Appendix To "Down or Out: Assessing The Welfare Costs of Household Investment Mistakes"*

Laurent E. Calvet, John Y. Campbell and Paolo Sodini

September 2007

1. Household Portfolio Data and Estimation Methodology

1.1. Wealth Distribution and Asset Allocation

Figure A1 reports the cross-sectional distribution of wealth at the end of 2002. The three lines in the figure represent gross wealth, financial assets, and net wealth. The lines diverge substantially for households in the middle of the wealth distribution, reflecting the fact that these households have a large fraction of their gross wealth in housing, and have correspondingly large mortgage debt. Sweden is a relatively egalitarian society by international standards, but even so wealthy households at the right of the figure have a disproportionate impact on aggregate asset allocation. The bottom 20% of households, on the other hand, have almost no measured wealth (recall that small bank accounts are not recorded in our dataset), and so we omit them from the figure.

Figure A2 illustrates the cross-sectional variation in the financial and real estate portfolio at the end of 2002. We subdivide households into gross wealth percentiles, and compute the average portfolio held by the members of each wealth group. Households in the lowest two deciles are not shown in the figure, because their total wealth is poorly measured and they hold almost nothing but cash. In the third and fourth deciles, households accumulate financial wealth in the form of cash, mutual funds, individual stocks and other financial assets. The share of real estate investments grows quickly

*Calvet: Department of Finance, HEC School of Management, 78351 Jouy-en-Josas, France; Department of Finance, Imperial College London, London SW7 2AZ, UK, and NBER, calvet@hec.fr. Campbell: Department of Economics, Littauer Center, Harvard University, Cambridge, MA 02138, USA, and NBER, john_campbell@harvard.edu. Sodini: Department of Finance, Stockholm School of Economics, Sveavägen 65, Box 6501, SE-113 83 Stockholm, Sweden, Paolo.Sodini@hhs.se.

with wealth for deciles in the middle of the wealth distribution. Households in the fifth to ninth percentile have about 60 to 80 percent of gross wealth invested in real estate and few risky financial assets. The share of real estate declines for households in the highest decile, while the share of risky financial assets rises quite substantially. The wealth composition of Swedish households is thus consistent with results reported for other industrialized countries such as the United States (Tracy, Schneider and Chan 1999, Bertaut and Starr-McCluer 2002).

1.2. Idiosyncratic and Systematic Risk

Given a benchmark index or asset B, we consider the return decomposition

$$r^e_{h,t} = \alpha_h + \beta_h r^e_{B,t} + \varepsilon_{h,t},$$

where $r^e_{h,t}$ and $r^e_{B,t}$ respectively denote the domestic excess returns on the household portfolio and on the benchmark. Note that the decomposition is purely statistical and does not assume an asset pricing model. We infer the variance decomposition

$$\sigma^2_h = \beta^2_h \sigma^2_B + \sigma^2_{i,h}.$$

The household portfolio thus has *systematic risk* $|\beta_h|\sigma_B$, and *idiosyncratic risk* $\sigma_{i,h}$. The relation between σ_h and β_h is illustrated by the scatter plot in Figure A3. The solid line represents $|\beta_h|\sigma_B$, which is the theoretical lower bound of σ_h for a given level of β_h. Households are almost all located away from the theoretical lower bound defined by the hedged world index, but tend to cluster in the region around the unhedged world index and the Swedish domestic index.

1.3. Global CAPM

We assume that assets are priced on world markets according to a global version of the CAPM expressed in an international currency, the US dollar. Returns in the domestic currency (the Swedish krona) can then be derived in three steps.

Step 1. Dollar CAPM on world markets
Let $r^{\$}_{f,t}$ denote the net simple return on the US T-bill, and $r^{\$}_{m,t}$ the dollar return of the market index. We assume that the dollar return $r^{\$}_{j,t}$ of every asset asset j satisfies:

$$\mathbb{E}(r^{\$}_{j,t} - r^{\$}_{f,t}) = \beta^{\$}_j \mathbb{E}(r^{\$}_{m,t} - r^{\$}_{f,t}). \tag{1.1}$$

This relation is used to price financial assets and portfolios worldwide.

Step 2. Domestic T-bill

Let X_t denote the value of one dollar in domestic currency (Swedish krona), and let x_t denote the corresponding net return: $x_t = X_t/X_{t-1} - 1$. We consider the investment strategy consisting of: (a) converting \$1 into the domestic currency at date $t-1$; (b) investing the proceeds at the domestic riskless rate $r^D_{f,t}$; and (c) converting the investment back into US dollars at date t. The gross return on this investment is $1 + r^{\$}_{0,t} = (1 + r^D_{f,t})/(1 + x_t)$. The dollar CAPM implies $\mathbb{E}(r^{\$}_{0,t} - r^{\$}_{f,t}) = \beta_0 \mathbb{E}(r^{\$}_{m,t} - r^{\$}_{f,t})$, or equivalently

$$\mathbb{E}(r^D_{f,t} - x_t - r^{\$}_{f,t}) \approx \beta_0 \mathbb{E}(r^{\$}_{m,t} - r^{\$}_{f,t}) \tag{1.2}$$

when returns are small.

Step 3. Mean-variance frontier in domestic currency

From the perspective of a domestic (Swedish) investor, the excess return of asset j with respect to the domestic interest rate is given by:

$$r^{e,D}_{j,t} = (1 + r^{\$}_{j,t})(1 + x_t) - (1 + r^D_{f,t}) \approx r^{\$}_{j,t} + x_t - r^D_{f,t}.$$

The expected domestic excess return is therefore

$$\mathbb{E}(r^{e,D}_{j,t}) \approx \mathbb{E}(r^{\$}_{j,t} - r^{\$}_{f,t}) + \mathbb{E}(r^{\$}_{f,t} + x_t - r^D_{f,t}).$$

By (1.1) and (1.2), the domestic excess return satisfies

$$\mathbb{E}(r^{e,D}_{j,t}) \approx \beta^D_j \mathbb{E}(r^{\$}_{m,t} - r^{\$}_{f,t}), \tag{1.3}$$

where $\beta^D_j = \beta^{\$}_j - \beta_0$. From the perspective of a domestic investor, the global pricing model induces a domestic CAPM (1.3) in which $r^{\$}_{m,t} - r^{\$}_{f,t}$ is the efficient benchmark. Under covered interest parity, $r^{\$}_{m,t} - r^{\$}_{f,t}$ coincides with the excess return of the currency-hedged market index.[1] Thus, the domestic CAPM can be estimated by regressing the domestic excess returns of each asset onto the domestic excess returns of the currency-hedged world index (or equivalently the dollar excess returns of the world index relative to the US T-bill).

The global CAPM is implemented as follows:

- We estimate the sample mean $\overline{r^{\$}_m - r^{\$}_f}$ and sample variance $(\sigma^{\$}_m)^2$ of the world index excess return series over the 1983-2004 period.

[1] If we buy a unit of the dollar-denominated market index and engage in a forward sale of the dollar, we obtain the gross return $(1 + r^{\$}_{m,t})F_{t-1}/X_{t-1}$. The covered interest parity implies $F_{t-1}/X_{t-1} = (1 + r^D_{f,t})/(1 + r^{\$}_{f,t})$. The return on the investment is therefore approximately $r^{\$}_{m,t} + r^D_{f,t} - r^{\$}_{f,t}$, which corresponds to an *excess* return equal to $r^{\$}_{m,t} - r^{\$}_{f,t}$.

- For each asset $j \in \{1, .., N\}$, we estimate the domestic beta β_j^D by regressing the asset's domestic excess return $r_{j,t}^{eD}$ onto the hedged world index $r_{m,t}^{\$} - r_{f,t}^{\$}$. We use 1994-2004 monthly data, or the available subset for assets with shorter histories. We then compute the $N \times N$ variance-covariance matrix $\mathbf{R}$ of the regression residuals.

- We finally infer the mean $\mu_j = \overline{r_m^{\$} - r_f^{\$}}\ \beta_j^D$ and variance-covariance matrix $\mathbf{\Sigma}^D = (\sigma_m^{\$})^2 \boldsymbol{\beta}^D \boldsymbol{\beta}^{D\prime} + \mathbf{R}$ of domestic excess returns.

1.4. Assets Most Widely Held by Households

We report in Table A1 the most widely held stocks and mutual funds in our entire database of all Swedish households. For individual stocks (Panel A), we eliminate households that hold more than $5 million in a single stock. This procedure filters out large insider holdings and enables us to focus on "popular stocks". For each company, the columns of Panel A report respectively: (1) the dollar value of household direct stockholdings in the company; (2) the company's weight in the aggregate value of household direct stockholdings; (3) the fraction of direct stockholding households that own at least one share of the company; (4) the fraction of the company's market capitalization that is directly held by Swedish households; (5) the company's value-weighted share of the Swedish stockmarket; (6) the stock's beta with the currency-hedged world index; (7) the company's Sharpe ratio estimated from the dollar CAPM.

The telecommunications company Ericsson is the most widely held stock in Sweden. It is directly owned by almost half of direct investors and its share of direct stockholdings (8.6%) is considerably larger than its value share of the Swedish index (5.2%). Other popular stocks include telecommunications companies (TeliaSonera), fashion companies (Hennes and Mauritz), paper manufacturers (Svenska Cellulosa), pharmaceuticals (Astra Zeneca and Pharmacia), and banks (SEB, SHB, and Förenings Savings Bank or FSB). There is also a Finnish stock (Nokia).[2] These stocks are well-known household names, often with relatively low Sharpe ratios.

In Panel B of Table A1 we report the ten most widely held mutual funds. These funds are characterized by considerably higher Sharpe ratios, on the order of 30%. They do however charge management fees ranging between 1.3% and 1.5%. They are sold by a few large banks: the aforementioned SEB, SHB, and FSB, along with Nordea. We note that most of them are internationally diversified. With the exception of SEB Sverige, each fund holds more than 25% of its assets in international securities. The most widely held fund (FSB/Robur Kapitalinvest) contains 54% of international stocks, while the second most popular fund (Nordea Futura) holds 17% in foreign stocks and 33%

[2] The data reported for Nokia in Table A1 apply only to Nokia shares that are traded in Sweden, not to Nokia shares traded in other countries.

in foreign bonds. These numbers suggest that popular mutual funds enable Swedish households to achieve reasonable levels of international diversification. None of these funds, however, hedges for currency risk. It is thus considerably easier for Swedish households to hold portfolios with the efficiency of the unhedged world index than to hold portfolios that are comparable to the hedged world index.

2. Robustness Checks

2.1. Bank Account Imputation

The balance of a bank account is frequently unreported when the account yields less than 100 SEK (or \$11) during the year. This problem affects about $2,000,000$ of the $4,800,000$ households in our 2002 dataset. We have considered three imputation methods.

- *Household characteristics.* The method used in the main text relies on the subsample of individuals (about 250,000) for which we observe the bank account balance even though the earned interest is less than 100 SEK. We regress the balance onto the following observable characteristics: age and squared age of household head, household size, real estate wealth, level and squared level of household disposable income, and financial wealth other than bank accounts. The coefficient of determination is modest ($R^2 = 1.2\%$) but the regression coefficients are highly significant. We use the regression to impute the account balances of individual household members and then aggregate the imputed amounts to infer the household bank account balance.

- *Constant balance.* Another approach takes advantage of the comprehensive nature of the data. We estimate the aggregate value of missing bank balances by taking the difference between: (a) the aggregate household deposits reported to the Swedish Central Bank, and (b) the aggregate bank balances in our dataset. The implied average balance is then assigned to each missing observation. We verify in Tables A2 and A3 that diversification losses and their decomposition are very similar to the results reported in Tables 4 and 5 of the paper.

- *No imputation.* Another approach consists of excluding from the estimation all households with missing bank account data. Tables A4 and A5 show that the results are again very similar to Tables 4 and 5 of the paper.

2.2. Capital Insurance

Capital insurance is a form of investment subjected to a special tax treatment by the Swedish Tax Authority. For every household, the Swedish dataset provides only the

overall value of capital insurance products, while the exact asset allocation is not observed. Capital insurance can be invested in cash and mutual funds, but not directly in stocks. In Table A6, we recompute the cross-sectional distribution of diversification losses using two alternative assumptions on the asset allocation of capital insurance savings. In Panel A, the capital insurance portfolio is a rescaled version of cash and mutual fund holdings in the "complete" portfolio. In Panel B, capital insurance is a rescaled version of mutual fund holdings alone. Both scenarios imply a median return loss of 1% relative to the currency-hedged world index (0.3% relative to the unhedged index), as well as substantial losses for a small group of households. These results suggest that Table 4 is robust to the inclusion of capital insurance.

2.3. Total Risk Decomposition

The return loss on the complete portfolio can be written as $RL_h = S_B w_h \sigma_h RSRL_h$, or in logs:

$$\ln(RL_h) = \ln(S_B) + \ln(w_h) + \ln(\sigma_h) + \ln(RSRL_h). \tag{2.1}$$

The log return loss is the sum of the log Sharpe ratio on the benchmark portfolio, which of course does not vary across households, the household's log risky share, the log standard deviation of the risky portfolio chosen by the household, and the household's log relative Sharpe ratio loss.

In Table A7, we regress the contributors to the total risk decomposition onto observable characteristics. The first two set of columns are identical to Table 5. The OLS regressions of $\ln(\sigma_h)$ and $\ln(RSRL_h)$, respectively, produce very similar results as the ones obtained for $\ln(\beta_h)$ and $\ln(RSRL_h/(1-RSRL_h))$ in the paper. In particular, financial wealth has a negative effect on the risky portfolio volatility σ_h and the Sharpe ratio loss $RSRL_h$; that is, rich people choose more systematic exposure $w_h\beta_h$ but partially offset its impact by reducing idiosyncratic risk.

2.4. Taxes

The apparent inefficiency of some households portfolios could in principle be driven by tax optimization strategies. For instance, the Swedish wealth tax can cause distortions in portfolio choices because it is not levied on the stocks of certain companies (O shares). In Tables A8 and A9, we recompute the diversification losses and the complete return regressions on the subset of the households that do not pay the wealth tax. We obtain very similar results, confirming that our basic results are not caused by tax optimization.

In Finland, which has also had a wealth tax, another distortion is of concern, namely an artificial increase in cash balances at yearend. Ordinary bank accounts are exempt from the Finnish wealth tax, and households have successfully reduced their wealth tax by transferring funds into their bank accounts on the last day of the year, and out of

their accounts at the beginning of the following year.[3] In Sweden, however, this tax loophole does not exist because individuals are required to report the yearend balances of all their bank accounts if their aggregate value exceeds 25,000 kronas, or about 2,500 dollars. In addition, financial institutions must report the balances of all the accounts that have earned more than 100 kronas, or about $10, in interest during the year. These rules effectively prevent Swedish households from using their bank accounts to avoid paying the wealth tax. Furthermore, quarterly aggregate statistics reveal that total deposits are typically lower at the end of December than at the end of September, presumably because of higher spending during the holiday season.

2.5. Currency Hedging and the Benchmark Index

We analyze in Table A10 how the complete return loss varies with observable characteristics when the unhedged version of the world index is taken as a benchmark. The complete portfolio return loss then satisfies $w_h\sigma_h(S_B - S_h) = (Er_m^e)w_h\beta_h(S_B/S_h - 1)$. We infer that:

$$\ln|RL_{complete,h}| = \ln(Er_m^e) + \ln(w_h) + \ln|\beta_h| + \ln\left|\frac{RSRL_h}{1 - RSRL_h}\right|,$$

where β_h is the risky portfolio's beta with the *hedged* index, and $RSRL_h = 1 - S_h/S_B$ is the relative Sharpe ratio loss relative to the *unhedged* index. As in Table 5 of the paper, more sophisticated households are more efficient but are also more aggressive, implying higher return losses on the complete portfolio.

2.6. Year of Observation

The main text investigates the participation and investment behavior of Swedish households at the end of 2002. World stock markets experienced very rapid growth in the late 1990s and then a sharp decline in the early 2000's. The returns on the world index in dollars (including dividends) were +25% in 1999, −13% in 2000, −17% in 2001 and −20% in 2002. The Swedish stock market was even more volatile, with SEK returns of +91% in 1999, −12% in 2000, −18% in 2001 and −42% in 2002. Given the volatility and negative returns of the early 2000's, investors might have learned about financial risk and thus modified their diversification behavior during the 1999-2002 period.

For this reason, we recompute our results in Tables A11-A14 using an alternative sample of 100,000 households that are present in our dataset (although not necessarily participating in risky asset markets) in all four years. This sample, which is also used in Calvet, Campbell, and Sodini (2007b), is a completely different sample than the one

[3] We thank Matti Keloharju for bringing this tax optimization strategy to our attention.

used in the main text, so Table A14 confirms the robustness of our results to the choice of an alternative set of households.

We emphasize that we do not apply any filtering procedure to the new sample of 100,000 households, while in the main text we filter out households with at least one of the following characteristics: (a) the average disposable income over the past three years is lower than 1,000 SEK ($113); (b) financial wealth is less than 3,000 SEK ($339); (c) some assets in the household portfolio have fewer than 24 observed monthly returns through 2004. Table A14 thus confirms the robustness of our results to the presence or absence of such filters.

The median Sharpe ratio loss and the median risky portfolio return loss are almost exactly constant during the 1999-2002 period, which suggests that the diversification of the risky portfolio did not change for a large group of reasonably efficient households. The right tail is thicker in 1999 than in 2002 because inefficient investors were selecting more severely underdiversified risky portfolios at the peak of the bull market.

Complete portfolios exhibit higher return losses in 1999; the return loss relative to the hedged index has a median of 1.6% (1.2% in 2002) and a 95th percentile of 6.9% (5.0% in 2002). Dollar losses are also higher in 1999, with a median of $259 and a 95th percentile of $6,635. These large losses originate primarily in more aggressive portfolios in 1999. Specifically, the median share of risky assets is 52% in 1999 as compared to 43% in 2002. In the right tail of the loss distribution, the 1999 losses are also increased by less efficient investing.

We also reestimate the regression of the return loss on observable household characteristics (Tables A15-A18). The risky share and diversification loss regressions produce very similar results in 1999, 2000 and 2001. The most notable change is that household wealth tends to increase the risky share and thus the complete return loss more strongly in 1999. This may be the result of reverse causality; undiversified investors in technology stocks were wealthier in 1999 than they came to be by the year 2002. Other variables, such as education, immigration and household size, have almost exactly the same effect on the return loss in 1999 as in 2002.

Finally, we investigate the role of investor experience by considering a dummy variable equal to 1 if a household participated in risky asset markets throughout the period 1999-2002. When we add this variable to the set of characteristics in Table 5, we find in Table A19 that experience, like financial wealth and education, implies both higher efficiency and higher risk-taking, and overall results in substantially higher return losses. The regression coefficients of the other characteristics are unaffected, which shows that the experience variable usefully complements the effects of wealth and education.

Overall, the 1999, 2000 and 2001 data confirm our main results that a large group of households is reasonably well diversified, and that more sophisticated investors (as measured by wealth and experience) invest more efficiently but incur higher return losses

due to higher risk-taking. We study the dynamics of portfolio choice in greater detail, exploiting the panel structure of our dataset, in a subsequent paper (Calvet, Campbell, and Sodini 2007).

2.7. Asset Pricing Model

We assess the robustness of our results to asset pricing assumptions by considering the global Fama and French (1993) three-factor model:

$$r^{\$}_{j,t} - r^{\$}_{f,t} = \beta^{\$}_j (r^{\$}_{m,t} - r^{\$}_{f,t}) + \gamma^{\$}_j SMB_t + \delta^{\$}_j HML_t + u^{\$}_{j,t},$$

where SMB_t and HML_t are the US size and value factors, and $u^{\$}_{j,t}$ is an uncorrelated residual. We infer in turn that domestic excess returns satisfy[4]:

$$r^{e,D}_{j,t} = \beta_j (r^{\$}_{m,t} - r^{\$}_{f,t}) + \gamma_j SMB_t + \delta_j HML_t + u_{j,t}. \tag{2.2}$$

Let $\mathbf{f}_t = (r^{\$}_{m,t} - r^{\$}_{f,t}, SMB_t, HML_t)'$ denote the column vector of the three factors in date t. We implement the following estimation procedure:

- We compute the same mean $\bar{\mathbf{f}} = \sum_{t=1}^{T} \mathbf{f}_t / T$ and variance-covariance matrix $\mathbf{\Sigma}_F = \sum_{t=1}^{T} (\mathbf{f}_t - \bar{\mathbf{f}})(\mathbf{f}_t - \bar{\mathbf{f}})'/T$ of the factors.

- For each asset j, we estimate the loadings $\mathbf{b}_j = (\beta_j, \gamma_j, \delta_j)'$ by regressing the domestic excess returns on the factors:

$$\mathbf{b}_j = (\mathbf{F}'\mathbf{F})^{-1} \mathbf{F}' \mathbf{r}^{e,D}_{\mathbf{j}},$$

  where $\mathbf{r}^{e,D}_{\mathbf{j}} = (r^{e,D}_{j,1}; ...; r^{e,D}_{j,T})'$ and $\mathbf{F} = (\mathbf{f}_1, ..., \mathbf{f}_T)'$. Let $\mathbf{R}$ denote the $N \times N$ variance-covariance matrix of the regression residuals.

- We estimate the expected domestic excess return on each asset j by $\mu_j = \mathbf{b}'_j \bar{\mathbf{f}}$, and the variance-covariance matrix of the assets by

$$\mathbf{\Sigma} = \mathbf{B} \mathbf{\Sigma}_{\mathbf{F}} \mathbf{B}' + \mathbf{R},$$

  where $\mathbf{B}$ is the matrix of factor loadings $(\mathbf{b}_1, ..., \mathbf{b}_N)'$.

[4] The derivation is analogous to the argument used for the domestic CAPM in Section 1.3 of the Appendix. A US fund manager investing in the Swedish T-bill earns the net return $r^{\$}_{0,t} \approx r^{D}_{f,t} - x_t$. The global Fama and French model implies $\mathbb{E}(r^{\$}_{0,t} - r^{\$}_{f,t}) = \beta^{\$}_0 \mathbb{E}(r^{\$}_{m,t} - r^{\$}_{f,t}) + \gamma^{\$}_0 \mathbb{E}(SMB_t) + \delta^{\$}_0 \mathbb{E}(HML_t)$. The domestic expected excess return on an asset j, $\mathbb{E}(r^{e,D}_{j,t}) = \mathbb{E}(r^{\$}_{j,t} - r^{\$}_{f,t}) + \mathbb{E}(r^{\$}_{f,t} - r^{D}_{f,t} + x_t)$, therefore satisfies (2.2), with $\beta_j = \beta^{\$}_j - \beta^{\$}_0$, $\gamma_j = \gamma^{\$}_j - \gamma^{\$}_0$, and $\delta_j = \delta^{\$}_j - \delta^{\$}_0$.

We report in Table A20 the cross-sectional distribution of return losses in 2002 under the three-factor model. The median household has a relative Sharpe ratio loss of 32% with respect to the hedged world index, which is slightly smaller than the 35% loss estimated under the CAPM. This difference is explained by a slight tilt of Swedish household portfolios towards small stocks and value stocks, relative to the world index, which improves their returns slightly in the Fama-French model. Specifically, we verify that the value and size loadings are positive for respectively 80% and 90% of risky portfolios. Other loss estimates are also slightly smaller under the Fama and French model. The median return loss on the complete portfolio is 1.04% with respect to the hedged world index (1.17% under the CAPM), and 0.29% relative to the unhedged index (0.30% under the CAPM). Extreme losses are substantial under both asset pricing models.

We next consider the contributors to the return loss on the complete portfolio. Since $RL_{complete,h} = w_h\sigma_h(S_B - S_h) = w_h(S_h\sigma_h)(S_B/S_h - 1)$, we infer that:

$$\ln|RL_{complete,h}| = \ln w_h + \ln|Er^{e,D}_{h,t}| + \ln\left|\frac{RSRL_h}{1-RSRL_h}\right|, \tag{2.3}$$

where $Er^{e,D}_{h,t} = S_h\sigma_h$ denotes the expected excess return on the household's risky portfolio. Under the Fama French model (2.2), the expected return satisfies $Er^{e,D}_{h,t} = \beta_h E(r^{\$}_{m,t} - r^{\$}_{f,t}) + \gamma_h E(SMB_t) + \delta_h E(HML_t)$, where β_h, γ_h, and δ_h denote the risky portfolio's factor loadings. Equation (2.3) is therefore a direct extension of the "systematic risk decomposition" developed in the main text under the CAPM. The corresponding regressions, reported in Table A21, confirm that our results are robust to the choice of alternative pricing model.

2.8. Availability of Leverage

One explanation for return losses might be that households are unable to leverage the market portfolio (Black 1972). A risk-tolerant but constrained household might rationally select an inefficient portfolio of high-beta stocks in order to obtain a higher expected return than is available by holding the unleveraged market portfolio. However only 3.7% of complete portfolios have a beta larger than one, a necessary condition for a borrowing constraint to be binding if all cash holdings are a financial investment. We have reestimated the distribution of losses on the subset of households with a beta less than one, and have found very little difference, and have found almost exactly the same results as in Tables 4 and 5 of the main text.

Some might argue that household cash is held for liquidity reasons, and thus a household with cash may still face a binding borrowing constraint within the financial portfolio. We use mutual funds with high betas to construct a modified efficient frontier

that can be reached without altering cash holdings. Consider an asset or portfolio p that has a higher standard deviation and a higher expected return than the market, that is $\sigma_p > \sigma_m$ and $\beta_{p,m} > 1$. We proxy the leveraged frontier by the union of:

1. unleveraged positions in cash and the currency-hedged index:

$$\{(w\sigma_m, r_f + wE(r_m - r_f)), w \in [0,1]\};$$

2. unleveraged positions in the currency-hedged index and asset p:

$$\{(\sigma(r_w), E(r_w)), \text{ where } r_w = r_m + w(r_p - r_m),\ w \in [0,1]\}.$$

The highest expected return that can be achieved on a portfolio of standard deviation σ_h (constrained frontier) is a continuous increasing function $\mu(\sigma_h)$, which is linear on $[0, \sigma_m]$ and concave on $[\sigma_m, \sigma_p]$. We exclude from the analysis all portfolios with a standard deviation higher than σ_p.

The vertical distance of a household risky portfolio to the constrained frontier can be computed as previously when $\sigma_h \in [0, \sigma_m]$. On the other hand when $\sigma_h \in [\sigma_m, \sigma_p]$, the efficient portfolio is determined by the weight w that satisfies

$$\sigma(r_w) = \sigma_h,$$

or equivalently $w^2\left(\sigma_p^2/\sigma_m^2 + 1 - 2\beta_{p,m}\right) + 2w(\beta_{m,p} - 1) + 1 - \sigma_h^2/\sigma_m^2 = 0$. When $\sigma_h \in [\sigma_m, \sigma_p]$, this equation has a unique positive root:

$$w(\sigma_h) = \frac{\sqrt{\Delta'} - (\beta_{m,p} - 1)}{\sigma_p^2/\sigma_m^2 + 1 - 2\beta_{p,m}},$$

where $\Delta' = (\beta_{m,p} - 1)^2 + \left(\sigma_p^2/\sigma_m^2 + 1 - 2\beta_{p,m}\right)\left(\sigma_h^2/\sigma_m^2 - 1\right)$. The return loss

$$RL_h = E(r_w) - E(r_h).$$

is then computed by standard methods.[5]

We report in Table A22 a list of potential mutual funds p with high standard deviations and Sharpe ratios in the 35%-40% range. They are all aggressive growth funds with high systematic exposure and return volatility. All these funds have analogous implications for return losses in the presence of leverage constraints. To illustrate this

[5] Since $E(r_w) - r_f = S_m\sigma_m + w(\sigma_h)\left[E(r_p) - E(r_m)\right]$ and $E(r_h) - r_f = S_h\sigma_h$, we infer that

$$RL_h = S_m\sigma_m - S_h\sigma_h + w(\sigma_h)\left[E(r_p) - E(r_m)\right].$$

point, we consider two choices: a) Firstnordic Global, which has a return standard deviation of 63% and a beta coefficient of 3.4; and b) Erik Penser Trippelfond Finans, which has a standard deviation of 45% and a beta of 2.7.

The corresponding diversification losses are reported in Table A23. We find slightly lower median return losses (1.06% as compared to 1.17% in Table 4) and much lower but still substantial return losses in the far right tail of the loss distribution. In Tables A24 and A25, we verify that the positive link between sophistication and return losses is robust to the new definition of the frontier and is therefore unlikely to arise from leverage constraints.

2.9. Mutual Fund Fees

Estimates of diversification losses may be sensitive to the treatment of mutual funds. We have so far priced mutual funds like any other assets by using the CAPM. To check the robustness of our results, in Table A26 we alternatively estimate the expected return on a fund by subtracting a yearly fee. For the ten most popular mutual funds, we use the management fees reported in Table A1 for 2002, which range between 1.3 and 1.5% per annum. For other managed funds, we use the average fee values reported by Fondbolagens Förening for 2006: 1.21% for risky funds, 0.6% for bond funds. We also subtract a fee of 0.4% from the benchmarks, which is approximately equal to the cost of a diversified global equity index fund in Sweden.

With this procedure, the median relative Sharpe ratio loss on the complete portfolio is 44%, which is substantially higher than the 35% estimate reported in Table 4. The corresponding complete portfolio's median return loss is 1.46% relative to the currency-hedged index and 0.58% relative to the unhedged index, which are both about 0.3% higher than the estimates reported in Table 4. The estimated impact of the fee on the return loss is consistent with the following quick calculation. Participants with the median return loss hold on average about 13% of their complete portfolio in bond funds and 32% in other funds, and the standard deviation of their complete portfolio return is on average 7.5%. Fees therefore reduce the return loss by approximately $0.13 \times 0.6\% + 0.32 \times 1.4\% - (7.5/14.7) \times 0.4\%$, or 0.32%, which is close to our more precise 0.29% loss estimate. Mutual fund fees of this magnitude thus have a measurable but not overwhelming impact on measured diversification losses. Fees have a smaller effect on very inefficient portfolios, presumably because they are invested in individual stocks and in funds with lower fees. As a consequence, mutual fund fees have very little effect on the regressions that estimate demographic contributors to return losses, as is evident in Table A27. We acknowledge, however, that there is considerable heterogeneity in fees, and view a more careful treatment of mutual funds as deserving of further research.

2.10. Demographic Effects

Aggressiveness and portfolio efficiency both diminish with age, as can be seen in Table 5 of the paper. Agarwal, Driscoll, Gabaix, and Laibson (2007) have argued that financial sophistication is hump-shaped in age, increasing until the early 40's and then decreasing. In Table A28, we add a quadratic term in age to the regressions of Table 5. We find that age squared does not have large effects on the coefficients of other variables and does not imply a positive age effect on financial sophistication even for younger households. Some of the other variables in our model, however, are themselves correlated with age; for example, private pension saving is highest for middle-aged households. When we remove the other variables from the model and estimate only an age effect in unreported work we do find a hump shape consistent with the results of Agarwal, Driscoll, Gabaix, and Laibson. We note, however, that this age effect cannot be separately identified from a cohort effect, a point emphasized by Ameriks and Zeldes (2004).

2.11. Investor Preferences

What are the welfare consequences of the reported return and Sharpe ratio losses? We now develop a utility-based measure of losses for a household that has constant relative risk aversion.

Principle. Consider a household with an infinite horizon, CRRA utility of consumption with discount factor δ and risk aversion γ:

$$E_0 \sum_{t=0}^{\infty} \delta^t \frac{C_t^{1-\gamma}}{1-\gamma}.$$

The household is able to invest in two assets: a safe asset with log return r_f, and a risky asset with log return r_{t+1} distributed i.i.d. normal. Let σ denote the standard deviation of the risky asset, and S its Sharpe ratio.

The household's investment problem consists of choosing the optimal portfolio share in the risky asset, w, and the optimal consumption-wealth ratio. We verify that

$$w = \frac{S}{\gamma\sigma}. \tag{2.4}$$

The optimal consumption-wealth ratio is fully determined by

$$\left(1 - \frac{1}{\gamma}\right)\left(r_f + \frac{1}{2}\frac{S^2}{\gamma}\right) - \frac{\ln(\delta)}{\gamma}.$$

Financial opportunities (r_f and S) impact household utility through the choice of the consumption-wealth ratio.

This gives us all the ingredients we need to analyze the welfare effect of a change in Sharpe ratios. We consider a household h with risk aversion γ_h and observed Sharpe ratio S_h. If the household adopts instead the Sharpe ratio S_B of a benchmark, the effect on utility is equivalent to an increase in the riskless interest rate of

$$UL_h = \frac{S_B^2 - S_h^2}{2\gamma_h}. \tag{2.5}$$

The utility loss increases with the inefficiency of the household portfolio, $S_B^2 - S_h^2$, and decreases with household risk aversion γ_h. While the Sharpe ratios in (2.5) are easily measured, the selection of γ_h must be addressed. We consider below two alternative methods.

Heterogeneous Coefficients of Risk Aversion. Since an investor's portfolio is in principle informative on her risk-aversion, we find it sensible to impute γ_h from the observed portfolio of risky assets. For this reason, assume that the investor correctly perceives the Sharpe ratio S_h of her complete portfolio but is unaware of the benchmark Sharpe ratio S_B. We then infer from (2.4) that the coefficient of relative risk aversion satisfies

$$\gamma_h = S_h/(w_h\sigma_h), \tag{2.6}$$

where σ_h is the standard deviation of the risky portfolio. This relation provides an estimate of the risk aversion of each household. It is easy to check that with the efficient benchmark, the inferred utility loss UL_h is necessarily larger than the return loss RL_h (the increase in expected return at a constant standard deviation) of the complete portfolio. This because households incur two types of losses: (1) they do not choose the highest-yielding portfolio given their risk level; and (2) they choose a suboptimal level of risk because they are unduly pessimistic about the optimal Sharpe ratio.

We report the estimates in Table A29. The median utility loss is equivalent to a decline in the riskless interest rate of 1.52% compared to the hedged world index and 0.34% compared to its unhedged version. The median utility loss is thus relatively modest, and only slightly larger than the return loss reported in Table 4. The right tail of the utility loss distribution is, however, even fatter than the right tail of the return loss distribution, because the difference between the utility loss and return loss increases when these losses are large. To understand the magnitude of these losses, the middle panel of Table A29 reports them in dollars per year, and the bottom panel expresses them as a fraction of financial wealth. 5% of households incur utility losses greater than \$3000 per year or 11% of their disposable income, relative to the hedged world index. Relative to the unhedged world index, the losses are only one-third as large, but are still substantial.

Homogeneous Coefficients of Risk Aversion. To see how sensitive our results are to the choice of risk aversion, we now set γ_h equal to the median value computed using the previous method (2.6). That is, we set $\gamma_h = 3.64$. The results in Table A30 are again roughly similar in the left and the middle of the distribution, but generate less extreme values in the right tail.

Overall, the utility analysis confirms that a majority of households incurs modest diversification losses, while a minority selects very underdiversified portfolios.

2.12. Validity in Other Countries

Are our results specific to Sweden, or do they apply to other countries? A full answer to this question would require an international cross-section of disaggregate household portfolios, which is presently unavailable. Partial answers can be obtained, however, from national surveys. For instance, Jappelli, Juillard and Pagano (2001) impute the diversification level of Italian households from a survey, and conclude that they are reasonably well diversified.

The diversification of US households can be roughly analyzed using the 2001 Survey of Consumer Finances.[6] For each household h in the 2001 SCF, we know the share w_h of the risky portfolio in the complete portfolio, the fraction D_h of direct stockholdings in the risky portfolio, and the number n_h of directly held stocks.

The imputation is based on the following assumptions.

- Direct stockholdings are split equally across the n_h stocks.
- The indirect portion is invested in a diversified U.S. equity index with return r_M.

Let μ_M and σ_M denote the expected return and standard deviation of this index. All individual stocks have the same excess return of 6%, so that $\mu_M - r_f = 6\%$. The standard deviation of the index is $\sigma_M = 20\%$, so the Sharpe ratio of the index is 0.3, roughly comparable to that of the unhedged world index for Swedish investors. Individual stocks have the same expected excess return $\mu_D - r_f = 6\%$, the same standard deviation $\sigma_D = 50\%$, and the same pairwise correlation ρ. Standard arguments imply that if the index is made up of an infinite number of stocks, $\rho \equiv \sigma_M^2/\sigma_D^2 = 0.16$.

The diversification level of a household h is then imputed as follows. The return on direct stockholdings is the equal-weighted average of n_h stocks:

$$r_{h,D} = \frac{1}{n_h} \sum_{i=1}^{n_h} r_i.$$

[6] We thank Nick Barberis for developing this comparison as part of the paper's discussion at the 2006 NBER Summer Institute.

It has mean μ_D, variance

$$\sigma^2_{h,D} = \frac{\sigma^2_D}{n_h}\left[1 + (n_h - 1)\rho\right],$$

and covariance with the index $Cov(r_M, r_{h,D}) = \sigma^2_D \rho$.

The risky portfolio, which contains both direct and indirect stockholdings, yields the return

$$D_h(r_{h,D} - r_f) + (1 - D_h)(r_M - r_f).$$

Its variance is $\sigma^2_h = D^2_h \sigma^2_{h,D} + (1 - D_h)^2 \sigma^2_M + 2D_h(1 - D_h)\sigma^2_D \rho$, and its Sharpe ratio

$$S_h = \frac{D_h(\mu_D - r_f) + (1 - D_h)(\mu_M - r_f)}{\sigma_h}.$$

We then easily compute the return loss on the complete portfolio, $w_h\ \sigma_h(S_B - S_h)$.

Under these assumptions, the relative Sharpe ratio loss has a median value of 0.15 and a 95th percentile of 0.56, which is close to the values of 0.14 and 0.60 that are respectively obtained in Table 4 for Swedish household portfolios relative to the unhedged world index. The cross-sectional distribution of the Sharpe ratio loss thus appears to be similar in the U.S. and in Sweden. The return loss, on the other hand, tends to be higher in the SCF data because U.S. households take more risk in their financial wealth than Swedish households.[7] The return loss has a median value of 0.65% and a 95th percentile of 3.59% in the U.S., as compared to 0.30% and 2.65% in Sweden. Of course, the return loss depends on the Sharpe ratio of 0.3 assumed for the index, while the relative Sharpe ratio loss does not. Overall, this imputation method suggests that diversification losses are comparable if somewhat higher for U.S. households.

References

[1] Agarwal, Sumit, John C. Driscoll, Xavier Gabaix, and David Laibson. 2007. "The Age of Reason: Financial Decisions Over the Life Cycle", NBER working paper 13191.

[2] Bertaut, Carol, and Martha Starr-McCluer, 2002, Household portfolios in the United States, in Luigi Guiso, Michael Haliassos and Tullio Jappelli eds. *Household Portfolios*, MIT Press, Cambridge, MA.

[3] Calvet, Laurent E., John Y. Campbell, and Paolo Sodini. 2007. "Fight or Flight? Portfolio Rebalancing by Individual Investors." Working paper (March), HEC Paris, Harvard University and Stockholm School of Economics.

[7] In part this may reflect the inclusion of retirement accounts in the SCF data, while they are excluded from our Swedish data.

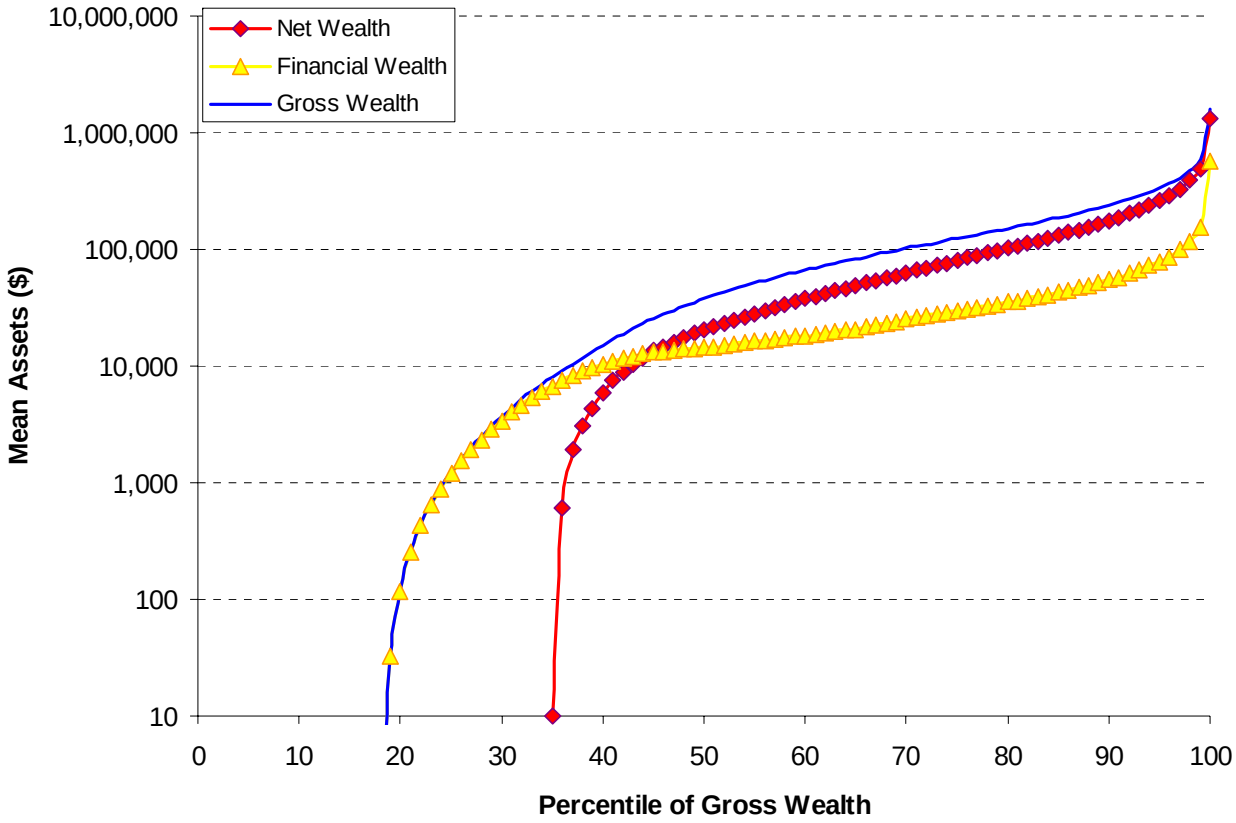
[4] Jappelli, Tullio, Christian Juillard, and Marco Pagano. 2001. "La Diversificazione del Portafoglio delle Famiglie Italiane." In *XIX Rapporto sul Risparmio e sui Risparmiatori in Italia*, edited by Andrea Beltratti. Rome: BNL/Centro Einaudi.

[5] Tracy, Joseph, Henry Schneider, and Sewin Chan, 1999, Are stocks overtaking real estate in household portfolios?, *Current Issues in Economics and Finance* 5:5, Federal Reserve Bank of New York.

1 – HOUSEHOLD

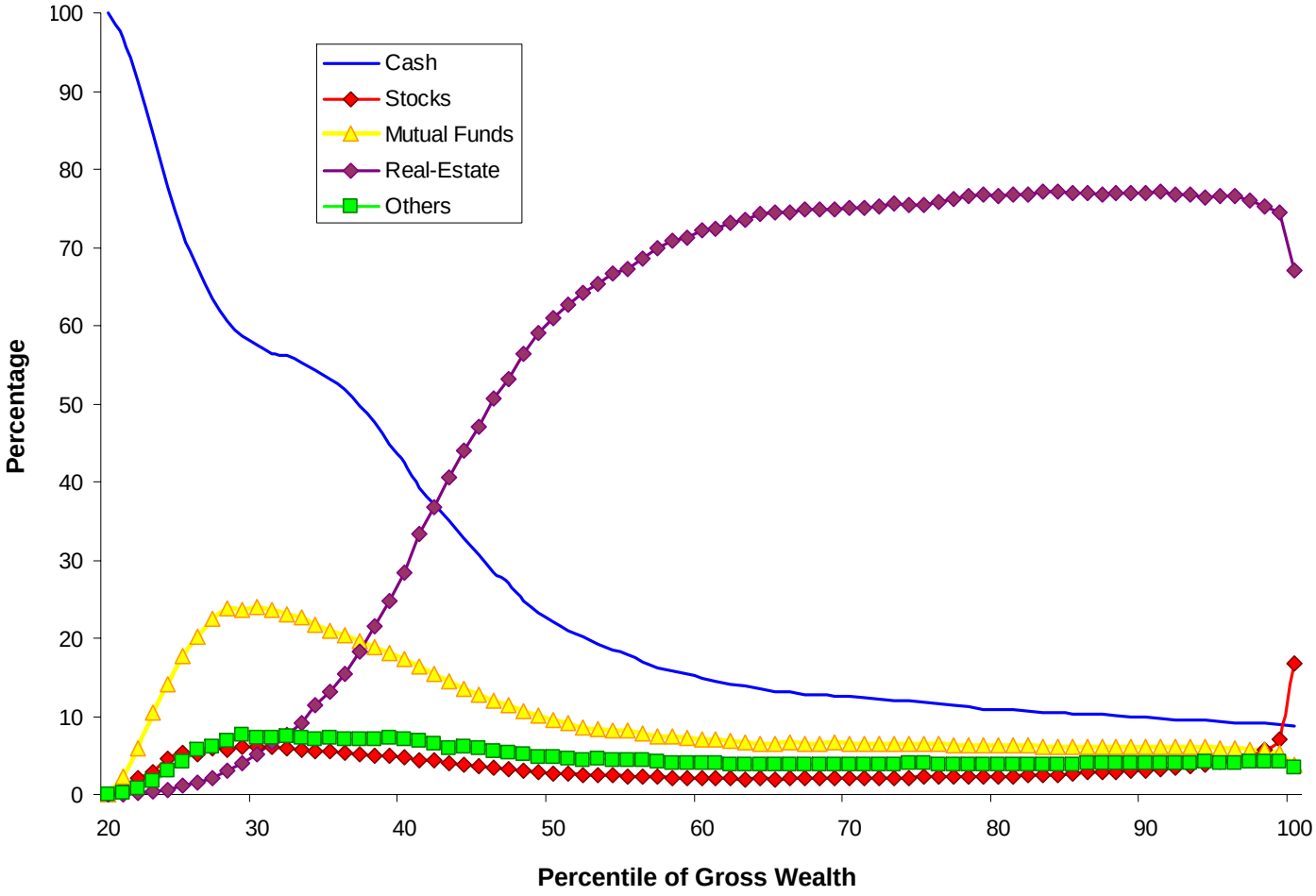
PORTFOLIO DATA

FIGURE A1. WEALTH DISTRIBUTION



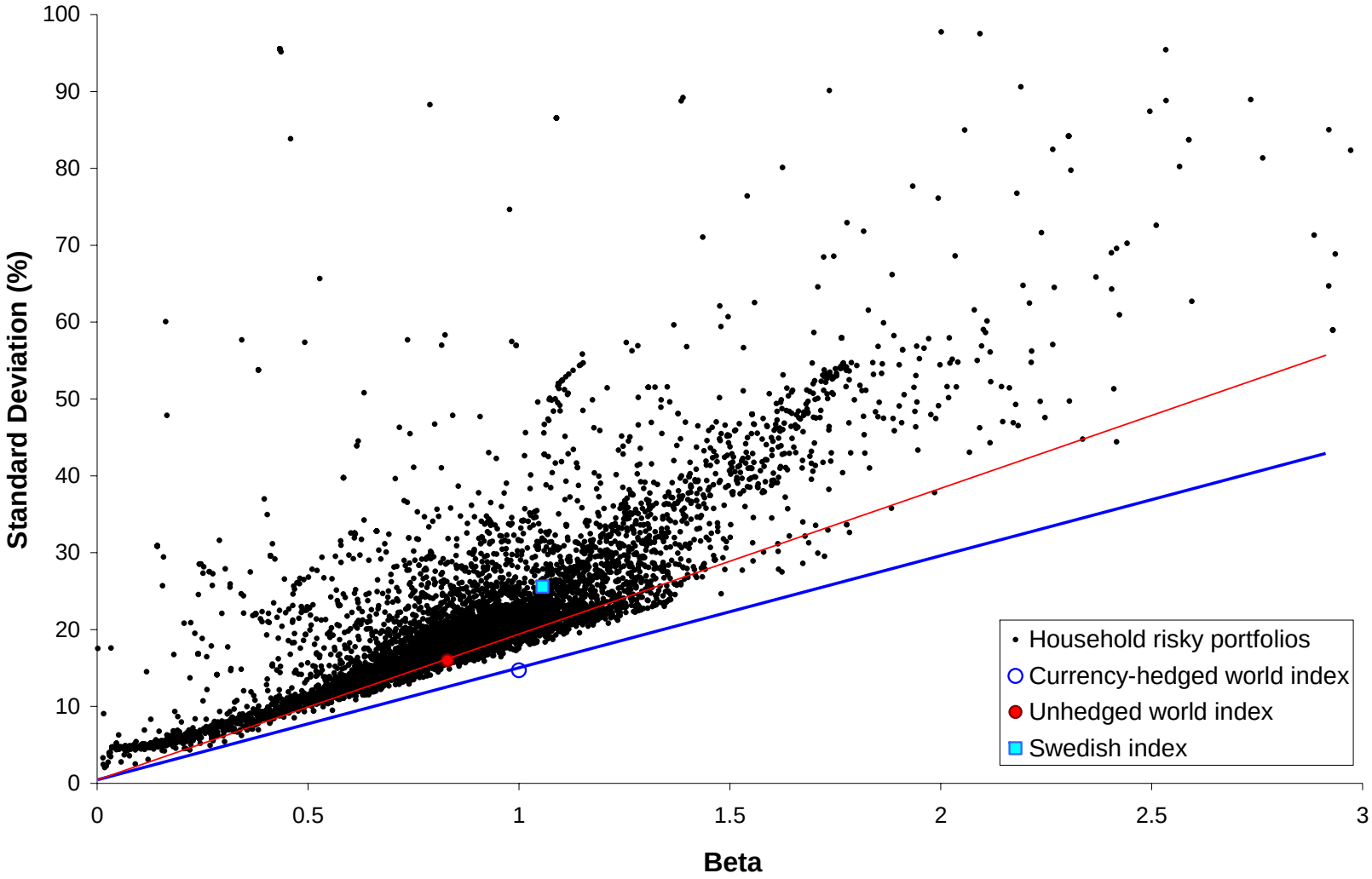
The figure represents the cross-sectional distribution of gross wealth, financial assets and net wealth owned by Swedish households at the end of 2002. We subdivide households into gross wealth percentiles, and report the average values of the assets within each wealth group. The lines diverge substantially for households in the middle of the wealth distribution, reflecting the fact that these households have a large fraction of their gross wealth in housing, and have correspondingly large mortgage debt.

FIGURE A2. COMPOSITION OF FINANCIAL AND REAL ESTATE PORTFOLIO



The figure illustrates the cross-sectional variation in the financial and real estate portfolio at the end of 2002. We subdivide households into gross wealth percentiles, and compute the average portfolio held by the members of each wealth group. Households in the lowest two deciles are not shown in the figure, because their total wealth is poorly measured and they hold almost nothing but cash.

FIGURE A3. VOLATILITY AND BETA OF RISKY PORTFOLIOS



The scatter plot illustrates the volatility and beta with the hedged index of household risky portfolios. It is based on a random sample of 10,000 households at the end of 2002. The origin corresponds to the riskless asset, the empty circle to the currency-hedged world index, the full circle to the unhedged world index, and the square to the MSCI Sweden index. Households are almost all located away from the lower bound defined by the currency-hedged world index, but tend to cluster in the region around the unhedged world index and the Swedish domestic index.

TABLE A1. ASSETS MOST WIDELY HELD BY HOUSEHOLDS

A. Direct Stockholdings

Name	Holdings (million $)	Share of Household Stock Wealth	Fraction of Stockholders	Household Share of Market Cap	Relative Market Cap	Beta	Sharpe Ratio
Ericsson B	1,977	8.6%	44.5%	18.9%	5.2%	1.83	23.2%
AstraZeneca	1,467	6.4%	7.7%	10.3%	7.1%	0.23	5.5%
Hennes & Mauritz B	1,144	5.0%	9.7%	8.3%	6.9%	0.67	14.0%
SHB A	1,022	4.4%	3.9%	12.0%	4.2%	0.93	18.9%
Nokia	976	4.2%	7.9%	33.9%	1.4%	1.32	17.5%
SEB A	916	4.0%	15.8%	16.6%	2.7%	1.07	15.9%
Pharmacia Corporation	640	2.8%	8.1%	38.0%	0.8%	0.45	10.1%
Svenska Cellulosa	619	2.7%	3.2%	9.8%	3.1%	0.67	15.3%
FöreningsSparbanken A	613	2.7%	19.0%	10.0%	3.0%	1.14	27.6%
TeliaSonera	604	2.6%	36.8%	3.6%	8.4%	1.24	21.7%

B. Risky Mutual Funds

Fund	Holdings (million $)	Share of Risky Fund Wealth	Asset Allocation (%)						Management Fee (% of assets)	Sharpe Ratio
			Foreign		Domestic					
			Stocks	Bonds	Stocks	Bonds	Cash	Futures		
FSB/Robur Kapitalinvest	1,911	5.2%	54.1	0.0	45.0	0.0	0.9	0.0	1.41	29.2%
Nordea Futura	1,246	3.4%	16.7	33.3	22.5	27.5	0.0	0.0	1.40	29.2%
FSB/Robur Allemansfond III	1,110	3.0%	38.6	0.0	60.0	0.0	1.4	0.0	1.41	31.7%
FSB/Robur Mixfond	982	2.7%	29.1	17.1	22.9	22.1	8.8	0.0	1.41	32.0%
FSB/Robur Allemansfond IV	904	2.5%	38.9	0.0	60.0	0.0	1.1	0.0	1.41	30.7%
SHB Sverige/Världen	787	2.2%	25.4	0.0	72.7	0.0	1.9	0.0	1.50	36.4%
Nordea Beta	786	2.2%	25.0	0.0	75.0	0.0	0.0	0.0	1.40	27.2%
SEB Sverige I	684	1.9%	0.0	0.0	93.9	0.2	5.9	0.0	1.30	29.4%
FSB/Robur Allemansfond II	632	1.7%	38.8	0.0	60.0	0.0	1.2	0.0	1.41	28.6%
SEB Aktiesparfond	627	1.7%	39.5	0.0	47.6	3.8	9.6	-0.5	1.40	30.0%

Panel A reports the ten stocks that are most widely held by Swedish households. Stocks are sorted by aggregate value in household direct stockholdings, which are given in the first column. The following columns report: the company's weight in the aggregate value of direct stockholdings; the fraction of direct investors who own at least one share of the company; the fraction of the company's market capitalization that is directly held by households; the company's value-weighted share of the Swedish stock market; the company's estimated beta with the hedged world index; and the stock's estimated Sharpe ratio. Similarly, Panel B reports popular risky mutual funds sorted by the aggregate value in household portfolios given in the first column. The following columns report: the fund's share of aggregate household investments in risky funds; the fund's asset allocation at the end of 2002; management fees as a percentage of the fund's net asset value; and the fund's estimated Sharpe ratio.

2 - ROBUSTNESS CHECKS

Bank account imputation

TABLE A2. DIVERSIFICATION LOSSES
Constant Imputed Balance

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.29	0.35	0.42	0.55	0.69	0.89
Unhedged World Index	0.19	0.07	0.14	0.24	0.41	0.60	0.85
Sweden Index	-0.02	-0.16	-0.08	0.04	0.26	0.49	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.70	0.57	1.22	2.10	3.45	5.02	9.75
Unhedged World Index	0.66	0.09	0.32	0.72	1.56	2.62	5.74
Sweden Index	-0.03	-0.38	-0.11	0.05	0.57	1.13	3.14
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.09	2.01	2.90	4.26	8.30	11.81	17.23
Unhedged World Index	1.71	0.41	0.87	1.74	4.54	7.00	10.92
Sweden Index	0.13	-0.82	-0.39	0.20	1.93	3.20	7.52
	Return Loss in Dollars						
Currency-hedged World Index	884	40	146	477	1333	2441	8508
Unhedged World Index	409	7	37	147	469	927	3754
Sweden Index	92	-62	-9	4	84	230	1297
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	2.22	0.15	0.54	1.74	4.66	8.17	24.95
Unhedged World Index	0.90	0.03	0.13	0.55	1.71	3.21	11.59
Sweden Index	0.01	-0.22	-0.03	0.02	0.32	0.92	4.45

The table reports the cross-sectional distribution of diversification losses using the constant bank account imputation method. We estimate the aggregate value of missing bank balances by taking the difference between: (1) the aggregate household deposits reported to the Swedish Central Bank, and (2) the aggregate bank balances in our dataset. The implied average balance is then assigned to each missing observation. The results confirm the robustness of our diversification estimates to an alternative imputation method.

TABLE A3. CONTRIBUTORS TO COMPLETE RETURN LOSS
Constant Imputed Balance

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.003	2.73	1.2%	-0.005	-3.96	-1.6%	0.005	8.08	1.8%	0.003	4.45	1.0%
Private pension premia/Income	0.587	4.44	2.0%	0.987	7.71	3.4%	0.074	1.09	0.3%	-0.473	-6.53	-1.6%
Financial wealth (in logs)	0.103	25.50	19.2%	0.139	35.70	26.9%	-0.010	-4.78	-1.7%	-0.027	-12.20	-4.5%
Real-estate wealth (in logs)	0.006	6.74	4.3%	0.005	5.83	3.6%	0.003	5.60	1.8%	-0.002	-3.23	-1.1%
Total liability (in logs)	0.016	13.90	9.8%	0.006	5.49	3.6%	0.011	18.70	6.6%	-0.001	-1.77	-0.7%
Retired dummy	-0.012	-0.61	-1.2%	0.032	1.66	3.2%	-0.043	-4.28	-4.2%	-0.001	-0.07	-0.1%
Unemployment dummy	-0.097	-4.82	-9.3%	-0.108	-5.54	-10.3%	0.005	0.51	0.5%	0.006	0.52	0.6%
Entrepreneur dummy	-0.193	-7.65	-17.6%	-0.309	-12.60	-26.6%	0.065	5.03	6.7%	0.051	3.66	5.2%
Student dummy	-0.047	-1.28	-4.6%	-0.013	-0.37	-1.3%	-0.048	-2.53	-4.7%	0.014	0.68	1.4%
Demographic Characteristics												
Age	0.000	0.76	0.7%	0.000	0.00	0.0%	-0.002	-8.22	-4.0%	0.003	9.04	4.9%
Household size	-0.019	-4.28	-2.4%	0.039	9.13	5.2%	-0.013	-5.85	-1.7%	-0.045	-18.50	-5.6%
High-school dummy	0.115	7.93	10.8%	0.094	6.74	9.0%	0.055	7.37	5.3%	-0.034	-4.30	-3.5%
Post high-school dummy	0.145	12.10	15.6%	0.116	10.00	12.3%	0.033	5.37	3.3%	-0.004	-0.54	-0.4%
Dummy for unavailable education data	0.140	6.45	15.1%	0.118	5.61	12.6%	-0.066	-5.94	-6.4%	0.088	7.39	9.2%
Immigration dummy	0.044	2.80	4.5%	-0.086	-5.71	-8.3%	0.047	5.92	4.8%	0.083	9.66	8.6%
Intercept	-6.189	-121.00		-3.130	-63.30		-0.148	-5.66		-0.200	-7.14	
Adjusted R^2	0.03			0.04			0.05			0.03		

In this table, we regress the contributors to the complete return loss onto household characteristics using the constant bank account imputation method. As in Table A2, we estimate the aggregate value of missing bank balances by taking the difference between: (1) the aggregate household deposits reported to the Swedish Central Bank, and (2) the aggregate bank balances in our dataset. The implied average balance is then assigned to each missing observation. Losses are computed in 2002 relative to the hedged index. The results confirm the robustness of the return loss regression to an alternative imputation method.

TABLE A4. DIVERSIFICATION LOSSES
No Imputed Balance

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.29	0.34	0.42	0.54	0.68	0.89
Unhedged World Index	0.19	0.07	0.14	0.24	0.40	0.58	0.85
Sweden Index	-0.03	-0.17	-0.08	0.04	0.25	0.48	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.57	0.52	1.11	1.95	3.17	4.53	8.88
Unhedged World Index	0.60	0.09	0.29	0.65	1.40	2.30	5.14
Sweden Index	-0.04	-0.35	-0.11	0.04	0.48	0.96	2.80
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.02	2.02	2.87	4.26	8.08	11.03	16.39
Unhedged World Index	1.66	0.41	0.85	1.72	4.36	6.46	10.69
Sweden Index	0.09	-0.82	-0.40	0.21	1.93	3.20	7.06
	Return Loss in Dollars						
Currency-hedged World Index	1129	65	210	632	1690	3007	10484
Unhedged World Index	526	12	54	195	594	1166	4860
Sweden Index	125	-88	-16	7	107	291	1591
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	2.64	0.23	0.72	2.18	5.53	9.55	28.75
Unhedged World Index	1.06	0.04	0.19	0.69	2.02	3.78	13.28
Sweden Index	0.01	-0.29	-0.05	0.02	0.40	1.09	5.27

The table reports the cross-sectional distribution of diversification losses in the absence of bank account imputation. Specifically, we exclude from the estimation all households with missing bank account data. The results confirm the robustness of our diversification estimates to the absence of bank account imputation.

TABLE A5. CONTRIBUTORS TO COMPLETE RETURN LOSS
No Imputed Balance

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.007	4.54	2.5%	-0.003	-2.07	-1.1%	0.006	8.17	2.3%	0.004	4.70	1.4%
Private pension premia/Income	0.699	4.99	2.8%	1.139	8.26	4.6%	0.077	1.11	0.3%	-0.517	-6.95	-2.0%
Financial wealth (in logs)	0.044	8.31	6.0%	0.080	15.40	11.3%	-0.013	-4.96	-1.7%	-0.023	-8.33	-3.1%
Real-estate wealth (in logs)	0.005	3.98	2.8%	0.005	3.95	2.8%	0.002	3.52	1.2%	-0.002	-3.12	-1.2%
Total liability (in logs)	0.020	15.10	12.7%	0.011	8.06	6.5%	0.011	16.60	6.8%	-0.001	-2.10	-0.9%
Retired dummy	0.028	1.26	2.8%	0.061	2.80	6.3%	-0.041	-3.72	-4.0%	0.008	0.67	0.8%
Unemployment dummy	-0.043	-1.65	-4.2%	-0.057	-2.23	-5.5%	0.006	0.46	0.6%	0.008	0.59	0.8%
Entrepreneur dummy	-0.230	-8.32	-20.5%	-0.330	-12.10	-28.1%	0.048	3.46	4.9%	0.053	3.58	5.4%
Student dummy	0.066	1.32	6.8%	0.074	1.51	7.7%	-0.033	-1.33	-3.3%	0.025	0.93	2.5%
Demographic Characteristics												
Age	0.001	1.34	1.5%	0.001	2.19	2.5%	-0.003	-7.72	-4.3%	0.002	5.71	3.5%
Household size	-0.006	-1.15	-0.8%	0.052	9.96	6.7%	-0.015	-5.76	-1.9%	-0.043	-15.20	-5.2%
High-school dummy	0.156	9.14	14.5%	0.128	7.59	12.0%	0.060	7.05	5.8%	-0.032	-3.47	-3.2%
Post high-school dummy	0.146	10.60	15.7%	0.118	8.70	12.5%	0.032	4.70	3.3%	-0.005	-0.62	-0.4%
Dummy for unavailable education data	0.141	5.76	15.2%	0.089	3.69	9.3%	-0.034	-2.78	-3.4%	0.086	6.62	9.0%
Immigration dummy	0.025	1.35	2.5%	-0.115	-6.38	-10.9%	0.054	5.86	5.5%	0.086	8.86	9.0%
Intercept	-5.652	-82.70		-2.648	-39.40		-0.083	-2.44		-0.209	-5.76	
Adjusted R^2	0.02			0.03			0.05			0.03		

The table reports the contributors to the complete return loss relative to the hedged index in the absence of bank account imputation. As in Table A4, we exclude from the estimation all households with missing bank account data. The results confirm that the results of the return loss regression are not driven by the imputation of unreported balances.

Capital insurance

TABLE A6. CAPITAL INSURANCE

A. Rescaled version of the cash and mutual fund portfolio

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.28	0.34	0.41	0.58	0.75	0.89
Unhedged World Index	0.19	0.06	0.13	0.23	0.46	0.67	0.86
Sweden Index	-0.03	-0.18	-0.09	0.03	0.32	0.59	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.54	0.45	1.07	1.93	3.22	4.82	8.79
Unhedged World Index	0.59	0.06	0.24	0.62	1.49	2.57	5.64
Sweden Index	-0.04	-0.38	-0.11	0.03	0.58	1.24	3.81

B. Rescaled version of the mutual fund portfolio

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.28	0.34	0.41	0.58	0.75	0.89
Unhedged World Index	0.18	0.06	0.13	0.23	0.45	0.67	0.86
Sweden Index	-0.03	-0.18	-0.09	0.03	0.31	0.59	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.62	0.52	1.18	2.05	3.31	4.89	8.84
Unhedged World Index	0.61	0.07	0.27	0.66	1.52	2.60	5.64
Sweden Index	-0.06	-0.42	-0.13	0.02	0.60	1.26	3.82

The table reports the cross-sectional distribution of diversification losses when capital insurance is included in the "complete" financial portfolio considered in the paper. For every household, the Swedish dataset provides only the overall value of capital insurance products, while the exact asset allocation is not observed. Capital insurance can be invested in cash and mutual funds, but not directly in stocks. We consider two alternative scenarios. In Panel A, the capital insurance portfolio is a rescaled version of the cash and mutual fund holdings in the "complete" portfolio. In Panel B, capital insurance is a rescaled version of mutual fund holdings alone.

Total risk decomposition

TABLE A7. TOTAL RISK DECOMPOSITION

	Return Loss $\ln(RL_{complete,h})$			Risky Share $\ln(w_h)$			Risky Portfolio Volatility $\ln(\sigma_h)$			Sharpe Ratio Loss $\ln\|RSRL_h\|$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.007	3.49	2.1%	-0.007	-3.83	-2.1%	0.011	14.30	3.4%	0.003	5.67	0.9%
Private pension premia/Income	0.248	3.36	1.8%	0.351	4.92	2.6%	-0.060	-2.07	-0.4%	-0.043	-2.19	-0.3%
Financial wealth (in logs)	0.090	20.20	14.1%	0.137	31.90	22.3%	-0.036	-20.40	-5.1%	-0.011	-9.23	-1.6%
Real-estate wealth (in logs)	0.008	7.97	5.1%	0.005	5.21	3.2%	0.003	7.00	1.8%	0.000	0.58	0.1%
Total liability (in logs)	0.012	9.40	7.0%	0.004	3.21	2.3%	0.008	16.40	4.8%	0.000	-0.67	-0.1%
Retired dummy	-0.043	-1.95	-4.2%	-0.023	-1.10	-2.3%	-0.034	-3.91	-3.4%	0.015	2.45	1.5%
Unemployment dummy	-0.086	-4.01	-8.2%	-0.105	-5.06	-9.9%	0.009	1.05	0.9%	0.010	1.75	1.0%
Entrepreneur dummy	-0.115	-4.01	-10.8%	-0.261	-9.40	-22.9%	0.116	10.20	12.3%	0.030	3.92	3.1%
Student dummy	0.020	0.65	2.0%	0.069	2.32	7.1%	-0.047	-3.90	-4.6%	-0.002	-0.20	-0.2%
Demographic Characteristics												
Age	-0.001	-1.97	-1.9%	-0.001	-2.01	-1.9%	-0.001	-4.28	-1.7%	0.001	6.19	1.7%
Household size	-0.143	-29.30	-16.9%	-0.086	-18.20	-10.5%	-0.031	-16.10	-3.9%	-0.026	-19.80	-3.3%
High-school dummy	0.111	6.87	10.5%	0.107	6.87	10.2%	0.030	4.64	2.9%	-0.026	-5.99	-2.6%
Post high-school dummy	0.173	13.20	18.9%	0.124	9.81	13.2%	0.042	8.10	4.3%	0.007	1.95	0.7%
Dummy for unavailable education data	0.112	4.62	11.9%	0.087	3.68	9.1%	-0.002	-0.19	-0.2%	0.028	4.22	2.8%
Immigration dummy	0.043	2.53	4.4%	-0.112	-6.76	-10.6%	0.099	14.50	10.4%	0.057	12.30	5.8%
Intercept	-1.093	-20.00		-2.751	-52.20		3.348	155.00		-0.896	-61.10	
Adjusted R^2	0.03			0.04			0.05			0.03		

The table reports how the three components of the "total risk decomposition" covary with household characteristics. Losses are relative to the hedged world index. For each regression, we compute the linear coefficient, standard deviation and marginal effect of each predicting variable. The marginal effect is assessed by computing the impact on the dependent variable (in levels) of increasing a continuous regressor by one standard deviation, or of setting a dummy variable equal to one.

Taxes

TABLE A8. DIVERSIFICATION LOSSES
Payers of the Wealth Tax Excluded

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.29	0.34	0.42	0.56	0.69	0.89
Unhedged World Index	0.19	0.07	0.14	0.24	0.42	0.60	0.85
Sweden Index	-0.02	-0.17	-0.08	0.04	0.27	0.49	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.63	0.52	1.13	1.98	3.29	4.97	9.94
Unhedged World Index	0.64	0.08	0.29	0.68	1.52	2.62	5.84
Sweden Index	-0.01	-0.36	-0.10	0.05	0.61	1.16	3.25
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.16	1.98	2.89	4.17	8.63	12.52	19.24
Unhedged World Index	1.76	0.39	0.86	1.68	4.61	7.07	12.11
Sweden Index	0.16	-0.83	-0.39	0.20	1.93	3.20	7.52
	Return Loss in Dollars						
Currency-hedged World Index	337	30	106	315	740	1179	2775
Unhedged World Index	136	5	26	97	264	473	1361
Sweden Index	3	-44	-7	3	58	149	601
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	1.34	0.12	0.42	1.24	2.99	4.98	12.13
Unhedged World Index	0.53	0.02	0.10	0.39	1.12	2.00	5.93
Sweden Index	-0.02	-0.17	-0.03	0.01	0.25	0.67	2.86

The table reports the cross sectional distribution of diversification losses on the subsample of households that do not pay the Swedish wealth tax. The results are very similar to the ones obtained in the paper for all participants, confirming that our basic findings are not caused by tax optimization strategies.

TABLE A9. CONTRIBUTORS TO COMPLETE RETURN LOSS
Payers of the Wealth Tax Excluded

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1\text{-}RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.033	6.95	5.4%	-0.010	-2.21	-1.6%	0.037	15.00	6.0%	0.007	2.68	1.1%
Private pension premia/Income	0.524	4.72	2.8%	0.621	5.78	3.3%	0.091	1.61	0.5%	-0.188	-3.07	-1.0%
Financial wealth (in logs)	0.071	13.50	9.6%	0.139	27.50	19.8%	-0.033	-12.50	-4.2%	-0.035	-12.30	-4.5%
Real-estate wealth (in logs)	0.008	7.22	5.0%	0.005	5.15	3.4%	0.003	5.06	1.7%	0.000	-0.59	-0.2%
Total liability (in logs)	0.007	5.06	4.0%	0.001	0.81	0.6%	0.008	11.10	4.5%	-0.002	-2.43	-1.0%
Retired dummy	-0.033	-1.33	-3.3%	-0.029	-1.18	-2.8%	-0.039	-3.05	-3.8%	0.034	2.48	3.5%
Unemployment dummy	-0.087	-3.90	-8.3%	-0.115	-5.36	-10.9%	0.004	0.35	0.4%	0.025	2.01	2.5%
Entrepreneur dummy	-0.077	-2.38	-7.4%	-0.251	-8.03	-22.2%	0.123	7.51	13.1%	0.051	2.89	5.3%
Student dummy	0.025	0.81	2.6%	0.060	1.95	6.1%	-0.039	-2.45	-3.8%	0.005	0.28	0.5%
Demographic Characteristics												
Age	-0.002	-3.14	-3.2%	-0.001	-2.40	-2.4%	-0.003	-8.87	-4.6%	0.002	6.68	3.9%
Household size	-0.156	-28.20	-18.5%	-0.087	-16.30	-10.8%	-0.021	-7.56	-2.7%	-0.048	-15.80	-6.1%
High-school dummy	0.094	5.46	8.9%	0.104	6.26	9.9%	0.046	5.26	4.5%	-0.056	-5.92	-5.8%
Post high-school dummy	0.179	12.70	19.5%	0.133	9.76	14.2%	0.042	5.86	4.3%	0.004	0.54	0.4%
Dummy for unavailable education data	0.085	3.11	8.8%	0.068	2.60	7.1%	-0.056	-4.07	-5.4%	0.072	4.83	7.5%
Immigration dummy	0.044	2.43	4.5%	-0.119	-6.74	-11.2%	0.048	5.16	4.9%	0.115	11.50	12.2%
Intercept	-0.826	-13.30		-2.719	-45.10		0.091	2.89		-0.092	-2.68	
Adjusted R^2	0.03			0.03			0.06			0.03		

The table reports the contributors to the complete return loss relative to the hedged index in 2002 on the subsample of households that do not pay the Swedish wealth tax. The results are very similar to the ones obtained in the paper for all participants, confirming that our basic findings are not caused by tax optimization strategies.

Benchmark index

TABLE A10. CONTRIBUTORS TO COMPLETE RETURN LOSS
Relative to Unhedged Index

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.014	5.60	4.5%	-0.007	-3.83	-2.1%	0.009	9.12	2.7%	0.013	5.82	3.9%
Private pension premia/Income	0.176	1.78	1.3%	0.351	4.92	2.6%	-0.016	-0.44	-0.1%	-0.159	-1.90	-1.2%
Financial wealth (in logs)	0.063	10.60	9.7%	0.137	31.90	22.3%	-0.016	-6.93	-2.2%	-0.059	-11.60	-8.2%
Real-estate wealth (in logs)	0.008	5.49	4.7%	0.005	5.21	3.2%	0.003	6.65	2.1%	-0.001	-0.91	-0.6%
Total liability (in logs)	0.011	6.37	6.3%	0.004	3.21	2.3%	0.010	15.00	5.6%	-0.003	-1.88	-1.5%
Retired dummy	-0.014	-0.49	-1.4%	-0.023	-1.10	-2.3%	-0.050	-4.53	-4.9%	0.059	2.36	6.1%
Unemployment dummy	-0.054	-1.89	-5.3%	-0.105	-5.06	-9.9%	-0.001	-0.11	-0.1%	0.052	2.13	5.3%
Entrepreneur dummy	-0.050	-1.31	-4.9%	-0.261	-9.40	-22.9%	0.097	6.75	10.2%	0.114	3.49	12.0%
Student dummy	-0.007	-0.18	-0.7%	0.069	2.32	7.1%	-0.053	-3.44	-5.2%	-0.023	-0.67	-2.3%
Demographic Characteristics												
Age	0.001	0.85	1.1%	-0.001	-2.01	-1.9%	-0.002	-7.56	-3.7%	0.004	6.05	7.0%
Household size	-0.194	-29.80	-22.2%	-0.086	-18.20	-10.5%	-0.010	-4.13	-1.3%	-0.098	-17.70	-11.9%
High-school dummy	0.070	3.24	6.8%	0.107	6.87	10.2%	0.057	7.06	5.6%	-0.094	-5.15	-9.9%
Post high-school dummy	0.178	10.20	19.4%	0.124	9.81	13.2%	0.042	6.47	4.3%	0.011	0.75	1.1%
Dummy for unavailable education data	0.161	4.94	17.5%	0.087	3.68	9.1%	-0.037	-3.04	-3.7%	0.111	4.03	11.8%
Immigration dummy	0.155	6.75	16.7%	-0.112	-6.76	-10.6%	0.045	5.26	4.6%	0.221	11.40	24.8%
Intercept	-2.104	-28.90		-2.751	-52.20		-0.108	-3.95		-1.139	-18.40	
Adjusted R^2	0.02			0.04			0.05			0.03		

The table reports the contributors to the complete return loss relative to the *unhedged* version of the world index. Under the global CAPM, the log complete portfolio return loss relative to the benchmark unhedged index is the sum of: the log of the equity premium; the log risky share; the log risky portfolio beta with the hedged index; and the log diversification loss relative to the unhedged benchmark. As with the hedged index considered in Table 5 of the paper, more sophisticated households are more efficient but also more aggressive, resulting in higher return losses on the complete portfolio.

Year of observation

TABLE A11. DIVERSIFICATION LOSSES
Year 1999

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.30	0.35	0.41	0.58	0.70	0.93
Unhedged World Index	0.19	0.09	0.14	0.23	0.45	0.61	0.91
Sweden Index	-0.02	-0.15	-0.08	0.03	0.31	0.51	0.89
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	2.31	0.82	1.62	2.60	4.56	6.94	13.70
Unhedged World Index	0.97	0.15	0.44	0.91	2.23	3.89	8.60
Sweden Index	0.08	-0.43	-0.15	0.03	0.84	1.92	5.43
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.34	2.16	2.96	4.03	8.04	11.92	30.83
Unhedged World Index	1.93	0.49	0.88	1.68	4.42	7.22	21.64
Sweden Index	0.32	-0.78	-0.38	0.15	2.06	4.45	15.77
	Return Loss in Dollars						
Currency-hedged World Index	2546	61	259	962	3188	6635	29115
Unhedged World Index	1259	11	72	294	1153	2810	14277
Sweden Index	401	-103	-14	2	174	653	5126
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	6.51	0.27	1.13	4.03	12.04	22.42	81.25
Unhedged World Index	2.89	0.05	0.31	1.27	4.48	9.43	40.05
Sweden Index	0.49	-0.43	-0.06	0.01	0.76	2.51	15.86

The table reports the cross-sectional distribution of diversification losses in 1999. The estimates are based on the set of participants from a random sample of 100,000 households.

TABLE A12. DIVERSIFICATION LOSSES
Year 2000

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.37	0.30	0.34	0.41	0.52	0.67	0.89
Unhedged World Index	0.18	0.08	0.14	0.23	0.38	0.57	0.85
Sweden Index	-0.03	-0.16	-0.08	0.03	0.21	0.46	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	2.24	0.82	1.62	2.64	4.62	6.76	12.04
Unhedged World Index	0.90	0.14	0.42	0.93	2.22	3.63	7.16
Sweden Index	0.00	-0.47	-0.17	0.03	0.79	1.65	4.46
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.23	2.13	2.96	4.31	8.33	11.04	22.89
Unhedged World Index	1.79	0.44	0.88	1.72	4.51	6.57	14.63
Sweden Index	0.17	-0.82	-0.41	0.16	1.93	3.28	9.69
	Return Loss in Dollars						
Currency-hedged World Index	1871	58	234	847	2666	5496	23100
Unhedged World Index	844	10	61	260	938	2123	10227
Sweden Index	160	-101	-15	2	128	427	3055
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	4.94	0.25	0.99	3.38	9.80	17.75	58.65
Unhedged World Index	2.05	0.04	0.25	1.08	3.51	7.03	27.60
Sweden Index	0.12	-0.40	-0.06	0.01	0.55	1.66	9.69

The table reports the cross-sectional distribution of diversification losses in 2000. The estimates are based on the set of participants from a random sample of 100,000 households.

TABLE A13. DIVERSIFICATION LOSSES
Year 2001

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.37	0.30	0.34	0.41	0.53	0.68	0.89
Unhedged World Index	0.18	0.08	0.14	0.23	0.38	0.58	0.85
Sweden Index	-0.03	-0.16	-0.08	0.03	0.22	0.47	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.98	0.71	1.44	2.41	4.02	5.85	10.75
Unhedged World Index	0.77	0.12	0.38	0.83	1.86	3.08	6.40
Sweden Index	-0.03	-0.43	-0.15	0.03	0.65	1.35	3.65
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.13	2.09	2.96	4.18	8.01	10.85	21.68
Unhedged World Index	1.73	0.44	0.88	1.68	4.23	6.45	13.31
Sweden Index	0.13	-0.81	-0.40	0.19	1.84	3.20	8.48
	Return Loss in Dollars						
Currency-hedged World Index	1495	53	208	730	2166	4211	15607
Unhedged World Index	670	9	54	224	757	1607	6819
Sweden Index	120	-92	-14	3	104	317	1946
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	3.71	0.22	0.83	2.77	7.60	13.58	41.93
Unhedged World Index	1.49	0.04	0.21	0.88	2.74	5.27	18.83
Sweden Index	0.02	-0.34	-0.06	0.01	0.42	1.24	6.52

The table reports the cross-sectional distribution of diversification losses in 2001. The estimates are based on the set of participants from a random sample of 100,000 households.

TABLE A14. DIVERSIFICATION LOSSES
Year 2002 – Alternative Sample

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.38	0.29	0.35	0.42	0.55	0.69	0.89
Unhedged World Index	0.19	0.07	0.14	0.24	0.41	0.60	0.85
Sweden Index	-0.02	-0.16	-0.08	0.04	0.26	0.49	0.82
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.67	0.54	1.18	2.05	3.41	5.05	9.59
Unhedged World Index	0.66	0.09	0.30	0.71	1.55	2.62	5.70
Sweden Index	-0.02	-0.36	-0.11	0.05	0.58	1.13	3.19
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.09	2.01	2.90	4.26	8.30	11.81	17.23
Unhedged World Index	1.71	0.41	0.87	1.74	4.54	7.00	10.92
Sweden Index	0.13	-0.82	-0.39	0.20	1.93	3.20	7.52
	Return Loss in Dollars						
Currency-hedged World Index	884	40	146	477	1333	2441	8508
Unhedged World Index	409	7	37	147	469	927	3754
Sweden Index	92	-62	-9	4	84	230	1297
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	2.22	0.15	0.54	1.74	4.66	8.17	24.95
Unhedged World Index	0.90	0.03	0.13	0.55	1.71	3.21	11.59
Sweden Index	0.01	-0.22	-0.03	0.02	0.32	0.92	4.45

The table reports the cross-sectional distribution of diversification losses at the end of 2002 for an alternative sample of households than the one considered in the paper. We have drawn a new random sample of 100,000 households and reestimated the diversification losses on the subset of participants. The table confirms the robustness of our results to the choice of an alternative sample.

TABLE A15. CONTRIBUTORS TO COMPLETE RETURN LOSS
Year 1999

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	-0.001	-0.24	-0.1%	-0.022	-10.40	-4.3%	0.008	7.42	1.7%	0.013	8.69	2.6%
Private pension premia/Income	0.007	0.09	0.0%	0.154	2.15	0.8%	-0.056	-1.43	-0.3%	-0.092	-1.82	-0.5%
Financial wealth (in logs)	0.287	79.10	68.8%	0.272	81.20	64.5%	0.042	23.20	8.1%	-0.028	-12.00	-5.0%
Real-estate wealth (in logs)	-0.005	-5.29	-3.0%	-0.006	-6.85	-3.6%	-0.001	-1.85	-0.5%	0.002	3.05	1.2%
Total liability (in logs)	0.029	27.10	18.0%	0.017	17.30	10.3%	0.012	21.40	6.8%	0.000	0.31	0.1%
Retired dummy	-0.091	-4.89	-8.7%	-0.052	-3.04	-5.1%	-0.029	-3.07	-2.9%	-0.010	-0.82	-1.0%
Unemployment dummy	-0.080	-4.88	-7.7%	-0.077	-5.12	-7.4%	0.006	0.75	0.6%	-0.009	-0.82	-0.9%
Entrepreneur dummy	-0.205	-8.67	-18.6%	-0.293	-13.40	-25.4%	0.025	2.08	2.5%	0.063	4.08	6.5%
Student dummy	0.029	0.96	3.0%	0.077	2.73	8.0%	-0.040	-2.59	-3.9%	-0.008	-0.39	-0.8%
Demographic Characteristics												
Age	-0.004	-8.16	-7.0%	-0.003	-7.08	-5.6%	-0.004	-14.10	-6.1%	0.003	8.46	5.0%
Household size	-0.184	-44.00	-21.1%	-0.122	-31.60	-14.6%	-0.017	-8.21	-2.2%	-0.044	-16.30	-5.6%
High-school dummy	0.059	4.32	5.8%	0.070	5.49	6.8%	0.031	4.39	3.0%	-0.041	-4.60	-4.2%
Post high-school dummy	0.165	14.30	18.0%	0.085	8.02	8.9%	0.025	4.36	2.6%	0.054	7.27	5.6%
Dummy for unavailable education data	0.057	2.76	5.8%	-0.012	-0.62	-1.2%	-0.035	-3.37	-3.4%	0.104	7.76	10.9%
Immigration dummy	0.033	2.24	3.4%	-0.049	-3.58	-4.8%	0.031	4.08	3.1%	0.052	5.37	5.3%
Intercept	-7.452	-162.00		-3.840	-90.00		-0.657	-28.20		-0.244	-8.15	
Adjusted R^2	0.14			0.13			0.05			0.02		

The table reports the contributors to the complete return loss relative to the hedged index in 1999. The results confirm the robustness of Table 5 in the paper to the choice of an alternative year.

TABLE A16. CONTRIBUTORS TO COMPLETE RETURN LOSS
Year 2000

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.003	2.32	0.9%	-0.006	-5.92	-2.0%	0.005	8.17	1.5%	0.004	6.39	1.5%
Private pension premia/Income	0.147	0.99	0.4%	0.721	5.32	2.0%	-0.207	-2.92	-0.6%	-0.367	-4.12	-1.0%
Financial wealth (in logs)	0.242	71.20	55.4%	0.235	76.00	53.5%	0.031	19.30	5.9%	-0.024	-12.00	-4.4%
Real-estate wealth (in logs)	-0.003	-3.14	-1.7%	-0.003	-4.16	-2.1%	0.000	1.11	0.3%	0.000	0.19	0.1%
Total liability (in logs)	0.029	27.50	17.7%	0.016	16.90	9.5%	0.012	23.40	6.8%	0.001	1.64	0.6%
Retired dummy	-0.056	-3.16	-5.5%	-0.029	-1.77	-2.8%	-0.031	-3.63	-3.0%	0.003	0.31	0.3%
Unemployment dummy	-0.045	-2.79	-4.4%	-0.051	-3.49	-5.0%	-0.006	-0.73	-0.6%	0.012	1.22	1.2%
Entrepreneur dummy	-0.163	-7.18	-15.0%	-0.282	-13.70	-24.5%	0.041	3.83	4.2%	0.078	5.75	8.1%
Student dummy	-0.012	-0.40	-1.2%	0.075	2.69	7.8%	-0.070	-4.80	-6.8%	-0.017	-0.93	-1.7%
Demographic Characteristics												
Age	-0.004	-8.64	-7.1%	-0.003	-6.49	-4.9%	-0.004	-15.40	-6.0%	0.002	7.66	4.0%
Household size	-0.170	-43.40	-19.7%	-0.107	-30.00	-12.9%	-0.023	-12.20	-2.9%	-0.040	-17.30	-5.1%
High-school dummy	0.120	9.60	11.3%	0.096	8.47	9.2%	0.047	7.89	4.6%	-0.023	-3.11	-2.4%
Post high-school dummy	0.130	12.20	13.9%	0.074	7.56	7.7%	0.021	4.18	2.2%	0.035	5.52	3.6%
Dummy for unavailable education data	0.090	4.60	9.4%	0.030	1.67	3.0%	-0.041	-4.41	-4.0%	0.101	8.65	10.6%
Immigration dummy	0.065	4.69	6.7%	-0.045	-3.57	-4.4%	0.048	7.29	4.9%	0.062	7.49	6.4%
Intercept	-6.964	-161.00		-3.487	-88.40		-0.473	-22.90		-0.293	-11.30	
Adjusted R^2	0.11			0.11			0.06			0.02		

The table reports the contributors to the complete return loss relative to the hedged index in 2000. The results confirm the robustness of Table 5 in the paper to the choice of an alternative year.

TABLE A17. CONTRIBUTORS TO COMPLETE RETURN LOSS
Year 2001

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.003	2.63	1.0%	-0.005	-4.68	-1.7%	0.004	7.40	1.4%	0.004	5.86	1.3%
Private pension premia/Income	0.303	2.66	1.1%	0.662	6.20	2.4%	-0.017	-0.30	-0.1%	-0.341	-5.26	-1.2%
Financial wealth (in logs)	0.183	50.50	38.9%	0.190	56.20	40.7%	0.019	10.40	3.4%	-0.026	-12.70	-4.6%
Real-estate wealth (in logs)	-0.001	-0.87	-0.5%	-0.002	-1.84	-1.0%	0.002	5.20	1.5%	-0.002	-3.06	-1.0%
Total liability (in logs)	0.025	22.60	15.1%	0.014	13.70	8.3%	0.011	20.70	6.6%	-0.001	-1.01	-0.4%
Retired dummy	-0.026	-1.40	-2.5%	0.011	0.64	1.1%	-0.034	-3.72	-3.4%	-0.003	-0.25	-0.3%
Unemployment dummy	-0.083	-4.57	-7.9%	-0.081	-4.79	-7.8%	0.001	0.11	0.1%	-0.003	-0.25	-0.3%
Entrepreneur dummy	-0.157	-6.73	-14.6%	-0.282	-12.90	-24.6%	0.055	4.74	5.7%	0.070	5.23	7.2%
Student dummy	0.019	0.59	2.0%	0.052	1.69	5.4%	-0.037	-2.26	-3.6%	0.004	0.23	0.4%
Demographic Characteristics												
Age	-0.003	-5.72	-5.0%	-0.002	-4.61	-3.8%	-0.003	-12.00	-5.2%	0.002	7.99	4.1%
Household size	-0.138	-33.80	-16.2%	-0.078	-20.40	-9.5%	-0.018	-8.85	-2.3%	-0.042	-18.20	-5.2%
High-school dummy	0.123	9.33	11.6%	0.099	7.98	9.4%	0.047	7.22	4.6%	-0.023	-3.04	-2.3%
Post high-school dummy	0.142	12.80	15.2%	0.105	10.10	11.1%	0.028	5.03	2.8%	0.009	1.42	0.9%
Dummy for unavailable education data	0.114	5.67	12.0%	0.068	3.64	7.1%	-0.055	-5.55	-5.4%	0.101	8.85	10.6%
Immigration dummy	0.056	3.91	5.8%	-0.056	-4.17	-5.5%	0.040	5.65	4.1%	0.072	8.82	7.5%
Intercept	-6.532	-140.00		-3.195	-73.40		-0.397	-17.20		-0.228	-8.62	
Adjusted R^2	0.07			0.07			0.05			0.03		

The table reports the contributors to the complete return loss relative to the hedged index in 2001. The results confirm the robustness of Table 5 in the paper to the choice of an alternative year.

TABLE A18. CONTRIBUTORS TO COMPLETE RETURN LOSS
Year 2002 – Alternative Sample

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.005	4.53	1.9%	-0.002	-2.01	-0.8%	0.005	7.98	1.7%	0.003	4.40	1.0%
Private pension premia/Income	0.678	5.13	2.3%	1.082	8.46	3.7%	0.073	1.08	0.2%	-0.477	-6.59	-1.6%
Financial wealth (in logs)	0.095	23.50	17.6%	0.132	33.70	25.3%	-0.010	-4.77	-1.7%	-0.027	-12.20	-4.5%
Real-estate wealth (in logs)	0.005	5.62	3.6%	0.004	4.65	2.9%	0.003	5.58	1.8%	-0.002	-3.16	-1.1%
Total liability (in logs)	0.016	13.90	9.8%	0.006	5.54	3.7%	0.011	18.70	6.6%	-0.001	-1.78	-0.7%
Retired dummy	-0.031	-1.57	-3.1%	0.013	0.70	1.4%	-0.043	-4.29	-4.2%	-0.001	-0.11	-0.1%
Unemployment dummy	-0.095	-4.69	-9.0%	-0.105	-5.39	-10.0%	0.005	0.46	0.5%	0.006	0.52	0.6%
Entrepreneur dummy	-0.182	-7.19	-16.6%	-0.298	-12.20	-25.8%	0.065	5.05	6.7%	0.051	3.69	5.2%
Student dummy	-0.033	-0.90	-3.3%	-0.001	-0.03	-0.1%	-0.046	-2.46	-4.5%	0.014	0.70	1.4%
Demographic Characteristics												
Age	0.000	0.48	0.5%	0.000	-0.33	-0.3%	-0.002	-8.24	-4.0%	0.003	9.13	4.9%
Household size	-0.132	-29.60	-15.5%	-0.073	-17.00	-8.9%	-0.013	-5.86	-1.7%	-0.045	-18.50	-5.6%
High-school dummy	0.118	8.12	11.1%	0.097	6.91	9.2%	0.055	7.40	5.3%	-0.034	-4.28	-3.5%
Post high-school dummy	0.166	13.90	18.0%	0.136	11.80	14.6%	0.033	5.46	3.4%	-0.004	-0.55	-0.4%
Dummy for unavailable education data	0.128	5.87	13.6%	0.106	5.03	11.2%	-0.066	-5.96	-6.4%	0.088	7.38	9.2%
Immigration dummy	0.028	1.78	2.8%	-0.103	-6.84	-9.8%	0.048	6.01	4.9%	0.083	9.75	8.7%
Intercept	-5.861	-115.00		-2.802	-56.70		-0.147	-5.66		-0.200	-7.15	
Adjusted R^2	0.04			0.04			0.05			0.03		

The table reports the contributors to the complete return loss for an alternative sample of households than the one considered in the paper. We have drawn a new random sample of 100,000 households and reestimated the loss regression on the subset of participants. Losses are computed in 2002 relative to the hedged world index. The table confirms the robustness of our results to the choice of an alternative sample.

TABLE A19. CONTRIBUTORS TO COMPLETE RETURN LOSS
Year 2002 – Alternative Sample and Maintained Participation Dummy

	Return Loss $\ln(RL_{complete,h})$			**Risky Share $\ln(w_h)$**			**Risky Portfolio Beta $\ln\lvert\beta_h\rvert$**			**Diversification Loss $\ln\lvert RSRL_h/(1\text{-}RSRL_h)\rvert$**		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.006	5.03	2.1%	-0.002	-1.53	-0.6%	0.005	8.09	1.8%	0.003	4.23	1.0%
Private pension premia/Income	0.554	4.22	1.9%	0.907	7.22	3.1%	0.071	1.05	0.2%	-0.425	-5.88	-1.4%
Financial wealth (in logs)	0.072	17.70	13.1%	0.100	25.70	18.6%	-0.010	-4.94	-1.8%	-0.018	-7.98	-3.0%
Real-estate wealth (in logs)	0.004	3.96	2.5%	0.002	2.30	1.4%	0.003	5.52	1.8%	-0.001	-1.98	-0.7%
Total liability (in logs)	0.016	13.80	9.7%	0.006	5.31	3.5%	0.011	18.70	6.6%	-0.001	-1.61	-0.6%
Retired dummy	-0.030	-1.54	-3.0%	0.014	0.75	1.4%	-0.043	-4.28	-4.2%	-0.001	-0.11	-0.1%
Unemployment dummy	-0.089	-4.43	-8.5%	-0.098	-5.10	-9.3%	0.005	0.52	0.5%	0.004	0.33	0.4%
Entrepreneur dummy	-0.176	-7.01	-16.1%	-0.288	-12.00	-25.0%	0.065	5.05	6.7%	0.048	3.46	4.9%
Student dummy	-0.048	-1.32	-4.7%	-0.019	-0.54	-1.9%	-0.048	-2.54	-4.7%	0.019	0.93	1.9%
Demographic Characteristics												
Age	-0.001	-2.02	-1.9%	-0.002	-3.87	-3.5%	-0.002	-8.30	-4.0%	0.003	10.80	5.9%
Household size	-0.137	-31.00	-16.0%	-0.080	-18.90	-9.7%	-0.013	-5.89	-1.7%	-0.043	-17.80	-5.4%
High-school dummy	0.110	7.64	10.4%	0.086	6.28	8.3%	0.054	7.35	5.3%	-0.031	-3.95	-3.2%
Post high-school dummy	0.154	13.00	16.6%	0.120	10.60	12.8%	0.032	5.33	3.3%	0.001	0.15	0.1%
Dummy for unavailable education data	0.131	6.08	14.0%	0.110	5.33	11.7%	-0.066	-5.93	-6.4%	0.087	7.32	9.1%
Immigration dummy	0.065	4.23	6.8%	-0.049	-3.33	-4.8%	0.048	6.01	4.9%	0.067	7.85	6.9%
Lagged participation dummy	0.529	35.10	69.7%	0.726	50.10	106.6%	0.011	1.40	1.1%	-0.207	-25.00	-18.7%
Intercept	-5.944	-117.00		-2.915	-60.00		-0.149	-5.71		-0.168	-6.03	
Adjusted R^2	0.05			0.08			0.05			0.04		

The table reports how household experience of risky asset markets affects the contributors to the complete return loss. We proxy experience by a lagged participation dummy that is equal to 1 if and only if the household held risky assets at the end of every year during the 1999-2002 period. Maintained participation is associated with both a higher risky share and a higher Sharpe ratio, resulting in substantially higher return losses.

Asset pricing model

TABLE A20. DIVERSIFICATION LOSSES
Fama and French Factors

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.35	0.25	0.32	0.40	0.53	0.68	0.89
Unhedged World Index	0.18	0.06	0.14	0.25	0.41	0.60	0.86
Sweden Index	0.05	-0.09	0.00	0.13	0.31	0.54	0.84
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.54	0.48	1.04	1.83	3.12	4.71	9.58
Unhedged World Index	0.66	0.07	0.29	0.72	1.57	2.69	6.10
Sweden Index	0.20	-0.17	0.00	0.22	0.89	1.68	4.28
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	3.83	1.81	2.55	3.84	7.75	11.86	17.86
Unhedged World Index	1.78	0.34	0.86	1.72	4.50	6.91	12.08
Sweden Index	0.67	-0.49	0.02	0.81	2.87	4.65	8.99
	Return Loss in Dollars						
Currency-hedged World Index	638	33	118	383	1039	1922	6345
Unhedged World Index	278	5	30	121	388	762	2894
Sweden Index	85	-21	0	24	138	324	1522
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	1.88	0.13	0.46	1.45	3.94	6.85	20.82
Unhedged World Index	0.79	0.02	0.12	0.48	1.53	2.92	10.19
Sweden Index	0.20	-0.08	0.00	0.10	0.57	1.33	5.60

The table reports the cross-sectional distribution of diversification losses under the Fama and French model. Asset returns are driven by the following three factors: (1) the excess return on the currency-hedged world index in dollars relative to the US T-bill; (2) the US size factor; and (3) the US value factor. Household diversification losses are computed at the end of 2002. The results confirm the robustness of our loss estimates to the choice of an alternative asset pricing model.

TABLE A21. CONTRIBUTORS TO COMPLETE RETURN LOSSES
Fama and French Factors

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Expected Return** $\ln\|Er_h\|$			**Diversification Loss** $\ln\|RSRL_h/(1-RSRL_h)\|$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.006	2.95	1.8%	-0.007	-3.83	-2.1%	0.009	9.25	2.7%	0.004	3.57	1.2%
Private pension premia/Income	0.256	3.43	1.9%	0.351	4.92	2.6%	-0.026	-0.70	-0.2%	-0.070	-1.60	-0.5%
Financial wealth (in logs)	0.075	16.60	11.6%	0.137	31.90	22.3%	-0.010	-4.36	-1.4%	-0.053	-20.20	-7.5%
Real-estate wealth (in logs)	0.008	7.61	5.0%	0.005	5.21	3.2%	0.003	6.85	2.2%	-0.001	-1.25	-0.5%
Total liability (in logs)	0.011	8.49	6.4%	0.004	3.21	2.3%	0.010	15.40	5.6%	-0.003	-3.62	-1.5%
Retired dummy	-0.040	-1.81	-4.0%	-0.023	-1.10	-2.3%	-0.051	-4.65	-5.0%	0.034	2.60	3.5%
Unemployment dummy	-0.074	-3.42	-7.1%	-0.105	-5.06	-9.9%	-0.005	-0.48	-0.5%	0.036	2.84	3.6%
Entrepreneur dummy	-0.144	-4.96	-13.4%	-0.261	-9.40	-22.9%	0.105	7.40	11.1%	0.012	0.69	1.2%
Student dummy	0.010	0.32	1.0%	0.069	2.32	7.1%	-0.048	-3.17	-4.7%	-0.011	-0.59	-1.1%
Demographic Characteristics												
Age	-0.002	-3.41	-3.4%	-0.001	-2.01	-1.9%	-0.002	-5.89	-2.8%	0.001	2.40	1.4%
Household size	-0.142	-28.70	-16.7%	-0.086	-18.20	-10.5%	-0.012	-4.99	-1.5%	-0.044	-15.20	-5.5%
High-school dummy	0.111	6.82	10.5%	0.107	6.87	10.2%	0.056	7.06	5.5%	-0.052	-5.50	-5.4%
Post high-school dummy	0.165	12.50	18.0%	0.124	9.81	13.2%	0.044	6.80	4.5%	-0.003	-0.38	-0.3%
Dummy for unavailable education data	0.107	4.34	11.3%	0.087	3.68	9.1%	-0.030	-2.46	-2.9%	0.050	3.48	5.1%
Immigration dummy	0.052	3.01	5.4%	-0.112	-6.76	-10.6%	0.042	4.92	4.3%	0.122	12.10	13.0%
Intercept	-0.963	-17.40		-2.751	-52.20		1.733	64.10		0.055	1.72	
Adjusted R^2	0.03			0.04			0.04			0.03		

The table reports the contributors to the complete return loss under the Fama and French three factor model. The estimation is based on: (1) the excess return on the currency-hedged world index in dollars relative to the US T-bill; (2) the US size factor; and (3) the US value factor. Diversification losses are computed in 2002 relative to currency-hedged world index. The table confirms the robustness of our results to the choice of an alternative asset pricing model.

Availability of leverage

TABLE A22. LIST OF HIGH SIGMA/HIGH SR FUNDS
Leverage

Fund Name	Standard Deviation of Returns	Sharpe Ratio	Mean Return	Beta
Erik Penser Index Sverige 2	93.7%	36.6%	34.3%	5.16
Evli US Emerging Tech	88.3%	38.4%	34.0%	5.11
Firstnordic SRI Europe	82.3%	37.2%	30.6%	4.60
Firstnordic Global	62.6%	36.5%	22.8%	3.44
Union Invest New Markets	61.3%	37.8%	23.2%	3.49
Skandia Fond Time Aggressive	57.7%	37.4%	21.6%	3.25
Evli Emerging Technologies	56.9%	37.6%	21.4%	3.22
Union Invest UniDynamic Global	47.0%	37.9%	17.8%	2.68
Erik Penser Trippelfond Finans	45.3%	39.3%	17.8%	2.68
Banco Global Tillväxt	41.2%	38.9%	16.0%	2.41

The table reports the risk characteristics of mutual funds with high standard deviation of returns and high Sharpe ratios, which can be used to compute reasonable proxies of the efficient frontier in the presence of leverage constraints. For each fund, we report in annual units: (1) the standard deviation of returns; (2) the estimated Sharpe ratio; (3) the mean return computed with the global CAPM; and (4) the fund's beta coefficient relative to the currency-hedged world index.

TABLE A23. DIVERSIFICATION LOSSES
Leverage

A. Firstnordic Global

Cross-Sectional Distribution						
Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
Complete Portfolio Relative Sharpe Ratio Loss						
0.35	0.28	0.32	0.38	0.50	0.63	0.89
Complete Portfolio Return Loss (%)						
1.36	0.49	1.06	1.81	2.77	3.80	6.45
Risky Portfolio Return Loss (%)						
3.20	1.88	2.59	3.53	6.09	8.01	12.01
Return Loss in Dollars						
624	32	116	385	1054	1917	6293
Return Loss as a Fraction of Disposable Income (%)						
1.81	0.13	0.44	1.45	3.90	6.81	19.97

B. Erik Penser Trippelfond

Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
Complete Portfolio Relative Sharpe Ratio Loss						
0.35	0.28	0.32	0.37	0.49	0.62	0.89
Complete Portfolio Return Loss (%)						
1.32	0.49	1.06	1.79	2.67	3.49	5.69
Risky Portfolio Return Loss (%)						
2.98	1.88	2.60	3.36	5.10	6.69	9.22
Return Loss in Dollars						
645	33	120	398	1084	1974	6557
Return Loss as a Fraction of Disposable Income (%)						
1.84	0.13	0.46	1.49	4.01	6.97	20.41

The table reports the cross-sectional distribution of diversification losses relative to the efficient frontier in the presence of leverage constraints. The frontier is proxied by unleveraged portfolios of the riskless asset, the currency-hedged index, and a risky mutual fund. We choose the latter fund to be either Firstnordic Global (Panel A) or Erik Penser Trippelfond (Panel B).

TABLE A24. CONTRIBUTORS TO COMPLETE RETURN LOSS
Leverage with Firstnordic Global

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.003	1.83	1.0%	-0.006	-3.51	-1.9%	0.008	8.63	2.6%	0.002	1.50	0.5%
Private pension premia/Income	0.271	3.78	2.0%	0.349	5.00	2.6%	-0.011	-0.29	-0.1%	-0.067	-1.72	-0.5%
Financial wealth (in logs)	0.106	24.40	16.8%	0.132	31.10	21.2%	-0.014	-6.07	-2.0%	-0.012	-4.97	-1.7%
Real-estate wealth (in logs)	0.008	7.70	4.8%	0.005	5.41	3.3%	0.003	6.67	2.1%	-0.001	-1.79	-0.6%
Total liability (in logs)	0.010	8.37	6.1%	0.005	3.74	2.6%	0.010	15.00	5.6%	-0.004	-5.40	-2.1%
Retired dummy	-0.032	-1.49	-3.2%	-0.019	-0.90	-1.9%	-0.049	-4.45	-4.8%	0.036	3.05	3.7%
Unemployment dummy	-0.096	-4.59	-9.2%	-0.108	-5.33	-10.3%	-0.002	-0.16	-0.2%	0.014	1.25	1.4%
Entrepreneur dummy	-0.167	-5.95	-15.3%	-0.272	-10.00	-23.8%	0.097	6.77	10.2%	0.009	0.56	0.9%
Student dummy	0.036	1.20	3.7%	0.080	2.72	8.3%	-0.057	-3.69	-5.5%	0.013	0.82	1.4%
Demographic Characteristics												
Age	-0.001	-1.28	-1.2%	-0.001	-2.03	-1.9%	-0.002	-6.93	-3.4%	0.002	7.78	4.2%
Household size	-0.132	-27.80	-15.7%	-0.089	-19.20	-10.9%	-0.008	-3.26	-1.0%	-0.035	-13.60	-4.5%
High-school dummy	0.102	6.47	9.7%	0.100	6.56	9.6%	0.058	7.18	5.6%	-0.057	-6.57	-5.8%
Post high-school dummy	0.157	12.20	16.9%	0.121	9.72	12.8%	0.041	6.27	4.2%	-0.005	-0.76	-0.5%
Dummy for unavailable education data	0.104	4.38	11.0%	0.085	3.69	8.9%	-0.040	-3.28	-3.9%	0.059	4.53	6.1%
Immigration dummy	-0.003	-0.20	-0.3%	-0.113	-6.90	-10.6%	0.039	4.49	3.9%	0.071	7.71	7.3%
Intercept	-6.021	-113.00		-2.670	-51.40		-0.149	-5.43		-0.491	-16.80	
Adjusted R^2	0.04			0.04			0.05			0.03		

The table reports the contributors to the complete return loss relative to the efficient frontier in the presence of leverage constraints. The frontier is proxied by unleveraged portfolios of the riskless asset, the currency-hedged index and the Firstnordic Global fund. The results for 2002 confirm that the positive link between sophistication and return losses is robust to the new definition of the frontier and is therefore unlikely to arise from borrowing constraints.

TABLE A25. CONTRIBUTORS TO COMPLETE RETURN LOSS
Leverage with Erik Penser Trippelfond

	Return Loss $\ln(RL_{complete,h})$			**Risky Share** $\ln(w_h)$			**Risky Portfolio Beta** $\ln\lvert\beta_h\rvert$			**Diversification Loss** $\ln\lvert RSRL_h/(1-RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.001	0.80	0.5%	-0.007	-3.94	-2.2%	0.007	7.61	2.3%	0.001	1.23	0.4%
Private pension premia/Income	0.263	3.73	2.0%	0.307	4.49	2.3%	0.009	0.25	0.1%	-0.053	-1.38	-0.4%
Financial wealth (in logs)	0.129	29.30	20.7%	0.142	33.10	22.9%	-0.006	-2.46	-0.8%	-0.007	-2.83	-1.0%
Real-estate wealth (in logs)	0.008	8.24	5.2%	0.005	5.30	3.2%	0.004	7.54	2.4%	-0.001	-1.49	-0.5%
Total liability (in logs)	0.010	8.15	5.9%	0.005	3.71	2.6%	0.009	14.10	5.3%	-0.003	-5.04	-1.9%
Retired dummy	-0.028	-1.32	-2.8%	-0.020	-0.97	-2.0%	-0.048	-4.27	-4.7%	0.040	3.36	4.1%
Unemployment dummy	-0.108	-5.09	-10.2%	-0.114	-5.54	-10.8%	-0.006	-0.55	-0.6%	0.012	1.06	1.2%
Entrepreneur dummy	-0.188	-6.59	-17.1%	-0.262	-9.46	-23.0%	0.081	5.50	8.5%	-0.007	-0.46	-0.7%
Student dummy	0.045	1.50	4.6%	0.073	2.47	7.6%	-0.042	-2.67	-4.1%	0.015	0.88	1.5%
Demographic Characteristics												
Age	0.000	-0.76	-0.7%	-0.001	-1.49	-1.4%	-0.002	-6.09	-3.0%	0.002	7.00	3.8%
Household size	-0.122	-25.60	-14.7%	-0.091	-19.60	-11.2%	0.000	0.19	0.1%	-0.032	-12.10	-4.0%
High-school dummy	0.117	7.41	11.1%	0.100	6.49	9.5%	0.066	7.98	6.4%	-0.048	-5.54	-4.9%
Post high-school dummy	0.154	12.00	16.6%	0.122	9.80	13.0%	0.037	5.62	3.8%	-0.006	-0.81	-0.6%
Dummy for unavailable education data	0.111	4.68	11.7%	0.078	3.38	8.1%	-0.035	-2.84	-3.4%	0.068	5.21	7.0%
Immigration dummy	-0.039	-2.28	-3.8%	-0.105	-6.30	-10.0%	0.008	0.94	0.8%	0.057	6.10	5.9%
Intercept	-6.340	-117.00		-2.765	-52.70		-0.305	-10.90		-0.559	-18.80	
Adjusted R^2	0.05			0.04			0.05			0.03		

The table reports the contributors to the complete return loss relative to the efficient frontier in the presence of leverage constraints. The frontier is proxied by unleveraged portfolios of the riskless asset, the currency-hedged index and Erik Penser Trippelfond. The results for 2002 confirm that the positive link between sophistication and return losses is robust to the new definition of the frontier and is therefore unlikely to arise from borrowing constraints.

Mutual fund fees

TABLE A26. DIVERSIFICATION LOSSES
Mutual Fund Fees

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Complete Portfolio Relative Sharpe Ratio Loss						
Currency-hedged World Index	0.47	0.38	0.44	0.49	0.62	0.75	1.19
Unhedged World Index	0.29	0.17	0.25	0.33	0.50	0.67	1.25
Sweden Index	0.12	-0.02	0.08	0.17	0.38	0.59	1.31
	Complete Portfolio Return Loss (%)						
Currency-hedged World Index	1.81	0.67	1.46	2.37	3.44	4.61	8.71
Unhedged World Index	0.81	0.24	0.58	1.04	1.60	2.26	4.84
Sweden Index	0.23	-0.02	0.10	0.33	0.71	1.15	2.79
	Risky Portfolio Return Loss (%)						
Currency-hedged World Index	4.34	2.72	3.44	4.41	7.53	10.62	15.54
Unhedged World Index	2.02	1.05	1.50	2.00	3.66	5.71	9.60
Sweden Index	0.64	-0.12	0.37	0.82	1.61	2.56	6.81
	Return Loss in Dollars						
Currency-hedged World Index	891	49	174	554	1474	2588	8113
Unhedged World Index	426	18	71	234	622	1079	3426
Sweden Index	151	-2	8	52	177	337	1164
	Return Loss as a Fraction of Disposable Income (%)						
Currency-hedged World Index	2.37	0.18	0.63	2.03	5.22	8.87	24.58
Unhedged World Index	1.07	0.07	0.25	0.86	2.28	3.96	11.22
Sweden Index	0.30	-0.01	0.03	0.20	0.74	1.47	4.97

The table reports the cross sectional distribution of diversification losses in the presence of mutual fund fees, which are calculated as follows. For the ten most popular fund, we use the management fees reported for 2002 in Table A1, which range between 1.3 and 1.5% of net asset value. For other funds, we use the 2006 average fees reported by the Swedish Mutual Fund Association (Fondbolagens Forening): 1.21% for risky funds and 0.6% for bond funds. We substract a fee of 0.4% from the benchmarks, which roughly corresponds to the cost of a diversified global equity index fund in Sweden. We estimate the net-of-fee expected returns implied by the global CAPM, and report the distribution of household losses at the end of 2002.

TABLE A27. CONTRIBUTORS TO COMPLETE RETURN LOSS
Mutual Fund Fees

	Return Loss $\ln(RL_{complete,h})$			Risky Share $\ln(w_h)$			Risky Portfolio Beta $\ln\lvert\beta_h\rvert$			Diversification Loss $\ln\lvert RSRL_h/(1\text{-}RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.003	2.50	1.0%	-0.002	-1.97	-0.8%	0.005	8.08	1.8%	-0.002	-3.32	-0.7%
Private pension premia/Income	0.742	5.82	2.5%	1.077	8.41	3.7%	0.074	1.09	0.3%	-0.375	-5.54	-1.3%
Financial wealth (in logs)	0.087	22.40	16.0%	0.132	33.70	25.3%	-0.010	-4.78	-1.7%	-0.036	-17.30	-5.9%
Real-estate wealth (in logs)	0.004	4.76	2.9%	0.004	4.73	2.9%	0.003	5.60	1.8%	-0.003	-5.87	-1.9%
Total liability (in logs)	0.012	11.00	7.4%	0.006	5.54	3.7%	0.011	18.70	6.6%	-0.008	-14.00	-4.7%
Retired dummy	-0.023	-1.19	-2.2%	0.013	0.67	1.3%	-0.043	-4.28	-4.2%	0.016	1.62	1.7%
Unemployment dummy	-0.098	-5.03	-9.3%	-0.105	-5.36	-10.0%	0.005	0.51	0.5%	-0.005	-0.48	-0.5%
Entrepreneur dummy	-0.228	-9.36	-20.4%	-0.299	-12.20	-25.8%	0.065	5.03	6.7%	-0.021	-1.63	-2.1%
Student dummy	-0.026	-0.74	-2.6%	-0.001	-0.03	-0.1%	-0.048	-2.53	-4.7%	0.034	1.77	3.4%
Demographic Characteristics												
Age	0.000	-0.41	-0.4%	0.000	-0.31	-0.3%	-0.002	-8.22	-4.0%	0.002	6.79	3.4%
Household size	-0.112	-26.10	-13.3%	-0.073	-17.00	-9.0%	-0.013	-5.85	-1.7%	-0.013	-5.75	-1.7%
High-school dummy	0.108	7.77	10.3%	0.097	6.90	9.2%	0.055	7.37	5.3%	-0.052	-7.03	-5.3%
Post high-school dummy	0.150	13.00	16.1%	0.136	11.80	14.6%	0.033	5.37	3.3%	-0.035	-5.67	-3.4%
Dummy for unavailable education data	0.125	5.96	13.3%	0.106	5.02	11.2%	-0.066	-5.94	-6.4%	0.067	5.98	6.9%
Immigration dummy	-0.002	-0.15	-0.2%	-0.104	-6.89	-9.9%	0.047	5.92	4.8%	0.034	4.32	3.5%
Intercept	-5.562	-113.00		-2.804	-56.60		-0.148	-5.66		0.348	13.30	
Adjusted R^2	0.03			0.04			0.05			0.04		

The table reports the contributors to the complete return loss in the presence of mutual fund fees, which are calculated as follows. For the ten most popular fund, we use the management fees reported in Table A1 for 2002, which range between 1.3 and 1.5% of net asset value. For other funds, we use the 2006 average fees reported by the Swedish Mutual Fund Association (Fondbolagens Forening): 1.21% for risky funds and 0.6% for bond funds. We substract a fee of 0.4% from the benchmark, which approximately corresponds to the cost of a diversified global equity index fund in Sweden. We estimate the net-of-fee expected returns implied by the global CAPM, and regress household diversification losses relative to the hedged world index at the end of 2002.

Demographic effects

TABLE A28. NONLINEARITY IN AGE

	Return Loss $\ln(RL_{complete,h})$			Risky Share $\ln(w_h)$			Risky Portfolio Beta $\ln\lvert\beta_h\rvert$			Diversification Loss $\ln\lvert RSRL_h/(1\text{-}RSRL_h)\rvert$		
	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change	Estimate	t-stat	Change
Financial Characteristics												
Disposable income	0.007	3.47	2.1%	-0.007	-3.85	-2.2%	0.009	9.02	2.7%	0.005	4.88	1.6%
Private pension premia/Income	0.246	3.33	1.8%	0.349	4.89	2.6%	-0.021	-0.56	-0.2%	-0.083	-2.06	-0.6%
Financial wealth (in logs)	0.090	20.20	14.1%	0.137	31.90	22.3%	-0.016	-6.97	-2.3%	-0.032	-13.00	-4.5%
Real-estate wealth (in logs)	0.008	7.88	5.1%	0.005	5.12	3.2%	0.003	6.33	2.0%	0.000	-0.46	-0.2%
Total liability (in logs)	0.012	9.33	7.0%	0.004	3.15	2.2%	0.010	14.80	5.5%	-0.001	-2.06	-0.8%
Retired dummy	-0.030	-1.16	-2.9%	-0.010	-0.39	-1.0%	-0.022	-1.68	-2.2%	0.002	0.11	0.2%
Unemployment dummy	-0.085	-4.00	-8.2%	-0.104	-5.05	-9.9%	-0.001	-0.08	-0.1%	0.020	1.70	2.0%
Entrepreneur dummy	-0.115	-4.02	-10.9%	-0.261	-9.42	-23.0%	0.096	6.68	10.1%	0.050	3.18	5.1%
Student dummy	0.025	0.81	2.5%	0.074	2.47	7.7%	-0.042	-2.67	-4.1%	-0.007	-0.44	-0.7%
Demographic Characteristics												
Age	0.002	0.58	2.9%	0.002	0.65	3.1%	0.004	2.67	6.8%	-0.004	-2.53	-6.5%
Age squared	0.000	-1.00	-5.6%	0.000	-1.08	-5.8%	0.000	-4.29	-11.6%	0.000	4.01	13.4%
Household size	-0.144	-29.10	17.0%	-0.087	-18.20	10.6%	-0.012	-4.73	1.5%	-0.045	-16.80	5.7%
High-school dummy	0.111	6.88	-10.5%	0.107	6.88	-10.2%	0.057	7.09	-5.6%	-0.054	-6.10	5.5%
Post high-school dummy	0.173	13.20	18.9%	0.124	9.79	13.2%	0.042	6.41	4.3%	0.007	0.94	0.7%
Dummy for unavailable education data	0.133	4.15	14.3%	0.109	3.49	11.5%	0.008	0.49	0.8%	0.017	0.98	1.7%
Immigration dummy	0.043	2.49	4.4%	-0.113	-6.80	-10.7%	0.044	5.08	4.5%	0.112	11.90	11.8%
Intercept	-1.149	-14.70		-2.809	-37.30		-0.228	-5.83		-0.005	-0.12	
Adjusted R^2	0.03			0.04			0.05			0.03		

This table investigates the effect of an additional squared age term in the OLS regression of the complete return loss. Losses are computed relative to the hedged world index. For each regression, we report the linear coefficient, standard deviation and marginal effect of each predicting variable. The marginal effect is assessed by computing the impact on the dependent variable (in levels) of increasing a continuous regressor by one standard deviation, or of setting a dummy variable equal to one.

Investor preferences

TABLE A29. DIVERSIFICATION UTILITY LOSSES
Heterogeneous CRRA

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Utility Loss as a Fraction of Wealth (%)						
Currency-hedged World Index	2.62	0.70	1.52	2.79	5.27	8.25	18.08
Unhedged World Index	0.98	0.10	0.34	0.84	2.26	3.90	9.18
Sweden Index	0.14	-0.33	-0.10	0.06	0.81	1.77	4.90
	Utility Loss in Dollars						
Currency-hedged World Index	1,204	47	178	596	1,664	3,145	10,956
Unhedged World Index	487	7	38	162	552	1,118	4,449
Sweden Index	116	-52	-8	5	102	300	1,574
	Utility Loss as a Fraction of Wealth (%)						
Currency-hedged World Index	3.36	0.19	0.68	2.28	6.44	11.57	39.07
Unhedged World Index	1.28	0.03	0.15	0.63	2.10	4.31	16.56
Sweden Index	0.21	-0.19	-0.03	0.02	0.41	1.27	6.96

The table reports the cross sectional distribution of utility losses at the end of 2002. An underdiversified household with constant relative risk aversion γ_h incurs the utility loss $UL_h = [(S_m)^2 - (S_h)^2]/(2\gamma_h)$, where S_m and S_h respectively denote the Sharpe ratios of the index and the household's risky portfolio. The household's coefficient of relative risk aversion γ_h is estimated by $S_h / (w_h \sigma_h)$, where w_h is the risky share and σ_h is the standard deviation of the risky portfolio.

TABLE A30. DIVERSIFICATION UTILITY LOSSES
Median CRRA

Benchmark	Cross-Sectional Distribution						
	Mean	**25th p**	**50th p**	**75th p**	**90th p**	**95th p**	**99th p**
	Utility Loss as a Fraction of Wealth (%)						
Currency-hedged World Index	1.67	1.40	1.60	1.86	2.24	2.54	2.77
Unhedged World Index	0.50	0.24	0.44	0.69	1.07	1.37	1.60
Sweden Index	-0.11	-0.37	-0.17	0.08	0.47	0.76	1.00
	Utility Loss in Dollars						
Currency-hedged World Index	593	68	198	558	1,256	1,983	5,025
Unhedged World Index	188	11	43	148	395	668	1,870
Sweden Index	-21	-60	-12	6	73	184	658
	Utility Loss as a Fraction of Wealth (%)						
Currency-hedged World Index	2.08	0.26	0.74	2.07	4.83	7.69	18.11
Unhedged World Index	0.66	0.05	0.16	0.56	1.53	2.68	7.43
Sweden Index	-0.08	-0.22	-0.05	0.02	0.28	0.75	3.01

The table reports the 2002 cross sectional distribution of utility losses at the end of 2002. An underdiversified household with constant relative risk aversion γ_h incurs the utility loss $UL_h = [(S_m)^2 - (S_h)^2]/(2\gamma)$, where S_m and S_h respectively denote the Sharpe ratios of the index and the household's risky portfolio. In this table, the coefficient of relative risk aversion γ is common to all agents and set equal to the median value of the coefficient $\gamma_h = S_h / (w_h \sigma_h)$ considered in Table A29. We find empirically that the median is $\gamma = 3.64$.