from firms that are not quoted on the market, as we saw in Figure 1, p. 6.

$1\% - 11\% = -10\%$ tell us that who can invest abroad, the 10% of families, do not do it.

A indicator of household participation in international financial markets and equity home bias at micro level with heterogeneous agents is the difference between international investor and potential international investor (as we saw in the formula (5)) can be a realistic and relatively simply way to understand the barriers to entry into financial markets and financial services in foreign countries in general. For the equity home bias we can refer to formula (6), $\nabla^{EHB} = -8\%$. The indicators at household-level can be applied in different economic surveys for international comparison.

A latent model for estimating household economic behaviour. I estimated the potentiality of households using a latent model. This method enables us to individuate people's attitude without asking them directly for the information we want. It is possible to distinguish between potential international and domestic investors. For example carrying out a household survey on a specific problem such as financial integration is difficult because it is not easy to formulate the question directly (and such an approach would also be expensive). However, it would be a huge step forward if the socioeconomic household surveys conducted around the world could contain questions relative to financial market participation, equity home bias, financial integration.

A description of the heterogeneous financial behaviour of Italian families with particular attention given to foreign investment. This part represents an empirical proposal to analyse the phenomenon of equity home bias and household participation in international financial markets on the basis of micro data. First, we observe a very low level of participation (only 1%) by Italian families on foreign stock markets. Second, we are able to identify the characteristics of families that do actually invest abroad. The data indicate a clear link between foreign stock-market participation and the wealth and education levels of families. We can thus better identify the causes of equity home bias (and therefore the low level of financial integration): asymmetric information, risk aversion and entry costs. The goal of Section 3 was to identify the characteristics of Italian families that invest abroad. It was found that the families that invest in foreign stock markets belong to the top 25% of Italians with respect to financial wealth, own 4.5% of the total financial wealth of all families, invest 1% of this total financial wealth on foreign stock markets, belong to the top 25% of the population with respect to income, are highly educated and are less averse than other families to risky investments.

A microeconomic system for describing equity home bias and household participation in international financial markets. This approach could open up a different perspective on this topic. Given the microeconomics point of view, the analysis focuses on households. In addition, this approach is flexible. In fact, there is nothing to prevent the incorporation of empirical results and new theoretical findings into the present framework. For example, an interesting extension of this research might be to examine the level of financial integration or the relevance of risk-sharing theory for households and to study the corresponding empirical evidence. See Hayashi, Altonji and Kotlikoff (1996).

These results open the way for future work. I believe my work represents only a first step in this direction. In the following I propose potential future research at both the empirical and theoretical levels.

Empirical work could be developed by analysing European panel data

at family level. This applies, in particular, to data from the ECHP (European Community Household Panel).[19] Another potentially interesting study would be an investigation of financial integration in the euro zone.

The explorative analysis of the Bank of Italy data set on the financial behaviour of Italian families suggests that increased transparency, lower costs and more information could be useful in enhancing the attractiveness of cross-border investment. It became clear in my work that households wanted to invest abroad but did not do so for a variety of reasons.

There is a need both for more policies that encourage efforts to intensify the process of integration and for more research and studies in the field. The fact is that academic interest and economic research in financial integration tend to proceed only from a macroeconomic perspective and often fail to enter into rigorous detail, for example by providing precise definitions of the concepts involved.

Competition in the financial services sector in the European Union will be a true growth engine and an opportunity for risk-sharing between families. Introducing financial services such as student borrowing in southern European countries will represent a way to increase financial integration and free competition in the credit market. Thus, the expressed preference of 10% of Italian families can become an actual choice.

The financial market must be open to the majority of people. To this end, we must improve its transparency and carry out a social program to increase participation in the financial and credit markets. This could turn into a virtuous circle, in the sense that more participation would create more transparency, and more transparency would provide greater incentives to participate on both foreign and domestic stock markets.

What is needed is a large and unrestricted financial market with strong financial institutions (as indicated in part in Rajan and Zingales (2004)). A large financial market (spanning numerous countries) means having more financial services. An unrestricted market means that both the supply and the demand sides can choose. Households are offered little variety with respect to financial products.

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[19] These data are collected in the interest of providing harmonised panel data at a European level. The survey covers a wide range of socioeconomic variables and the sample size counts some 5,000 households.

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