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 household-level information on consumption, income and portfolio holdings. Since equity funds are typically diversified at the national or international level , we use data on equity fund ownership to proxy for regional home bias. Cross-regional patterns of equity fund ownership are qualitatively consistent with simple portfolio theory: regions with more asymmetric business cycles are more diversified because they have higher fund participation rates (the extensive margin of diversification) and higher average holdings of equity funds (diversification's intensive margin). Also, fund holdings increase with the exposure of non-tradable income components (such as labor or entrepreneurial income) to regional shocks. Finally, interregional consumption risk sharing increases with fund holdings and this effect seems strongest when participation is widespread. Increased equity market participation could substantially improve interregional risk sharing.

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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

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[1]Cochrane (1991), Townsend (1994), Asdrubali, Sørensen and Yosha (1996), Sørensen and Yosha (1998) are classic analyses. Recent examples are Becker and Hoffmann (2006) and Asdrubali and Kim (2008).

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 portfolio home bias at the international level.

Our second contribution is to draw attention to the distinction between what we call the two margins of diversification: the rate of participation in interregional asset markets is the *extensive* margin, whereas the share of wealth that participating households hold in out-of-region assets captures 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 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 its exposure to local (i.e. region-specific) economic conditions. We find this prediction broadly fulfilled: regions with more strongly idiosyncratic GDP fluctuations hold a larger share of their wealth in equity funds. Specifically, 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 and participation rates are generally higher in regions with very asymmetric business cycle shocks.[2]

So, do more diversified regions share more risk overall? 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 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,

[2]See e.g. Heaton and Lucas (2000, *Econ J.*) and Grande and Ventura (2002) on the role of labor income risk for portfolio choice. Grande and Ventura (2002) also offers an excellent survey of the theoretical literature.

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. Our analysis here shows not only 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. 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 the Italian Survey of Household Income and Wealth (SHIW) which is collected by the Bank of Italy and available from 1977. This data set has been widely used in empirical research (see Fabbri and Padula (2004) and Pellizon and Weber (2009) for recent contributions). Our analysis is based on the period 1987-2004, because the portfolio characteristics which are central to our analysis are not available in earlier editions. Over this period, the SHIW has been run every second year (three years 1995-98) and the sample size of each wave is about 8,000 households. Apart from a small fraction of panel households, the SHIW consists of repeated cross-sections. This, however, is not a problem for our analysis here, since our focus will be on regional aggregates. In compiling these aggregates, we restrict our sample to households where the household head is between 26 and 62 years of age.[3]

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. In our baseline specifications, we deliberately exclude both of these income sources 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' income concept should be a reasonable reflection of the genuine sources of income risk that households are exposed to. We examine the robustness of our conclusions to the alternative income measure that includes transfers later on. To measure consumption, we use household expenditure on non-durables. Finally, the SHIW also contains information on ownership of real and financial assets. Section 3 discusses in detail how we make use of this information.

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. Specifically, for each point in time, we calculate regional averages (across households) of consumption, raw income, asset ownership and

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

other characteristics, thus forming a synthetic region-representative household. We repeat the same exercise just for those households that own equity mutual funds. As a result, we obtain two regional panel data sets: one that reflects the aggregate of all households in a region and a second one that just reflects the fund holders in a region.[4]

We take care to ensure that this aggregation to the regional level leads to reasonably representative data: 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.

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. A third advantage of our approach is that helps overcome the limitations of the specific rotating panel structure of the SHIW. Only about one third of all households are included in two consecutive waves of the household survey so that it is not possible to obtain panel observations over longer sample periods without some form of aggregation. Finally, virtually all of the literature on international and interregional risk sharing to which we relate in this paper has been conducted based on panel data and for the sake comparability we wish to follow this approach here.

Our regional entities are the twenty Italian administrative regions: 1. Piemonte 2. Valle

[4]Our 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.

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.[5] This leaves us with a total of 14 cross-sectional (regional) entities. Between 1987 and 2004, the SHIW contains 9 waves, so that we have a total of $14 \times 9 = 126$ region-time observations on the level of all variables of interest.[6]

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.

[5]Results are not sensitive to alternative groupings.

[6]Since our regressions below are generally formulated in growth rates, we have an effective number of 126-14=112 observations.

While we have no direct evidence on the actual extent of interregional diversification of mutual funds held by Italian households, there is some evidence as to the extent to which funds are internationally diversified. We obtain data from various issues of the annual Fact Book of *Assogestioni*, the Italian Fund Management Industry Association. These data suggest that in 1999/2000, Italian equity accounted for only around 20 percent of the equity held in Italian mutual funds.[7] Data from the same source suggests that direct household ownership of foreign financial assets is virtually negligible. This evidence provides further support for our approach: if households own international assets mainly through funds, mutual fund holdings should be a good indicator of private household's degree of interregional or international diversification.

3.1. Mutual fund ownership: Some descriptives

To set the scene, Table 1 gives some descriptive statistics for household owning mutual funds and for the average of the population.[8] A wide literature has emphasized that stock ownership is associated with special household characteristics such as e.g. the ownership of private businesses (see Heaton and Lucas (*Journal of Finance*, 2000). To compare the development of such characteristics over time, we report numbers from the first (1987) and last (2004) year of our sample period. As is clearly apparent from the table, fund holders are considerably richer- both in terms of income and financial wealth – better educated and and much more likely to be self-employed. However, fund holders are a much less distinct group at the end of the sample (2004) than they were back at its beginning (in 1987): they are relatively less rich, relatively less educated and less likely to be self-employed. This reflects

[7] Such numbers can be somewhat distorted because funds may own domestic equity indirectly through ownership of funds in financial centers such as Luxemburg or Ireland. Still, even data corrected for such indirect holdings would continue to suggest that mutual funds provide a considerable diversification opportunity for household- or region-specific risk (see Felettigh and Monti (2008)).

[8] We consider as fund holders all households that report positive mutual fund holdings. Experimenting with various threshold levels did not affect results.

the trend for widening stock market participation: over our sample period, many relatively less affluent households seem to have gained access to equity markets.

Tables 2 and 3 provide some first evidence on how well fund holders do in terms of risk sharing. Table 2 reports the volatility of consumption, income and wealth for the two households groups. Table 3 provides cross-regional consumption and income correlations. Prima facie, the evidence suggests that fund holders share less risk than other households: they have much higher consumption volatility (see als Mankiw and Zeldes (1991)). However, turning to the correlations we see that fund holders also have much lower income correlations. And even though their consumption correlations are also lower than those for non-fund holders, on average, the difference between their interregional consumption correlations and the income correlations is generally higher. Fund holders consumption could therefore be more volatile and less correlated across regions simply because these households face more idiosyncratic risk or because a higher proportion of this risk is *a priori* non-insurable, e.g. because they are much more likely to be self-employed. This would suggest that fund holders diversify a larger portion of the *diversifiable* risk they face – and would be consistent with the hypothesis we pursue in this paper, i.e. that fund ownership provides diversification on the margin.

3.2. Interregional diversification: Consolidated measure, intensive and extensive margins

We now use mutual fund holdings to measure interregional diversification. Our data set allows us to distinguish between two dimensions of interregional diversification: variation across regions in the share of mutual funds in fund holders' portfolios measures the intensive margin. Variation in the fraction of households that own mutual funds at all measures the extensive margin.

We capture the intensive-margin through the ratio of fund holdings over fund holders' (raw) income or real net wealth in the respective region and denote these two measure with MFY and MFW respectively.[9]. We proxy the extensive margin through the share of households that participate in mutual funds and denote this participation rate with $PART$.

In analogy to the intensive-margin measures, we capture total regional home bias as the share of raw income or real net wealth of *all* households in the region. We abbreviate these region-wide measures with FY and FW respectively.

Table 4 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 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 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- and/or household-type 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

[9]Here, raw income is the sum of labor income and entrepreneurial income inclusive of rents. Real net wealth is defined as real assets (real estate, businesses, valuables) less financial liabilities on real estate.

very exposed to region-specific risk.[10]

Clearly, this basic intuition will hold only to the extent that higher exposure to idiosyncratic or region-specific risk does not increase precautionary demand for safe assets, which would tend to mitigate the demand for out-of-region risky assets. To control for this potentially offsetting effect on asset demand and to structure our discussion, we use a simple model of the portfolio choice problem faced by a region's investor. The model is inspired by Heathcote and Perri (2004)[11] but we extend the menu of assets beyond local and out-of region equity to include a safe asset (bonds or bank deposits). In addition, households are subject to non-tradable labor income risk that may, however, be correlated with the pay-offs from both local and out-of region risky assets. In period 0, the household splits its wealth (W) between home risky assets (H), a mutual fund of risky assets in other regions(F), and the safe asset (B) so that

$$H + F + B = W$$

In period 1, the (region-)household then consumes the proceeds from its investment and from (risky) labor income

$$C = R_h H + (1-\tau) R_f F + (1+r) B + Y$$

where Y is labor income, R_h and R_f are the gross returns on the home and out-of-region risky assets and τ is an iceberg cost associated with the investment in other regions. Note that there is no cost of investing in the bond market. We assume that household utility is exponential, $u(C) = -\frac{1}{A}exp(-AC)$ where A is the coefficient of absolute risk aversion. We solve for the share of the home risky asset in total wealth taking as given the households

[10] 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.

[11] See Artis and Hoffmann (2008) and Crucini (1999) for similar models.

choice of safe assets. Under the assumption of log-normality of the risky payoffs, we obtain

$$\frac{H}{W} = min \left\{ \begin{array}{c} \left[1 - \frac{B}{W}\right], \\ \\ \frac{\tau\mu/A}{\boldsymbol{var}(R_h-(1-\tau)R_f)W} - \frac{\boldsymbol{cov}(g,R_h-(1-\tau)R_f)}{\boldsymbol{var}(R_h-(1-\tau)R_f)} \times \frac{E_0(Y)}{W} \\ + \left[1 - \frac{\boldsymbol{cov}(R_h,R_h-(1-\tau)R_f)}{\boldsymbol{var}(R_h-(1-\tau)R_f)}\right] \times \left[1 - \frac{B}{W}\right] \end{array} \right\} \quad (1)$$

where we have assumed that the expected return on home and Italy-wide risky assets are equal to $\mu = \boldsymbol{E_0}(R_h) = \boldsymbol{E_0}(R_f)$ and where g is the labor income shock expressed as percentage deviation from the expected value, i.e. $g = (Y - \boldsymbol{E_0}(Y))/\boldsymbol{E_0}(Y)$. In analogy to Heathcote and Perri (2004), the min-operator ensures that the household cannot invest more than 100 percent of its risky asset holdings $(1 - B/W)$ into home equity. While details on the derivation of equation (1) are given in the appendix, it is important to note here that our solution for H/W takes holdings of the safe asset as given. In this way, our analysis implicitly takes account of the effect that precautionary motives could have on the demand for risky assets.

The first term of the second argument in the min-operator measures the conventional speculative demand for home assets which increases in the difference of the (trading-cost adjusted) expected returns on home and foreign assets ($\tau\mu$). It decreases in the variance of the excess return on home risky assets over the trading-cost adjusted return on the fund.

The third term captures the conventional hedging demand for home risky assets. It is our measure of the regions' incentive for diversification if all income risk was directly tradable. The covariance term captures the exposure of the region to nation-wide fluctuations in R_f.

The second term reflects the demand for insurance induced by the additional source of household level (as opposed to purely regional) 'background' or non-tradable risk, Y. This demand increases in the covariance of the excess return of the mutual fund over home risky assets and decreases in the covariance with the fund. This covariance term can be interpreted as the household's exposure to local economic conditions because it tells us how correlated labor income shocks are with the returns on tradable home and out-of-region risky assets. Not surprisingly, this term increases in the expected share of labor income in wealth: households that receive little labor income as share of their wealth will demand less diversification even if their labor (raw) income is very exposed to regional conditions.[12]

Based on this model we now calibrate values for H/W for each Italian region. We use regional GDP growth rates as measures of home returns, R_h, and the Italy-wide GDP growth rate as a gauge for R_f. Broadly, we find that the long-term means of these growth rates are almost equal across regions, so that the assumption that $\mu = \boldsymbol{E_0}(R_h) = \boldsymbol{E_0}(R_f)$ is generally satisfied. We use regional labor income growth rates to measure the g-shocks, thus implicitly assuming that regional labor income follows a random walk. Finally, we measure B/W as the share of bonds or bank deposits minus debt in a region's household net wealth.

In a first exercise, we confront the implied values for H/W with mutual fund holdings in the data. To the extent that the model captures the relevant features of the data, we should expect a negative relation between a region's mutual fund holdings and the calibrated values of H/W.

This is what is borne out by the regressions reported in panel I of Table 5. Here we present cross-sectional regressions of the actual (region-wide) diversification measures (FW and FY) as calculated from the data on the values of H/W obtained from (1). The calibrations are based on $\tau = 0.05$ and $A = 1000$.[13] In all regressions, we control for potential north-south differences with a 'Mezzogiorno' dummy. As an additional control we include the share of households where the household head has completed at least upper secondary education.

[12]See Cardak and Wilkins (2009) on the impact of background risk on household demand for risky assets.

[13]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, 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.

As is apparent from the first two columns, the coefficient on both diversification measures, FW and FY is significant and signed as predicted by the model (i.e. negative): a higher calibrated share of home assets goes in hand with lower fund holdings in that region.

In the remaining columns of the table, we seek to identify further which of the two margins of diversification is responsible for this result. We find that participation in mutual funds is indeed higher in regions where the model would predict that home asset holdings should be relatively low. The effect is significant at the 10% level. Turning to the intensive margin, MFW does not appear to be significantly related to the calibrated home portfolio shares. Conversely, MFY is very strongly significant.

Panel II reports on a second calibration of the home equity share H/W in which we assume that $B = 0$ and that raw income, Y, is uncorrelated with asset returns. In addition, in this calibration, we impose $var(R_f) = var(R_h)$. With these assumptions, our model becomes identical to the model studied by Heathcote and Perri (2004). This change in specification does not affect our main result: the implied home equity share is still significantly and negatively related to actual, total regional mutual fund holdings irrespective of whether we use FY or FW. However, it is important to note that it now becomes impossible to identify an effect on the margins of diversification. The coefficients on the participation measure as well as on both intensive margin measures now become insignificant. This suggests that the hedging demand induced by the exposure of household income to local economic conditions as well as cross-regional differences in the variability of home and out-of-region GDP are important determinants of the margins of diversification. As a second exercise, we now explore this issue in more detail.

To this end note again that our calibrated measure H/W aggregates two separate motives for out-of-region asset ownership. The first is the incentive arising from the extent to which home returns (i.e. in our approximation: GDP growth rates) are region-specific. This incentive is captured by the last covariance term in 1 above which we denote with δ:

$$\delta_h = \frac{\boldsymbol{cov}(R_h, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)}$$

We can think of this term as the exposure to the region-specific component of business cycles. It is common to all households in the region: Specifically, it is irrelevant whether a household has already chosen to participate or is just considering changing its holding of mutual funds – all will be confronted with the same δ in making their portfolio decision. Therefore, regions in which GDP is very idiosyncratic should invest more in other regions *ceteris paribus*, be it along the intensive or the extensive margin.

The second motive is the additional hedging demand that is induced by households' non-tradable income risk. In the solution for H/W, this motive is captured by

$$\gamma_h = \frac{\boldsymbol{cov}(g, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)}$$

and a higher (lower) value of γ should again be associated with higher (lower) shares of out-of-region (home) equity holdings. But note that, differently from δ, the exposure measured by γ may differ across households in the region. Specifically, γ may differ between fund-holders and non-fundholders. Clearly, we would only expect fund holdings to vary with γ for those households that actually have chosen to participate in the first place, therefore affecting the intensive margin mainly.

To test these implications of our model, we obtain measures of δ_h and γ_h through regressions of the form

$$\Delta gdp_t^k = \delta^k(\Delta gdp_t^k - \Delta gdp_t) + \mu_\delta^k + u_t^k$$

$$\Delta y_t^{ki} = \gamma^{ki}(\Delta gdp_t^k - \Delta gdp_t) + \mu_\gamma^{ki} + v_t^{ki} \tag{2}$$

where Δgdp_t^k is region k's and Δgdp_t national GDP growth, Δy_t^{ki} is the growth rate of household raw income for household-type i in region k, and the μs are region-specific fixed effects. Note that the regressor, relative regional GDP growth ($\Delta gdp_t^k - \Delta gdp_t$), almost[14] perfectly corresponds to the excess return as we have used it in our calibration exercise for H/W, so that the coefficient estimates from the above regressions are the direct empirical counterparts of γ and δ .

Figure 1 provides an optical impression how diversification along the two margins varies with exposure. The upper row of panels gives the cross-plots of diversification against the common regional exposure measure, δ^k. The lower two rows of panels plot diversification against the estimates of γ^{ki} for all households ($i = All$, middle row) and mutual fund holders ($i = MF$, third row).

It is immediately apparent from the upper panel that there is a positive link between regional exposure and both the intensive and extensive margins diversification. This is true for both measures of the intensive margin (MFW and MFY). The link between exposure and the margins appears visually much weaker if we consider the exposure of all households in terms of their raw income, presented in the second row of the panels. However, once we just consider the exposure of fund-holding households, there is again a strong positive link between exposure in terms of non-tradable income risk and the intensive margin of diversification. There is, however, no clear link between fund holders' exposure and regional

[14]'Almost' because the exact way we constructed $R_h - (1-\tau)R_f$ was as $\Delta gdp_t^k - (1-\tau)\Delta gdp_t$ for the values of τ as indicated above. This difference does not matter empirically and we think that using relative GDP growth is more straightforward.

participation rates, very much as we would expect from our theory.

Figure 1 suggests that the simple model we have presented captures important aspects of the link between risk exposure and fund holdings at the regional and household levels: regions with more idiosyncratic GDP shocks seem to hold more funds (both in terms of participation as well as along the intensive margin). Equally, fund holdings increase in the local exposure of income risk for those households that do own mutual funds already.

We now explore this proposition more formally. The coefficients δ andγ^{ki} are estimated from relatively short time series and are therefore likely to be imprecise. Therefore, instead of running cross-sectional regressions of fund holdings on γ, we estimate panel regressions in which we directly parametrize the exposure coefficients γ^{ki} as functions of mutual fund holdings. Specifically, we write

$$\delta^k = \delta_0 + \boldsymbol{\delta}_1' \mathbf{z}^k$$

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

where $\mathbf{z^k}$ is a vector of region k characteristics, γ_0^i and δ_0 are constants and $\gamma_1^{i\prime}$ and δ^k vectors of coefficients. While δ is common for all households in the region, in keeping with our discussions above, we letγ vary also by household type i, thus distinguishing between fund holding and non-fund holding households. In our specifications, the vector $\mathbf{z}^k$ comprises sample period averages of our intensive and extensive margin measures respectively along with some additional controls. This parametrization allows to write the two regressions in (2) as

$$\Delta gdp_t^k = \delta_0(\Delta gdp_t^k - \Delta gdp_t) + \boldsymbol{\delta}_1' \mathbf{z}(\Delta gdp_t^k - \Delta gdp_t) + \mu_\delta^k + u_t^k$$

$$\Delta y_t^{ki} = \gamma_0^i(\Delta gdp_t^k - \Delta gdp_t) + \boldsymbol{\gamma}_1^{i\prime} \mathbf{z}^{ik}(\Delta gdp_t^k - \Delta gdp_t) + \mu_\gamma^{ki} + v_t^{ki} \tag{3}$$

which in turn puts us in a position to estimate γ_0^i (δ_0) and $\boldsymbol{\gamma}_1^{i\prime}$ $(\boldsymbol{\delta_1'})$ from a panel regression.

Again, the μs denote fixed effects.[15] We note that, even though in this specification, γ^{ik} and δ^k vary as a function of portfolio characteristics (contained in the vector $\mathbf{z}$), we do not want to to interpret these relations as causal. 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 (3) in Table 6. Panel I gives the results when exposure is measured in terms of regional GDP growth (i.e. for δ^k), panel II gives the estimates of γ based on all households ($i = All$). The optical impression from the graphs is strongly confirmed. In the GDP-based specification, the estimates for δ^k are positive and significant for both the intensive margin (MFY) and for the participation rate. This remains true once we include our control for north-south differences and for education into the vector $\mathbf{z}$. These results are given in the second group of columns. The regressions explain around 40 percent of the variation in the data, irrespective of whether we include additional controls or not and the coefficients on MFY, MFW and the participation rate $PART$ are stable across specifications.

Turning to the exposure specification based on raw income of all households, the link between the margins of diversification and exposure seems to vanish. None of the coefficients on the different margins would seem significant. The regressions also have much lower explanatory power, which partly just reflects the fact that raw household income is much more volatile than GDP.

However, as we have argued above, we expect a link between γ and mutual fund holdings to differ across household types, simply because the intensive margin of diversification only matters for those households that own mutual funds. This conjecture is confirmed in Table 7, where we present the income-based regressions but now for fund-holders only ($i = MF$).

[15] Note that we do not need to include the un-interacted terms $\mathbf{z}^{ik}$ here, since they are time invariant and will be captured through the fixed effects.

As is apparent from the table, there is a strong link between $\gamma^{k,MF}$ and the intensive margin. The coefficient is positive and stable across specifications. In the MFY (funds over income)-based specifications it is also highly significant. It is still significant at the 10-percent level or marginally above for the MFW-based specification.[16,17]

Our results suggest that a simple model of portfolio choice can explain a considerable share of the cross-regional variation in overall mutual fund holdings. Regions that are less correlated with the rest of the country in terms of their output are more diversified *ceteris paribus*. Participation rates seem higher in such regions and, conditional on participation, households hold more funds if their income is very exposed to local shocks.

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

$$\Delta c_t^{ki} - \Delta c_t^{i} = \beta^i \left[\Delta y_t^{ki}(k) - \Delta y_t^{i}\right] + \mu^{ki} + \varepsilon_t^{ki} \tag{4}$$

[16] There is an outlier in MFW for Campania that is not apparent in MFY. Specifications based on MFW are significant at the 5% level if we drop this region.

[17] Many fiscal transfers are quasi-automatic which could amplify or dampen household's exposure to income shocks. Therefore, we re-estimate the specifications for γ for both fund holders and all households based on income inclusive of net transfers. The results are very similar to those reported here.

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 β^i as a measure of how much of the idiosyncratic labor income risk of household group i systematically spills over into idiosyncratic consumption fluctuations. In particular, if β^i is unity, no risk is shared, whereas if $\beta^i = 0$, 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 8. Interestingly, the fraction of uninsured risk, β^i, is very similar for the two household groups, suggesting that fund ownership *per se* – the ownership of out-of-region assets – is not unconditionally associated with more or less interregional risk sharing at the household level. 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 to 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 (4), except that we let this equation now apply to *all* households in a region and we therefore drop the group index i in what follows. In addition, we now let β vary both across regions and time. To capture this variation, we posit a linear relation between β_t^k and a vector $\mathbf{z}_t^k$ of region-time characteristics, so that

$$\beta_t^k = \beta_0 + \boldsymbol{\beta}'\mathbf{z}_t^k$$

where $\mathbf{z}_t^k$ contains, in particular, our diversification measures, MFW and MFY, and the mutual fund participation rate, $PART$. Plugging this relation back into the risk sharing regression, 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

$$\Delta c_t^k - \Delta c_t = \beta_0 \left[\Delta y_t^k - \Delta y_t\right] + \boldsymbol{\beta}'\mathbf{z}_t^k \left[\Delta y_t^k - \Delta y_t\right] + \boldsymbol{\phi}'\mathbf{z}_t^k + \mu^k + \varepsilon_t^k \tag{5}$$

Table 9, column 1 reports the results for all households when no interaction terms are considered. Columns 2-8 report the results for the interaction term regressions (5). 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, MFW and MFY. While MFY is highly significant, the individual coefficients on MFW 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 at the region-aggregate level: if all households own mutual funds the marginal effect of an increase in MFY or MFW 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.

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 (5) which puts us in a position to assess time variation in the marginal effect of diversification along the extensive and intensive margins respectively. Let ω_t^k and $PART_t^k$ stand for the intensive margin and the participation rate in time t, region k. Then the marginal impact along the the intensive margin is $\partial\beta_t^k/\partial\omega_t^k = \beta_1 + \beta_3 PART_t^k$ and along the extensive margin $\partial\beta_t^k/\partial PART_t^k = \beta_2 + \beta_3\omega_t^k$, where β_1, β_2 and β_3 are the coefficients on ω_t^k, $PART_t^k$ and the interaction respectively. 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.

We first 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, which we denote without time and region index. The first row of Table 10 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 these marginal effects. For example, in the data, the nationwide average participation rate as well as average fund holdings rose during the 1990s but dropped dramatically after the stock market crash in 2000. Therefore in the following rows of Table 10, 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, when stock market participation also reached a peak.

The results here support the view that fund ownership, on the margin, does provide interregional risk sharing, and that widening equity fund participation may be an important avenue through which broader aggregate risk sharing can be brought about.

4.2.4. Robustness: Common time trends, the role of fiscal transfers and evidence from aggregate regional data

In principle, risk-sharing across regions might have increased for some other reasons than cross-border mutual fund holdings, for example due to an Italy-wide trend in financial market integration. We account for this possibility by including time-period fixed-effects into the vector $\mathbf{z}$, thus allowing for nation-wide variation in the risk-sharing coefficient β. Table 11 replicates Table 9 with this set of time effects in the interaction as well as with a number of controls that could have an important bearing on interregional risk sharing: a dummy for the South of Italy, 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)).

We first check whether time effect and control variates are independently significant. These results are given in column (1) which otherwise corresponds to the same column in Table 9. The p-value of an F-test for the joint significance of all time interaction terms is displayed at the bottom of the column and shows that they are jointly insignificant. The same is true for the four control variable interactions, for which the p-values of the F-test are given in the second but last row.

We now add these time interactions and controls to our previous specifications as we explored them in Table 9, columns (2)-(8). Doing so makes virtually all coefficients in the regression – time effects, controls and coefficients of interest – insignificant. Clearly, this may arise because, depending on the particular specification, we are seeking to estimate between 18 and 20 coefficients from just $112(= 8 \times 14)$ region-time observations which makes identification somewhat difficult.[18] It is, however, noteworthy that the point estimates of our coefficients of interest are quite stable across specifications. This pattern is apparent in particular for both intensive margins as it is for our preferred specifications from Table 9, i.e. the ones in which the intensive and the extensive margin interact. In one of the preferred specifications, the interaction even stays significant at the 10 percent level.

An exception to this stability of our parameters of interest is the coefficient on the par-

[18]Reducing the specifications in Table 11 to a more parsimonious form essentially leads us back to the specifications in Table 9: the time effects are never significant and the only control that ever appears significant, the share of proprietors, also becomes insignificant once we drop the other (insignificant) controls.

ticipation rate alone. This instability is driven by the the time effects, i.e. it does not arise if we just include the control variables alone. It may be an indication that regional participation rates are dominated by common, country-wide rather than cross-sectional variation.[19] Clearly, to the extent that this is the case, it will be difficult to directly separate their impact on risk sharing from that of other country-wide trends. However, we note again that our preferred specifications in columns (7) and (8), that also involve the interaction between the two margins, remain relatively robust. One way to read this result is that identification can be achieved by focussing on cross-regional variation in the potential *impact* of participation on risk sharing: this impact seems higher in regions where households already hold a larger share of their wealth in mutual funds.

As an additional check, we run our risk sharing regressions (5) based on growth rates of regional per capita consumption and GDP for the years 1987-2004 from the CRENoS Regional Accounts data base (Paci and Saba, 1998). The setup of our regression is otherwise analogous to the specification in the last column of table 9. Though numerically somewhat different, the coefficients of interest all have the same signs as in the regressions based on household data and are significant.

Finally, we explore the possibility that larger public transfers could have increased risk sharing. As in section 4.1, we run our regressions based on net disposable income, i.e. raw income plus income from transfers. We get similar coefficient estimates and the same pattern of statistical significance, i.e. accounting for transfer incomes does not alter our 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.

[19]For example, the dramatic increase in the nationwide fund participation rate during the technology boom of the late 1990s and its subsequent drop could be such a common factor.

5. Summary and Conclusion

Our contribution in this paper is twofold: first, we explore the role of interregional portfolio diversification for the patterns and extent of *interregional* risk sharing between households. A number of current papers have investigated 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 1989-2004. One of our main innovations is to use mutual equity fund ownership as 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, be it at the regional or international level: 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 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, 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 interregional 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. In fact, an interesting future extension of our work here could be to explore the role of mutual fund holdings for risk sharing across national boundaries.

A. Appendix

Parametrizing the utility function in terms of the budget constraint and using $F = W - H - B$, we obtain the following first order condition:

$$\boldsymbol{E}\left\{u'(C)\left[R_h - (1-\tau)R_f\right]\right\} = 0$$

which, using Stein's Lemma we write as

$$\boldsymbol{E}(u'(C))\boldsymbol{E}(R_h - (1-\tau)R_f) + \boldsymbol{E}(u''(C))\boldsymbol{cov}(C, R_h - (1-\tau)R_f) = 0$$

Using that $u''(C) = -Aexp(-AC) = -Au'(\mathrm{C})$ and assuming $\boldsymbol{E}(R_h) = \boldsymbol{E}(R_f) = \mu$ we can rearrange to obtain

$$A\boldsymbol{cov}(C, R_h - (1-\tau)R_f) = \tau\mu \tag{6}$$

Now plugging in for $C = R_hH + (1-\tau)R_fF + (1+r)B + Y$ using $F = W - H - B$ and rearranging terms we get

$$\begin{aligned}\left[\boldsymbol{var}(R_h) - (1-\tau)\boldsymbol{cov}(R_h, R_f) - (1-\tau)\boldsymbol{cov}(R_f, R_h) + (1-\tau)^2\boldsymbol{var}(R_f)\right] H& \\ +(1-\tau)\left[\boldsymbol{cov}(R_f, R_h) - (1-\tau)\boldsymbol{var}(R_f)\right](W-B)& \\ +\left[\boldsymbol{cov}(R_h, Y) - (1-\tau)\boldsymbol{cov}(R_f, Y)\right] &= \frac{\tau\mu}{A}\end{aligned}$$

Finally, solving for H, dividing through by W and collecting terms

$$\begin{aligned}\frac{H}{W} &= \frac{\tau\mu/(AW)}{\boldsymbol{var}(R_h - (1-\tau)R_f)} - \frac{\boldsymbol{cov}(Y/W, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)} \\ &\quad -(1-\tau)\frac{\boldsymbol{cov}(R_f, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)}\left[1 - \frac{B}{W}\right]\end{aligned}$$

Note that we can rewrite the last covariance term as

$$-(1-\tau)\frac{\boldsymbol{cov}(R_f, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)} = 1 - \frac{\boldsymbol{cov}(R_h, R_h - (1-\tau)R_f)}{\boldsymbol{var}(R_h - (1-\tau)R_f)}$$

Then, defining the income growth shock $g = (Y - \boldsymbol{E}(Y))/\boldsymbol{E}(Y)$ and realizing that W is known *ex ante*, we obtain the expression in the main text.

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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)
Net entrepreneurial income	7.901	19.752	6.257	9.458
	(17.945)	(29.473)	(24.876)	(22.584)
Income from financial assets	0.5	4.106	-0.023	1.084
	(3.73)	(6.36)	(2.154)	(4.139)
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)
Real assets	322.844	112.651	350.501	184.699
	(464.666)	(240.32)	(540.451)	(310.358)
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)
Net wealth = Real assets + Financ. assets - Financ. liab.	385.569	128.658	403.383	192.347
	(497.159)	(252.247)	(569.263)	(323.434)

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: 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 3: 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 4: 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 5: THEORETICAL HOME PORTFOLIO SHARES AND ACTUAL DIVERSIFICATION PATTERNS

Panel I: Baseline model with non-tradeable income risk and bond holdings					
	Total Diversification		Intensive and Extensive Margin		
	Fund Holdings over		Participation	Fund Owners' holdings over	
	real wealth	raw income	Rate	real wealth	raw income
PF share (H/W)	-0.004**	-0.024**	-0.015*	-0.007	-0.104**
	(0.002)	(0.008)	(0.008)	(0.011)	(0.048)
Mezzogiorno	-0.011**	-0.066**	-0.094**	0.001	-0.077
	(0.005)	(0.025)	(0.026)	(0.036)	(0.155)
Education	-0.017	-0.052	-0.061	-0.084	-0.220
	(0.037)	(0.188)	(0.191)	(0.267)	(1.154)
constant	0.022	0.116	0.055	0.128	0.707
	(0.017)	(0.087)	(0.088)	(0.123)	(0.533)
R^2	[0.537]	[0.647]	[0.728]	[0.084]	[0.379]

Panel II: Restricted Model with $B = 0$, $cov(Y, R_h - (1-\tau)R_f) = 0$ and $var(R_f) = var(R_h)$					
	Total Diversification		Intensive and Extensive Margin		
	Fund Holdings over		Participation	Fund Owners' holdings over	
	real wealth	raw income	Rate	real wealth	raw income
PF share (H/W)	-0.024***	-0.115**	-0.065	-0.053	-0.451
	(0.008)	(0.046)	(0.045)	(0.058)	(0.277)
Mezzogiorno	-0.003	-0.018	-0.065**	0.016	0.129
	(0.004)	(0.022)	(0.022)	(0.028)	(0.134)
Education	0.026	0.221	0.108	-0.005	0.960
	(0.029)	(0.179)	(0.174)	(0.225)	(1.070)
constant	0.006	0.008	-0.013	0.101	0.230
	(0.013)	(0.082)	(0.080)	(0.104)	(0.493)
R^2	[0.611]	[0.570]	[0.694]	[0.116]	[0.276]

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

The table reports cross-sectional regressions of the diversification measure given in the respective column heading on the calibrated home portfolio share H/W from equation (1) in the main text. Standard errors are in parentheses.

Table 6: Region- and household-level exposures and fund ownership

Panel I: Exposure of local GDP to regional shocks.

Interactions of $\Delta gdp_t^k - \Delta gdp_t$ with	No Controls			With Controls		
	Fund Holdings over wealth	Fund Holdings over income	Particip.	Fund Holdings over wealth	Fund Holdings over income	Particip.
	$X = MFW$	$X = MFY$	$X = PART$	$X = MFW$	$X = MFY$	$X = PART$
1 (uninteracted)	0.56*	-0.09	0.63**	-1.38	-1.36	-1.65
	(0.38)	(0.46)	(0.25)	(1.41)	(1.37)	(1.36)
Div.-Margin X^k	5.59	2.05***	5.25*	5.30	1.88**	11.46**
	(4.11)	(0.79)	(2.74)	(4.14)	(0.82)	(4.17)
Mezzogiorno				0.36	0.33	1.18**
				(0.40)	(0.39)	(0.47)
Education				4.34	2.95	3.39
				(3.02)	(3.05)	(2.97)
R^2	[0.40]	[0.42]	[0.41]	[0.41]	[0.43]	[0.44]

Panel II: Exposure of local household raw income to regional shocks (all households)

Interactions of $\Delta gdp_t^k - \Delta gdp_t$ with	No Controls			With Controls		
	Fund Holdings over wealth	Fund Holdings over income	Particip.	Fund Holdings over wealth	Fund Holdings over income	Particip.
	$X = MFW$	$X = MFY$	$X = PART$	$X = MFW$	$X = MFY$	$X = PART$
1 (uninteracted)	-0.88	-0.09	0.63	-11.89**	-11.64**	-11.14**
	(1.59)	(1.95)	(1.05)	(5.80)	(5.72)	(5.78)
Div. Margin X^k	13.99	2.05	5.25	9.85	2.32	-2.03
	(17.18)	(3.38)	(11.52)	(17.08)	(3.45)	(17.67)
Mezzogiorno				3.56**	3.57**	3.54*
				(1.64)	(1.64)	(2.01)
Education				24.18*	22.61*	24.84*
				(12.47)	(12.79)	(12.59)
R^2	[0.01]	[0.01]	[0.01]	[0.05]	[0.06]	[0.05]

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

The table reports regressions of the form $\Delta gdp_t^k = \delta_0(\Delta gdp_t^k - \Delta gdp_t) + \delta_1' \mathbf{z}(\Delta gdp_t^k - \Delta gdp_t) + \mu_\delta^k + u_t^k$ (Panel I) and $\Delta y_t^k = \gamma_0(\Delta gdp_t^k - \Delta gdp_t) + \gamma_1' \mathbf{z}^k(\Delta gdp_t^k - \Delta gdp_t) + \mu_\gamma^k + v_t^k$ (Panel II), where Δgdp_t^k is regional GDP growth and Δy_t^k the growth rate of raw income for all households in region k. The vector $\mathbf{z}$ contains the region characteristics given in the first column. X^k stands for the respective diversification measure as indicated in the heading of each column.

Table 7: OUT-OF-REGION-ASSET OWNERSHIP AND HOUSEHOLD LEVEL EXPOSURE: FUNDHOLDERS

Fund holders' Exposure in terms of raw income				
	No Controls		With Controls	
Interactions of $\Delta gdp_t^k - \Delta gdp_t$ with	Fund Holdings over wealth $(X = MFW)$	Fund Holdings over income $(X = MFY)$	Fund Holdings over wealth $(X = MFW)$	Fund Holdings over income $(X = MFY)$
1 (uninteracted)	-8.20	-15.36	-34.36	-33.38
	(4.59)	(5.51)	(16.92)	(16.43)
Div.-Margin X^k	85.84*	26.43***	79.60*	24.54***
	(49.57)	(9.57)	(49.82)	(9.91)
Mezzogiorno			6.26	6.02
			(4.80)	(4.71)
Education			58.19*	40.50
			(36.36)	(36.74)
R^2	[0.03]	[0.07]	[0.05]	[0.08]

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
The table reports regressions of the form $\Delta y_t^{MF,k} = \gamma_0(\Delta gdp_t^k - \Delta gdp_t) + \gamma_1' \mathbf{z}^k(\Delta gdp_t^k - \Delta gdp_t) + \mu_\gamma^k + v_t^k$ where $\Delta y_t^{MF,k}$ stands for the growth rate of fund holders' raw income in region k. Δgdp_t^k is regional and Δgdp_t the national GDP growth rate. The vector $\mathbf{z^k}$ contains the region characteristics given in the first column. X^k stands for the respective diversification measure as indicated in the heading of each column. Standard errors appear in parentheses.

Table 8: UNSMOOTHED COMPONENT: FUND-HOLDERS VS NON-FUND-HOLDERS

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

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table shows β^i from equation (4) in the main text: $\Delta c_t^{ki} - \Delta c_t^i = \beta^i \left[\Delta y_t^{ki}(k) - \Delta y_t^i\right] + \mu^{ki} + \varepsilon_t^{ki}$.
β^i measures the fraction of income risk that is uninsured for household type i.

Table 9: Unsmoothed component: Full sample

Interactions of $\Delta y_t^u(k)$ with		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 (uninteracted)	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 shows β_0 and $\boldsymbol{\beta'}$ from equation (6) in the main text: $\Delta c_t^k - \Delta c_t = \beta_0 \left[\Delta y_t^k - \Delta y_t\right] + \boldsymbol{\beta'}\mathbf{z}_t^k \left[\Delta y_t^k - \Delta y_t\right] + \boldsymbol{\phi'}\mathbf{z}_t^k + \mu^k + \varepsilon_t^k$.
β_0 measures the fraction of income risk that is uninsured. The elements of β' measure how the unsmoothed component is affected by the intensive and extensive margins of fund holdings and by further interaction terms.
Further controls (coefficients not displayed): un-interacted terms $\mathbf{z}_t^k$.

Table 10: 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

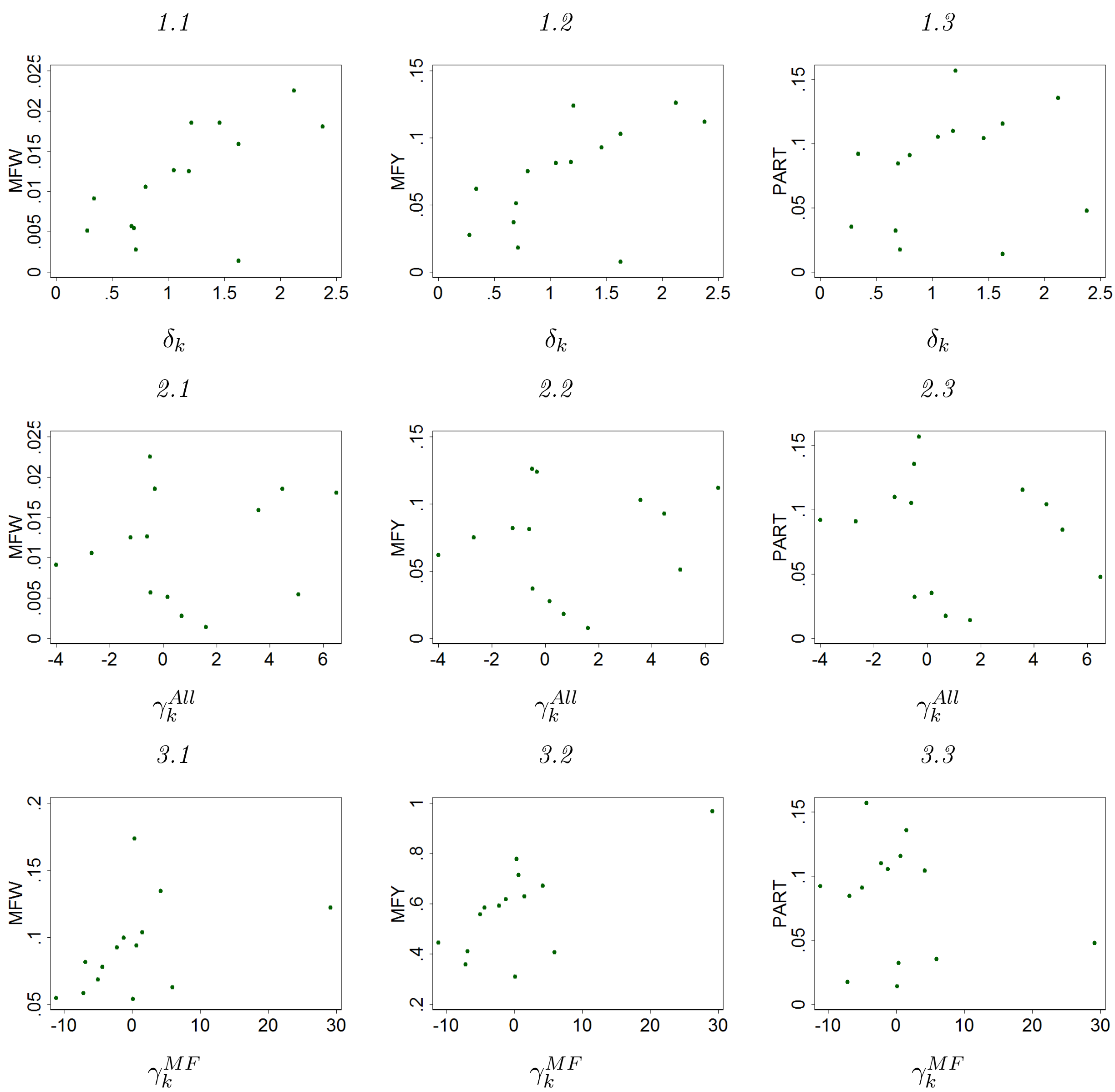
Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table provides estimates of the marginal effects of diversification along the intensive and extensive margin over time. The intensive margin effect is calculated as $\beta_1 + \beta_3 \times PART$ in year t). The extensive margin is calculated as $\beta_1 + \beta_2 \times MFW$ in year t. t=1989,...2004. The estimates of β_1, β_2 and β_3 are from Table 10. The column p-value provides the probability that either marginal effect is zero.

Table 11: Robustness checks with time trends and further controls

Interactions of $\Delta y_t^u(k)$ with	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 (uninteracted)	.952 (.146)***	1.081 (.174)***	1.061 (.168)***	.951 (.159)***	1.079 (.187)***	1.068 (.181)***	.881 (.276)***	.609 (.309)**
Intensive margin:								
Fund holdings over real net wealth (MFW)		-1.261 (1.001)			-1.270 (1.013)		1.295 (2.641)	
Fund holdings over raw income (MFY)			-.243 (.182)			-.245 (.184)		.649 (.524)
Extensive margin:								
Fraction of fund-holders				-.260 (2.214)	-.226 (2.242)	-.548 (2.222)	1.721 (3.076)	5.433 (3.922)
Interactions:								
Intensive (MFW) * extensive margin							-29.003 (25.597)	
Intensive (MFY) * extensive margin								-9.613 (5.150)*
Controls:								
Share of proprietors	-4.099 (2.452)*	-4.827 (2.509)*	-4.067 (2.465)*	-4.104 (2.484)*	-4.834 (2.540)*	-4.082 (2.494)	-4.719 (2.545)*	-4.048 (2.471)
Share with upper-sec educ	-.546 (1.645)	-.403 (1.648)	-.266 (1.674)	-.525 (1.673)	-.383 (1.677)	-.222 (1.701)	-.386 (1.680)	-.479 (1.691)
Southern Italy	-.073 (.208)	-.067 (.214)	-.090 (.220)	-.102 (.273)	-.093 (.284)	-.144 (.286)	-.042 (.303)	.011 (.297)
Specialization index	-1.776 (5.470)	-1.658 (5.509)	-2.029 (5.474)	-1.747 (5.528)	-1.627 (5.567)	-1.983 (5.531)	-1.684 (5.855)	-4.829 (5.915)
Full set of year dummies	yes	yes	yes	yes	yes	yes	yes	yes
p-value of F-statistic of joint significance of control variable interactions	.3978	.2904	.4916	.4468	.3300	.5175	.3374	.4163
p-value of F-statistic of joint significance of set of year dummies' interactions	.1034	.1613	.2131	.5196	.5438	.5732	.5925	.5109
Obs.	112	112	112	112	112	112	112	112

Source: Italian Survey of Household Income and Wealth SHIW, 1987-2004.
Table shows β_0 and β' from equation (7) in the main text: $\Delta c_t(k) - \Delta c_t = \beta_0 \left[\Delta y_t(k) - \Delta y_t\right] + \beta' \mathbf{z}_t^k \left[\Delta y_t(k) - \Delta y_t\right] + \delta' \mathbf{z}_t^k + \mu^k + \varepsilon_{ut}$.
β_0 measures the fraction of income risk that is uninsured. The elements of β' measure how the unsmoothed component is affected by the intensive and extensive margins of fund holdings and by further interaction terms.

Figure 1: Diversification incentives



Source: SHIW, 1987-2004, authors' own calculations.
The figure plots intensive and extensive margins against the exposure measures estimated from equation (2).