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Equity Fund Ownership and the Cross-Regional Diversification of Household Risk*

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Abstract

We explore the link between portfolio home bias and consumption risk sharing among Italian regions using aggregated household level information on consumption, income and portfolio holdings. We propose to use data on equity fund ownership to proxy for regional home bias: equity funds are typically diversified at the national or international level and will therefore provide interregional diversification. In assessing the impact of equity fund ownership on interregional risk sharing we distinguish between two dimensions: variation in the share of equity funds in fund-holder's wealth (the *intensive* margin) and variation in the fraction of households that hold funds (the *extensive* margin). We find that equity fund ownership is an important determinant of interregional risk sharing. First, diversification incentives qualitatively line up with actually observed portfolio choices: fund holders in regions where households are particularly exposed to region-specific labor income risk hold a larger fraction of their wealth in (out-of-region) funds. Secondly, for a region as a whole, risk sharing increases in both the intensive and the extensive margins of diversification and the two margins reinforce each other. The marginal effect of wider equity fund participation seems particularly strong, suggesting that policies aimed at increasing equity market participation could help foster better interregional risk sharing.

KEYWORDS: CONSUMPTION RISK SHARING, REGIONAL HOME BIAS, SURVEY OF HOUSEHOLD INCOME AND WEALTH, LABOR INCOME RISK, PORTFOLIO CHOICE, STOCK MARKET PARTICIPATION.

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1 Introduction

Risk sharing between households, regions and nations has been the focus of an important and continually growing literature over the last decade.[1] Still, little is known to date about the link between portfolio structure and consumption risk sharing at the regional level. In this paper, we ask two questions. First, how do region-specific risks affect regional home bias in household portfolios? And, secondly, how does household portfolio diversification affect interregional risk sharing? By attempting to get at these issues, we hope to help close an important gap, as we see it, between the macroeconomic literature on interregional risk sharing and the literature on risk sharing and portfolio choice at the household level.

Our contribution is twofold: First, our regional evidence on the link between portfolio structure and risk sharing complements existing international evidence in an important way. In any attempt to gauge the impact of financial globalization on international risk sharing, regional evidence serves as a natural empirical benchmark. Such a comparison was, however, so far not possible with respect to international portfolio choice because regional evidence on the link between portfolio structure and risk sharing virtually did not exist. We provide such evidence here. Our results therefore provide a new perspective on the portfolio home bias puzzle.

Our second contribution is to draw attention to the distinction between what we call the two margins of diversification: increased participation in interregional asset markets improves diversification along the *extensive* margin, whereas we refer to an increase in the share of wealth held in out-of-region assets as improved diversification along the *intensive* margin. The potential importance of this distinction has, to our reading, not been acknowledged in the extant literature. In order to make the distinction between the two margins empirically, we aggregate household level information about consumption, income and portfolios to the regional level. Specifically, we make use of the Survey of Household Income

[1] Household level analyses start with Mace (1991) and Cochrane (1991) and Townsend (1994). Asdrubali, Sørensen and Yosha (1996), Hess and Shin (2000), and von Hagen (2000) are prominent examples of papers that have studied the extent of risk sharing between regions. Sørensen and Yosha (1998), van Wincoop (1999) and Becker and Hoffmann (2006) have looked at risk sharing between countries.

and Wealth by the Banca d'Italia (SHIW). The SHIW combines detailed information on household income and consumption patterns with data on the household's portfolio of real and financial assets for the years 1987 to 2004, making it particularly suited for our purposes here. Household level data sets do, however, not generally contain direct information about the cross-regional allocation of household assets and the SHIW is no exception to this rule. The key innovation we propose to overcome this obstacle is to proxy for out-of-region equity ownership through household level information about ownership of equity mutual fund shares. The rationale for doing so is that equity funds are generally managed at a national or even international level, so that through ownership of mutual fund shares the household effectively achieves interregional diversification.

Our setup allows us to tackle the two questions we asked in the first paragraph. In our answer to the first question, our point of departure is an observation from standard portfolio theory: *ceteris paribus*, a household's incentive to invest into out-of-region assets rises in the its exposure to local (i.e. region-specific) economic conditions.[2] We find this prediction broadly fulfilled: regions with more strongly idiosyncratic GDP fluctuations hold a larger share of their wealth in equity funds. While there is evidence that both margins contribute to this finding, the effect of higher participation is insignificant. But households that already do own equity funds seem to hold more of them in regions where they are more exposed.

So, do more diversified regions share more risk overall? Our answer to this second question is a qualified yes. We find that consumption risk sharing with the rest of the country is better in regions in which more households participate in funds and where households hold a relatively large fraction of their wealth in such instruments. The interaction between the extensive and intensive margins of diversification plays a key role: the effects of higher fund holdings on aggregate risk sharing are much stronger when fund ownership is widespread in the population. Over our sample period, 1987-2004, increasing the participation rate by one percentage point would have led to an about 2 percentage point increase in aggregate

[2]See e.g. Lucas and Heaton (2000, *Econ J.*) on the role of labor income risk for portfolio choice.

risk sharing. Conversely, the effect of inducing households to allocate a larger fraction of their wealth to funds is much smaller. We find the intensive margin to be of significance mainly during the bull market of the late 1990s, when unprecedentedly high participation rates and high stock market valuations allowed many households to decouple consumption from region-specific income shocks.

These findings suggest that stock market and in particular, equity fund participation, is strongly associated with interregional diversification and that policies aimed at increasing participation rates could possibly be highly effective in improving the nationwide pooling of household level risks.

Our results also add important regional evidence to a recent literature in macroeconomics and international finance that documents that portfolio diversification and consumption risk sharing go hand in hand at the international level. Sørensen, Yosha, Wu and Zu (2007) show that countries with larger international asset positions have larger cross-border capital income flows and share more risk. Sørensen et al. therefore argue that the equity home bias puzzle and the lack of international consumption risk sharing are twin puzzles separated at birth. Our analysis here shows not only shows that this logic carries over to the regional and even to the household level. It also points at the importance of distinguishing between the two margins of diversification for understanding the impact of financial globalization on risk sharing. To our knowledge, the role of participation in financial markets for risk sharing has not been systematically explored.

The remainder of this paper is structured as follows. We describe our data and empirical implementation in detail in the next section. Section three provides first descriptive statistics on the characteristics of fund-owning and non-fund-owning households. Section four presents our main results. We first explore a simple proposition: basic portfolio theory would suggest that, *ceteris paribus*, a household's incentive to invest into out-of-region assets rises in the correlation of its labor income with region-specific economic conditions. We show that this is indeed the case: regions where households are more strongly exposed to region-specific risk have more fund owners and these fund owners invest a larger fraction

of their wealth into mutual funds. We then go on to investigate whether, in turn, regions with lower 'home' bias achieve better risk sharing. Section five summarizes and concludes.

2 Data and Empirical Implementation

2.1 The Survey of Household Income and Wealth (SHIW)

Our empirical analysis draws on a large-scale, public-use micro data set. The Italian Survey of Household Income and Wealth (SHIW) gathers information on household income, consumption and wealth, which makes it particularly well suited for our purposes. The SHIW is collected by the Bank of Italy, is available from 1977 onwards and has been run on a yearly basis until 1987 (with the exception of 1985) and every other year since then (with the exception of 1995-1998 with a 3-year gap between surveys). From 1987 onwards, the set of questions asked to respondents stabilized, allowing for consistent analyses over longer time horizons. We concentrate our analysis on the period 1987-2004, thus covering nearly two decades. The sample size is about 8,000 households per survey. Apart from a small fraction of panel households,[3] the SHIW consists of repeated cross-sections. This, however, is not a problem for our analysis here, since we are interested in regional aggregates to understand risk sharing patterns.

We restrict our sample to households where the household head is between 26 and 62 years of age. This excludes young household and pensioners without regular labor income.[4]

Since we analyze risk sharing, our aim is to define an income measure that properly reflects households' actual exposure to idiosyncratic risk as closely as possible. The literature discusses various risk sharing channels including fiscal transfers and asset income. We deliberately exclude these forms of income since they may already provide some form of insurance. We therefore use the sum of net labor income from dependent employment, net income from self-employment (entrepreneurial income), and rental income. This 'raw'

[3]The number of households that can be followed for 3 or more waves is too small to allow for an analysis of idiosyncratic household income and consumption risks over time.

[4]We experimented with different age ranges and results are robust when varying the minimum and maximum age by some years.

income concept should be a reasonable reflection of the genuine sources of income risk that households are exposed to. We summarize the exact construction of the data we use and some key statistics in Table 1.

From a theoretical point of view, consumption is the flow of consumption "services" resulting from both durable and non-durable goods. Whereas the former is not available,[5] non-durable goods are thought of as delivering an immediate flow of services. Non-durable consumption is thus our preferred consumption measure.

The SHIW also contains information on ownership of various asset classes, including government bonds, individual stocks and equity funds. This constitutes a rich data source for studying the impact of asset ownership on consumption smoothing. Section 3 discusses in detail how we make use of these asset wealth data for our analysis. Again, we refer the reader to Table 1 for a synopsis.

2.2 Constructing the regional data set

We form synthetic panel groups based on region of residence and fund-owner status to obtain a panel of region-year observations. Not only does this allow us to obtain a regional aggregate of all households, but it also allows us to distinguish between fund-holding and non-fund-holding households at the regional level. Under the sampling plan of the SHIW, each household is assigned a weight inversely proportional to its probability of inclusion in the sample; the weights are supposed to align the structure of the sample with that of the Italian population with respect to several known characteristics. We use these sampling weights in the computation of region-level per capita variables. Our construction of synthetic panel groups follows Attanasio and Davis (1996), who analyze repeated cross-sectional data from the American Consumer Expenditure Survey (CEX) to study the effect of relative wage movements on the distribution of consumption. Whereas they form panel groups by birth cohorts and education level of household head, our focus on regional risk-sharing leads us to build region-level synthetic panel groups. The use of synthetic panel groups

[5] One would need access to item-by-item ownership of durable goods to derive consumption "services" under non-trivial assumptions.

constructed from household-level data has several advantages. First, whereas individual-level studies potentially suffer from endogeneity of income (e.g. endogenous labor supply), grouped data averages out individual-level idiosyncracies. Secondly, and differently from regional accounts data, our household-level data contain information on fund-owning characteristics that allow us to look at different household types instead of at (only) a single representative household, as has virtually all of the earlier literature on regional risk sharing.

Our regional entities are the twenty administrative Italian regions: 1. Piemonte 2. Valle d'Aosta 3. Lombardia 4. Trentino/Alto Adige 5, Veneto 6. Friuli/Venezia-Giulia 7. Liguria 8. Emilia-Romagna 9. Tuscany (Toscana) 10. Umbria 11. Marche 12. Lazio 13. Abruzzo 14. Molise 15. Campania 16. Puglia 17. Basilicata 18. Calabria 19. Sicily (Sicilia) 20. Sardegna. However, in some regions and years, the SHIW has only very few households owning stocks or mutual funds. In addition, due to the repeated cross-section nature of the data set these households change over time, so that it becomes virtually impossible to form a meaningful synthetic panel group of fund-owning households for some of the smaller regions. In our empirical analysis, we take account of this by forming some synthetic panel groups based on aggregates over several neighboring regions. Specifically, we merge Val d'Aosta with Piemonte, Umbria with Tuscany, Molise with Puglia, Basilicata and Sicily with Calabria and Sardegna with Lazio. While we experimented with alternative groupings, we note that none of our results proved sensitive to this.

3 Measuring interregional diversification through mutual fund ownership

Our main interest in this paper is to relate cross-regional risk sharing to household level portfolio choice. Regional portfolios are the result of decisions at the household level. In our analysis we therefore distinguish between households that own out-of-region productive assets (i.e. equity) and households that do not. However, unlike at the international level, data on regional portfolios do not exist. We therefore proxy ownership of out-of-region productive assets with mutual fund ownership. The motivation for this choice is that most

mutual funds will hold a portfolio that is to the least nationally, if not internationally diversified.

In this section, we first provide some descriptives on the characteristics of fund-owning and non-fund owning households. We then suggest and discuss several measures of inter-regional diversification that make use of fund-ownership information and that provide the basis of our further analysis.

3.1 Mutual fund ownership: some descriptives

Table 1 gives some descriptive statistics about household owning mutual funds relative to the average of the population.[6] To compare the development of these characteristics over time, we report numbers from the first (1987) and last (2004) year of our sample period . The numbers suggest that owners of mutual fund shares have above average wealth and high income. They are also more likely than the national average to be self-employed, either in the free professions or as the owner-manager of their own or their family's business. However, our comparison over time clearly shows that fund holders were a more distinct group back in 1987 than they are in 2004. Whereas in 1987, the fraction of fund-owners with an upper-secondary schooling degree or more exceeded that of the population average by far (75.2% vs. 39.2%), in 2004, that fraction actually falls in group of fund-owners whereas in the population as a whole, there is a marked increase (74.8% vs. 50.1%). Similarly the fraction of fund-owning households with self-employment income decreases from 47.3% to 30.8%. This reflects the trend for widening stock market participation and more widespread fund holdings. Over our sample period, many relatively less affluent households seem to have gained access to equity markets as is suggested in the marked decline in net disposable income experienced by the average fund-owning household.

Table 2 provides a summary of asset portfolio characteristics for fund-holders and non-fund-holders. Both groups have similar ratios of real assets to total net wealth. But the

[6]We consider as fund holders all households that report positive mutual fund holdings. We also experimented with various threshold levels, without any significant effect on any of the results reported in the paper.

composition of the financial asset portfolio is quite different. Fund holders hold a much larger fraction – roundabout a third in 1987 and almost two thirds in 2004 – of their financial wealth in 'Other securities'. This asset category includes assets that are traded in national capital markets such as the mutual fund shares that provide the basis for our cut at the data here, but also foreign government securities, equity held outside of funds etc.

Clearly, ownership of mutual fund shares can only be an imperfect measure of the interregional diversification of households. While our focus here is on household ownership of out-of-region equity, households could also own other out-of-region assets. Bonds or deposits may help countries to smooth consumption out of current income; households could also own productive capital in other regions directly or through ownership of a private business. Our data set does however not allow us to identify such out-of-region ownership of equity or – for that matter – of bonds and deposits. Nor are we aware of any outside data that would allow us to do so. Against the backdrop of these considerations, household information on mutual fund ownership is, therefore, almost certainly a conservative proxy of actual interregional equity cross-holdings.

Table 3 compares the standard deviations of growth rates in ('raw') income, consumption and net wealth across the two subgroups. Our measure of consumption is household expenditure on non-durables. This measure excludes purchases of precious objects, cars, furniture etc. Net wealth is measured as value of real assets plus financial assets minus financial liabilities.

As is apparent, fund-holders have considerably more volatile income and consumption flows and much more volatile wealth than their non-fund owning counterparts – a result that suggests that fund owners face more idiosyncratic risk than the population average. This finding is in line with the findings reported in Mankiw and Zeldes (1991) for stock holders.

Table 4 shows cross-regional income and consumption correlations. For each Italian region, column 1 provides the correlation of the consumption of fund owners residing in the respective region with that of other fund owners in the rest of Italy. Column 2 gives the

analogous correlation for non-fund holders. In columns 3 and 4 we repeat the same exercise for income. The cross-regional consumption correlation of fund owners is lower than that of non-fund owners in 12 of 14 (aggregated) regions. For income this is true in 11 cases. The average consumption correlation for fund owners is 0.096, that for other households 0.47. For income, the respective correlations are 0.12 and 0.40.

The purely descriptive evidence in Tables 3 and 4 suggests that – as a group – fund holders seem to face lots more idiosyncratic risk and that they achieve much less cross-regional risk sharing than do non-fund holders. This ties in with the evidence in Tables 1 and 2 where we find that fund owners are more likely to be self-employed and hold a much larger share of their wealth in business property. Heaton and Lucas (2000 *J.Finance*) have prominently argued that proprietors constitute an important group of shareholders that is also subject to non-insurable background risk. To the extent that fund-owners tend to be proprietors, a higher share of fund owners may simply imply a lot more uninsurable region-specific risk for them. In fact, Agronin (2003) provides evidence based on U.S. state level data that regions with more small, proprietary businesses achieve less income insurance. These findings may help rationalize the unconditional correlations we observe here.[7]

In this paper, we abstain from an attempt to explain *why* households own stocks or mutual funds. Our approach is more modest: given that we observe that certain households participate in stock markets – and in particular: mutual funds – we ask to what extent cross-regional variation in the incentives to invest into out-of-region assets can explain cross-regional variation in mutual fund ownership – both along the intensive as well as the extensive margins. We then ask, to what extent the interaction between these two margins can explain the relative success of a region as a whole in obtaining interregional consumption risk sharing. We start by describing our diversification measures.

[7]Note that there is a version of the Backus, Kehoe and Kydland (1992) quantity puzzle in these household group data: the average cross-regional consumption correlations of fund-owners is even lower than the average correlation in their respective incomes.

3.2 Measures of interregional diversification: intensive and extensive margins

We now use the mutual fund holding characteristics discussed in the previous subsection to obtain measures of interregional diversification (or, for that matter: home bias). Our data set allows us to distinguish between two dimensions of interregional diversification: variation across regions in the the fraction of the wealth held in mutual funds by households that already own fund measures the intensive margin. Variation in mutual fund participation, i.e. the fraction of all households in the region that own mutual funds at all measures the extensive margin.[8]

We examine two measures of diversification along the intensive margin: our first measure puts the ratio of households' mutual fund holdings to the value of their real assets. This measure emphasizes the weight of fund owners out-of-region (i.e. mutual fund) assets relative to what one might consider their local assets, notably owner occupied housing. We call this measure MFW. As a second measure of diversification along the intensive margin, we consider mutual fund holdings relative to fund owners' labor income. We call this ratio MFY. As a measure of diversification along the extensive margin we use the fraction of households in a given region that own mutual funds, i.e. the mutual fund participation rate.

Table 5 gives an overview of the regional variation in our diversification measures. As is apparent, there is a lot of dispersion in mutual fund ownership rates across regions. Fund ownership is much more widespread in the northern regions such as Lombardia and Emilia-Romagna, with 13 and 15 percent respectively, whereas in the southern regions such as Calabria, Basilicata and Sicilia less than 2 percent of households hold mutual funds.

The share of wealth held in mutual funds, be it relative to local (i.e. housing) assets or relative to income, still varies widely across regions., but somewhat less than does the fund participation. Furthermore, the north-south divide, while present, is not quite as clear-cut as it appears for the participation rates. Note that the two intensity measures MFW and

[8]We experimented with thresholds other than zero (strictly positive fund-holdings), e.g. more than 2,000 EUR as minimum fund holdings to be classified as a fund-owning households, but results were largely unaffected.

MFY are also very highly correlated across regions.

4 Results

4.1 Incentives for interregional diversification and household portfolios

In examining the link between interregional risk sharing and household portfolio characteristics we take guidance from some simple principles of portfolio theory: the more exposed households are to region-specific risks, the lower should *ceteris paribus* be the share of local assets that the household would optimally want to hold in its portfolio. Hence, the share of out-of-region assets should increase for households that are very exposed to region-specific risk. Clearly, this is true only to the extent that expected return differentials between assets in the home region and in the rest of the country are zero. Given that data limitations make an empirical approximation of such expected return differentials *between regions* virtually impossible and given that we want to focus on the role of portfolio choice for hedging consumption risk, we make this assumption here. We measure incentives for the inter-regional hedging of consumption risk using two different approaches:

In the first, we gauge how exposed households' raw income is to region-specific GDP shocks. This provides a measure of diversification incentives at the level of household types. In the second, we gauge how strong diversification incentives are for the region as a whole by asking to what extent its GDP fluctuations correlate with the national aggregate. We then use a simple theoretical model to back out implied regional portfolio weights.

We implement the first approach by a regression of household income on regional GDP growth

$$\Delta y_t^{ki} = \gamma^{ki}(\Delta gdp_t^k - \Delta gdp_t) + \mu^{ki} + v_t^{ki} \tag{1}$$

where Δy_t^{ki} is the growth rate of raw income for household-type i in region k and μ^{ki} is a region-specific fixed effect. As discussed in the previous section, we distinguish between two household types – the average household in region k ($i = all$) and those households that hold mutual funds ($i = MF$).

We measure region specific economic conditions through the difference in GDP growth rates between regions k and the national average, $(\Delta gdp_t^k - \Delta gdp_t)$. The coefficient γ^{ki} can then be interpreted as a measure of the sensitivity to local economic conditions.

The left panel of Figure 1 plots the estimates of γ^{ki} for mutual fund holders ($i = MF$) against the first of our intensive regional diversification measures, the ratio of mutual fund holdings to local (real) assets (MFW). As is apparent, there is a clear positive link between the two variables and the regression coefficient seems highly significant. The figure highlights the role of region-specific risk for diversification along the intensive margin:[9] in regions, where fund holders are particularly exposed to local economic conditions, they invest a larger share of their wealth in mutual funds.

Interestingly, there is even a positive link between fund-holders degree of diversification (the intensive margin) and *average* household exposure in the regions (see right panel of Figure 1). This suggests that there is a strong correlation between the local exposures of fund-owners and other households. The cross-sectional correlation between the γ^k for fund-holders and non-fund-holders is bigger than 0.5. and highly significant. This does, however, not imply that diversification along the extensive margin (participation rates) is systematically higher in regions where people are strongly exposed to local economic shocks. In the data, the link between mutual fund participation rates and exposure to local economic conditions is insignificant. While explaining stock market participation is beyond the scope of our analysis here, these result seem to deepen the puzzle of non-participation in equity markets: given that diversification incentives are broadly the same for the two household groups, it is surprising that they react so differently.

The coefficients γ^{ki} are estimated from relatively short time series samples and are therefore likely to be imprecise. The above cross-plots can therefore at best be suggestive of a link between these variables. We attempt to solve this problem by parametrizing the exposure coefficients γ^{ki} as functions of mutual fund holdings directly. To this end, we invert the conjectured linear relation between exposure and fund holdings underlying the

[9] To save space, we do not report the results for MFY graphically. The figure looks similar and the link is is equally significant.

cross-plots above and write

$$\gamma^{ki} = \gamma_0^i + \gamma_1^{i\prime}\mathbf{z}^{ik}$$

where $\mathbf{z}^{ik}$ is a vector of region k household group i portfolio characteristics, γ_0^i is a group-specific constant and $\gamma_1^{i\prime}$ is a vector of coefficients. Specifically,we choose $\mathbf{z}_t^{ik}$ to comprise sample period averages of our intensive and extensive margin measures respectively as well as their interactions. This parametrization for γ^{ik} allows to write (1) as

$$\Delta y_t^{ki} = \gamma_0^i(\Delta gdp_t^k - \Delta gdp_t) + \gamma_1^{i\prime}\mathbf{z}^{ik}(\Delta gdp_t^k - \Delta gdp_t) + \mu^{ki} + v_t^{ki} \tag{2}$$

which in turn puts us in a position to estimate γ_0^i and $\gamma_1^{i\prime}$ from a panel regression. Again, μ^{ki} is the fixed effect. We note that, even though in this specification, γ^{ik} varies as a function of portfolio parameters, we do not want to to interpret this relation as a causal one. We just want to ascertain statistically that actual diversification decisions are positively related to diversification incentives as we measure them by household exposure to region-specific economic conditions.

We provide results for regressions of the form (2) in the first two panels of Table 6. In the first column of the table, $\mathbf{z}^{ik}$ consists of the intensive margin diversification measure, in the second column we have the extensive margin. In the third column, $\mathbf{z}^{ik}$ includes both measures and in the fourth column $\mathbf{z}^{ik}$ is the interaction between the two measures. We find the intuition provided by the cross-plots largely confirmed. Panel I reports the results for mutual-fund owning households. Higher fund holdings are clearly and significantly associated with higher exposure. The extensive margin or the interaction between the two margins are not significant. The same picture also emerges in panel II, where we consider all households. It is variation along the intensive margin – i.e. higher fund-holdings by households that already hold stocks – rather than variation in the incidence of fund-holding households that is associated with higher exposure.

We further illustrate the link between diversification incentives and actual portfolio choices using a second approach that imposes somewhat stronger theoretical restrictions.

Heathcote and Perri (2004) have suggested a model in which countries or regions can trade claims that carry a dividend equal to a region's per capita output. There is a friction in the form of an iceberg cost on interregional dividend flows. Consumption in a region is then a portfolio weighted average of home and rest of the country outputs (see also Artis and Hoffmann (2008) and Crucini (1999) for similar models):

$$C^k = \lambda GDP^k + P^k(1-\lambda)(1-\tau)GDP \tag{3}$$

where τ is the iceberg cost and P^k is the price of a claim to region k output. Assuming that utility is exponential and output log-normal with $\mathbf{E}(GDP_t^k) = \mathbf{E}(GDP_t) = \theta$ and variance $\mathbf{var}(GDP_t^k) = \mathbf{var}(GDP_t) = \sigma^2$ leads to the following optimal share in home asset holdings:

$$\lambda = min\left\{\frac{(1-\tau)^2 - (1-\tau)\rho + \frac{\tau\theta}{A\sigma^2}}{1-2(1-\tau)\rho + (1-\tau)^2}, 1\right\} \tag{4}$$

where A is the absolute risk aversion parameter. The *min*-operator ensures that countries can not go short on foreign equity. We use this equation to calibrate optimal portfolio shares for each region based on the correlation of its GDP growth rate with GDP in the rest of the country [10], using a range of values for τ and the risk aversion parameter A.[11]

We then regress actual portfolio holdings on these calibrated portfolio weights. Panel III of Table (6) provides the results of this exercise for $\tau = 0.05$ and $A = 1000$.[12] As is apparent, there is significantly negative relation between the share of a region's wealth held in mutual funds and the optimal share of home assets held by the model. While the slope coefficient of these regressions is not directly meaningful because the theoretical model is very stylized, these results clearly line up with our earlier findings – actual patterns of interregional

[10] These data are taken from the CRENoS data base and are described in more detail in section 4.2 below

[11] The model assumes that the mean and variance of home and 'foreign' output are identical. This assumption is a good approximation for Italian regional data.

[12] We experimented with a range of values for τ and A.The results were not sensitive to this choice, provided one chooses sufficiently high values of A. Values of A below 10 are are however implausible in this setup because they lead to negative shares of home equity given the GDP correlations in the data. Another reason to choose rather high levels of risk aversion is that our analysis focuses on the hedging demand for out-of-region assets.

household diversification are consistent with theoretical diversification incentives: regions that are more exposed to idiosyncratic risk seem to hold more out-of-region assets.

From the perspective of the region as whole, it is not clear *a priori*, along which margin we should expect to see diversification to work when households are highly exposed to local economic conditions. Higher diversification incentives could find their reflection both in higher fund ownership rates and/or in more substantial holdings of out-of-region assets. This impression is also confirmed by our second approach to measuring diversification incentives: if we regress participation rates or our intensive margin measures individually on the calibrated values of λ (last three columns of panel III in Table 6), we always find a negative sign for the coefficient, but the link is not generally significant (though the evidence in this case would point somewhat more strongly in the direction of the *extensive* margin).

Our findings here broadly suggest that diversification incentives, measured through correlations of labor income with region-specific GDP fluctuations, seem to line up with actual diversification behavior at the regional level. There is evidence that stronger diversification incentives seem to lead to higher fund holdings of those households that already own mutual funds. There is also a slightly higher propensity to participate in funds in regions that are subject to more idiosyncratic shocks but the effect is not significant. This may reflect liquidity constraints, costs of participation and other obstacles to equity ownership: while diversification incentives may well be present for many households in the region, it is plausible that mainly those households that hold equity anyway may be able to react to them. It is beyond the scope of the paper to explain *why* households participate in equity markets. While we would argue that non-participation clearly remains a puzzle also from an interregional risk sharing perspective, the evidence from Table 6, panel III suggests that regional participation patterns at least qualitatively line up the direction of diversification incentives.

4.2 Does mutual fund ownership increase interregional risk sharing?

Our analysis so far has focused on how the structure of shocks faced by households in different regions affects portfolio decisions. We now turn to asking what the effects of portfolio diversification on interregional risk sharing may be. We first ask whether fund owners as a group systematically share more consumption risk than do non-fund owners. We then turn to the question whether regions as a whole share more risk if they have more fund-owning households or if fund-owners hold a larger fraction of their wealth in mutual funds.

4.2.1 Fund holders vs. non-fund holders

As our metric for risk sharing, we employ panel regressions of the form

$$\Delta c_t^i(k) - \Delta c_t^i = \beta^i(k) \left[\Delta y_t^{ki}(k) - \Delta y_t^i \right] + \mu^{ki} + \varepsilon_{ut}^i \tag{5}$$

Regressions of this kind have been proposed by Mace (1991) and Cochrane (1991) as tests of the null of complete financial markets. We propose to interpret $\beta^i(k)$ as a measure of how much of the idiosyncratic labor income risk of household group i in region k systematically spills over into idiosyncratic consumption fluctuations. In particular, if $\beta^i(k)$ is unity, no risk is shared, whereas if $\beta^i(k) = 0$, all risk is shared. This interpretation of β^i as a metric for risk sharing was first popularized by Asdrubali, Sørensen and Yosha (1996).

We present the results obtained from regressions of this form for fund-holders and non-fund-holders in Table 7. As is apparent, there is no major difference in the actual risk sharing outcomes between owners of mutual funds and other households in the population. Both groups insure between 40 and 50 percent of their idiosyncratic income shocks (the respective β^i for fund-holders is 0.57, and 0.60 for non-fund-holders). Interestingly, the fraction of uninsured risk, β^i, is virtually the same for both household groups, suggesting that fund ownership *per se* – the ownership of out-of-region assets – does not necessarily imply more or less interregional risk sharing. However, given the particular characteristics of fund-owners as we documented them earlier, it is conceivable that an above average fraction

of fund owners' idiosyncratic risk is non-diversifiable. The fact that, in spite of this, the same fraction of all idiosyncratic risk is shared may suggest that fund owners could ultimately be able diversify a larger portion of their *diversifiable* risk than the population as a whole. In this respect our results here appear consistent with the view that fund ownership provides interregional risk sharing *ceteris paribus*.

4.2.2 Impact on aggregate risk sharing

To explore the link between portfolio characteristics and interregional risk sharing on risk sharing in the region aggregate, we again consider simple risk sharing regressions of the form:

$$\Delta c_t(k) - \Delta c_t = \beta(k) \left[\Delta y_t^k(k) - \Delta y_t \right] + \mu^k + \varepsilon_{ut} \tag{6}$$

Note that this equation now applies to the regional aggregate and we therefore drop the group index i in what follows. We then posit a linear relation between our (region-specific) measure of risk sharing $\beta_u(k)$ and regional portfolio characteristics, so that

$$\beta(k) = \beta_0 + \beta' \mathbf{z}_t^k$$

where $\mathbf{z}_t^k$ is, again, a vector of region-specific characteristics. Plugging this relation into (6), we obtain an equation with a set of interaction terms. Since we allow the vector of characteristics to vary over time and across regions, the effect of the non-interacted $\mathbf{z}_t^k$ will not be adequately captured by the region-specific fixed effect and we therefore also include the non-interacted regional characteristics $\mathbf{z}_t^k$ into the regression which then becomes

$$\Delta c_t(k) - \Delta c_t = \beta_0 \left[\Delta y_t(k) - \Delta y_t \right] + \beta' \mathbf{z}_t^k \left[\Delta y_t(k) - \Delta y_t \right] + \delta' \mathbf{z}_t^k + \mu^k + \varepsilon_{ut} \tag{7}$$

The vector $\mathbf{z}_t^{ik}$ contains our diversification measures, MFW and MFY, and the mutual fund participation rate.

Table 8, column 1 reports the results for all households when no interaction terms are considered. Around 55% of the region-specific income risk of the typical household remains

uninsured. Columns 2-8 report the results for the interaction term regressions (7). The coefficients on the interaction terms are correctly signed throughout: more diversification, be it along the intensive or extensive margin seems to lead to more risk sharing. This is true for both of our intensive proxies, MPW and MPY. While MPY is highly significant, the individual coefficients on MPW and on the participation measure appear only marginally so. However, an F-test that they are jointly zero strongly rejects the null: when considered jointly, participation and higher household level portfolio diversification *do* tend to be associated with more interregional risk sharing.

We expect the impact of diversification and participation on risk sharing to reinforce each other: if all households own mutual funds the marginal effect of an increase in MPY or MPW on aggregate risk sharing will be higher than if only very few households hold funds. Conversely, we would expect that wider participation induces a larger increase in aggregate risk sharing if average fund holdings are high than if they are low. To control for such a potential non-linearity, we also include an interaction term between our intensive and extensive (participation) measures. Columns 7 and 8 report on this exercise . The coefficient on the interaction term is negative for both MFY and MFW: increasing diversification along either margin increases the impact of the other margin on aggregate risk sharing.

To check the results in Tables 7 and 8 for robustness, we rerun our regressions including a set of control variables into $\mathbf{z}_t^{ik}$ that theory and earlier empirical work would suggest could have an important bearing on interregional risk sharing: an indicator of a region's economic backwardness and remoteness (a Mezzogiorno dummy), the fraction of households that report positive income from entrepreneurial activity. (Heaton and Lucas (2000a,b), and Guiso et al. (1996)) and an index of regional specialization (Kalemli-Ozcan, Sørensen and Yosha (2003)). The inclusion of these variables does not generally affect our results and none of them was found to be individually significant. To capture the potential influence of other omitted, slow moving variables such as financial development, we also experimented with the inclusion of a linear trend. This somewhat affects the significance of the participation measure, apparently due to some collinearity with the general increase in mutual fund

participation but leaves our other conclusions unaffected.

As an additional check, we obtain results similar to those in table 8 based on aggregate regional data. So far, our findings were mainly based on household consumption and income data that are aggregated up to the regional level. To make sure that our results from these data are broadly representative, we we run our risk sharing regressions 7) , using the micro-level information on fund holdings and participation rates, but now based on annual growth rates of regional per capita consumption and GDP for the years 1987-2004 from the CRENoS Regional Accounts data base Regio-IT 1970-2004 (Center for North South Economic Research, http://www.crenos.it, see Paci and Saba, 1998). The setup of our regression is otherwise analogous to the specification in the last column of table 8.[13] The results from this exercise are as follows: the coefficients on our diversification measures, though numerically somewhat different, all have the same signs as in the regressions based on household data. They are also all significant. This clearly strengthens our earlier conclusions: *i)* equity fund ownership seems to improve interregional risk sharing. *ii)* The interaction between the intensive and extensive margins seems to matter for this result. We explore next, how the contribution of these margins has varied over time.

4.2.3 Time variation in the margins of diversification

Our results on the interaction between extensive and intensive margins suggest that the link between equity ownership and risk sharing has varied over our sample period: the interaction between the two margins seems to matter in regression (7) which puts us in a position to assess time variation in the marginal effect of diversification along the extensive and intensive margins respectively. For the intensive margin measures, we have

$$\frac{\partial \beta_u^k}{\partial \omega_t^k} = \beta_1 + \beta_3 PART_t^k$$

[13] Since our diversification measures are observed only every second or sometimes even every third year (1995 and 1998), the interaction terms in the aggregate regressions are based on region-specific sample averages, so that we set $\mathbf{z}_t^i k = \mathbf{z}^i k$ for our regressions based on aggregate data.

as measure of the marginal effect of better diversification along the intensive margin and

$$\frac{\partial \beta_u^k}{\partial PART_t^k} = \beta_2 + \beta_3 \omega_t^k$$

as marginal effect of higher participation, i.e. the extensive margin. Here, ω_t^k stands for the time t share of mutual funds in fund-owners portfolio in region k, and $PART_t^k$ is the mutual fund participation rate in region k. In the remainder of this section, we report our findings based on our first proxy, i.e. $\omega_t^k = MFW_t^k$ but note that all our results remain virtually unchanged if we use MFY.

To compute the value of the marginal effects for the average region over our entire sample period we use the time averages of the cross-sectional means of the respective variables:

$$\begin{aligned} PART &= \frac{1}{T}\sum_t PART_t = \frac{1}{TK}\sum_t \sum_k PART_t^k \\ \omega &= \frac{1}{T}\sum_t \omega_t = \frac{1}{TK}\sum_t \sum_k \omega_t^k \end{aligned}$$

The first row of Table 9 provides the values of $\beta_1 + \beta_3 PART$ and $\beta_2 + \beta_3 \omega$ along with the p-value of an F-test that either of these effects was zero. We find that the marginal effect along the intensive margin is -0.8 – a one percentage point increase in fund holdings increases risk sharing by 0.8 percentage point, but this effect seems insignificant for the sample period as a whole. Conversely, an increase in participation – the extensive margin – increases aggregate risk sharing by more than 2 percentage points and this effect is highly significant.

Both the mutual fund ownership rate as well as the valuation of shares and therefore the share of wealth held in mutual funds have varied substantially over our sample period, so that the numbers we just reported may mask considerable time-variation in the magnitude and significance of the marginal effects. Figure 2 illustrates this point. The left panel plots the cross-sectional mean participation rate $PART_t$ and the one to the right the cross-

sectional mean holdings of mutual funds in real wealth, MFW_t. Both reach a peak during the stock market boom of the late 1990s. Therefore in the following rows of Table 9, we let the intensive and extensive marginal effects for the average region vary over time by using the cross-regional means $PART_t$ and $\omega_t = MFW_t$ to compute them. For each year, this part of the table reports the value of the variable driving the margin (i.e. $PART_t$ for the intensive and MFW_t for the extensive margin), the value of the marginal effect and the associated $p - value$.

The effect on aggregate risk sharing along the extensive margin is between 2 and 3 percentage points for most of the sample period and, with the exception for the year 1991, also highly significant. Conversely, the effect of higher stock holdings, the intensive margin, is subject to considerable time variation and insignificant in all but three years – 1998, 2000 and 2002 — when it also reaches 2-3 percentage points. These are the years of the technology bull market and the immediate aftermath, when stock market participation reached a peak, only to drop to pre-boom levels in the years till the end of our sample.

The results here support the view that fund ownership, on the margin, does provide interregional risk sharing, even though our results above would suggest that fund holders do not systematically share more risk across regional boundaries. But they also show that at least in the early part of our sample, fund holders are a special group. Widening mutual fund ownership to households with less specific characteristics, such as high levels of non-diversifiable background risk is therefore likely to make a big impact on aggregate risk sharing. This suggests that widening equity fund participation may be an important avenue through which broader aggregate risk sharing can be brought about.

5 Summary and Conclusion

Our contribution in this paper has been twofold: first, we have explored the role of interregional portfolio diversification for the patterns and extent of *interregional* risk sharing between households. A number of current papers are exploring the link between risk sharing and national portfolio structure in international data. It would seem that regional evidence

on the link between aggregate risk sharing and household portfolio choice should provide an important benchmark for a better understanding of financial globalization. However, virtually no evidence along these lines existed to date. Our results here help close this gap.

An important obstacle to region-level analyses of the link between risk sharing and portfolio structure is that regional portfolio data do not exist. We suggest a solution to this problem that is based on aggregating household level data from the Banca d'Italia Survey of Household Income and Wealth (SHIW) from 1987-2004. One of our main innovations is to use mutual equity fund ownership as a measure of out-of-region asset ownership : equity funds tend to be managed at the national or even international level so that purchase of mutual fund shares implicitly leads to interregional portfolio diversification.

Our second contribution is to draw attention to the interaction between what we call the two margins of diversification for our understanding of aggregate risk sharing: variation in the share of mutual funds in fund-holders' wealth captures the intensive margin of diversification. Variation in the fraction of households that hold funds (i.e. in equity fund participation rates) is the extensive margin. Based on this distinction, we uncover a number of interesting links between household portfolio structure and interregional risk sharing.

First, fund owners living in regions where households are particularly exposed to region-specific labor income risk hold a larger fraction of their wealth in equity funds. Equally, in regions that are less correlated with the national average in terms of their GDP fluctuations, a larger share of aggregate household wealth is held in equity funds and it seems that both margins of diversification contribute to this regularity. These results suggest that interregional diversification incentives qualitatively line up with actual diversification patterns.

Secondly, we find no major difference in how much risk is shared by fund-owning and non-fund-owning households, even though a larger fraction of the idiosyncratic income risk faced by fund-holders is non-diversifiable (in line with the findings in e.g. Heaton and Lucas (2000)). Our results therefore also appear consistent with the view that mutual fund owners diversify away a larger fraction of their insurable risk than do non-owners.

Third, we document that regions with higher average mutual fund holdings and larger mutual fund participation rates tend to achieve more risk sharing with the rest of the country. Interestingly, the level and incidence of fund holdings have a mutually reinforcing effect on risk sharing: the more widespread mutual fund holdings are, the larger is the marginal effect on risk sharing of an increase of the fraction of fund-holders' wealth invested into mutual funds. These findings suggest that the link between regional portfolio structure and risk sharing may vary in strength over time. Over our sample period, we estimate that the marginal effects along both the intensive and extensive margins were highest during the stock market boom of the late 1990s, when both asset valuations and participation rates reached a peak.

Our results imply that policies aimed at increasing mutual fund ownership could have a potentially important effect on interregional risk sharing. They also add a novel perspective to an emerging literature in international finance that has recently started to investigate the link between country portfolios and international consumption risk sharing. So far, this literature has mostly focused on the impact of the recent decline in international portfolio home bias on international consumption risk sharing. While our results here are not the first to show that home bias is clearly not only an international phenomenon (for an early contribution see Coval and Moskowitz (1999)), they may help shift the debate towards the role of financial market participation – the extensive margin of diversification – for understanding risk sharing at the aggregate level – be it between regions or countries.

References

Agronin, Eugene, "Risk-Sharing Across the United States, Proprietary Income, and the Business Cycle," *mimeo*, 2003.

Artis, Michael J. and Mathias Hoffmann, "Financial Globalization, International Business Cycles, and Consumption Risk Sharing," *Scandinavian Journal of Economics*, 2008, *110* (3), 447–471.

Asdrubali, Pierfederico, Bent E. Sørensen, and Oved Yosha, "Channels of interstate risk sharing: United States 1963-90," *Quarterly Journal of Economics*, 1996, *111*, 1081–1110.

Attanasio, Orazio and Steven J. Davis, "Relative Wage Movements and the Distribution of Consumption," *Journal of Political Economy*, December 1996, *104* (6), 1227–1262.

Backus, David K., Patrick J. Kehoe, and Finn E. Kydland, "International Real Business Cycles," *Journal of Political Economy*, 1992, *100* (4), 745–775.

Becker, Sascha O. and Mathias Hoffmann, "Intra-and International Risk-Sharing in the Short Run and the Long Run," *European Economic Review*, 2006, *50* (3), 777–806.

Cochrane, John H., "A Simple Test of Consumption Insurance," *Journal of Political Economy*, 1991, *99* (5), 957–976.

Coval, Joshua D. and Tobias J. Moskowitz, "Home Bias at Home: Local Equity Preference in Domestic Portfolios," *Journal of Finance*, December 1999, *54* (6), 2045–2074.

Crucini, Mario J., "On International and National Dimensions of Risk Sharing," *The Review of Economics and Statistics*, February 1999, *81* (1), 73–84.

Demyanik, Yuliya, Charlotte Ostergaard, and Bent E. Sørensen, "U.S. Banking Deregulation, Small Businesses, and Interstate Insurance of Personal Income," *Journal of Finance*, December 2007, *62* (6), 2763–2801.

Guiso, Luigi, Tullio Jappelli, and Daniele Terlizzese, "Income Risk, Borrowing Constraints, and Portfolio Choice," *The American Economic Review*, March 1996, *86* (1), 158–172.

Heathcote, Jonathan and Fabrizio Perri, "Financial Globalization and Real Regionalization," *Journal of Economic Theory*, 2004, *119*, 207–243.

Heaton, John and Deborah Lucas, "Portfolio Choice and Asset Prices: The Importance of Entrepreneurial Risk," *The Journal of Finance*, June 2000, *55* (3), 1163–1198.

_ and _ , "Portfolio Choice in The Presence of Background Risk," *The Economic Journal*, January 2000, *110* (1), 1–26.

Hess, Gregory D. and Kwanho Shin, "Risk Sharing by Households Within and Across Regions and Industries," *Journal of Monetary Economics*, 2000, *45*, 533–560.

Kalemli-Ozcan, Sebnem, Bent E. Sørensen, and Oved Yosha, "Risk Sharing and Industrial Specialization: Regional and International Evidence," *American Economic Review*, June 2003, *93* (3), 903–918.

Kraay, Aart, Norman Loayza, Luis Serven, and Jaume Ventura, "Country Portfolios," *Journal of the European Economic Association*, June 2005, *3* (4), 914–945.

Lane, Philip D. and Gian Maria Milesi-Ferretti, "International Financial Integration," *IMF Staff Papers*, 2003, *50* (Special Issue), 82–113.

Mace, Barbara J, "Full Insurance in the Presence of Aggregate Uncertainty," *Journal of Political Economy*, October 1991, *99* (5), 928–956.

Mankiw, N. Gregory and Stephen P. Zeldes, "The consumption of stockholders and nonstockholders," *Journal of Financial Economics*, March 1991, *29* (1), 97–112.

Paci, Raffaele and Andrea Saba, "The empirics of regional economic growth in Italy 1951-93," *Rivista Internazionale di Scienze Economiche e Commerciali*, 1998, *45*, 515–542.

Sørensen, Bent E. and Oved Yosha, "International risk sharing and European Monetary Unification," *Journal of International Economics*, 1998, *45*, 211–38.

_ and _ , "Producer Prices versus Consumer Prices in the Measurement of Risk Sharing," *Applied Economics Quarterly*, 2007, *53* (1), 3–17.

_ , Yi-Tsung Wu, Oved Yosha, and Yu Zhu, "Home Bias and International Risk Sharing: Twin Puzzles Separated at Birth," *Journal of International Money and Finance*, June 2007, *26* (4), 587–605.

Townsend, Robert M., "Risk and Insurance in Village India," *Econometrica*, May 1994, *62* (3), 539–591.

van Wincoop, Eric, "How big are potential welfare gains from international risk sharing?," *Journal of International Economics*, 1999, *47*, 109–135.

von Hagen, Jürgen, "Fiscal Policy and Intranational Risk Sharing," in Gregory D. Hess and Eric van Wincoop, eds., *Intranational Macroeconomics*, Cambridge: Cambridge University Press, 2000.

Table 1: Descriptive statistics: Full sample and fund-holder subsample

	1987		2004	
	Full sample	Fund holders	Full sample	Fund holders
Fund-holder (% of sample)	0.055	1	0.104	1
	(0.227)		(0.305)	
Age	45.205	46.508	46.96	48.224
	(9.729)	(9.354)	(9.41)	(8.547)
Upper-secondary schooling (% of sample)	0.392	0.752	0.5	0.748
	(0.488)	(0.432)	(0.5)	(0.435)
Proprietor (% of sample)	0.29	0.473	0.247	0.31
	(0.454)	(0.5)	(0.431)	(0.463)
Transfer recipient (% of sample)	0.037	0.025	0.075	0.07
	(0.19)	(0.157)	(0.263)	(0.255)
Net labor income (yl)	16.803	22.46	16.039	21.251
	(14.745)	(22.244)	(14.195)	(17.765)
Pensions and other transfers (yt)	2.236	2.488	4.005	5.113
	(4.825)	(5.393)	(7.381)	(9.156)
Pensions and pension arrears	2.073	2.361	3.683	4.763
	(4.7)	(5.325)	(7.229)	(8.889)
Other transfers	.163	.127	.322	.35
	(1.184)	(1.006)	(1.758)	(1.815)
Net entrepreneurial income (ym)	7.901	19.752	6.257	9.458
	(17.945)	(29.473)	(24.876)	(22.584)
Property income (yc)	4.455	13.787	5.92	11.051
	(8.13)	(14.413)	(8.003)	(14.033)
Income from buildings (yca)	3.955	9.681	5.943	9.967
	(6.548)	(11.482)	(7.7)	(13.593)
Income from financial assets (ycf)	.5	4.106	-.023	1.084
	(3.73)	(6.36)	(2.154)	(4.139)
Raw income (=yl+ym+yca)	28.659	51.892	28.238	40.676
	(22.374)	(32.242)	(29.276)	(29.651)
Net disposable income excl. asset inc. (yraw+yt)	30.895	54.38	32.243	45.789
	(21.938)	(31.715)	(28.975)	(28.631)
Net disposable income (yraw+yt+ycf)	31.396	58.486	32.22	46.873
	(23.07)	(34.626)	(29.21)	(29.036)
Consumption (cn+cd)	24.602	41.534	23.993	32.39
	(15.618)	(22.359)	(13.713)	(16.515)
Non-durable consumption (cn)	21.511	35.128	21.79	29.181
	(12.18)	(18.361)	(11.654)	(14.48)
Durable consumption (cd)	3.091	6.406	2.203	3.209
	(6.492)	(8.515)	(5.414)	(6.22)

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Number of observations: 5,853 households in 1987, 4,776 households in 2004.
All monetary variables are in 1,000s of current EUR.

Table 2: Descriptive statistics: Portfolio characteristics of fund-holders and non-fund-holders

	1987		2004	
	Fund holders	non-Fund holders	Fund holders	non-Fund holders
Real assets	322.844	112.651	350.501	184.699
	(464.666)	(240.32)	(540.451)	(310.358)
Real estate (housing and land)	219.133	83.981	284.379	154.237
	(273.602)	(141.266)	(315.659)	(223.869)
Businesses	87.756	24.039	57.685	25.776
	(326.615)	(160.922)	(343.269)	(164.97)
Valuables	15.955	4.63	8.437	4.686
	(25.432)	(13.162)	(30.461)	(12.818)
Financial assets	67.176	19.038	64.075	15.894
	(73.523)	(36.643)	(126.561)	(50.421)
Deposits, CDs, repos, postal savings certificates	23.242	13.02	15.19	10.421
	(27.766)	(21.722)	(27.999)	(29.495)
Government securities	21.145	4.777	5.248	1.757
	(32.936)	(20.315)	(21.342)	(10.427)
Other securities (bonds, mutual funds, equity etc.)	22.789	1.241	43.637	3.715
	(33.904)	(11.82)	(108.457)	(36.256)
Financial liabilities	4.451	3.031	11.192	8.246
	(14.993)	(16.521)	(35.571)	(22.763)
Fin. liab. for purchase of real estate and other real assets	3.622	2.423	9.738	7.136
	(14.396)	(16.278)	(35.07)	(22.407)
Other Financial Liabilities	0.829	0.608	1.454	1.11
	(2.799)	(2.522)	(4.72)	(3.482)
Net wealth = Real assets + Financ. assets - Financ. liab.	385.569	128.658	403.383	192.347
	(497.159)	(252.247)	(569.263)	(323.434)
Real net wealth = Real assets - Financ. liab on real estate	319.222	110.227	340.763	177.563
	(465.145)	(238.695)	(536.416)	(305.045)

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Number of observations: 5,853 households in 1987, 4,776 households in 2004.
Net wealth = Real assets + Financ. assets - Financ. liab.
Real net wealth = Real assets - Financ. liab on real estate
All monetary variables are in 1,000s of current EUR.

Table 3: Standard deviation of growth rates in consumption, income, and wealth

	Fund-holders	Non-fund-holders
Non-durable consumption	0.115	0.053
Durable consumption	0.249	0.204
'Raw' income	0.081	0.053
Wealth	0.192	0.070

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.

Standard-deviation computed over average growth rates of given variables in consecutive survey years, separately for fund-holders and non-fund-holders.
For definition of variables, see main text and Table 1.

Table 4: Cross-regional correlations: Fund-holders vs. non-fund-holders

	Raw income		Non-durable consumption	
	Fund holders	non-Fund holders	Fund holders	non-Fund holders
PIE+VDA	0.158	0.396	0.713	0.780
LOM	-0.357	0.508	0.253	-0.033
TAA	-0.169	0.164	0.752	-0.047
VEN	0.474	0.211	-0.277	0.273
FVG	-0.183	0.440	0.198	0.420
LIG	-0.529	-0.073	-0.323	-0.129
EMR	-0.335	0.043	-0.052	0.338
TOS+UMB	0.523	0.472	0.235	0.488
MAR	0.102	0.742	-0.186	0.817
LAZ+SAR	0.228	0.511	0.418	0.520
ABR	0.270	0.218	0.603	0.653
CAM	0.455	0.707	-0.319	0.759
PUG+MOL	-0.394	0.470	0.167	0.840
CAL+BAS+SIC	-0.243	0.854	0.688	0.823
Average	0.000	0.450	0.205	0.464

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.

Region abbreviations are as follows: PIE+VDA denotes Piemonte and Valle d'Aosta; LOM denotes Lombardia; TAA denotes Trentino-Alto Adige; VEN denotes Veneto; FVG denotes Friuli-Venezia Giulia; LIG denotes Liguria; EMR denotes Emilia Romagna; TOS+UMB denotes Toscana and Umbria; MAR denotes Marche; LAZ+SAR denotes Lazio and Sardegna; ABR denotes Abruzzo; CAM denotes Campania; PUG+MOL denotes Puglia and Molise; CAL+BAS+SIC denotes Calabria, Basilicata and Sicily (Sicilia).
For definition of variables, see main text and Table 1.

Table 5: Extensive and intensive margins of fund ownership

Region	% Fund-holders	MFW	MFY
PIE+VDA	0.096	0.099	0.642
LOM	0.129	0.111	0.671
TAA	0.079	0.059	0.433
VEN	0.101	0.080	0.560
FVG	0.104	0.075	0.591
LIG	0.112	0.096	0.669
EMR	0.155	0.076	0.624
TOS+UMB	0.085	0.063	0.523
MAR	0.086	0.064	0.593
LAZ+SAR	0.035	0.062	0.449
ABR	0.042	0.178	1.582
CAM	0.016	0.050	0.285
PUG+MOL	0.031	0.103	0.834
CAL+BAS+SIC	0.016	0.062	0.443

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.

Region abbreviations are as follows: PIE+VDA denotes Piemonte and Valle d'Aosta; LOM denotes Lombardia; TAA denotes Trentino-Alto Adige; VEN denotes Veneto; FVG denotes Friuli-Venezia Giulia; LIG denotes Liguria; EMR denotes Emilia Romagna; TOS+UMB denotes Toscana and Umbria; MAR denotes Marche; LAZ+SAR denotes Lazio and Sardegna; ABR denotes Abruzzo; CAM denotes Campania; PUG+MOL denotes Puglia and Molise; CAL+BAS+SIC denotes Calabria, Basilicata and Sicily (Sicilia).
MFW is the ratio of funds over fund holder's real assets (including housing).
MFY is the ratio of funds over fund holder's raw income.

Table 6: Interregional diversification patterns and diversification incentives

Panel I: Fund-owners: diversification incentives				
	(1)	(2)	(3)	(4)
MFW	162.784		186.411	
	(56.927)***		(58.382)***	
Participation rate		-30.119	-59.867	
		(37.422)	(37.125)	
MFW * Participation rate				139.748
				(399.769)
Number of obs.	112	112	112	112
R^2	0.070	0.006	0.092	0.001
Panel II: Full sample: diversification incentives				
	(1)	(2)	(3)	(4)
MFW	45.906		50.965	
	(19.951)**		(20.615)**	
Participation rate		-4.685	-12.818	
		(12.983)	(13.109)	
MFW * Participation rate				91.991
				(138.168)
Number of obs.	112	112	112	112
R^2	0.053	0.008	0.062	0.011

Panel III: Diversification patterns a la Heathcote and Perri (2004)

	Total diversification		Intensive and extensive margins		
Dependent variable:	Equity fund-holdings over region-total real wealth	income	Participation rate	Equity fund-holdings over share-holder real wealth	income
	(1)	(2)	(3)	(4)	(5)
Optimal PF share λ	-0.047	-0.229	-0.202	-0.095	-0.550
	(0.013)***	(0.089)***	(0.114)*	(0.093)	(0.485)
Number of obs.	14	14	14	14	14
R^2	0.502	0.359	0.208	0.079	0.097

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Panels I and II show coefficients γ_1^i from equation (2): $\Delta y_t^{ki} = \gamma_0^i(\Delta gdp_t^k - \Delta gdp_t) + \gamma_1^{i\prime}\mathbf{z}^{ik}(\Delta gdp_t^k - \Delta gdp_t) + \mu^{ki} + v_t^{ki}$
Panel III shows coefficients b_x from the cross-sectional regression $x_k = const + b_x\lambda_k$ where λ_k is the optimal share of home assets in region k's portfolio and x_k are the dependent variables given in the table header.
MFW is the ratio of funds over fund holder's real assets (including housing).

Table 7: Unsmoothed component: Fund-holders vs non-fund-holders

	Fund-holders (1)	Non-fund-holders (2)
$\Delta y_t^u(k)$	.569 (.061)***	.596 (.060)***
Obs.	112	112

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table shows $\beta^i(k)$ from equation (3) in the main text: $\Delta c_t^i(k) - \Delta c_t^i = \beta^i(k)\left[\Delta y_t^{ki}(k) - \Delta y_t^i\right] + \mu^{ki} + \varepsilon_{ut}^i$.
$\beta^i(k)$ measures the fraction of income risk that is uninsured.

Table 8: Unsmoothed component: Full sample

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta y_t^u(k)$	β_0	0.542 (0.060)***	0.684 (0.096)***	0.771 (0.106)***	0.715 (0.102)***	0.818 (0.119)***	0.875 (0.124)***	0.595 (0.181)***	0.544 (0.226)**
Intensive margin:									
Fund holdings over real net wealth (MFW)	β_1		-1.498 (0.870)*			-1.224 (0.871)		1.981 (2.082)	
Fund holdings over raw income (MFY)	β_1			-0.393 (0.151)***			-0.339 (0.153)**		0.332 (0.415)
Extensive margin:									
Fraction of fund-holders	β_2				-2.176 (1.029)**	-1.963 (1.036)*	-1.690 (1.038)	0.475 (1.801)	2.147 (2.346)
Interactions:									
Extensive * intensive margin 1	β_3							-34.737 (19.959)*	
Extensive * intensive margin 2	β_3								-7.426 (4.072)*
p-value of F-statistic of joint significance of main effects of intensive and extensive margin						0.0408	0.0109		
Obs.		112	112	112	112	112	112	112	112

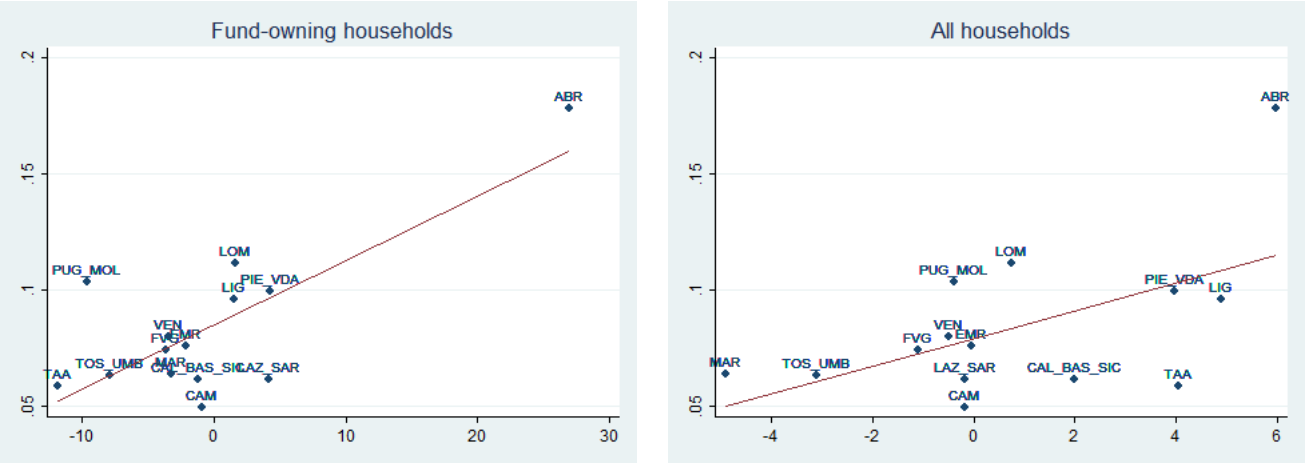
Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table shows $\beta^i(k)$ from equation (3) in the main text: $\Delta c_t^i(k) - \Delta c_t^i = \beta^i(k)\left[\Delta y_t^{ki}(k) - \Delta y_t^i\right] + \mu^{ki} + \varepsilon_{ut}^i$.
$\beta^i(k)$ measures the unsmoothed the fraction of income risk that is uninsured. Columns (2) through (4) posit $\beta^i(k) = \beta_0 + \beta^{i\prime}\mathbf{z}_t^{ik}$ and measure how the unsmoothed component is affected by the intensive and extensive margins of fund holdings.

Table 9: Marginal effects: Full sample

	intensive margin			extensive margin		
	% fund-owners	p-value	marg. effect	MFW	p-value	marg. effect
	(1)	(2)	(3)	(4)	(5)	(6)
1989-2004	0.080	0.389	-0.800	0.087	0.021	-2.544
1989	0.027	0.518	1.046	0.099	0.013	-2.952
1991	0.029	0.538	0.973	0.064	0.106	-1.741
1993	0.052	0.878	0.190	0.092	0.016	-2.727
1995	0.051	0.875	0.194	0.077	0.038	-2.215
1998	0.114	0.042	-1.983	0.099	0.013	-2.947
2000	0.138	0.025	-2.827	0.113	0.010	-3.454
2002	0.133	0.026	-2.633	0.078	0.035	-2.249
2004	0.096	0.125	-1.359	0.073	0.051	-2.069

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table provides estimates of the marginal effects of diversification along the intensive and extensive margin over time. The intensive margin effect is calculated as $\beta_1 + \beta_3 *$ percentage of fund-holders in year t. The extensive margin is calculated as $\beta_1 + \beta_2 * MFW$ in year t. t=1989,...2004. The estimates of β_1, β_2 and β_3 are from Table 8. The column p-value provides the probability that either marginal effect is zero.

Figure 1: **Diversification incentives**



Source: SHIW, 1987-2004, authors' own calculations.
On the y-axis: fund-holdings over real wealth for fund-holders in region i. On the x-axis: γ^{ki} from the following regression of household income (yraw from Table 1) on regional GDP growth: $\Delta y_t^{ki} = \gamma^{ki}(\Delta gdp_t^k - \Delta gdp_t) + \mu^{ki} + v_t^{ki}$ where k=fund-owning households (left panel) or k=all households (right panel).

Figure 2: **Trends in share of fund-owners and in ratio of fund volumes over raw income**

Source: SHIW, 1987-2004, authors' own calculations.
Both panels show Italy-wide averages.