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.

JEL Code: F36, F37, G1.

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 analysis is based on the Survey of Household Income and Wealth by the Banca d'Italia and uses data from 1987 to 2004. This data set is particularly suited for our purposes here, since it contains both detailed information on household income and consumption patterns as well as on the household's portfolio of real and financial assets. Household level data sets do not contain direct information about the cross-regional allocation of household assets, though. We therefore propose to proxy for out-of-region equity ownership through household level information about ownership of equity mutual fund shares. Our motivation 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.

Importantly, our method of aggregating household level data to obtain information on cross-region asset ownership, allows us to distinguish between two dimensions of regional diversification: increased participation in interregional asset markets (here: ownership of mutual funds) 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. We find this distinction important in exploring the link between

[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.

regional home bias and risk sharing and, specifically, in answering our two questions above.

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 correlation of its labor income with local (i.e. region-specific) economic conditions.[2] Along the intensive margin, we find this prediction fulfilled: in regions where households are more strongly exposed to region-specific risk, those households that do own funds actually hold more of them. But we find that exposure to local economic shocks *cannot* explain equity fund participation rates; also when viewed through the lens of interregional risk sharing, non-participation remains a puzzle.

So, do more diversified regions share more risk overall? Again, our answer 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, 1989-2004, increasing the participation rate by one percentage point would have led to an about 2 percentage point increase in aggregate 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 macroeco-

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

nomics 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 that this logic carries over to the regional and even to the household level.

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.

2.2 Forming Synthetic Panel Groups

We base our analysis on two main samples: one for regional totals, and one restricted to fund-owning households within regions. We form synthetic panel groups based on region of residence and fund-owner status to obtain a panel of region-year observations for all households and a panel of region-year observations for fund-owning households alone. 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 population with respect to several known characteristics. We use these sampling weights to compute region-level per capita variables, separately for all households and for fund-owning households. The use 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 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

[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.

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 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.[4] 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 household 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 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

[4]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.

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 (labour) income, consumption[5] and net wealth[6] across the two subgroups. 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

[5]Our measure of consumption is household expenditure on non-durables. This measure excludes purchases of precious objects, cars, furniture etc.

[6]Net wealth is measured as value of real assets plus financial assets minus financial liabilities.

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.

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]

[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.

[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

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 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 a household's labor income is to region-specific economic conditions, 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

unaffected.

very exposed to region-specific risk.

We gauge the exposure of labor income to local economic conditions through the coefficient of a regression of household labor 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 labour 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 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-fundholders is bigger than 0.5. and highly significant. This, in turn, 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.

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

In the data, we find a clearly insignificant link between mutual fund participation rates and exposure to local economic conditions. 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 parameters 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 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 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.

¿From the perspective of the region as whole, it is not clear *a priori*, along which margin we should expect to see the diversification 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.

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. But, if anything, stronger diversification incentives seem to lead to higher fund holdings of those households that already own mutual funds rather than to a higher propensity to hold mutual funds in the population as a whole. Clearly, this may just 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, only 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, but our results suggest that non-participation is clearly a puzzle also from an interregional risk sharing perspective and that it is likely to lead to interregional non-diversification for many households: home bias is a phenomenon that is clearly also present at the regional level.

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. Do fund owners as a group systematically share more consumption risk than do non-fund owners? Do 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?

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

$$\Delta c_t^i(k) - \Delta c_t^i = \beta^i(k) \left[\Delta y_t^{ki}(k) - \Delta y_t^i \right] + \mu^{ki} + \varepsilon_{ut}^i \tag{3}$$

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 in the first columns of Tables 7 and 8 respectively. Table 7 gives the estimates of β^i for fund-holders ($i = MF$) Table 8 for all ($i = all$) households.

As is apparent from the first two columns of both tables, there is no major difference in the actual risk sharing outcomes between the population as a whole and owners of mutual funds. Both groups insure between 40 and 50 percent of their idiosyncratic income shocks with $\beta^{MF} = 0.58$ and $\beta^{all} = 0.54$. Interestingly, the fraction of uninsured risk for fund holders, β^i is slightly higher for fund holders. The difference between the groups is, however, not very big and insignificant, 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*.

To explore the link between portfolio characteristics and interregional risk sharing more formally, we posit a linear relation between our (region-specific) measure of risk sharing $\beta_u^i(k)$ and regional portfolio characteristics, so that

$$\beta^i(k) = \beta_0 + \beta^{i\prime}\mathbf{z}_t^{ik}$$

where $\mathbf{z}_t^{ik}$ is, again, a vector of region-specific characteristics. Plugging this relation into (3), 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 $\mathbf{z}_t^{ik}$ will not be adequately captured by the region-specific fixed effect and we therefore also include the non-interacted regional characteristics $\mathbf{z}_t^{ik}$ into the regression which then becomes

$$\Delta c_t^i(k) - \Delta c_t^i = \beta_0^i \left[\Delta y_t^{ki}(k) - \Delta y_t^i\right] + \beta^{i\prime}\mathbf{z}_t^{ik} \left[\Delta y_t^{ki}(k) - \Delta y_t^i\right] + \delta'\mathbf{z}_t^{ik} + \mu^{ik} + \varepsilon_{ut}^i \qquad (4)$$

The vector $\mathbf{z}_t^{ik}$ contains our diversification measures, MFW and MFY, and the mutual fund participation rate. We first estimate the specifications (4) for fund-owners. Our results are reported in columns 2-4 of Table 7. For both intensive measures, MFW and MFY, the point estimate of the marginal effect on risk sharing is negative, but only for the mutual funds over income measure it is significant. Interestingly, also the participation measure is significant, which suggests that fund holders have benefited from the possibility to share risk with a larger group of people as mutual fund participation rates have widened.

We turn again to our results for the full sample. Table 8, columns 2-8 report the results for the interaction term regressions (4). 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.

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. Regression (4) explicitly allows us to assess time variation in the marginal effect of diversification along the extensive and intensive margins respectively. For the intensive margin measures, we have

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

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

In international data a still small but growing literature documents that wider diversification leads to more consumption risk sharing – home bias and the lack of risk sharing are twin puzzles separated at birth. This paper has explored the role of interregional portfolio diversification for the patterns and extent of *interregional* risk sharing between households.

Regional portfolio data do not exist. We therefore aggregate household level data from the Banca d'Italia Survey of Household Income and Wealth (SHIW) ¿from 1989-2004 to obtain an insight into this issue. As measure of out-of-region asset ownership we have proposed to use data on mutual equity fund 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 analysis allows us to distinguish between two dimensions of the impact of fund ownership on interregional 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.

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 more funds. This suggests 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. Since it also seems that 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 are 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 an 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.

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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	16.803	22.46	16.039	21.251
	(14.745)	(22.244)	(14.195)	(17.765)
Pensions and other transfers	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	0.163	0.127	0.322	0.35
	(1.184)	(1.006)	(1.758)	(1.815)
Net entrepreneurial income	7.901	19.752	6.257	9.458
	(17.945)	(29.473)	(24.876)	(22.584)
Property income	4.455	13.787	5.92	11.051
	(8.13)	(14.413)	(8.003)	(14.033)
Income from buildings	3.955	9.681	5.943	9.967
	(6.548)	(11.482)	(7.7)	(13.593)
Income from financial assets	0.5	4.106	-0.023	1.084
	(3.73)	(6.36)	(2.154)	(4.139)
Net disposable income (excl asset inc.)	30.895	54.38	32.243	45.789
	(21.938)	(31.715)	(28.975)	(28.631)
Net disposable income	31.396	58.486	32.22	46.873
	(23.07)	(34.626)	(29.21)	(29.036)
Consumption	24.602	41.534	23.993	32.39
	(15.618)	(22.359)	(13.713)	(16.515)

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
Labor income	0.081	0.053
Wealth	0.192	0.070

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

	Labor income		Non-durable consumption	
	Fund holders	non-Fund holders	Fund holders	non-Fund holders
PIE+VDA	0.158	0.396	0.713	0.78
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	0.44	0.198	0.42
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	0.52
ABR	0.27	0.218	0.603	0.653
CAM	0.455	0.707	-0.319	0.759
PUG+MOL	-0.394	0.47	0.167	0.84
CAL+BAS+SIC	-0.243	0.854	0.688	0.823
Average	0.000	0.450	0.205	0.464

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).

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

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 labor income.

Table 6: Diversification incentives: Fund-holders and full sample

Panel I: Fund-owners

	(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	0.07	0.006	0.092	0.001

Panel II: Full sample

	(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

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
MFW is the ratio of funds over fund holder's real assets (including housing).

Table 7: Unsmoothed component: Fund-holders

	(1)	(2)	(3)	(4)
$\Delta y_t^u(k)$	0.578	0.551	0.750	0.694
	(0.062)***	(0.083)***	(0.108)***	(0.088)***
Intensive margin:				
$\Delta y_t^u(k)$ * Fund holdings over real net wealth (MFW)		0.101		
		(0.517)		
$\Delta y_t^u(k)$ * Fund holdings over raw income (MFY)			-0.291	
			(0.147)**	
Extensive margin:				
$\Delta y_t^u(k)$ * Fraction of fund-holders				-1.944
				(1.055)*
Obs.	112	112	112	112

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

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 labor 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

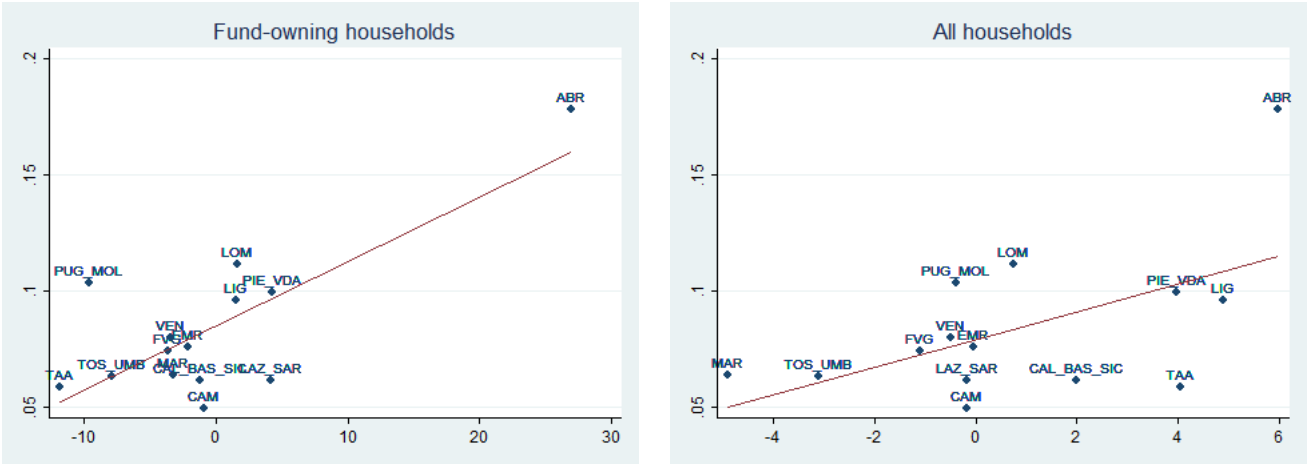
Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.

Table 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 labor income 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.

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