Can Security Design Solve Household Reluctance to Take Risk?

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ABSTRACT

Using a comprehensive administrative panel of Swedish households, we show how the introduction of capital protected investments and their broad adoption lead to a significant increase in exposure to stock markets for a large share of the population. This effect is significantly more pronounced for households exhibiting a high reluctance to take financial risk before the introduction. To rationalize our empirical findings, we develop a lifecycle model and confront a set of utility functions to the data. We find that first order risk aversion can explain both the increase in the risky share and the heterogeneity we empirically observe. Our results illustrate how security design can mitigate household reluctance to take financial risk.

JEL classification: I22, G1, D18, D12.

Keywords: Financial innovation, household finance, capital-protected investment, behavioral biases, stock market participation, risk-taking.

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I. Introduction

The low share of household wealth invested in stocks and mutual funds is a major challenge of household finance in developed economies (Campbell, 2006). Households with low exposures to the risk premium forfeit an important source of income over their lives (Mankiw and Zeldes, 1991; Haliassos and Bertaut, 1995), which reinforces wealth inequality (Bach, Calvet, and Sodini, 2017). Furthermore, as household savings are mainly directed toward safe assets, raising external capital might be costlier for firms as a consequence.[1] Relatedly, another puzzling fact in household finance is the ubiquitous presence of retail equity-linked products offering a capital protection, which we label *capital-protected investments* in the remainder of the study. While there is so far no clear theoretical motivation for these products, they represent more than $ 5tn in outstanding volumes globally. In Sweden, their introduction led to a fast and broad adoption –13% of the population within 5 years–, which contrast with the slower penetration of other innovative products with a clear economics rationale, such as ETFs.

This paper investigates both theoretically and empirically whether the non-linear payoff design of capital-protected investments, which caps the maximum loss investor can incur, affects household risk-taking. Can security design solve household reluctance to take financial risk? If so, through which economic mechanism? And are households better off as a result? Answering these questions also provide a rationale behind the success of capital-protected investments.

For our empirical analysis, we study the introduction of capital-protected investments in Sweden during the 2000's. We exploit unique Swedish micro data with granular information on both household characteristics and their exact portfolio allocation (see Calvet, Campbell, and Sodini (2007)), which we merge with a dataset that contains detailed information on all synthetic capital-protected investments sold in Sweden since market inception (see Célérier and Vallée (2017)). The dataset offers a comprehensive coverage of the first five years of the development of the retail market for capital-protected investments for the whole population of Sweden.[2] We can therefore observe how the introduction of these innovative products impacted household holdings and risk ranking at the security level.

[1] Traditional explanations for the low household exposure to risky assets rely on a high risk aversion combined with fixed participation costs, risky human capital, beliefs and behavioral biases such as loss aversion (Gomes, 2005).

[2] The market developed from 2002 in Sweden.

Capital protected investments in Sweden take the form of synthetic retail structured products, which have a mixed reputation among academics and regulators.[3] The first step of our empirical analysis is therefore to ensure that these products offer in expectation a significant share of the risk premium to households once we account for all aspects of these products: the disclosed fees, their exact payoff design, their ex dividend nature and the credit risk they bear. We therefore conduct a rigorous asset pricing exercise and find that despite relatively high total markups (1.6% per year) as previously found in the literature, these products do offer a significant share of the equity risk premium: 58% on average. Somewhat surprisingly, both these quantities, the yearly markups and exposure to the risk premium, are comparable in magnitude for mutual funds in Sweden over the same period. We compute yearly markups and exposure to the risk premium for funds by exploiting unique data on mutual fund fees and returns and applying the World CAPM.[4]

We then turn to measuring the impact of the introduction of capital-protected investments on household risk-taking. To do so, we develop a measure of financial risk-taking that takes into account the exposure to the risk premium offered by each financial product, as well as their fees, which we label *adjusted risky share*.[5] Equipped with this measure, which amounts to 24% on average for Swedish stock market participants in 2002, we first document that households that invest in capital-protected investments over our sample period increase significantly more their adjusted risky share than households that do not. The magnitude is large: over the five years following the introduction of capital-protected investments, the adjusted risky share increases twice as much for households that participate in these products than for households that do not: by 5 percentage points of financial wealth for CPI buyers versus 2.5 percentage points for other stock market participants.

Second, we establish that the effect of capital-protected investments on household risky share is strongly *positively* correlated with household initial reluctance to take risk, which we measure in three different ways: the initial share of financial wealth kept in bank deposits, the deviation from the adjusted risky share predicted by household demographic characteristics, and an elicited

[3]See for instance Henderson and Pearson (2011), Célérier and Vallée (2017) and Vokata (2018).

[4]Gennaioli, Shleifer, and Vishny (2015) indicates similar magnitude for mutual funds in the US once taking into account all types of fees.

[5]The literature usually measures risk taking with the risky share, which is the weight of risky assets in the complete portfolio, without adjusting for the heterogeneity in the risk premium that each risky assets might offer based on the payoff design, beta and fees (see for example Calvet et al. (2007)).

measure of reluctance to take risk from a survey of a subsample of the population. While the initial adjusted risky share is only 2% of financial wealth for the households that are in the highest quintile of our estimated measure of reluctance to take risk in 2002, it increases up to 16% for households that do participate to capital protected investments versus only 8% for those that do not. The survey, which covers twins in Sweden, confirms this result: the effects of capital-protected investments on household risky share is twice larger for households that indicate that they are less willing to take financial risks.[6]

Third, when we investigate the portfolio composition of households who do participate in capital protected investment, we find that the quantity of capital protected investments household invest in *increases* with their initial reluctance to take risk, following the same pattern as bank deposits, while being in sharp contrast to the one for traditional equity investments: the share of financial wealth invested in funds and stocks by households *decreases* with their with reluctance to take risk. The same is true across other household characteristics, such as age, IQ and wealth: the investment patterns are the same for capital protected investments are for bank deposits, and opposite to the ones for equity funds or stocks.

To gain causal identification, we instrument the amount invested in capital-protected investments at the household level by a time-varying measure of bank idiosyncratic supply of capital-protected investments. We identify bank idiosyncratic supply shocks for each year exploiting data on the identity of the banks each household deposits money in. We then use bank-household relations to regress the share of financial wealth invested in capital protected investment on bank-year fixed effects while controlling for a large set of household characteristics, including demand for equity products as proxied by the time-varying risky share. We thus estimate more than 150 bank-year supply shocks. We then analyze the causal effects of the supply of capital-protected investments on household adjusted risky share in an instrumented panel model. To foster the robustness of this analysis we estimate the bank supply shocks and the causal effects in two different samples of the Swedish population. The instrument is a weighted average at the household level of the idiosyncratic supply shocks. We find that a 1 percentage point increase in the share of financial wealth invested in capital protected investments leads to a 0.3 pp increase in adjusted risky share.[7]

[6]The estimated and elicited measures have a correlation of 0.2.

[7]In the absence of any substitution with traditional equity products, this elasticity would be around 0.55 pp, i.e. the average share of the risk premium obtained when investing in a capital guaranteed investment.

Having empirically established that the introduction of capital-protected investments fosters household financial risk-taking and that the effect increases with their initial reluctance to take risk, we investigate theoretically the possible underlying economic mechanism. For this purpose, we adapt the life-cycle model of Cocco, Gomes, and Maenhout (2005) along two key dimensions: first we introduce capital protected investments in the investment set with precisely the same design, embedded markup and illiquidity as the median product in Sweden. Second, we solve the model with a set of utility functions: Epstein-Zin, Disappointment Aversion and Narrow Framing.

We find that both disappointment aversion (Gul et al., 1991; Routledge and Zin, 2010), and narrow framing (Barberis, Huang, and Thaler, 2006; Barberis and Huang, 2009) can generate significant demand for capital protected investments with realistic preference parameters, while an Epstein-Zin specification cannot. In line with our main empirical finding, we also find that the increase in risk-taking induced by the capital protected investment is more pronounced for households exhibiting a higher first order risk aversion, which translates into a lower risky share ex ante.

Finally, we use our quantitative model to size the welfare gain that the introduction of this product allows, and estimate how welfare gains are shared between product providers and the household.

This paper adds to the literature that studies the interaction between the design of financial products and investor preferences. Célérier and Vallée (2017) describe how banks design financial products to cater to yield-seeking investors. In this paper, we show that security design can also mitigate household reluctance to take risk and hence increase their participation to the risk premium, which translates into a significant welfare gain.

This study also contributes to the strand of the household finance literature documenting the limited stock market participation and low risky shares of households (Campbell, 2006; Calvet et al., 2007). While several papers explore possible explanations for low risk-taking (Attanasio and Vissing-Jørgensen, 2003; Guiso and Jappelli, 2005; Guiso, Sapienza, and Zingales, 2008; Haliassos and Bertaut, 1995; Hong, Kubik, and Stein, 2004; Barberis et al., 2006; Kuhnen and Miu, 2015), our work speaks to both the cause of this low participation and an effective way to alleviate it. In this respect, our study relates to papers that explore solutions to the frictions households face in their financial decisions, such as financial advisors (Gennaioli et al., 2015), default options (Madrian

and Shea, 2001), or innovative banking products (Cole, Iverson, and Tufano, 2016).

Our work also contributes to the literature on the cost and benefits of financial innovation. Several studies have underlined potential adverse effects of financial innovation, such as speculation (Simsek, 2013) or rent extraction (Biais, Rochet, and Woolley, 2015; Biais and Landier, 2015), particularly from unsophisticated agents (Carlin, 2009). The present paper illustrates how innovative financial products may also benefit unsophisticated market players. Our paper suggests that innovative security design can mitigate investor behavioral biases, and not merely exploit them (Célérier and Vallée, 2017), thereby having a positive impact on investor welfare.[8] This mechanism differs from and complements the more traditional role of financial innovation to improve risk-sharing and complete markets (Ross, 1976; Calvet, Gonzalez-Eiras, and Sodini, 2004).

Finally, our paper contributes to the literature that studies portfolio allocation in a life-cycle model by considering alternative utility functions and their effect on the optimal portfolio allocation.

The paper is organized as follows. Section II provides background on retail capital-protected investments and presents the data for our empirical analysis. Section III describes the product design, and performs an asset pricing exercise to measure their markups and expected returns. In Section IV, we test whether investing in capital-protected investments leads to an increase in household risk-taking. We provide causal evidence for this relation in Section V. In Section VI, we develop a theoretical lifecycle model of portfolio allocation to study the mechanism that can explain the empirical effect we document. In Section VII, we discuss whether this product offers a welfare gain, and how it is divided between product providers and households. Section VIII concludes. An Internet Appendix provides additional empirical results and derivation of the theoretical propositions.

II. Background and Data

A. Background on Capital Protected Investments

Capital-protected investments are retail investment products that offer some exposure to a risky asset and a protection for a substantial part of the capital, typically close to 100%. These products,

[8] While recent work has focused on the dark side of retail structured products (Arnold, Schuette, and Wagner, 2016; Henderson and Pearson, 2011; Hens and Rieger, 2014), the present study offers a more nuanced view of these markets.

therefore, provide investors with a way to obtain a share of the risk premium while capping the maximum loss they can incur if the risk materializes. Product providers can use three different approaches to offer capital protection: through a synthetic product, a portfolio insurance strategy, or by building reserves. Synthetic products, also referred to as retail structured products, are passive, limited-horizon products with a non-linear payoff that depends on the performance of the underlying (Célérier and Vallée, 2017). Providers use derivatives to hedge the non-linear payoffs of these products . Portfolio insurance is a dynamic trading strategy that aims at managing the downside risk. Finally, product providers can offer some protection by building reserves that offset fluctuations in asset returns (for example the Euro life insurance contracts in France described in Hombert and Lyonnet (2019)). Reserves increase when asset returns are high and decrease when asset returns are low, allowing intertemporal smoothing: Investors receive positive transfers in years when returns are negative, and negative transfers in years when the returns are positive. Each approach has its own limitations. The synthetic structure minimizes hedging risk, but forces to use a close-end format. The use of reserves might face unraveling if investors internalize the role they play and base their investment decision on them. Product designers might also choose a mix of these mechanisms, as for example with guaranteed variable annuities, and will typically underwrite the capital guarantee. This underwriting might generate systemic risk if hedging is partial or reserves are insufficient.

Capital protected investments are widespread across the globe and represent more than $5 trillion of outstanding volumes. Table II provides summary statistics for the different types of capital protected investments offered to retail investors across countries. Guaranteed variable annuities in the US represents a USD 1.6 trillion market (Ellul, Jotikasthira, Kartasheva, Lundblad, and Wagner, 2018). In China, structured certificates account for around $500 billion. In France, Euro-life insurance contracts stand for €1.4 trillion euros, or 60% of the GDP. The existence of capital-protected investments in many developed countries, and the large volume outstanding, speaks to the appeal of such security design for retail investors. However, we still know very little on whether they encourage investors to gain more exposure to the risk premium.

In Sweden, capital protected investments are typically offered to retail investors in the format of retail structured products. While retail structured products have a mixed reputation due to the general high level of markups and the excessive complexity observed in some segments of

the market, (Henderson and Pearson, 2011; Célérier and Vallée, 2017), those offering a capital-protection are relatively simple. In addition, while capital protected investments do not allow for risk obfuscation by construction, Célérier and Vallée (2017) show that markups and complexity increase jointly with the risk inherent to the payoff structure. This result suggests that obfuscating risk allows to increase markup without reducing demand, which is not possible in the market of capital-protected investments. Nonethless, we fully account for the specificities of these products by including all fees and undisclosed markups in both the empirical and theoretical analyses as well as by confirming that both our empirical and theoretical results are robust when restricting the sample to the simplest products.

INSERT TABLE II

B. Data

Our empirical analysis relies mostly on the merge of two datasets: a dataset on all synthetic capital protected investments issued in Sweden to retail investors since market inception, and a dataset on the portfolio composition and socio-demographic characteristics of the population of Swedish households from 2002 to 2007.

Capital-Protected Investments and Equity Funds

The data on synthetic capital protected investments is part of the dataset compiled by Célérier and Vallée (2017) on retailed structured products issued in Europe from 2002 to 2010. The dataset includes not only comprehensive information on the underlying, maturity, volumes and fees of each capital protected investment, but also a text describing their payoff formula. We obtain the exact payoff structure of each capital-protected investment through a text analysis of the pay-off description.[9]

Our sample of capital protected investments includes 1,505 equity-linked capital-protected investments issued in Sweden over the 2002 to 2007 period, for a total volume of 8 billion dollars.[10]

INSERT TABLE III

[9] See Célérier and Vallée (2017) for the precise methodology.

[10] In Sweden, the large majority of capital protected investments offer equity exposure (87% of the products).

We also collect data on the age, family, geographical scope, and historical fees of all Swedish equity funds during the period from fund factsheets. For each fund, we have information not only on the total expense ratio (TER), which includes operation costs and management fees, but also on the total cost ratio (totalkostnadsandel in Swedish - TKA). TKA is a Swedish invention that extends TER to include transaction fees. Throughout our analysis we use TKA as proxy for fund fees as it is the most comprehensive and frequently available measure in the dataset. When missing, we impute TKA from the other fund fees reported in the fact sheet, controlling for age, family and geographical scope of the fund.

Finally, we use market data from FinBas[11], Datastream and Bloomberg for the returns, volatility and dividends of the underlying assets of capital guaranteed investments, and for the mutual funds.

Household Asset Allocation and Socio-demographics

The household portfolio data, described in Calvet et al. (2007), is a panel of financial wealth and income data covering all Swedish households over the 2000 to 2007 period. The panel contains the detailed breakdown of the wealth of each household across real estate, cash, equity mutual funds, stocks and capital-protected investments. Importantly, within financial wealth, the panel also provides security-level information on the amount invested in any assets, which are identified by the International Security Identification Number (ISIN).[12] Statistics Sweden collected this highly disaggregated household-level data on wealth for the purpose of a wealth tax over this period. The data comes from a variety of sources, including the Swedish Tax Agency, welfare agencies, and the private sector. Financial institutions have supplied information to the tax agency on their customers' deposits, interest paid or received, security investments, and dividends. The data additionally provides unique identifiers of the institutions where bank accounts are held. Importantly, non-taxable securities and securities owned by investors below the wealth tax threshold are included. This panel has been used to study household portfolio diversification (Calvet et al., 2007), rebalancing (Calvet, Campbell, and Sodini, 2009a), investor sophistication (Calvet, Campbell, and Sodini, 2009b), financial risk-taking (Calvet and Sodini, 2014) and value and growth investing (Betermier, Calvet,

[11] FinBas is a financial database maintained by the Swedish House of Finance.

[12] Bonds and bond mutual funds, which we can also observe, are infrequent.

and Sodini, 2017).

The household portfolio data is of uniquely high quality since the information comes directly from tax filings: it covers the entire population and provides the exact portfolio composition. We, however, do not observe the value of households' defined contribution pension savings. These pension savings include assets in private pension plans and in public defined contribution accounts that were established in a 1999 pension reform. According to official statistics, defined contribution pension savings had an aggregate value of $25.6 billion in Sweden at the end of 2002, whereas aggregate household financial wealth invested outside pension plans amounted to $131.3 billion. Our data set therefore contains 84 percent of household financial wealth. In addition, while we observe the total value of endowment insurance products, a form of tax-favored saving, we do not observe the allocation of these assets. Here, we are conservative for the purpose of our analysis and assume that 100% of endowment insurance products are invested in equity funds.

The data also include detailed household socio-demographics characteristics such as the level of education, income, location at the parish level, gender and age of the household head.

Elicited Reluctance to Take Risk

We exploit a survey conducted on the population of twins in Sweden that collects information on preferences and behavioral biases. The Swedish Twin Registry (STR) is the largest twin registry in the world and it routinely administers surveys to Swedish twins (Lichtenstein, Sullivan, Cnattingius, Gatz, Johanson, Carlström, Björk, Svartengren, Volk, Klareskog, de Faire, Schalling, Palmgren, and Pedersen, 2006). Here, we use data from the survey SALTY, which is a collaborative effort between researchers in epidemiology, medicine and economics initiated in 2007. SALTY is the first major survey of twins which features an entire section specifically dedicated to economic decision-making (Cesarini, Johannesson, Magnusson, and Wallace, 2012). Beginning in early 2009, the survey was sent out to 24,914 Swedish twins born between 1943 and 1958. In the spring of 2010, final reminders were sent out to those who did not initially respond to the survey. The data collection was completed in the summer of 2010. The survey generated a total of 11,743 responses, equalling a response rate of 47.1%. Out of the respondents 11,418 (97.2%) gave informed consent to have their answers stored and analyzed.

In this paper, we concentrate on the following question of the survey to measure reluctance

to take financial risks: "Are you a person who is willing to take financial risks or trying to avoid financial risks?" one a 1 to 10 scale.[13]

Sample Construction

We build our final sample the following way. First, we drop households with household head younger than 25 y.o. and with financial wealth in 2002 below $200. Second, because we investigate the effects of the introduction of capital-protected investments on household risk taking over the 2002-2007 period, we only keep households that are observable over the total period.[14] Our final sample consists of 3,112,214 households.

We then merge the household portfolio data with the capital protected investment data and equity fund data using the unique ISIN identifiers of each financial asset the household has invested in. The dataset resulting from merging the two previous sources creates the ideal setting to investigate how the development of capital-protected investments affected household investment decisions, as the overlap of the datasets occurs during the launch and subsequent high growth period of the retail market for capital-protected investments.

C. Summary Statistics

Table IV presents demographic and financial characteristics for the total sample of around 3 million households, the sample of households participating in stock markets in 2002 of around 2 million households, or 67% of the total sample, and the sample of households that have participated at least once in capital-protected investments, of around 428,000 households, or 14% of the total sample.

INSERT TABLE IV

Panel A offers a preliminary picture of Swedish households' investment behaviors as of 2002. While the stock market participation rate in Sweden is relatively high compared to other developed

[13]While the survey also includes several questions related to behavioral biases, there is unfortunately very little heterogeneity in participants' answers for these questions.

[14]In our dataset, a household exits every time the composition of adults of the household changes, due to either death, divorce, marriage or change in partnership. The households exiting the panel data are on average 2.5 y.o. younger, and have a somewhat lower financial wealth and income than the average household in the sample.

economies (67%), the share of financial wealth invested in risky assets conditional on this participation remains modest, around 34%, far below what institutional investors have.[15] Participants mostly invest in risky assets through equity funds, which represent 23% of their financial wealth on average (median is 17%), while individual stocks represent only 9.5% on average (median is 1.6%).

When comparing the demographic characteristics between the three groups: whole population, stock market participants, and capital-guaranteed investments participants, we notice some heterogeneity, for instance on financial wealth, age and income, that requires precise controls when implementing our empirical analysis.

An additional take-away from the raw data is the broad adoption of capital-guaranteed investments despite their recent introduction. Figure 1 shows the evolution of the share of households participating in capital-protected investments and in other stock market products over the 2002 to 2007 period.[16] Despite the usual reluctance of households to invest in equity funds and stocks, capital-protected investments quickly gain traction within a few years in Sweden. At the end of 2007, 13.8% of Swedish households in our final sample have participated at least once in this new product class and invest a significant fraction of their financial wealth in these products.

INSERT FIGURE 1

This extensive margin effect also translates into a significant effect at the intensive margin. Panel B of Table IV indicates that conditional on investing in capital-guaranteed investments, households allocate 11% on average of their financial wealth to this type of investments in 2007, more than individual stocks. We also observe that the % increase in the share invested in equity products over the period 2002-2007 amounts to 70% on average for participants to capital-protected investments, versus 34.5% for the population of participants in standard equity products.

III. Design, Markup and Expected Returns

To study whether capital protected investments foster risk-taking, we must first investigate whether these products actually provide investors with a share of the risk premium. We, therefore,

[15] We discuss in detail theoretical benchmarks for this quantity in the theoretical framework.

[16] A household is viewed as a participant in a given financial product if it possesses a strictly positive amount of investment in that type of financial products in a given year.

start our analysis by implementing a rigorous and large-scale asset pricing exercise to derive the embedded markup and expected returns of the products.

For this purpose, we extend the Black and Scholes framework to derive a closed-form expression that fully captures the specificities of the products we consider, such as their option features, their ex dividend nature, the initial fee that is paid at investment, and the issuer credit risk. The relative homogeneity in product design we observe across capital-protected investments in Sweden allows for the standardization of this asset-pricing exercise.

We find that capital-protected investments offer a share of the risk premium that is comparable in magnitude to the one offered by the most popular household risky investment, equity mutual funds.

A. Product Design

The capital protected investment *Aktieobligation Europa Trygg 98, ISIN: SE0001940107,* issued by Nordea Bank in 2004 with a volume of USD19.3m, provides a representative example of this class of financial products in Sweden. The payoff of this product is designed as follows:

> *The product has a maturity of 3 years and a fee of 2% is charged at issuance. The product return is linked to the performance of the Eurostoxx 50 index as follows: at maturity the product offers a minimum capital return of 100% plus 80% of the positive performance of the index over the investment period. The performance of the index is calculated as the average of the index return since inception over the last 7 months, and does not include dividends.*

A capital-protected investment issued at time t is therefore typically defined by the following 6 parameters, listed with their corresponding value from the previous example:

1. an initial fee *init* charged when the product is originated at date 0, *(init=2%)*
2. a maturity date T *(T = t + 36 months)*,
3. an underlying asset or index, S_t, *(Eurostoxx 50)*
4. a Asian option period *(Last 7 monthly observations)*,
5. a participation rate p, *(80%)*
6. a guaranteed rate of return g. *(100%)*

Let the benchmark return R_T^* denotes the average performance of the underlying measured at prespecified dates $t_1 < \cdots < t_n$:

$$1 + R_T^* = \frac{S_{t_1} + S_{t_2} + ... + S_{t_n}}{n S_{t_0}}, \tag{1}$$

where S_{t_0} is the initial reference level of an index or asset at t_0, typically a few days after issuance. In the empirical section, we refer to $t_n - t_1$ as the length of the Asian option.

The gross return on the capital-protected investment between issuance and maturity therefore is

$$1 + R_{g,T} = \frac{1 + \max(p\, R_T^*; g)}{1 + init}. \tag{2}$$

The initial fee is paid in addition to the nominal amount invested at the initial date. Hence, the investor obtain a net capital protection of $g/(1 + init)$.

The capital protected investments are typically structured as notes, and therefore bear the credit risk of the bank structuring them.

Panel B of Table III provides summary statistics on the six previously defined design parameters for the sub-sample of products that possess this representative design. These products represents 55% of the retail capital-protected investments made during our sample period in Sweden, and 60% of the corresponding volumes. The average volume for a capital guaranteed investment issuance is around \$5 million. In terms of design, the median maturity is 4 years, the median guarantee is 100% notwithstanding an initial fee of 11%, and the participation rate stands at 110%.[17]

INSERT TABLE III

B. *Markups and Expected Returns: Methodology*

In order to measure the risk and return properties of the representative capital-protected investment, we develop a tailored pricing model based on the absence of arbitrage that accounts for all the design parameters. We assume that under the risk-adjusted measure $\mathbb{Q}$, the underlying asset

[17]The fact that the participation rate is higher than 100% despite the capital protection is made possible by the Asian option feature and the ex-dividend nature of the benchmark return.

follows a geometric Brownian motion:

$$\frac{dS_t}{S_t} = (r_f - q)dt + \sigma dZ_t, \tag{3}$$

where r_f is the continuous-time interest rate, q is the continuous-time dividend yield, and σ denotes volatility.

Let $\mathbb{E}_0^{\mathbb{Q}}$ denotes the expectation operator conditional on the information available at date 0. Under the risk-adjusted measure $\mathbb{Q}$, the mean return on the capital-protected investment is equal to the risk-free rate, $\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T}) = e^{r_f T}$, which by equation (2) implies the following pricing result.

Proposition 1 (Fair pricing of capital-protected investment). *The fair initial fee is given by:*

$$init = e^{-r_f T}\left[1 + g + p\, M_1^{\mathbb{Q}}\, N(d_1) - (p+g)\, N(d_2)\right] - 1, \tag{4}$$

where $M_1^{\mathbb{Q}}$ *and* $M_2^{\mathbb{Q}}$ *denote the first two moments under* $\mathbb{Q}$ *of the benchmark return:*

$$\begin{aligned} M_1^{\mathbb{Q}} &= \mathbb{E}_0^{\mathbb{Q}}(1+R_T^*) = \frac{1}{n}\sum_{i=1}^{n} e^{(r_f-q)(t_i-t_0)}, & (5)\\ M_2^{\mathbb{Q}} &= \mathbb{E}_0^{\mathbb{Q}}\left[(1+R_T^*)^2\right] = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} e^{[2(r_f-q)+\sigma^2][\min(t_i,t_j)-t_0]+(r_f-q)|t_j-t_i|}, & (6)\end{aligned}$$

$(w^{\mathbb{Q}})^2$ *denotes the variance of the log benchmark return:*

$$(w^{\mathbb{Q}})^2 = \mathrm{Var}_0^{\mathbb{Q}}\left[\ln(1+R_T^*)\right] = \ln\left[M_2^{\mathbb{Q}}\,(M_1^{\mathbb{Q}})^{-2}\right], \tag{7}$$

and d_1 *and* d_2 *are Black-Scholes normalized ratios:*

$$d_1 = \frac{1}{w^{\mathbb{Q}}}\left[\ln\left(\frac{p}{p+g}\right) + \ln(M_1^{\mathbb{Q}}) + \frac{(w^{\mathbb{Q}})^2}{2}\right] \tag{8}$$

and $d_2 = d_1 - w^{\mathbb{Q}}$*. Furthermore, the fair initial fee* (4) *increases with the participation rate* p *and the guaranteed return* g*.*

The gross markup is the difference between the fair initial fee and the initial fee investors pay.

When the underlying follows $\frac{dS_t}{S_t} = (\mu - q)dt + \sigma\, dZ_t$ under $\mathbb{P}$, we have:

Proposition 2 (Expected return of under $\mathbb{P}$). *The expected return on the guaranteed product under the physical measure is*

$$\mathbb{E}^{\mathbb{P}}(1 + R_{g,T}) = \frac{1 + g + pM_1^{\mathbb{P}} N(d_1^{\mathbb{P}}) - (p+g)N(d_2^{\mathbb{P}})}{1 + init},$$

where $M_1^{\mathbb{P}}$ and $M_2^{\mathbb{P}}$ denote the first two moments under $\mathbb{P}$ of the benchmark return:

$$M_1^{\mathbb{P}} = \mathbb{E}_0^{\mathbb{P}}(1 + R_T^*) = \frac{1}{n}\sum_{i=1}^{n} e^{(\mu-q)(t_i - t_0)}, \tag{9}$$

$$M_2^{\mathbb{P}} = \mathbb{E}_0^{\mathbb{P}}\left[(1 + R_T^*)^2\right] = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} e^{[2(\mu-q)+\sigma^2][\min(t_i,t_j)-t_0]+(\mu-q)|t_j-t_i|}, \tag{10}$$

$(w^{\mathbb{P}})^2$ denotes the variance of the log benchmark return:

$$(w^{\mathbb{P}})^2 = \mathrm{Var}_0^{\mathbb{P}}[\ln(1 + R_T^*)] = \ln\left[M_2^{\mathbb{P}}/(M_1^{\mathbb{P}})^2\right], \tag{11}$$

and

$$d_1^{\mathbb{P}} = \frac{1}{w^{\mathbb{P}}}\left[\ln\left(\frac{p}{p+g}\right) + \ln(M_1^{\mathbb{P}}) + \frac{(w^{\mathbb{P}})^2}{2}\right], \tag{12}$$

and $d_2^{\mathbb{P}} = d_1^{\mathbb{P}} - w^{\mathbb{P}}$.

The sub-sample of representative products covers 155 different underlying assets, which are either a stock index, a basket of stock indices, or a basket of stocks. We rely on the following assumptions for each underlying asset.

- We estimate the risk premium of a given underlying asset at the monthly frequency, $\mathbb{E}(R_{m,t})$, by applying the World CAPM over the longest time-series available and a risk premium on the world market of 6%. We then convert it into our model input $\mu = \ln[1 + \mathbb{E}(R_{m,t})]/t$, where $t = 1/12$ if μ is expressed in yearly units.
- We use historical volatility as measured over the 1990 - 2007 period for σ.
- We use the latest dividend yield before the capital-protected investment issuance for q.

- We use the SEK Swap Rate for the product maturity as the risk free rate r_f in the pricing model.

We apply Proposition 1 to calculate the gross markup and add the CDS spread of the issuer to adjust for the credit risk. Finally, we scale this markup by the product maturity in year to obtain a net yearly markup that is directly comparable to mutual fund yearly fees. We then derive the expected return the investor earns as per Proposition 2. The yearly excess expected return is obtained by annualizing this expected return and subtracting the risk-free rate, i.e. the rate of Swedish Treasury bills of corresponding maturity.

C. Markups and Expected Returns: Results

Panel B of Table III reports summary statistics on the yearly markups and excess expected returns obtained through the described methodology. There are two important take-aways. First, the cost to households/ the profitability to the banks of retail capital-protected investments represents 1.6% of the invested amount per year on average. Second, yearly excess expected returns for these products are significantly positive with an average of 3.2%, or more than half of the equity risk premium we assume.[18] More than 90% of products earn a positive risk premium. These results confirm that retail capital-protected investments allow households to earn a significant part of the risk premium.

Panel A of Figure 2 displays the distribution of yearly markups and excess expected returns for the capital-protected investments in our sample.

INSERT FIGURE 2

In Table IA.2 of the Internet Appendix, we conduct a sensitivity analysis that shows that these results are not driven by a particular set of parameters. Furthermore, Table IA.3 in the online appendix shows that the monotonic relationships between the initial fee, participation rate and guaranteed return implied by Proposition 1 hold in the cross-section of contracts.

[18] Our estimate of the share of the risk premium investors obtain has almost no sensitivity to our risk premium assumption.

D. *Comparison to Mutual Funds*

For comparison purposes, we leverage our dataset on all equity funds available in Sweden over the 2002-2007 period to obtain the fees and to calculate the expected returns they offer by applying the World CAPM to their historical returns.

Results are displayed in Panel C of Table III and Panel B of Figure 2.

Equity mutual fund fees, which include transaction costs, operation costs and management fees as described in Section 2.B., amount to 2.20% on average during our sample period. We find mutual fund betas to be around 0.9 on average. When taking into account fees and a risk premium of 6%, we therefore find that average mutual fund excess expected returns are around 3.2%.

When comparing the markups and expected returns of capital-guaranteed products and mutual funds, we observe that the magnitudes are similar across products but ,that dispersions are lower for mutual funds.

This finding hence suggests that banks have comparable financial incentives to market equity mutual funds and retail capital-protected investments.[19]

Having empirically established that the retail capital-protected investments marketed to Swedish households offers them a large fraction of the risk premium even when accounting for embedded markups, we turn to the portfolio data to test whether the introduction of these products has an impact on household risk-taking.

IV. Impact on Household Risk-Taking

We now turn to the central result of our empirical analysis: measuring the impact of the introduction of capital protected investments on household risk-taking.

A. *Measuring Household Risk Taking*

We introduce a novel measure of household financial risk-taking: the *adjusted risky share*. The literature usually measures household risk-taking as the share of their financial wealth invested in equity products (e.g. Calvet et al. (2009b)), hence assuming that each equity product provides the same (full) exposure to a similar risk premium, while this is typically not the case. The risk

[19]Discussions with practitioners also support this hypothesis.

exposure of an equity product indeed varies with its underlying asset, its payoff design and its fees. For example, a capital-protected investment on the Euro Stoxx 50 with a high markup offers a lower share of the risk premium than a low-fee mutual fund invested in emerging markets.

We first measure the marginal impact of investing in an equity product p on risk taking as the fraction of the equity premium η_p an investor receives in expectation when investing in this product:

$$\eta_p = \frac{\mathbb{E}(R_{p,T} - e^{r_f T})}{\mathbb{E}(R_{m,T} - e^{r_f T})}.$$

We then compute η_p for all the equity products Swedish households have invested in over our sample period, which include stocks, equity funds, and capital-protected investments. We assume that $\mathbb{E}(R_{m,T} - e^{r_f T})$, the market risk premium, amounts to 6%, and obtain $\mathbb{E}(R_{p,T} - e^{r_f T})$ from the asset pricing exercise in Section 3.C and 3.D for capital-protected investments and equity funds, respectively. For simplicity, we assume that $\eta = 1$ for stocks, and $\eta = 0.5$ for allocation funds.[20]

Panel B and C of Table III provide summary statistics for the fraction of the equity premium η offered by capital protected investments and equity funds, respectively. While we could expect capital-protected investment to offer a lower share of the risk premium than equity mutual fund because of the guarantee embedded in the former products, both products actually offer approximately the same share of the risk premium, 55% on average. The higher level of fees and the lower betas of equity funds relatively to the betas of the underlying asset of capital protected investments, respectively 2% on average versus 1.6%, and 0.9 versus 1.1, offset the gap in risk exposure induced by the design of capital protected investments.

We finally calculate household risk-taking by taking the weighted average of the risk exposure η offered by each of the n products the household invests in. Therefore, the *adjusted risky share* w_h of household h is:

$$w_h = \sum_{i=1}^{n} \eta_i \times \frac{EquityProduct_{h,i}}{FinancialWealth_h},$$

where i spans the n assets included in the household portfolio across the three equity-linked asset classes: capital-protected investments, equity mutual funds, and stocks.

Panel C of Table IV provides summary statistics on the adjusted risky share of stock market participants: while the standard measure of the risky share amounts to 34% in 2002, the *adjusted*

[20] Allocation funds represent around 2% of household financial wealth.

risky share amounts to 24% on average. The percentage change in the adjusted risky share is 3.5% for stock market participants versus 19.7% for participants in capital protected investments, suggesting a positive correlation between participating in capital-protecting investment and risk-taking.

B. *Impact of Capital Protected Investments on Households' Adjusted Risky Share*

We now investigate whether investing in capital-protected investments is associated with an increase in household risk-taking. To do so, we focus on the subsample of households participating in equity funds or stocks in 2002, and therefore estimate the effect at the intensive margin.[21]

Panel A of Figure 3 plots the predicted *adjusted risky share* in 2002 and in 2007 across two subsamples. The first subsample includes households that participate at least once in capital-protected investments over the 2002-2007 period, the "Participants in Capital Protected Investments". The second one, the "control group", includes households that do not participate in these products. We plot the *predicted* adjusted risky share to control for composition effects due to the heterogeneity in the socio-demographics across the two groups. We thus set a large set of socio-demographics at their mean value: financial wealth, age, year of education, gender and family size. We find that the risk-taking behaviors of the two groups diverge over the sample period: the gap in the adjusted risky share thus increases by more than 3 percentage points in 2007, or more than 10% of the baseline adjusted risky share.[22]

In Panel B of Figure 3, we restrict the sample to households that are taking low financial risks, and reproduce the same exercise. We identify households that are taking low financial risks as households in the highest quintile of bank deposit share of financial wealth in 2002. We observe that the divergence in risk-taking between capital protected investment participants and the control group is even more pronounced within this sample: the gap in the adjusted risky share is almost inexistent in 2002 and increases up to more than 8 percentage points (pp) in 2007. This 8 pp gap in adjusted risky share is particularly large when compared to the levels of adjusted risky share for this sample of the population: participants in capital protected investment and the control group have an adjusted risky share of only 2% in 2002. In 2007, capital protected investment participants

[21] Our results are robust to including the whole population. However, effects on the extensive margin are minimal, which suggests that capital protected investments do not address frictions to stock market participation.

[22] Using the unconditional adjusted risky share with a matched control group yields similar results.

have an adjusted risky share twice larger than non-participants, 16% versus 8%.

INSERT FIGURE 3

We confirm this result by running the following cross-sectional regression on the evolution of the adjusted risky share:

$$\Delta_{2007,2002}(w_h) = \alpha + \beta\, \mathbb{1}_{CP,h} + \lambda' x_h + \varepsilon_h, \tag{13}$$

where $\Delta_{2007,2002}(w_h)$ denotes the growth rate in adjusted risky share of household h measured using Davis and Haltiwanger (1992) growth measure, $\mathbb{1}_{CP,h}$ is a dummy indicating whether household h has participated at least once in capital-protected investments from 2002 to 2007, x_h is a vector of household characteristics, and ε_h is the error term.[23] The vector x_h of household characteristics includes the percentage changes in income and in financial wealth over the 2002-2007 period and fixed effects for the number of children, household size, gender, localities, years of education, and deciles of financial wealth, income, age and risky share in 2002.

The coefficient of the variable $\mathbb{1}_{CP,h}$ in Column 1 of Table VII confirms that households that participate in capital-protected investment over the 2002-2007 period increase their adjusted risky share significantly more than households that do not not. The percentage change in the adjusted risk share is 23 percentage points higher for participants in capital protected investments, while on average households increased their risky share by only 0.7% over the period.

INSERT TABLE VII

C. Heterogeneity along Household's Reluctance to Take Risk

We now test whether the impact of capital-protected investments on household risk-taking significantly varies with household reluctance to take financial risks, as Panel B of Figure 3 suggests. To do so, we use both revealed and elicited measures of household reluctance to take financial risks,

[23] The Davis and Haltiwanger (1992) growth measure limits the extreme values created by low denominator values in a standard growth rate. Its exact specification is:

$$\Delta_{2007,2002}(w_h) = \frac{2 * (w_{h,2007} - w_{h,2002})}{w_{h,2007} + w_{h,2002}}$$

exploiting information on household exact portfolio allocation in 2002 for the former, and data from the survey on behavioral biases and preferences among the twin subsample of the population for the latter.

C.1. Estimated Reluctance to Take Risk

To estimate the revealed household reluctance to take financial risks, we run the following specification:

$$w_{h,2002} = \alpha + \lambda' \, x_{h,2002} + \gamma' \, \Phi_h + \varepsilon_h,$$

where $w_{h,2002}$ is the household adjusted risky share in 2002, $x_{h,2002}$ are the control variables that are commonly used in life-cycle models, i.e. age, income, and financial wealth. To allow for non-linearity, we control for these household characteristics using decile fixed effects. We also include fixed effects for the regional location to control for possible supply effects due to the heterogeneous density of bank branches across regions.

We then split the residual of this regression ε_h into quintiles and define as $6 - quintile(\varepsilon_h)$ the revealed reluctance to take financial risks. The rationale is the following: both household preferences and economic circumstances drive financial risk-taking. We therefore control for the economic circumstances to isolate the preferences component central to our study.

Finally, we investigate how the effects of capital-protected investment on household risk-taking vary along household reluctance to take risk by estimating the following regression:

$$\Delta_{2007,2002}(w_h) = \alpha + \beta_0 \, \mathbb{1}_{CP,h} + \beta_1 \, \mathbb{1}_{CP,h} \times RiskReluctance_h + \lambda' x_h + \varepsilon_h, \tag{14}$$

where x_h includes fixed effects for deciles of wealth, income, and age.

Figure 4 plots the incremental change in adjusted risky share for participants in capital-protected investments over the measure of revealed reluctance to take risk. The incremental change is monotonically increasing with the revealed reluctance to take risk.[24] The magnitude is particularly large: among the quintile of households that are the most reluctant to take risk ex ante, the growth in adjusted risky share is 50 pp higher for participants in capital-protected investments than for non-

[24] We obtain a comparable result when using the ex-ante bank deposit share of the financial wealth as a proxy for household reluctance to take risk.

participants. The gap in risky share growth amounts only to 12 pp among the lowest quintile of estimated reluctance to take risk. Columns (2) to (6) in Table VII confirm this result by estimating equation (**??**) within each level of reluctance to take risk and by extending the set of household controls, including fixed effects for family size, gender, decile of ex-ante risky share, number of children and locality on top of fixed effects for deciles of financial wealth, income and age. The coefficient of $\mathbb{1}_{CP,h}$ indicates that the effect of participating in capital-protecting investment on the change in risky share increases from -2.2 pp (Column 2) to 58 pp (Column 6)

INSERT FIGURE 4

This relationship between the size of the incremental change in adjusted risky share for participants in capital-protected investments and their revealed reluctance to take risk suggests that these products are particularly effective at fostering risk-taking for households that are initially the less prone to it.

C.2. Elicited Reluctance to Take Risk

We further confirm the previous result on the relationship between the increase in adjusted risky share for capital-protected investments participants and their initial reluctance to take risk by exploiting the survey data from the twin sample.

Consistent with our previous approach, we first regress the answer to the question "Are you a person who is willing to take financial risks or trying to avoid financial risks?" on the usual set of household characteristics to obtain a conditional measure of elicited reluctance to take risk.

We then use the residual from this regression, in place of the estimated reluctance to take risk, in equation **??**, By construction the sample size is significantly reduced, as the survey data is only available for the twin sample. Results are displayed in figure 5. We observe a similar relationship between household preferences and the effect associated with participating in capital guaranteed products: the increase in adjusted risky share associated with participation in capital-protected investments is significantly more pronounced among households reluctant to risk as elicited in the survey.

INSERT FIGURE 5

D. An Equivalent to Bank Deposits?

To better understand the relationship between household initial reluctance to take risk and the size of the increase in their adjusted risky share when they buy capital protected investments, we investigate whether households invest in these products the same way as in traditional equity products, such as stocks or mutual funds.

We first run the following cross-sectional OLS regressions on the share of financial wealth invested in each financial asset - capital protected investment, bank deposits, stocks and equity funds - at the end of 2007 on the sample restricted to participants in the corresponding financial product:

$$\omega_{j,h} = \alpha_j + \beta RiskReluctance_h + \lambda_j' x_h + \varepsilon_{h,j},$$

where $\omega_{j,h}$ is the share of financial wealth invested in asset class j. The vector of characteristics, x_h, includes fixed effects for deciles of financial wealth, income, age and years of education in 2002.

Figure 6 plots the predicted share of financial wealth invested in each asset as a function of the revealed household reluctance to take risk. Household reluctance to take risk, measured in 2002, is negatively related with the extent of household investment into stocks and mutual funds in 2007, which is consistent with persistence in household preferences. On the other hand, household reluctance to take risk is positively related to the amount of financial wealth that households invest in both bank deposits and capital protected investments as of 2007. The sharp contrast between the pattern of investment in capital protected investments versus in traditional equity products, and the similarity with the one for bank deposits, suggests that households perceive capital protected investments to be closer to bank deposits than to traditional equity products, most likely as both protect the capital invested.

INSERT FIGURE 6

In a second step, we investigate whether the share of financial wealth invested in capital protected investments varies with households characteristics such as IQ, financial wealth and age, the same way as the share of financial wealth invested in cash, funds and stocks. The results displayed in Table VI confirm that household investment patters are similar for capital protected investments

as for bank deposits, but differ for funds and stocks. For example, while the share of financial invested in bank deposits and capital protected investments decreases with IQ and increases with age (columns (1) and (2)), it is the opposite for funds and stocks (columns (3) and (4)).

INSERT TABLE VI

E. Robustness

We conduct a set of robustness tests to ensure that mechanical effects or specification artifacts are not driving our main results.

We first ensure that the effects of capital protected investments on household risky share are not driven by variations in the adjusted risky share resulting from investment passive returns, as opposed to active investment decisions. Our result could for instance be driven by a drop in mutual fund value during our sample period.

To correct for the passive change in the adjusted risky share, we define the active change in the adjusted risky share between $t-n$ and t by:

$$A_{h,t} = w_{h,t} - w^p_{h,t},$$

where $w_{h,t}$ is the observed adjusted risky share in year t and $w^p_{h,t}$ is the adjusted risky share at the end of year t assuming the household does not trade between years $t-n$ and t. $w^p_{h,t}$ is calculated by applying to each asset of the household portfolio the realized returns of this asset between $t-n$ and t.

In Columns 1 and 2 of Table VII, we run our baseline specifications with the active change of the adjusted risky share between 2002 and 2007 as the dependent variable. The effect of capital-protected investment participation on household adjusted risky share, as well as the coefficient on the interaction term with household reluctance to take risk, are almost unchanged when passive variations are taken out. Thus, our main results are not driven by passive variation in portfolio weights caused by investment returns over the period.

In Columns 3 and 4 of Table VII, we restrict the control group to households that buy at least one mutual fund during our sample period, so that our analysis covers only households that actively invest in risky products during that period. The coefficient of the variable $\mathbb{1}_{SP,h}$ indicates

that capital-protected investment participants increase their risky share by an additional 2.6 pp over the 2002 to 2007 period compared to mutual fund buyers that do not participate in capital-protected investments. The coefficient is lower compared to the main model but still economically significant and increasing with household reluctance to take risk. This test suggests that the majority of the effect we document comes from households making larger purchases of CPIs than mutual funds, or funding their purchases with more bank deposits than households from the control group.

Capital-protected investments also offer less liquidity than traditional equity products. To ensure that our results are not driven by households not being able to exit capital protected investments, while they can exit mutual funds or stocks, we restrict our control group to households that do not fully exit an investment position during the sample period. Columns 5 and 6 provide the coefficient of our baseline specification in this setting. Once again, we observe that our results are consistent both directionally and quantitatively when implementing this robustness test.

INSERT FIGURE VII

Finally, we measure the elasticity of the adjusted risky share to the share of financial wealth invested in capital protected investments in a panel analysis. We thus confirm that the risky share increases when households buy capital-protected investments – and that this is not, for example, that participants in capital-protected investments have bought other products simultaneously, or that the control group has divested. We run the following specification:

$$w_{h,t} = \alpha + \beta\, \omega_{CPI,h,t} + \lambda' x_{h,t} + \gamma_h + \varepsilon_h, \tag{15}$$

where γ_h are household fixed effects and $x_{h,t}$ a vector of time-varying characteristics such as income and wealth.

Column 1 Table VIII reports the regression coefficients: the elasticity between the adjusted risky share and the share of financial wealth invested in capital protected investments is equal to 0.3. Because $\eta = 0.5$ for capital protected investments on average, the result suggests that households fund 60% of the amount invested in capital protected investments with bank deposits ($0.3/0.5 = 0.6$). Column 2 shows that the elasticity is higher for households that are more reluctant to take risk.

INSERT TABLE VIII

V. Instrumental Variable Analysis

A. *Identification Strategy*

An important limitation of our baseline result is that the decision of buying capital-protected investments is by nature endogenous. Capital protected investment participants might have increased their adjusted risky share even if these products were not offered by banks, which would result in an upward bias in our OLS estimates. On the other hand, participants and non-participants in capital protected investments are likely to differ along unobservable time-varying characteristics, which could also bias the OLS estimates, downwards or upwards.

These potential sources of endogeneity call for an instrumental variable analysis.

We use idiosyncratic shocks to the supply of capital protected investments at the bank level to instrument household investment in these products. To measure these shocks separately from household demand shocks, we implement the following methodology, adapted from the econometric framework of Amiti and Weinstein (2018). We first exploit identifiers for the banks the households deposit money in 2002 to identify household-bank relationships. We then measure the time-varying supply of capital-protected investments at the bank level with the following panel specification:

$$\omega_{cpi,h,t} = \alpha + \lambda' \, x_{h,t} + \gamma' \, \Phi_{b,t} + \varepsilon_{h,t}, \tag{16}$$

where $\omega_{cpi,h,t}$ is the share of financial wealth of household h invested in CPIs in year t, and $\Phi_{b,t}$ is a matrix of bank-year fixed effects. $\gamma = (\gamma_{b,t})_{1 \leq b \leq B, 2002 \leq t \leq 2007}$ therefore measures bank-year idiosyncratic supply shocks. While we cannot control for demand using household $\times$ year fixed effects as in Amiti and Weinstein (2018) because households usually do not buy the same products from two different banks, we control for demand of equity-linked products using as a large set of household characteristics, $x_{h,t}$ - fixed effects for wealth, age and income deciles, years of education, locality, gender and family size- .

The empirical model in equation (16) can easily be understood by contemplating the standard explanations for what causes the issuance of CPI by a bank to vary. If the issuance varies because

of changes in the demand for these products, we will measure that as arising from the household characteristics such as income, wealth, age and reluctance to take risk, that are captured by the large set of time varying characteristics in our specification. Most importantly, because we regress the share of risky wealth invested in CPI, we control for demand in equity-linked products. Similarly, if the supply of CPI increases because of a bank access to the technology to structure CPI we would capture that with the bank time varying fixed effects. We then calculate household aggregate exposure to bank idiosyncratic supply shocks as households can have several bank relationships:

$$exposure_{h,t} = \sum_{b=0}^{n} \gamma_{b,t} \frac{\text{Deposits in Bank b in year t}}{\text{Total Deposits in year t}}$$

We use this exposure to supply shocks as an instrument for participating in capital protected investments.

The exclusion restriction of this analysis is that this bank-year idiosyncratic variation in supply of CPIs only affects household risk-taking through the composition of the menu of products banks are offering to them.

To improve the robustness of our identification and further ensure that we isolate supply effects orthogonal to household characteristics, we split our total sample into two random samples of the same number of households. We estimate supply shocks on the first sample, and the causal effects of these supply shocks on the second sample in the following specification:

$$w_{h,t} = \alpha + \beta\, \widehat{\omega_{CPI,h,t}} + \lambda' x_{h,t} + \gamma_h + \varepsilon_h,$$

where $\widehat{\omega_{CPI,h,t}}$ is instrumented by $exposure_{h,t}$.

B. Results

Columns 3 to 5 in Table VIII report the results of the instrumental variable analysis.

Column 3 first displays the coefficients of the first stage. It confirms that a higher supply intensity significantly increases the amount invested in capital-protected investment products by a given household, even when controlling for detailed household characteristics. The F-statistics of 212.6 is significantly above the threshold for strong instruments (Stock and Yogo, 2005).

Columns 4 and 5 provide the coefficient of the two-stage least square estimates.

The positive and significant coefficient on the instrumented quantity of CPIs confirms our central result and strengthens its causal interpretation: offering CPIs is associated with a significant increase in the adjusted risky share of households. The larger magnitude of the coefficient in the instrumented specification suggests that the endogeneity issue is biasing our results downwards, which suggests that households participating in capital-protected investments would have actually reduced their risky share in the absence of these products. Finally, we interact our instrument with our measure of reluctance to take risk and find that the effect is stronger on households that are more reluctant to take risk.

C. Results

Table VIII reports the results of the instrumental variable analysis. Column 1 and 2 provide the OLS benchmark in a non-instrumented panel specification. Column 3 displays the coefficients of the first stage. It confirms that a higher supply intensity significantly increases the amount invested in capital-protected investment products by a given household, even when controlling for detailed household characteristics. Column 4 and 5 provides the coefficient of the 2SLS estimates.

The positive and significant coefficient on the instrumented quantity of CPIs confirms our central result and strengthens its causal interpretation: offering CPIs is associated with a significant increase in the adjusted risky share of households. The larger magnitude of the coefficient in the instrumented specification suggests that the endogeneity issue is biasing our results downwards, which suggests that households participating in capital-protected investments would have actually reduced their risky share in the absence of these products. Finally, we interact our instrument with our measure of reluctance to take risk and find that the effect is stronger on households that are more reluctant to take risk.

INSERT TABLE VIII

VI. Lifecycle Model of Portfolio Choice with Capital Guaranteed Investments

This section investigates the theoretical mechanisms that can explain the impact on household portfolios of the introduction of capital-protected investments we observe in our data.

A. Setup

A.1. Agent and Assets

We extend the lifecycle model of Cocco Gomes and Maenhout (2005) to the case of structured products. The framework incorporates both the nonlinear payoffs and illiquidity of these contracts.

We consider an agent living at dates $t = 1, ...T$. Every period, she receives a stochastic labor income Y_t and can consume and trade financial assets. The agent has Epstein-Zin preferences over consumption streams:

$$V_{i,t} = \left\{ (1-\delta)U(C_{i,t}) + \delta p_t \left[\mathbb{E}_t(V_{i,t+1}^{1-\gamma}) \right]^{\frac{1-1/\psi}{1-\gamma}} \right\}^{\frac{1}{1-1/\psi}}.$$

where $t = 1, ..., T-1$, $U(C) = C^{1-1/\psi}$, and p_t is the probability that the agent is alive at $t+1$ conditional on being alive at date t. We rule out the bequest motive, so that $V_{i,T} = C_{i,T}$ at the terminal date. We will of course consider alternative utility specifications.

The agent can trade a riskless asset, a stock, and structured products of staggered maturities. All structured products are identical except for the issue and maturity dates. Every period t, the agent can invest in a structured product issued at date t and maturing at date $t+M$. The investment cannot be accessed before the maturity date. We denote by $1 + R_{g,t+M}$ the gross return on the guaranteed product between t and $t+M$.

We assume for simplicity that the agent can hold at most one type of structured product at a given point in time. Her position at the beginning of period t can therefore be described by the following variables:

- cash on hand, $X_{i,t}$, defined as the sum of labor income and the value of holdings of the riskless asset, stocks, and structured products reaching maturity at the beginning of period t;

- the illiquid capital previously invested in a structured product, denoted by $K_{i,t}$;
- the gross cumulative return of the benchmark, CR_t, of a structured product purchased before date t;
- the time to maturity at t of an existing contract purchased in an earlier period, $\tau_{i,t}$.

By definition, $\tau_{i,t} = 0$ if the contract matures at t or if the agent does not hold a structured product at date $t-1$. The cumulative return is computed between the issue date and t and excludes dividends.

The control variables at t are (i) consumption, $C_{i,t}$, (ii) investment in the illiquid product issued at t, $I_{i,t}$, and (iii) the share of liquid wealth invested in the stock, $\alpha_{i,t}$. We impose the constraint $I_{i,t} = 0$ whenever $\tau_{i,t} > 0$, so that the agent only invests in one type of structured contract.

We now provide the laws of motion driving wealth accumulation. To simplify the exposition, we present the wealth dynamics under the assumption that the maturity of structured products exceeds 1 time period: $M > 1$. We refer the reader to the appendix for the version of the model corresponding to $M = 1$.

If $\tau_{i,t} = 0$, the capital previously invested in a structured product (if any) becomes available and is included in the cash on hand $X_{i,t}$ at the beginning of period t. The individual can invest $I_{i,t}$ in a new contract. Cash on hand at the beginning of period $t+1$ is given by

$$X_{i,t+1} = Y_{i,t+1} + (X_{i,t} - I_{i,t} - C_{i,t}) \left[(1 + R_{m,t+1})\alpha_{i,t} + (1 + R_f)(1 - \alpha_{i,t})\right],$$

where R_f denotes the riskless rate and $R_{m,t+1}$ the net return on the stock. The maturity of the illiquid investment next period is

$$\tau_{i,t+1} = \begin{cases} M - 1 & \text{if } I_{i,t} > 0, \\ 0 & \text{if } I_{i,t} = 0. \end{cases}$$

Without loss of generality, we assume that the value of the illiquid contract is not updated at intermediate dates. The capital invested in the guaranteed product is therefore

$$K_{i,t+1} = I_{i,t}$$

at the beginning of period $t+1$. The cumulative return of the benchmark is

$$CR_{i,t+1} = e^{-q}(1 + R_{m,t+1})$$

if $I_{i,t} > 0$.

If $\tau_{i,t} = 1$, the control variables at t are consumption, $C_{i,t}$, and the share of liquid wealth invested in the stock, $\alpha_{i,t}$. The investor cannot modify her position in the structured product, so that

$$\begin{aligned} I_{i,t} &= 0, \\ \tau_{i,t+1} &= \tau_{i,t} - 1, \\ CR_{i,t+1} &= 1. \end{aligned}$$

Cash on hand next period is therefore

$$\begin{aligned} X_{i,t+1} &= Y_{i,t+1} + (1 + R_{g,t+1})K_{i,t} \\ &\quad + (X_{i,t} - C_{i,t}) \left[(1 + R_{m,t+1})\alpha_{i,t} + (1 + R_f)(1 - \alpha_{i,t}) \right]. \end{aligned}$$

The joint distribution of $(R_{g,t+1}, R_{m,t+1})$ conditional on $CR_{i,t}$ is computed below.

If $\tau_{i,t} > 1$, the investor cannot modify her position in the structured product, so that

$$\begin{aligned} I_{i,t} &= 0, \\ \tau_{i,t+1} &= \tau_{i,t} - 1, \\ K_{i,t+1} &= K_{i,t}, \\ CR_{t+1} &= e^{-q} \left(1 + R_{m,t+1}\right) CR_t. \end{aligned}$$

Cash on hand is

$$X_{i,t+1} = Y_{i,t+1} + (X_{i,t} - C_{i,t}) \left[(1 + R_{m,t+1})\alpha_{i,t} + (1 + R_f)(1 - \alpha_{i,t}) \right]$$

at the beginning of $t+1$.

We now turn to the computation of the joint distribution of the benchmark and stock returns between t and $t+1$ conditional on the cumulative return, $CR_{i,t}$. We assume that the benchmark return is computed over the last year of the contract. The benchmark return

$$1+R^*_{t+1} = \frac{S_{t_1}+...+S_{t_n}}{nS_{t-M+1}} = \frac{S_t}{S_{t-M+1}}\frac{S_{t_1}+...+S_{t_n}}{nS_t}$$

can be rewritten as

$$R^*_{t+1} = (1+R^{**}_{t+1})\ CR_t,$$

where

$$1+R^{**}_{t+1} = \frac{S_{t_1}+...+S_{t_n}}{nS_t}.$$

Let $r_{m,t+1} = \ln(1+R_{m,t+1})$ and $r^*_{t+1} = \ln(1+R^*_{t+1})$.

The first and second moments of $1+R^{**}_{t+1}$ are

$$\begin{aligned}
M_1^{**} &= \mathbb{E}_t^P\left(1+R^{**}_{t+1}\right) = \frac{1}{n}\sum_{i=1}^{n} e^{(\mu-q)(t_i-t)}, \\
M_2^{**} &= \mathbb{E}_t^P\left[\left(1+R^{**}_{t+1}\right)^2\right] = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} e^{[2(\mu-q)+\sigma^2][\min(t_i,t_j)-t]+(\mu-q)|t_j-t_i|}.
\end{aligned}$$

Let

$$a^{\mathbb{P}} = e^{\frac{\mu-q}{12f}}, \qquad\qquad b^{\mathbb{P}} = e^{\frac{2(\mu-q)+\sigma^2}{12f}}.$$

We verify that

$$\begin{aligned}
M_1^{**} &= \frac{(a^{\mathbb{P}})^{12f}}{n}\frac{1-(a^{\mathbb{P}})^{-n}}{1-(a^{\mathbb{P}})^{-1}}, \\
M_2^{**} &= \frac{(b^{\mathbb{P}})^{12f}}{n^2(a^{\mathbb{P}}-1)}\left[2a^{\mathbb{P}}\frac{1-(b^{\mathbb{P}}/a^{\mathbb{P}})^{-n}}{1-(b^{\mathbb{P}}/a^{\mathbb{P}})^{-1}} - (a^{\mathbb{P}}+1)\frac{1-(b^{\mathbb{P}})^{-n}}{1-(b^{\mathbb{P}})^{-1}}\right],
\end{aligned}$$

for every n.

Conditional on CR_t, the vector $(r_{m,t+1}, r^*_{t+1})'$ is approximately Gaussian with means

$$\begin{aligned}
\mathbb{E}_t(r_{m,t+1}) &= \mu - \sigma^2/2, \\
\mathbb{E}_t(r^*_{t+1}) &= \ln(CR_t) + 2\ln(M_1^{**}) - 0.5\ln(M_2^{**}),
\end{aligned}$$

and second moments

$$
\begin{aligned}
Var_t(r_{m,t+1}) &= \sigma^2, \\
Var_t(r^*_{t+1}) &= \ln[M_2^{**}/(M_1^{**})^2], \\
Cov_t(r_{m,t+1}; r^*_{t+1}) &= \ln\left[\frac{\sum_{i=1}^n e^{(\mu-q+\sigma^2)(t_i-t)}}{\sum_{i=1}^n e^{(\mu-q)(t_i-t)}}\right].
\end{aligned}
$$

We show in the Appendix that

$$
Cov_t(r_{m,t+1}; r^*_{t+1}) = \ln\left[e^{\sigma^2}\frac{1-(c^{\mathbb{P}})^{-n}}{1-(c^{\mathbb{P}})^{-1}}\frac{1-(a^{\mathbb{P}})^{-1}}{1-(a^{\mathbb{P}})^{-n}}\right],
$$

where $c^{\mathbb{P}} = e^{\frac{\mu-q+\sigma^2}{12f}}$.

A.2. Labor Income

The labor income process is defined as in Cocco, Gomes and Maenhout (2005). Let RA denote the retirement age. Before retirement ($t \leq RA$), labor income is the product of a permanent component, $Y^P_{i,t}$, and a transitory component, $Y^H_{i,t}$:

$$
Y_{i,t} = Y^P_{i,t}\; Y^H_{i,t}.
$$

The permanent component of income is given by

$$
Y^P_{i,t} = e^{f(t;Z_{i,t})+\nu_{i,t}},
$$

where $f(t; Z_{i,t})$ is a deterministic fixed effect and $\nu_{i,t}$ follows a random walk: $\nu_{i,t+1} - \nu_{i,t} = u_{i,t+1} \sim N(0, \sigma_u^2)$. The transitory component of income is given by

$$
Y^H_{i,t} = e^{\varepsilon_{i,t}}.
$$

After retirement ($t > RA$), retirement income is

$$
Y_{i,t} = \lambda\; Y^P_{i,RA},
$$

where λ is a replacement ratio.

This framework nests the lifecyle model of Cocco, Gomes and Manehout (2005) when agents can only trade the riskless asset and the stock. In particular, we can use their parameters for all variables unrelated to structured products.

B. Policy Functions

We now derive the optimization problems that define the policy functions before and after retirement. This section provides the basis of the numerical implementation.

B.1. After Retirement

After retirement ($t \geq RA$), the vector of state variables consists of the permanent income in the last year of working life, cash-on-hand, and the size and maturity of the structured product investment, or more compactly:

$$(Y_{i,RA}^P, X_{i,t}, K_{i,t}, CR_t, \tau_{i,t}).$$

We normalize all flow and stock variables by $Y_{i,RA}^P$, which allows us to reduce the dimensionality of the optimization problem.

PROPOSITION 1 (Policy Function After Retirement): *The value function after retirement,* $V_{i,t}(Y_{i,RA}^P, X_{i,t}, K_{i,t}; CI$ *is homogenous of degree* 1 *with respect to* $(Y_{i,RA}^P, X_{i,t}, K_{i,t})$. *Let* $X_{i,t}^* = X_{i,t}/Y_{i,RA}^P$ *denote normalized cash on hand, and let* $K_{i,t}^* = K_{i,t}/Y_{i,RA}^P$ *denote the normalized holdings of the structured product. Consider the normalized state vector*

$$Z_{i,t}^* = (X_{i,t}^*, K_{i,t}^*, CR_t, \tau_{i,t}),$$

and the normalized value function $V_{i,t}^*(Z_{i,t}^*) = V_{i,t}(1, X_{i,t}^*, K_{i,t}^*; CR_t, \tau_{i,t})$. *At every* $t \geq RA$, *the normalized value function,* $V_{i,t}^*(Z_{i,t}^*)$, *is the solution to the program*

$$\max_{\{C_{i,t}^*, I_{i,t}^*, \alpha_{i,t}\}} \left[(1-\delta)U(C_{i,t}^*) + \delta p_t \left\{\mathbb{E}_t \left[V_{i,t+1}^*(Z_{i,t+1}^*)^{1-\gamma}\right]\right\}^{\frac{1-1/\psi}{1-\gamma}}\right]^{\frac{1}{1-1/\psi}}, \tag{17}$$

where the cumulative return satisfies

$$CR_{i,t+1} = (1 + R_{m,t+1})CR_{i,t},$$

and cash-on-hand is given by

$$X^*_{i,t+1} = (X^*_{i,t} + K^*_{i,t} - I^*_{i,t} - C^*_{i,t})[(1 + R_{m,t+1})\alpha_{i,t} + (1 + R_f)(1 - \alpha_{i,t})] + \lambda$$

if $\tau_{i,t} = 0$, *and*

$$X^*_{i,t+1} = (X^*_{i,t} - C^*_{i,t})[(1 + R_{m,t+1})\alpha_{i,t} + (1 + R_f)(1 - \alpha_{i,t})] + \lambda$$

if $\tau_{i,t} > 0$.

B.2. Before Retirement

At every $t < RA$, the vector of state variables is $(Y^P_{i,t}, X_{i,t}, K_{i,t}, \tau_{i,t})$, where $Y^P_{i,t}$ is permanent income. We normalize all flow and stock variables by $Y^P_{i,t}$, which allows us to reduce the dimensionality of the optimization problem.

PROPOSITION 2 (Value Function Before Retirement): *The value function after retirement,* $V_{i,t}(Y^P_{i,t}, X_{i,t}, K_{i,t}; \tau_{i,t})$, *is homogenous of degree* 1 *with respect to* $(Y^P_{i,t}, X_{i,t}, K_{i,t})$. *Let* $X^*_{i,t} = X_{i,t}/Y^P_{i,t}$ *denote normalized cash on hand, and let* $K^*_{i,t} = K_{i,t}/Y^P_{i,t}$ *denote the normalized holdings of the structured product. Consider the normalized state vector*

$$Z^*_{i,t} = (X^*_{i,t}, K^*_{i,t}, CR_t, \tau_{i,t}),$$

and the normalized value function $V^*_{i,t}(Z^*_{i,t}) = V_{i,t}(1, X^*_{i,t}, K^*_{i,t}; \tau_{i,t})$. *At every* $t < RA$, *the normalized value function,* $V^*_{i,t}(Z^*_{i,t})$, *maximizes*

$$\left[(1-\delta)U(C^*_{i,t}) + \delta p_t \left\{ \mathbb{E}_t \left[\left(\frac{Y^P_{i,t+1}}{Y^P_{i,t}} \right)^{1-\gamma} V^*_{i,t+1}(Z^*_{i,t+1})^{1-\gamma} \right] \right\}^{\frac{1-1/\psi}{1-\gamma}} \right]^{\frac{1}{1-1/\psi}},$$

where normalized cash-on-hand $X^*_{i,t+1}$ is given by

$$\left[(1+R_{m,t+1})S^*_{i,t}+(1+R_f)(X^*_{i,t}+K^*_{i,t}-C^*_{i,t}-I^*_{i,t}-S^*_{i,t})\right]\frac{Y^P_{i,t}}{Y^P_{i,t+1}}+Y^H_{i,t+1}$$

if $\tau_{i,t}=0$, and

$$\left[(1+R_{m,t+1})S^*_{i,t}+(1+R_f)(X^*_{i,t}-C^*_{i,t}-S^*_{i,t})\right]\frac{Y^P_{i,t}}{Y^P_{i,t+1}}+Y^H_{i,t+1}$$

if $\tau_{i,t}>0$.

C. *First-Order Risk Aversion*

We consider two specifications of preferences. In both cases, the utility $V_{i,t}$ is a function of the state variable $Z_{i,t}=(X_{i,t},K_{i,t},CR_t,\tau_{i,t})$.

C.1. Specification 1

We consider the specification of Gul (1991):

$$V_{i,t}=\left\{(1-\delta)\ C^{1-1/\psi}_{i,t}+\delta p_t\ (\mu_{i,t+1})^{1-1/\psi}\right\}^{\frac{1}{1-1/\psi}},$$

where $\mu_{i,t+1}$ is implicitly defined by:

$$(\mu_{i,t+1})^{1-\gamma}=E(V^{1-\gamma}_{i,t+1})+(\lambda-1)E\left[\left(V^{1-\gamma}_{i,t+1}-\mu^{1-\gamma}_{i,t+1}\right)1_{\{V_{i,t+1}<\mu_{i,t+1}\}}\right],$$

and $\lambda\geq 1$ is a kink parameter. Consistent with loss aversion, this specification introduces a kink when the outcome is disappointing. This class of preferences is often referred to as "disappointment aversion." It makes no hard-wired distinction between liquid and illiquid investments, which I like.

We also consider generalized disappointment aversion. The certainty equivalent $\mu_{i,t+1}$ is implicitly defined by:

$$(\mu_{i,t+1})^{1-\gamma}=E(V^{1-\gamma}_{i,t+1})+(\lambda-1)E\left\{\left[V^{1-\gamma}_{i,t+1}-(\kappa\mu_{i,t+1})^{1-\gamma}\right]1_{\{V_{i,t+1}<\kappa\mu_{i,t+1}\}}\right\}.$$

This specification coincides with disappointment aversion if $\kappa = 1$.

C.2. Specification 2

We consider the recursive specification with narrow framing developed by Barberis and Huang (2009):

$$V_{i,t} = \left\{(1-\delta)\, C_{i,t}^{1-1/\psi} + \delta p_t\, \left(\mu_{i,t+1}\right)^{1-1/\psi}\right\}^{\frac{1}{1-1/\psi}},$$

where

$$\mu_{i,t+1} = \left[\mathbb{E}_t(V_{i,t+1}^{1-\gamma})\right]^{\frac{1}{1-\gamma}} + b_0 E_t \sum_i v(G_{i,t+1}).$$

$G_{i,t+1}$ is a gamble resolved between t and $t+1$ and

$$v(x) = \begin{matrix} x & \text{if } x \geq 0, \\ -\lambda x & \text{if } x \leq 0. \end{matrix}$$

In our setting, the gambles would consist of the gains/losses from stock investments, $\alpha_t X_t(R_{m,t+1} - R_f)$, and the gains/losses from capital-protected investments, $K_{i,t}(R_{g,t+1} - R_f)$. The gains/losses from the capital-protected investment are computed only when the product reaches maturity (Are you comfortable with this simplifying assumption). Under this specification, loss aversion is generated by the specific performance of each asset class.

D. Model Calibration

D.1. Assumptions

We take the median parameters of the representative design:

- a maturity of 4 years,
- a capital guarantee of 100%,
- an initial fee of 11%,
- a market premium of 6% and a volatility of 20%,
- a Asian option of a length of 4 years

These inputs translate into a p, the percentage of index performance the investor receives through the capital-protected investment, of 117%.

We use the investment universe with only the risk-free asset as our initial benchmark. For each of the framework specification, we then sequentially introduce the stock index and the capital-protected investment, and study the change in portfolio allocation, in utility levels, and the interest rate increase that would lead to the same increase in utility. We also include quantiles of net portfolio returns.

D.2. Results

Portfolio Allocation

Figures **??** display part of the results with a narrow-framing utility function.

With a narrow framing utility function, there is some appetite for the guaranteed product without fees. The risky share expands significantly under loss aversion, which is consistent with the data. The effect is also increasing with the kink, which maps well our cross-sectional results. Under the loss-aversion mechanism, capital-protected investment would mitigate this behavioral bias and thereby foster households to participate more often and in a larger extent to risky asset markets.

INSERT FIGURE **??**

VII. Discussion

In this section, we temptatively discuss the welfare effects of the introduction of capital protected investments based on our theoretical and empirical results. Our theoretical model suggests even when the product is priced using the market parameters, the product increases consumption and risk taking. One intersting question is how the welfare gains are split between providers and investors. We also observe that markups and complexity do not decrease with IQ on this market, which suggest that exploitation might not be the main driver.

VIII. Conclusion

This study provides empirical evidence suggesting that security design can help alleviate the low participation of households in risky asset markets. We use a large administrative dataset to characterize the demand for capital-protected investments, an innovative class of retail financial products with option-like features.

The micro-evidence in this paper suggests that the introduction of retail capital-protected investments increases significantly financial risk taking. Both empirical and theoretical evidence is most consistent with these innovative products being successful at alleviating first order risk aversion among households.

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Figures and Tables

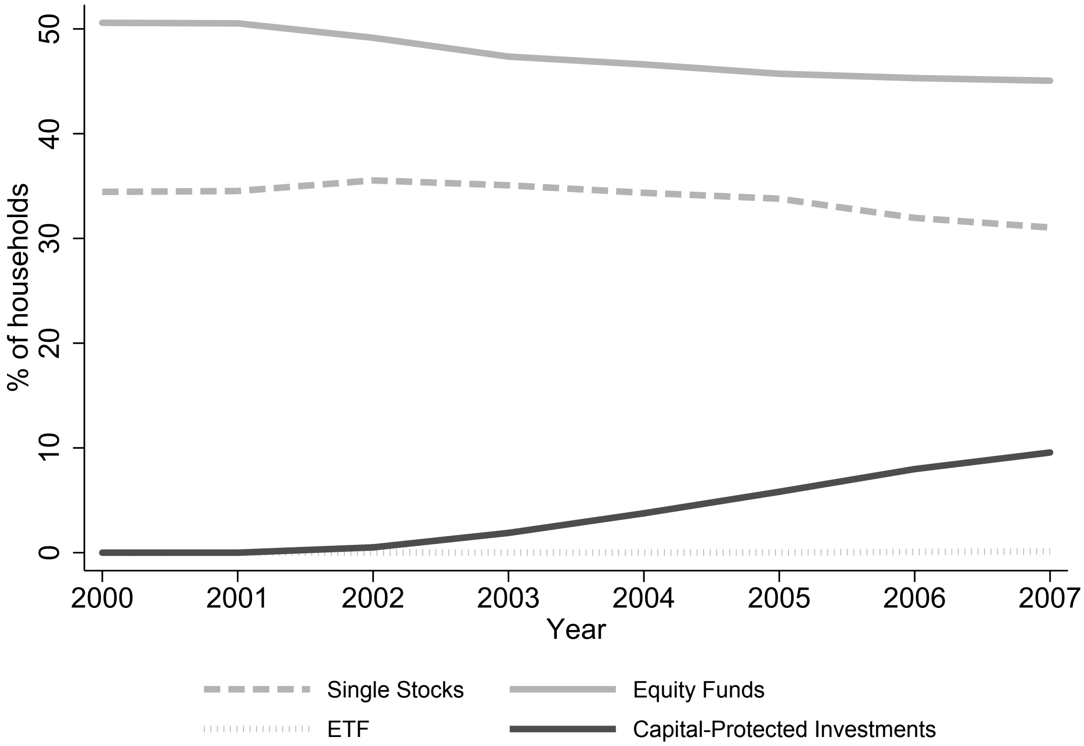


Figure 1. Adoption of Capital-protected Investments in Sweden (2000-2007): Fraction of Households Participating in Capital-Protected Investments, Stocks, and Equity Funds The figure shows the evolution of the share of Swedish households investing in equity markets through capital-protected investments (dark grey line), equity funds (grey line), single stocks (dashed line), and ETFs (dot line). Swedish banks started distributing retail capital-protected investments in 2000, the beginning of our sample period.

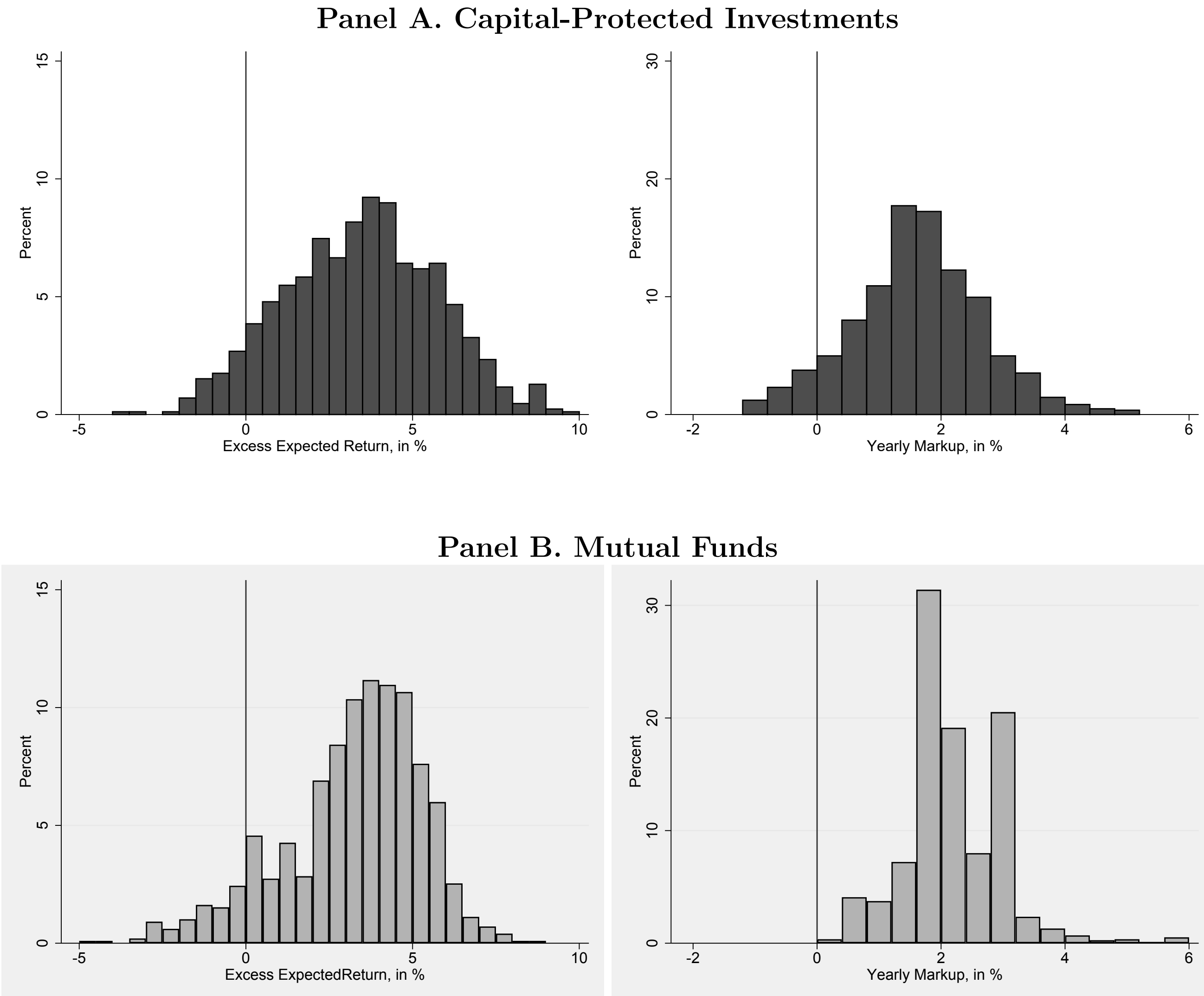


Figure 2. Histogram of the Excess Expected Return and Yearly Mark-up of Capital-protected Investments and Mutual Funds. This figure shows the histogram of the excess expected returns offered by the representative capital-protected investments in our sample (858 products issued from 2002 to 2007) and all the standard equity funds, as well as the mark-up of the banks distributing them.

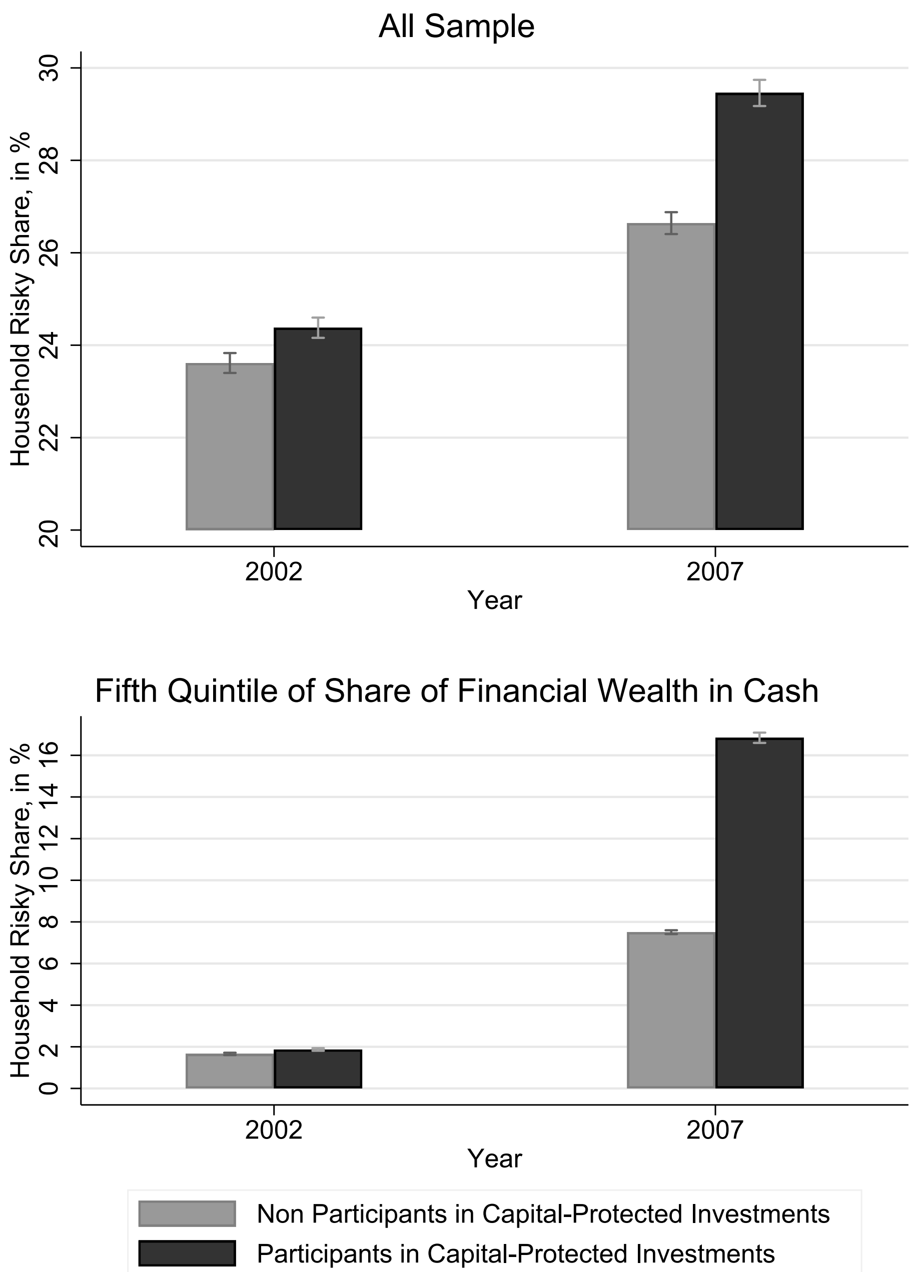


Figure 3. Household Risky Share in 2002 and 2007: Participants versus non-Participants. The upper part of this figure shows the estimated risky share for capital-protected investment participants versus equity fund or stock participants (that do not participate in capital-protected investments) in 2002 and 2007. The lower part of the figure reproduces the same graph when restricting the sample to households in the fifth quintile of cash share of financial wealth in 2002.

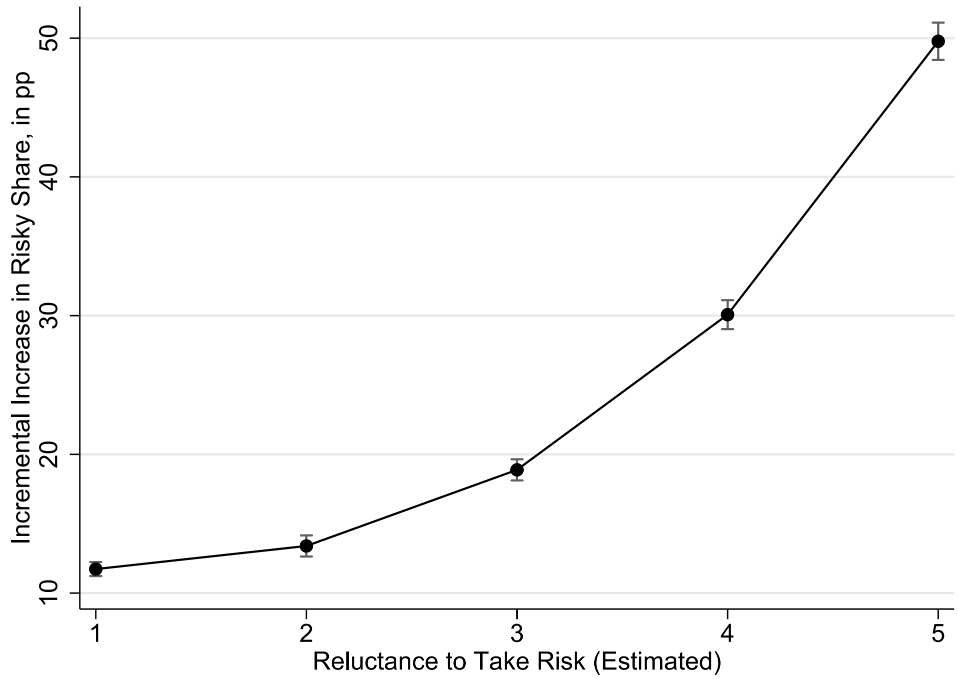


Figure 4. Incremental change in the risky share over the 2002 to 2007 period for participants in capital-protected investments across reluctance to take risk (estimated). This figure shows the incremental change in the risky share, in pp, over the 2002 to 2007 period for 2007 capital-protected investment participants versus equity fund or stock participants (that do not participate in capital-protected investments), broken down by reluctance to take risk, as inferred in the data.

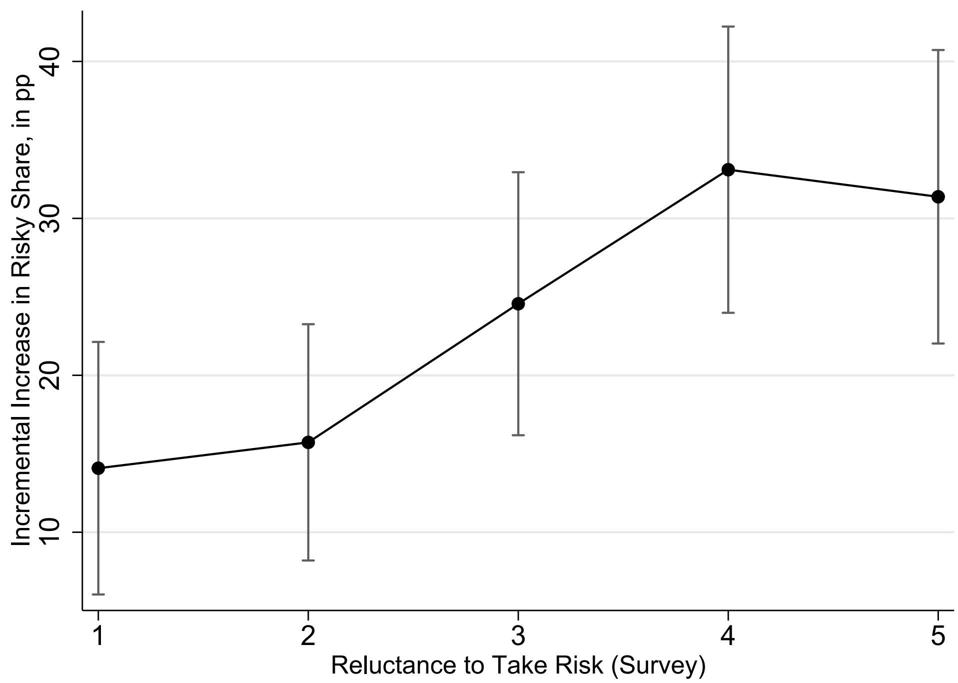


Figure 5. Incremental change in the risky share over the 2002 to 2007 period for participants in capital-protected investments across reluctance to take risk (elicited). This figure shows the incremental change in the risky share, in pp, over the 2002 to 2007 period for 2007 capital-protected investment participants versus equity fund or stock participants (that do not participate in capital-protected investments), broken down by reluctance to take risk, as elicited in the survey.

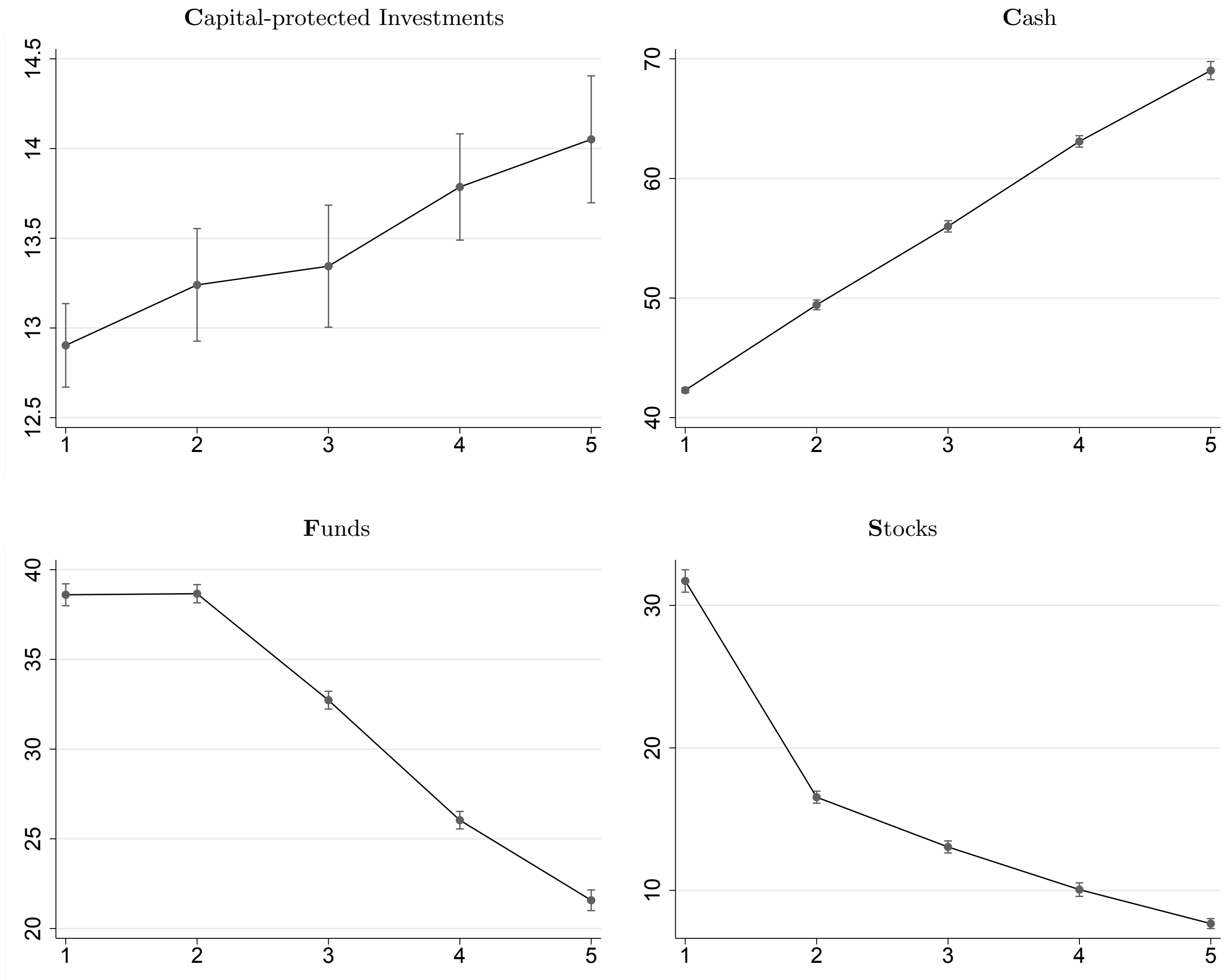


Figure 6. Portfolio Composition: Share of Financial Wealth Invested in Capital-protected Investments, Equity Funds, Stocks and Cash across Household Reluctance to Take Risk. This figure displays the estimated share of financial wealth invested capital protected investments, cash, funds and stocks as of end of 2007. The sample is restricted to participants in each asset category.

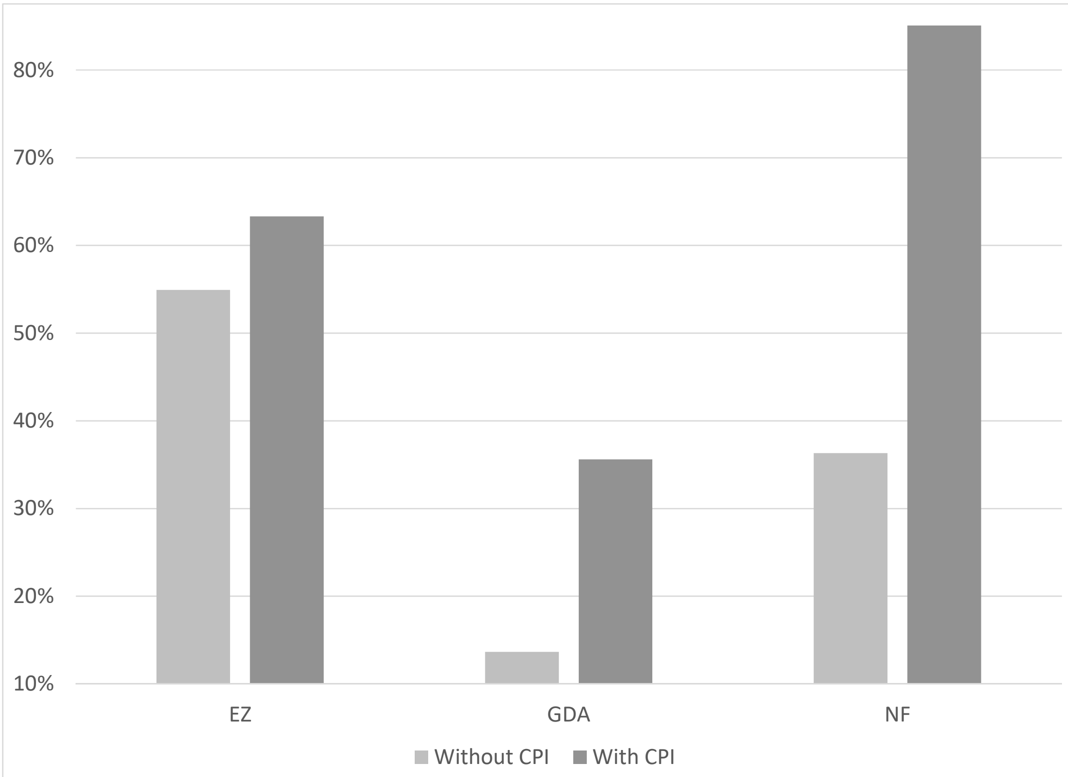


Figure 7. The Effects of Capital-Protected Investments in a Life-Cycle Model on the Risky Share: Epstein Zin, GDA, Narrow Framing.

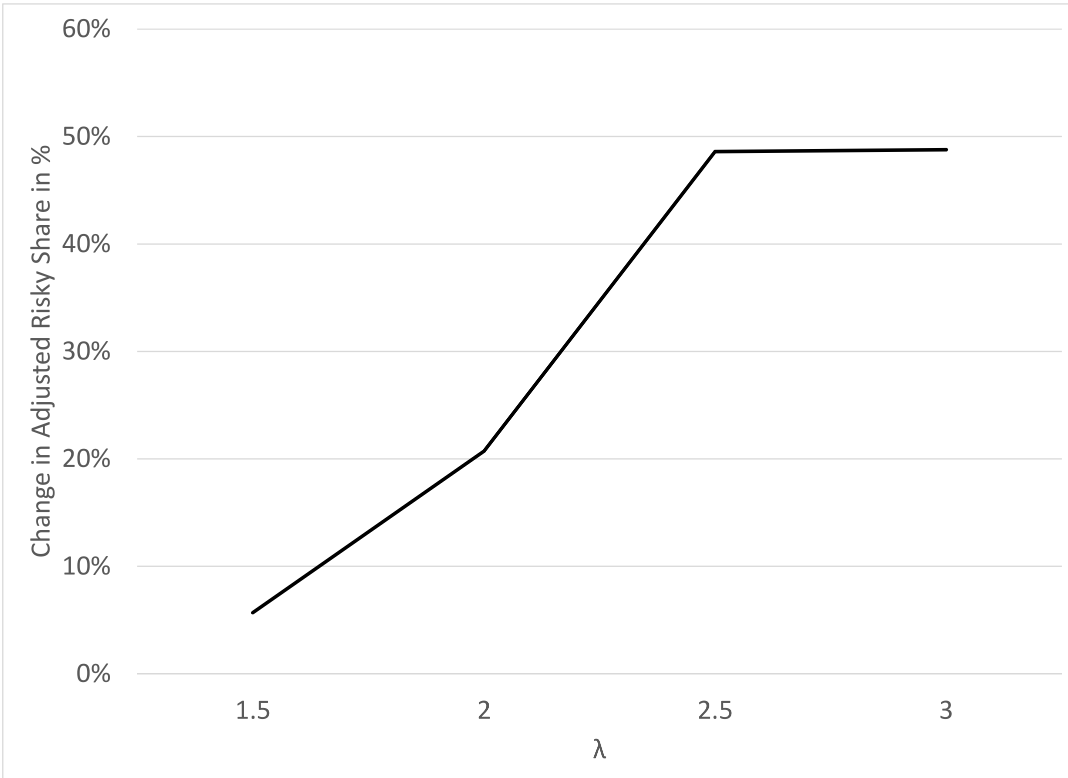


Figure 8. Change in the Risky Share and First-Order Risk Aversion in a Life Cycle Model with Narrow Framing.

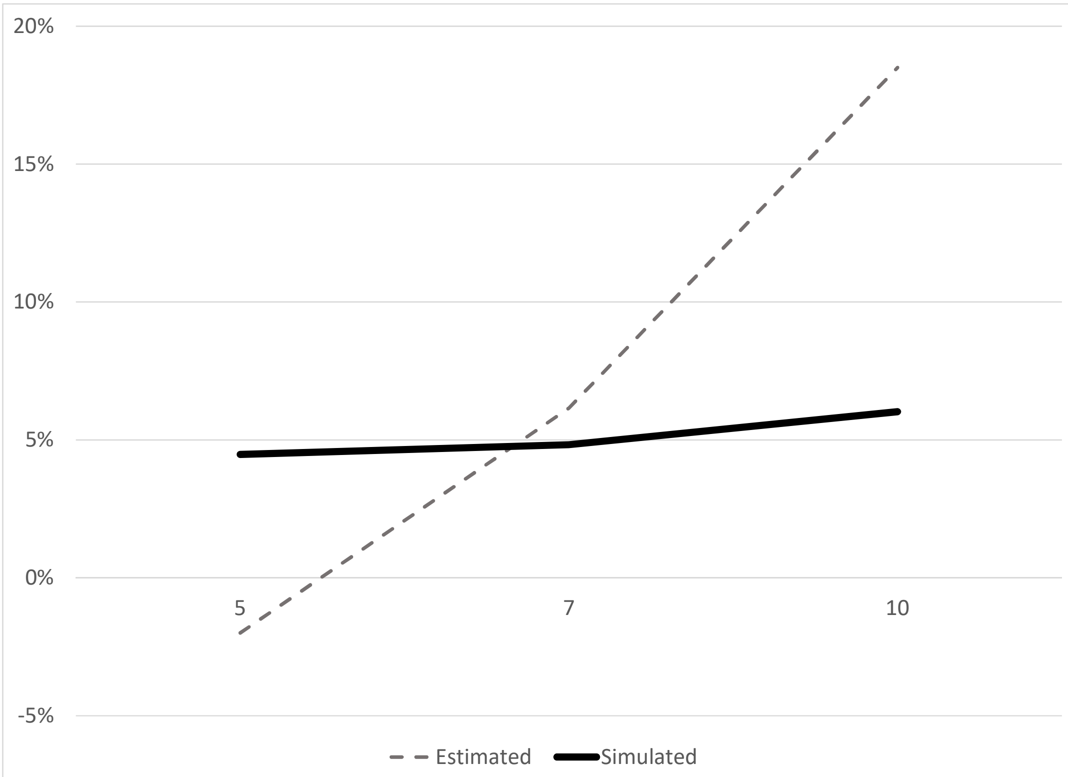


Figure 9. Change in the Risky Share and Risk Aversion in a Life Cycle Model with Epstein Zin and Misperception.

Table I. Capital-protected Investments Around the World

Product Type	Country	2015 Outstanding Volumes $USD	Reference	Structure
Structured Products with Capital Guarantee	Europe	300 bn	ESMA	Synthetic
Structured Certificate of Deposits	USA	25 bn		Synthetic
Guaranteed Life Annuities	USA	1.72tn	Ellul et al (2019)	Synthetic / Reserves
Market-linked Guaranteed Investment Certificates	Canada	CAD 100bn	(estimated)	
Euro Contracts	France	1.4tn	Hombert and Lyonnet (2019)	Reserves
Principal Protected Notes	US	?		Synthetic
Principal Protected Notes	Canada	30bn		Synthetic
Chinese Structured Deposits	China	1.8 tn		Synthetic
Uridashi Structured Bonds	Japan	?		
Autocallable Notes	South Korea	93.2 bn		

Volumes of capital protected investments around the world. 3% of total personal financial wealth invested in products with a capital guarantee

Table II. Stock Market Participation, 2015

Country	Percent of Aggregate Household Wealth Invested in Stocks	Stock Market Participation	Mean Percent of Household Wealth Invested in Stocks
Austria	27.48%	13.29%	55.08%
Belgium	38.28%	28.59%	54.52%
Croatia	n/a	4.28%	52.60%
Czech Republic	22.93%	9.25%	35.56%
Denmark	34.05%	37.52%	39.49%
Estonia	56.45%	4.41%	45.78%
France	22.35%	17.52%	35.39%
Germany	11.09%	21.24%	44.46%
Greece	20.87%	2.10%	39.40%
Israel	22.44%	13.24%	69.12%
Italy	32.14%	8.03%	69.17%
Luxembourg	32.06%	22.68%	49.06%
Poland	27.78%	1.89%	55.12%
Portugal	20.75%	6.46%	46.30%
Slovenia	25.93%	8.47%	42.99%
Spain	32.38%	4.82%	52.25%
Sweden	41.20%	57.72%	45.42%
Switzerland	n/a	36.56%	50.55%
United Kingdom	10.96%	31.0%	21.8%
United States	35.21%	51.88%	53.23%

Source: Survey of Health, Ageing and Retirement in Europe (SHARE), OECD National Accounts Data, and Survey of Consumer Finances.

Note United States values are from 2016. United Kingdom data on participation and mean percent of household wealth invested in stocks from (Paya, Wang, 2015).

The methodology used to calculate columns two and three involved gather household financial data from SHARE. To calculate the participation rate, we included households which responded "Yes" to having either stocks or mutual funds and divided this by the total number of households.

In calculating the Mean Percent of Household Wealth Invested in Stocks, we included SHARE imputed values. Our definition of financial wealth includes equity (stocks and mutual funds), bonds, bank account, and long term savings. Long term savings are defined as household retirement savings, savings for housing, and face value of whole life policies. Note that imputed values for investments do not separate equity from bonds in our calculation of equity, however, the amount of bonds is minimal.

Table III. Product Design, Markups and Expected Returns - Summary Statistics

Panel A: Total Sample of Capital Protected Investments (1,511 contracts)

	Mean	**p1**	**p10**	**p50**	**p90**	**p99**
Issuance year	2006	2002	2004	2006	2007	2007
Volume ($ million)	5.2	0.1	0.5	2.6	13.0	29.1
Design Parameters:						
- Term (months)	40.1	12.0	17.9	37.6	60.5	72.5
- Capital guarantee (%)	100.2	100.0	100.0	100.0	100.0	108.0
- Initial fee (%)	7.0	0.0	1.0	6.0	12.0	22.0

Panel B: Representative Capital Protected Investments (858 contracts)

	Mean	**p1**	**p10**	**p50**	**p90**	**p99**
Issuance year	2006	2002	2004	2006	2007	2007
Volume ($ million)	4.9	0.0	0.4	2.9	12.1	27.5
Design Parameters:						
- Term (months)	44.2	12.5	24.5	48.0	60.5	72.5
- Capital guarantee (%)	100.2	100.0	100.0	100.0	100.0	108.0
- Initial fee (%)	8.5	0.0	1.0	11.0	13.0	22.0
- Participation rate (%)	114.6	30.0	64.0	110.0	160.0	220.0
- Asian option length (months)	14.5	0.0	4.0	13.0	36.0	60.0
Asset Pricing Inputs:						
- Historical volatility	0.2	0.1	0.1	0.2	0.3	0.4
- Dividend Yields (%)	2.0	0.0	0.5	2.1	3.0	4.5
- CDS premium (%)	0.2	0.08	0.11	0.15	0.32	0.49
Asset Pricing Outputs:						
- Beta to world index	1.1	0.5	0.9	1.1	1.3	1.4
- Yearly markup (%)	1.6	-1.7	0.0	1.6	3.0	6.1
- Yearly excess expected return (%)	3.5	-1.6	0.4	3.5	6.3	8.9
- η (%)	57.6	-26.1	6.7	59.1	104.5	148.4

Panel C: Standard Equity Funds (1,430 funds)

	Mean	**p1**	**p10**	**p50**	**p90**	**p99**
Volume in 2007 ($ million)	29.4	0.0	0.0	0.6	41.7	730
Asset Pricing Outputs:						
- Beta to world index (%)	0.9	0.0	0.4	1.0	1.3	1.5
- Yearly markup (%)	2.2	0.5	1.4	2.0	3.0	4.6
- Yearly excess expected return (%)	3.2	-2.7	0.1	3.6	5.6	7.3
- η (%)	55.3	0.0	0.0	59.6	93.0	122.2

Panel A of this table reports summary statistics of the issuances of retail capital-protected investments in Sweden between 2002 and 2007. *Capital guarantee* represents the minimum fraction of the initial investment nominal amount that the household is guaranteed to receive at maturity. *Initial Fee* represents the additional amount that the household pays above the principal at issuance, in % of principal. Panel B displays summary statistics for the sample of representative products and the output from the expected returns and markup calculations from Section 3. *Participation Rate* represent the coefficient applied to the positive performance of the benchmark asset. *Asian Option Length* represents the period over which the underlying asset performance is averaged to define the benchmark asset. *Yearly Excess Expected Return* represents the annualized expected return of the capital-protected investment over the maturity of the product, minus the risk-free rate for the same period (Swedish treasury rate). η corresponds to the *Yearly Excess Expected Return* divided by the World index market premium assumed for the calculation of the expected return (6%). *Yearly Markup* corresponds to the difference between the issuance price of the product minus the fair replication value under the Black and Scholes framework described in Section 2 of a product, divided by the product maturity in years. Panel C of this table reports summary statistics of all the equity funds available in Sweden between 2002 and 2007. We obtain the beta of the fund by applying the World CAPM over the longest time-series available of the fund returns. *Yearly Markup* corresponds to the sum of the fees paid by retail investors (management plus entry fees) when investing in the fund. *Yearly Excess Expected Return* represents the fund beta that we apply to a risk premium of 6% to which we substract *Yearly Markup*. η corresponds to the *Yearly Excess Expected Return* divided by the 6% World index market premium assumed for the calculation of the expected return.

Table IV. Household Demographics, Financial Characteristics and Portfolio Allocation at the Start (2002) and End (2007) of the Sample Period: Summary Statistics

Sample	All (1) N= 3,112,214				Traditional Equity Product Participants (2) N=2,132,264, 68.5%				Capital-protected Investment Participants (3) N= 427,980, 13.8%			
	Mean	Median	p10	p90	Mean	Median	p10	p90	Mean	Median	p10	p90
Panel A. 2002												
Financial characteristics (in 2000 $, thousands):												
Financial Wealth	33.8	11.3	2.5	73.0	45.0	17.8	4.6	93.0	73.0	38.1	8.1	149.7
Cash	14.7	6.8	2.1	31.8	17.5	8.3	2.8	37.5	26.8	13.0	3.7	57.7
Traditional Equity Products	15.7	1.4	0.0	30.5	22.9	4.7	0.3	44.0	37.0	12.4	0.4	80.9
Stocks	7.1	0.0	0.0	6.4	10.4	0.3	0.0	11.2	13.5	0.9	0.0	22.4
Equity Funds	8.1	0.6	0.0	19.9	11.9	2.8	0.0	28.8	22.2	7.9	0.0	54.6
Other Financial Wealth	2.7	0.0	0.0	6.9	3.6	0.0	0.0	10.2	7.3	0.0	0.0	20.2
Fixed Income Funds	1.0	0.0	0.0	0.4	1.3	0.0	0.0	1.8	2.6	0.0	0.0	6.9
Bonds	1.6	0.0	0.0	3.0	2.2	0.0	0.0	5.1	4.4	0.0	0.0	12.0
Real Estate Wealth	82.4	41.8	0.0	205.0	105.9	66.8	0.0	240.0	132.8	87.0	0.0	279.7
Total Wealth	116.3	65.1	3.1	263.6	150.9	97.4	7.9	311.2	205.8	141.5	26.6	397.6
Total Debt	33.3	11.1	0.0	88.8	40.7	18.3	0.0	102.5	36.8	13.7	0.0	91.9
Demographics												
Household Head Age	53.1	52.0	33.0	76.0	52.0	52.0	32.0	73.0	55.1	56.0	37.0	72.0
IQ Score	5.2	5.0	3.0	8.0	5.3	5.0	3.0	8.0	5.4	5.0	3.0	8.0
Reluctance to Take Fin. Risk	3.0	3.0	1.0	5.0	2.9	3.0	1.0	5.0	2.8	3.0	1.0	5.0
Family Size	2.1	2.0	1.0	4.0	2.3	2.0	1.0	4.0	2.2	2.0	1.0	4.0
Number of Children	0.2	0.0	0.0	1.0	0.2	0.0	0.0	1.0	0.2	0.0	0.0	1.0
Stockholm Area, in %	18.9	0.0	0.0	100.0	17.5	0.0	0.0	100.0	16.9	0.0	0.0	100.0
Years of Schooling	11.4	11.0	8.0	15.0	11.8	11.0	8.0	15.0	11.9	12.0	8.0	16.0
Household Head Male, in %	60.0	100.0	0.0	100.0	63.5	100.0	0.0	100.0	62.9	100.0	0.0	100.0
Disposable Income (in 2000$)	27.5	22.8	10.5	48.0	31.5	28.0	12.3	52.0	35.3	30.9	14.2	57.0
% Households that participate in												
Traditional Equity Products	68.5	100.0	0.0	100.0	100.0	100.0	100.0	100.0	92.9	100.0	100.0	100.0
Stocks	40.7	0.0	0.0	100.0	59.4	100.0	0.0	100.0	67.0	100.0	0.0	100.0
Equity Funds	53.5	100.0	0.0	100.0	78.1	100.0	0.0	100.0	79.7	100.0	0.0	100.0
% Share of financial wealth invested in (2002 participants only)												
Traditional Equity Products					34.5	29.3	3.8	74.2	42.4	40.8	8.6	79.0
Stocks					9.3	1.4	0.0	30.2	10.5	3.3	0.0	32.4
Equity Funds					23.7	17.9	0.0	57.3	29.8	26.3	1.7	62.5
Cash					57.2	59.4	16.5	94.2	45.4	42.9	11.8	83.7
Panel B. 2007												
% Share of financial wealth invested in												
Capital-protected Investments	1.6	0.0	0.0	2.5	2.1	0.0	0.0	6.1	11.3	7.0	0.0	28.2
ETFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Traditional Equity Products	28.1	17.6	0.0	75.5	39.2	37.4	0.4	80.8	49.8	50.9	15.1	82.6
Stocks	6.4	0.0	0.0	21.8	9.1	0.3	0.0	31.6	9.7	2.2	0.0	31.6
Equity Funds	17.3	2.7	0.0	55.7	24.4	17.3	0.0	62.9	24.7	20.7	0.0	56.1
Cash	67.7	75.4	19.0	100.0	55.9	55.4	14.8	98.8	41.8	38.6	11.3	78.1
2002-2007 % change in:												
Financial Wealth					31.4	38.2	-62.3	113.4	54.9	55.9	-11.3	124.5
Income					13.6	12.1	-20.6	48.8	15.3	13.2	-22.3	56.3
% Share of fin. wealth in equity					31.9	59.6	-184.9	139.5	69.2	77.7	-24.7	158.6
Panel C. Household Adjusted Risky Share												
In 2002					23.9	18.6	1.9	54.1	29.1	26.0	4.8	57.5
In 2007					27.0	23.1	0.1	59.5	32.6	30.8	7.9	59.3
2002-2007 % Change					0.6	14.3	-188.5	118.5	16.7	15.3	-74.7	114.6

Table V. Participation in Capital-protected Investments, Financial Risk-Taking and Reluctance to Take Risks

Sample	2002-2007 Percentage Change in Adjusted Risky Share (Δw_h)						
		Quintiles of Estimated Reluctance to Take Risk					
	All (1)	Q1 (2)	Q2 (3)	Q3 (4)	Q4 (5)	Q5 (6)	Survey
$\mathbb{1}_{CP_h}$	21.25***	-3.71***	4.30***	16.95***	35.78***	56.14***	9.18**
	(0.24)	(0.21)	(0.28)	(0.36)	(0.49)	(0.49)	(4.36)
$\mathbb{1}_{CP_h} \times$ Elicited Reluctance to Take Risks							4.25***
							(1.31)
Elicited Reluctance to Take Risks							-4.47***
							(0.90)
Fixed Effects (2002 value)							
Risky Share Deciles	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Financial Wealth Deciles	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income Deciles	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age Deciles	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Years of Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Children	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls							
2002-2007 Change in fin. wealth	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2002-2007 Change in income	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,128,055	425,611	425,610	425,611	425,611	425,611	8,549
R^2	0.111	0.139	0.073	0.072	0.071	0.080	0.149
Summary Statistics							
$\mathbb{E}[w_{h,2002}]$	24%	57%	31%	18%	8.8%	5.4%	
$\mathbb{E}[\Delta w_h]$	0.7%	-32%	-14%	1.9%	15.3%	32.9%	

This table displays OLS regression coefficients. The dependent variable is the percentage change in the adjusted risky share from 2002 to 2007. The adjusted risky share is the weighted average of the fraction of the risk premium the household gets through each security of its portfolio, including equity funds, stocks and retail capital-protected investments. $\mathbb{1}_{CP_h}$ is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The sample is restricted to households participating in stock markets in 2002. The coefficient in column 1 means that the increase in stock market exposure over the 2002 to 2007 period was 23.1 pp higher for households who participated in capital-protected investments than for the ones that did not. Standard errors are clustered at the parish level. Standard errors are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table VI. Portfolio Allocation across Household Characteristics

	Share of Financial Wealth Invested in: (in %)			
	Capital-Protected Investments	Cash	Stocks	Funds
	(1)	(2)	(3)	(4)
Reluctance to Take Risks	0.377***	6.579***	-4.758***	-4.486***
	(0.032)	(0.029)	(0.029)	(0.040)
IQ Score	-0.211***	-0.250***	0.078***	0.177***
	(0.024)	(0.018)	(0.022)	(0.018)
Financial Wealth (log))	-3.376***	-6.440***	1.797***	-1.090***
	(0.046)	(0.042)	(0.067)	(0.054)
Age (years)	0.019***	0.222***	0.010**	-0.080***
	(0.006)	(0.007)	(0.005)	(0.006)
Fixed Effects				
Gender	Yes	Yes	Yes	Yes
Family Size	Yes	Yes	Yes	Yes
Number of Children	Yes	Yes	Yes	Yes
Locality	Yes	Yes	Yes	Yes
Observations	85,988	727,177	380,915	604,779
R^2	0.098	0.241	0.160	0.085

This table displays OLS regression coefficients. The dependent variable is the share of financial wealth invested in capital-protected investment products (column 1), cash (column 2), stocks (column 3), and equity funds (column 4) as of 2007. The sample is restricted to households participating in each asset class in 2007. Individual controls include a household head gender dummy, fixed effects for the size of the household, the number of children and the locality. Standard errors are clustered at the parish level. Standard errors are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table VII. Participation in Capital-protected Investments and Financial Risk-Taking: Robustness

Model	2002 -2007 Percentage Change in Adjusted Risky Share (Δw_h)					
	Active Change in Adjusted Risky Share		Active Participants Only		Excluding Exits	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}_{CP_h}$	14.05***	-11.08***	3.70***	-9.53***	15.72***	-8.64***
	(0.27)	(0.34)	(0.17)	(0.28)	(0.24)	(0.24)
$\mathbb{1}_{CP_h} \times$ Reluctance to Take Risks		8.71***		4.73***		8.45***
		(0.16)		(0.11)		(0.10)
Reluctance to Take Risks		-9.61***		-3.74***		-4.70***
		(0.18)		(0.19)		(0.14)
Fixed Effects (2002 value)						
Risky Share Deciles	Yes	Yes	Yes	Yes	Yes	Yes
Financial Wealth Deciles	Yes	Yes	Yes	Yes	Yes	Yes
Income Deciles	Yes	Yes	Yes	Yes	Yes	Yes
Age Deciles	Yes	Yes	Yes	Yes	Yes	Yes
Gender	Yes	Yes	Yes	Yes	Yes	Yes
Years of Education	Yes	Yes	Yes	Yes	Yes	Yes
Family Size	Yes	Yes	Yes	Yes	Yes	Yes
Number of Children	Yes	Yes	Yes	Yes	Yes	Yes
Locality	Yes	Yes	Yes	Yes	Yes	Yes
Controls						
2002-2007 Change in fin. wealth	Yes	Yes	Yes	Yes	Yes	Yes
2002-2007 Change in income	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,114,038	2,114,038	1,228,219	1,228,219	1,941,527	1,941,527
R^2	0.058	0.061	0.214	0.215	0.245	0.249

This table displays OLS regression coefficients. The dependent variable is the *active* change in risky share in Columns 1 and 2 and the percentage change in the adjusted risky share from 2002 to 2007 in columns 3 to 6. The adjusted risky share is the weighted average of the fraction of the risk premium the household gets through each securities of its portfolio, including equity funds, stocks and retail capital-protected investments. We compute the active change in the risky share by applying to each asset of the household portfolio the realized returns of this asset between 2002 and 2007 and compute the change in the adjusted risky share relative to this *passive* adjusted risky share. $\mathbb{1}_{CP_h} \times$ is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The sample is restricted to households participating in stock markets in 2002. In Columns 3 and 4 the sample is further restricted to active participants only, i.e. to households that have actively invested in an equity fund or a capital protected investments. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table VIII. Percentage Change in Risky Share and Participation in Capital-Protected Investments: Instrumented Panel Analysis

	OLS Panel		**Instrumented Panel**		
			First Stage	Second Stage	
	Risky Share, in %		Capital-protected Inv. Share	Risky Share, in %	
	(1)	(2)	(3)	(4)	(5)
CP Inv. Share	0.27***	-0.31***			
	(0.01)	(0.01)			
CP Inv. Share × Risk Reluctance		0.19***			
		(0.00)			
Bank-Idiosyncratic Supply			1.26***		
			(0.06)		
$\widehat{CPInv.Share}$				0.64***	-2.39***
				(0.14)	(0.07)
$\widehat{CPInv.Share}$					1.03***
× Risk Reluctance					(0.03)
Controls					
Year FE	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes
Income Deciles FE	Yes	Yes	Yes	Yes	Yes
Age Deciles FE FE	Yes	Yes	Yes	Yes	Yes
Years of Education	Yes	Yes	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes
Observations	4,164,828	4,164,828	4,125,252	4,125,252	4,125,252
R^2	0.817	0.818	0.484		
$F - Statistics$			395.95		

This table displays the results of our IV analysis. In the first stage, the dependent variable, *Capital-protected Investment Participant*, is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The independent variable is a time-varying measure of bank supply of capital protected investment. In the second stage, we estimate a panel model with household and year fixed effects where the dependent variable is the adjusted risky share, in % of financial wealth. The sample is restricted to household participating in stock markets in 2002. Standard errors are clustered at the parish level. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Appendix A. Proofs

We use the following result throughout the Appendix. If V is lognormally distributed and the standard deviation of V is s, then

$$\mathbb{E}\left[\max(V-K,0)\right] = \mathbb{E}(V)\,N(d_1) - K\,N(d_2) \tag{A1}$$

for every $K>0$, where

$$d_1 = \frac{\ln[\mathbb{E}(V)/K] + s^2/2}{s}$$

and $d_2 = d_1 - s$.

A.1. Moments of the Benchmark Return

Since $\mathbb{E}_0^{\mathbb{Q}}(S_{t_i}/S_{t_0}) = e^{(r_f-q)(t_i-t_0)}$ for every i, the first moment of the benchmark return is

$$M_1^{\mathbb{Q}} = \frac{1}{n}\sum_{i=1}^{n}\mathbb{E}_0^{\mathbb{Q}}\left(\frac{S_{t_i}}{S_{t_0}}\right) = \frac{1}{n}\sum_{i=1}^{n} e^{(r_f-q)(t_i-t_0)}.$$

The second moment satisfies

$$M_2^{\mathbb{Q}} = \frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n}\mathbb{E}_0^{\mathbb{Q}}\left(\frac{S_{t_i}}{S_{t_0}}\frac{S_{t_j}}{S_{t_0}}\right).$$

If $i \le j$, then

$$\begin{aligned}
\mathbb{E}_0^{\mathbb{Q}}\left(\frac{S_{t_i}}{S_{t_0}}\frac{S_{t_j}}{S_{t_0}}\right) &= \mathbb{E}_0^{\mathbb{Q}}\left[\left(\frac{S_{t_i}}{S_{t_0}}\right)^2\frac{S_{t_j}}{S_{t_i}}\right] \\
&= e^{(r_f-q)(t_j-t_i)}\,\mathbb{E}_0^{\mathbb{Q}}\left[\left(\frac{S_{t_i}}{S_{t_0}}\right)^2\right].
\end{aligned}$$

Since $\ln(S_{t_i}/S_{t_0})$ is normal with mean $(r_f-q-\sigma^2/2)(t_i-t_0)$ and variance $\sigma^2(t_i-t_0)$, we infer that

$$\begin{aligned}
\mathbb{E}_0^{\mathbb{Q}}\left[\left(\frac{S_{t_i}}{S_{t_0}}\right)^2\right] &= e^{2(r_f-q-\sigma^2/2)(t_i-t_0)+2\sigma^2(t_i-t_0)} \\
&= e^{[2(r_f-q)+\sigma^2](t_i-t_0)}.
\end{aligned}$$

Hence

$$\mathbb{E}_0^{\mathbb{Q}}\left(\frac{S_{t_i}}{S_{t_0}}\frac{S_{t_j}}{S_{t_0}}\right) = e^{[2(r_f-q)+\sigma^2](t_i-t_0)+(r_f-q)(t_j-t_i)}.$$

Thus

$$\mathbb{E}_0^{\mathbb{Q}}\left(\frac{S_{t_i}}{S_{t_0}}\frac{S_{t_j}}{S_{t_0}}\right) = e^{[2(r_f-q)+\sigma^2][\min(t_i,t_j)-t_0]+(r_f-q)|t_j-t_i|}.$$

for all i and j, and equation (6) holds.

By a similar derivation, the first and second moments of the benchmark return under the physical measure $\mathbb{P}$ satisfy (9) and (10).

Specialized Example. Assume that the benchmark is computed f times a month over the last Y months of the product. The frequency is 1 when the index is recorded every month, 2 if this is every two weeks, or 0.5 if this is every two months, etc. In our notation, the number of observations is $n = Y\,f$ and the time interval between two consecutive observations is $t_i - t_{i-1} = 1/(12\,f)$ in annual units. The instants at which the index is recorded are therefore

$$t_i = T - \frac{n-i}{12\ f},$$

where $i = 1, ..., Y f$. We also assume that $t_0 = 0$.

Let

$$\begin{aligned} a &= e^{\frac{r_f-q}{12\,f}}, \qquad b = e^{\frac{2(r_f-q)+\sigma^2}{12f}}, \\ a^{\mathbb{P}} &= e^{\frac{\mu-q}{12\,f}}, \qquad b^{\mathbb{P}} = e^{\frac{2(\mu-q)+\sigma^2}{12f}}. \end{aligned}$$

We easily infer from equations (5), (6), (9), and (10) the following results

$$M_1 = \frac{a^{12fT}}{n}\frac{1-a^{-n}}{1-a^{-1}} \tag{A2}$$

$$M_2 = \frac{b^{12fT}}{n^2\,(a-1)}\left[2a\frac{1-(b/a)^{-n}}{1-(b/a)^{-1}} - (a+1)\frac{1-b^{-n}}{1-b^{-1}}\right] \tag{A3}$$

$$M_1^{\mathbb{P}} = \frac{(a^{\mathbb{P}})^{12fT}}{n}\frac{1-(a^{\mathbb{P}})^{-n}}{1-(a^{\mathbb{P}})^{-1}}$$

$$M_2^{\mathbb{P}} = \frac{(b^{\mathbb{P}})^{12fT}}{n^2\,(a^{\mathbb{P}}-1)}\left[2a^{\mathbb{P}}\frac{1-(b^{\mathbb{P}}/a^{\mathbb{P}})^{-n}}{1-(b^{\mathbb{P}}/a^{\mathbb{P}})^{-1}} - (a^{\mathbb{P}}+1)\frac{1-(b^{\mathbb{P}})^{-n}}{1-(b^{\mathbb{P}})^{-1}}\right]$$

where $n = Y f$.

A.2. Proof of Proposition 1

The gross return on the guaranteed product, defined by (2), satisfies

$$1 + R_{g,T} = \frac{1 + g + \max[p(1+R_T^*) - p - g; 0]}{1 + init}.$$

The mean return on the capital-protected investment, $\mathbb{E}_0^{\mathbb{Q}}(1 + R_{g,T})$, is therefore given by a Black-Scholes type formula.

Lemma A1 (Expected return on the capital-protected investment under $\mathbb{Q}$). The mean return on the capital-protected investment under the risk-adjusted measure is given by

$$\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T}) = \frac{1+g+pM_1^{\mathbb{Q}}N(d_1)-(p+g)N(d_2)}{1+init}. \tag{A4}$$

Furthermore, the mean return $\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T})$ strictly increases with the participation rate p and the guaranteed return g.

Proof of Lemma A1. In order to price the capital-protected investment, we approximate the distribution of the benchmark return $1+R_T^*$ as of date $t=0$ under the risk-adjusted measure $\mathbb{Q}$ by a lognormal with mean $M_1^{\mathbb{Q}}$ and second moment $M_2^{\mathbb{Q}}$, as the Edgeworth expansion implies (Turnbull and Wakeman 1991). The variance of the log benchmark return is then given by equation (7), which follows from the properties of the lognormal distribution.

The average return on the capital-protected investment can be written as

$$\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T}) \quad = \quad \frac{1+g+p\,\mathbb{E}_0^{\mathbb{Q}}\left[\max(1+R_T^*-1-g/p;0)\right]}{1+init}.$$

We infer from (A1) that

$$\mathbb{E}_0^{\mathbb{Q}}\left[\max(1+R_T^*-1-g/p;0)\right] \quad = \quad M_1^{\mathbb{Q}}N(d_1)-(1+g/p)N(d_2),$$

where d_1 is defined by equation (8) and $d_2 = d_1 - w^{\mathbb{Q}}$. . The expected return on the guaranteed product therefore satisfies (A4).

The monotonicity of the expected return, $\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T})$, with respect to g results directly from the definition of the return on the guaranteed product, $R_{g,T}$, in equation (2).

We now derive the monotonicity of the expected return with respect to the participation rate p. The argument used for g does not apply in general because if g and R_T^* are both negative, a contract with a higher participation rate would incur a larger loss. The proof relies instead on the partial derivative of the function

$$\varphi(g,p) = 1+g+p\,M_1^{\mathbb{Q}}N(d_1)-(p+g)N(d_2)$$

with respect to p.

It is useful to show a few preliminary facts. We note that

$$\frac{\partial d_1}{\partial p} \quad = \quad \frac{\partial d_2}{\partial p} = \frac{g}{p\,(p+g)\,w^{\mathbb{Q}}},$$

We also note that

$$N'(d_2) = \frac{1}{\sqrt{2\pi}}\exp\left(-\frac{d_2^2}{2}\right) = \frac{1}{\sqrt{2\pi}}\exp\left[-\frac{(d_1-w^{\mathbb{Q}})^2}{2}\right]$$

and therefore

$$N'(d_2) = N'(d_1)\exp\left[d_1 w^{\mathbb{Q}} - \frac{(w^{\mathbb{Q}})^2}{2}\right].$$

Since

$$d_1 w^{\mathbb{Q}} - \frac{(w^{\mathbb{Q}})^2}{2} = \ln\left(\frac{p}{p+g}\right) + \ln(M_1^{\mathbb{Q}}),$$

we obtain that

$$(p+g)N'(d_2) = p\,M_1^{\mathbb{Q}}\,N'(d_1).$$

Hence

$$\begin{aligned}\frac{\partial\varphi}{\partial p}(g,p) &= M_1^{\mathbb{Q}}\,N(d_1) - N(d_2) + p\,M_1^{\mathbb{Q}}\,N'(d_1)\frac{\partial d_1}{\partial p} - (p+g)N'(d_2)\frac{\partial d_2}{\partial p} \\ &= M_1^{\mathbb{Q}}\,N(d_1) - N(d_2) + \frac{\partial d_1}{\partial p}\left[p\,M_1^{\mathbb{Q}}\,N'(d_1) - (p+g)N'(d_2)\right]\end{aligned}$$

and therefore

$$\frac{\partial\varphi}{\partial p}(g,p) = M_1^{\mathbb{Q}}\,N(d_1) - N(d_2).$$

Since $d_1 > d_2$ and $M_1^{\mathbb{Q}} > 1$, we conclude that

$$\frac{\partial\varphi}{\partial p}(g,p) > 0.$$

The function $\varphi(g,p)$ strictly increases with the participation rate p.[25] We conclude that Lemma A1 holds. ■

Under the risk-adjusted measure $\mathbb{Q}$, the mean return on the capital-protected investment is equal to the risk-free rate, $\mathbb{E}_0^{\mathbb{Q}}(1+R_{g,T}) = e^{r_f T}$, which implies that Proposition 1 holds.

A.3. Pricing of Contracts with a Cap

A subset of contracts include a cap to the return that can be earned on the initial investment net of fee. The return on the capital-protected investment is then given by:

$$1 + R_{g,T} = \min\left[\frac{1+\max(p\,R_T^*; g)}{1+init}; \frac{1+cap}{1+init}\right]$$

where *cap* denotes the cap rate. The cap rate is generally higher than the guaranteed rate.

[25] A similar derivation implies that

$$\frac{\partial\varphi}{\partial g}(g,p) = N(-d_2) > 0.$$

Lemma A2 (Fair price of capital-protected investment with a cap). The fair initial fee is given by

$$init = e^{-r_f T}\left[1 + g + pM_1^{\mathbb{Q}}N(d_1) - (p+g)N(d_2) - pM_1^{\mathbb{Q}}N(e_1) + (p+cap)N(e_2)\right] - 1,$$

where

$$e_1 = \frac{1}{w^{\mathbb{Q}}}\left[\ln\left(\frac{p}{p+cap}\right) + \ln(M_1^{\mathbb{Q}}) + \frac{(w^{\mathbb{Q}})^2}{2}\right] \tag{A5}$$

and $e_2 = e_1 - w^{\mathbb{Q}}$.

The fair initial fee is reduced by the presence of a cap.

Proof of Lemma A2. The return on the guaranteed product with a cap satisfies

$$1 + R_{g,T} = \frac{1 + g + \max(p\,R_T^* - g, 0) - \max(pR_T^* - cap; 0)}{1 + init}.$$

for all realizations of R_T^*. We infer from (A1) that the proposition holds. ■

Lemma A3 (Expected return of the guaranteed product under $\mathbb{P}$). The expected return on the guaranteed product under the physical measure is

$$\mathbb{E}^{\mathbb{P}}(1 + R_{g,T}) \quad = \quad \frac{1 + g + pM_1^{\mathbb{P}}N(d_1^{\mathbb{P}}) - (p+g)N(d_2^{\mathbb{P}}) - pM_1^{\mathbb{P}}N(e_1^{\mathbb{P}}) + (p+cap)N(e_2^{\mathbb{P}})}{1 + init},$$

where

$$\begin{aligned} d_1^{\mathbb{P}} &= \frac{1}{w^{\mathbb{P}}}\left[\ln\left(\frac{p}{p+g}\right) + \ln(M_1^{\mathbb{P}}) + \frac{(w^{\mathbb{P}})^2}{2}\right], \\ e_1^{\mathbb{P}} &= \frac{1}{w^{\mathbb{P}}}\left[\ln\left(\frac{p}{p+cap}\right) + \ln(M_1^{\mathbb{P}}) + \frac{(w^{\mathbb{P}})^2}{2}\right], \end{aligned}$$

$d_2^{\mathbb{P}} = d_1^{\mathbb{P}} - w^{\mathbb{P}}$, *and* $e_2^{\mathbb{P}} = e_1^{\mathbb{P}} - w^{\mathbb{P}}$.

A.4. Joint Distribution of the Underlying and the Benchmark

We derive the joint distribution of the market and the benchmark. Let $r_{m,T} = \ln(1 + R_{m,T})$ and $r_T^* = \ln(1 + R_T^*)$.

Lemma A4 (Joint distribution of the underlying and the benchmark). The vector $(r_{m,T}, r_T^*)'$ is Gaussian with mean $[(\mu - \sigma^2/2)T\,; 2\ln(M_1^{\mathbb{P}}) - 0.5\ln(M_2^{\mathbb{P}})]'$ and variance-covariance matrix

$$\begin{bmatrix} \sigma^2 T & \sigma_{m,b} \\ \sigma_{m,b} & (w^{\mathbb{P}})^2 \end{bmatrix}, \tag{A6}$$

where

$$\sigma_{m,b} = \ln\left[\frac{\sum_{i=1}^{n} e^{(\mu-q+\sigma^2)(t_i-t_0)}}{\sum_{i=1}^{n} e^{(\mu-q)(t_i-t_0)}}\right]. \tag{A7}$$

and $w^{\mathbb{P}}$ *is defined by* (11)*.*

Proof of Lemma A4. The total return on the stockmarket index (with reinvested dividends) has a lognormal distribution:

$$r_{m,T} = \ln(1 + R_{m,T}) \sim \mathcal{N}[(\mu - \sigma^2/2)T; \sigma^2 T].$$

The log benchmark return is approximately normal $r_T^* = \ln(1 + R_T^*) \sim \mathcal{N}\left[\mu^{\mathbb{P}}; (w^{\mathbb{P}})^2\right]$. The covariance of the log market return and the log benchmark return can be computed as follows. We know that

$$\begin{aligned}
\mathbb{E}^{\mathbb{P}}\left[(1 + R_{m,T})(1 + R_T^*)\right] &= \mathbb{E}^{\mathbb{P}}\left[\frac{S_T e^{qT}}{S_0}\frac{S_{t_1} + S_{t_2} + ... + S_{t_n}}{nS_{t_0}}\right] \\
&= \frac{e^{qT}}{n}\sum_{i=1}^{n}\mathbb{E}^{\mathbb{P}}\left[\frac{S_{t_0}}{S_0}\left(\frac{S_{t_i}}{S_{t_0}}\right)^2\frac{S_T}{S_{t_i}}\right], \\
&= \frac{e^{qT}}{n}\sum_{i=1}^{n} e^{(\mu-q)t_0} e^{[2(\mu-q)+\sigma^2](t_i-t_0)} e^{(\mu-q)(T-t_i)},
\end{aligned}$$

and therefore

$$\mathbb{E}^{\mathbb{P}}\left[(1 + R_{m,T})(1 + R_T^*)\right] = \frac{e^{\mu T}}{n}\sum_{i=1}^{n} e^{(\mu-q+\sigma^2)(t_i-t_0)}.$$

Recall that if $X = (X_1, X_2)$ is bivariate normal with mean $(\mu_1, \mu_2)'$ and variance-covariance matrix $\Sigma = (\sigma_{i,j})_{1\le i,j\le 2}$, then

$$\mathbb{E}^{\mathbb{P}}(e^{X_1+X_2}) = \exp\left(\mu_1 + \mu_2 + \frac{\sigma_{1,1} + \sigma_{2,2} + 2\sigma_{1,2}}{2}\right) = \mathbb{E}(e^{X_1})\,\mathbb{E}(e^{X_2})\,\exp(\sigma_{1,2}),$$

or equivalently

$$\sigma_{1,2} = \ln\left[\frac{\mathbb{E}(e^{X_1+X_2})}{\mathbb{E}(e^{X_1})\mathbb{E}(e^{X_2})}\right].$$

The covariance of $r_{m,T}$ and r_T^* is therefore

$$Cov(r_{m,T}; r_T^*) = \ln\left\{\frac{\mathbb{E}^{\mathbb{P}}\left[(1 + R_{m,T})(1 + R_T^*)\right]}{\mathbb{E}^{\mathbb{P}}(1 + R_{m,T})\ \mathbb{E}^{\mathbb{P}}(1 + R_T^*)}\right\},$$

which implies (A7).

Appendix B. Additional Figures and Tables

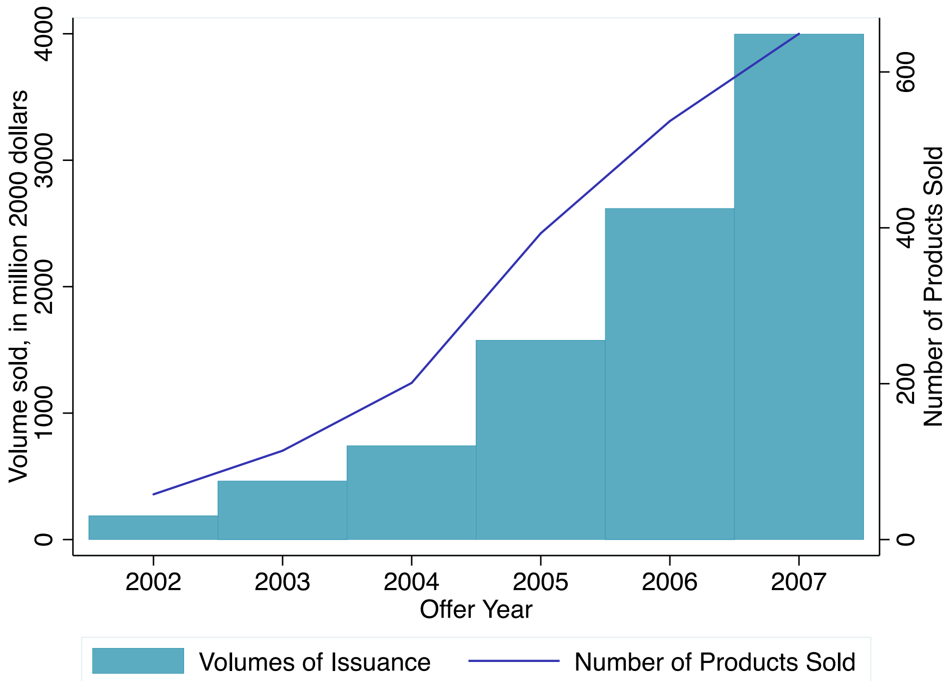


Figure IA.1. Volume and Number of Products Sold per Year. This figure shows volume issuance in millions of 2000 USD of retail capital-protected investments over the 2002 to 2007 period in the Swedish market.

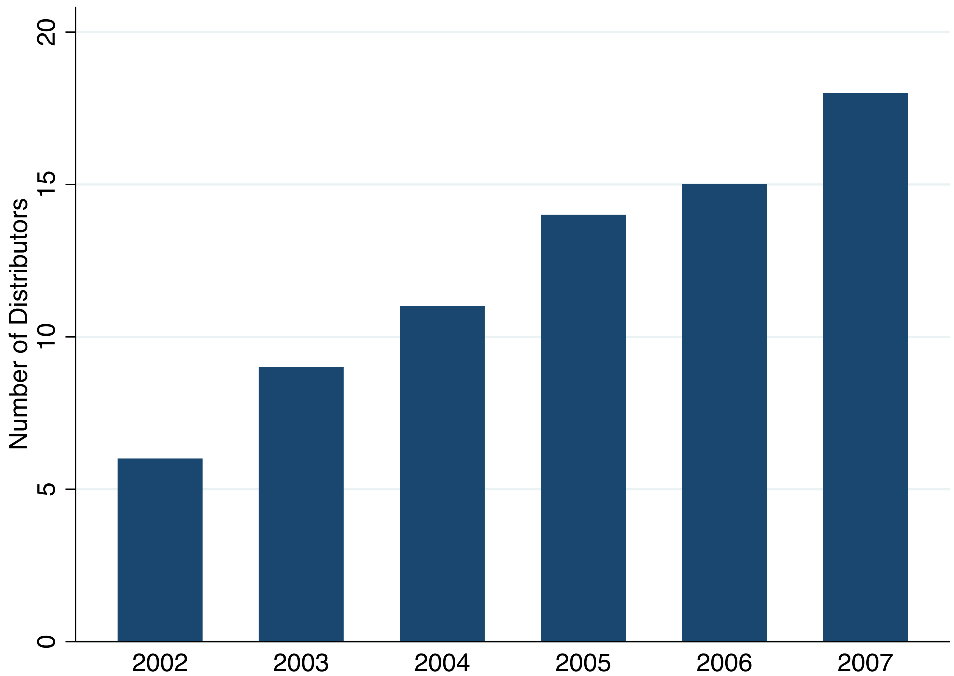


Figure IA.2. Number of Distributors per Year. This figure shows the evolution of the number of capital-protected investment distributors over the 2002 to 2007 period.

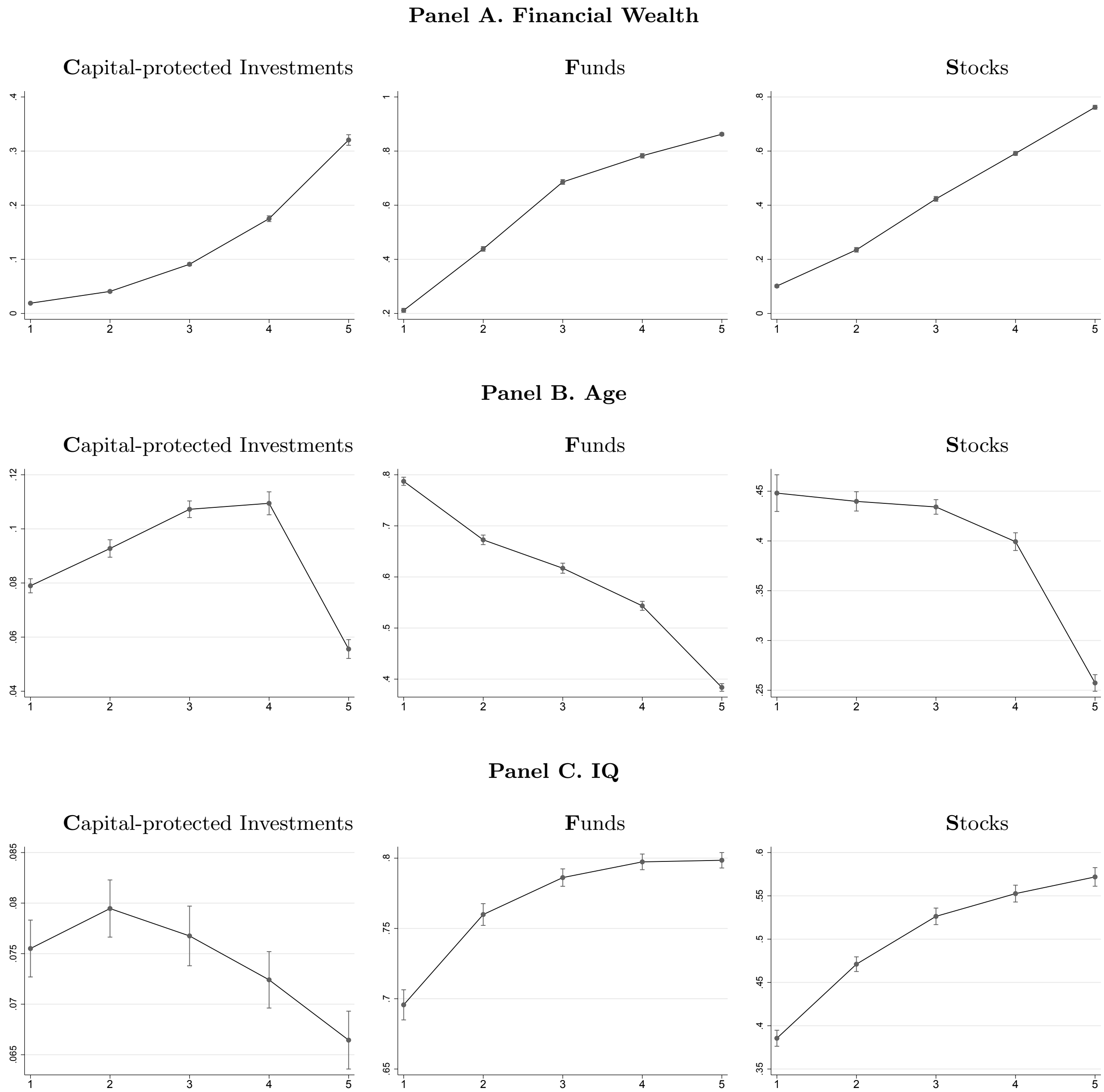


Figure IA.3. Likelihood of Participation in Capital-protected Investments, Equity Funds and Stocks. This figure shows predicted probabilities estimated from logit regressions, where the dependent variable is an indicator variable for investing in a given investment products at least one year during the 2002 to 2007 period. All regressions include the same explanatory variables: financial wealth deciles, IQ score levels (from 0 to 9), age categories, the number of adults in the household, the number of children in the households, and indicator variable for living in an urban area, and the gender of the household. All explanatory variables are defined in 2002.

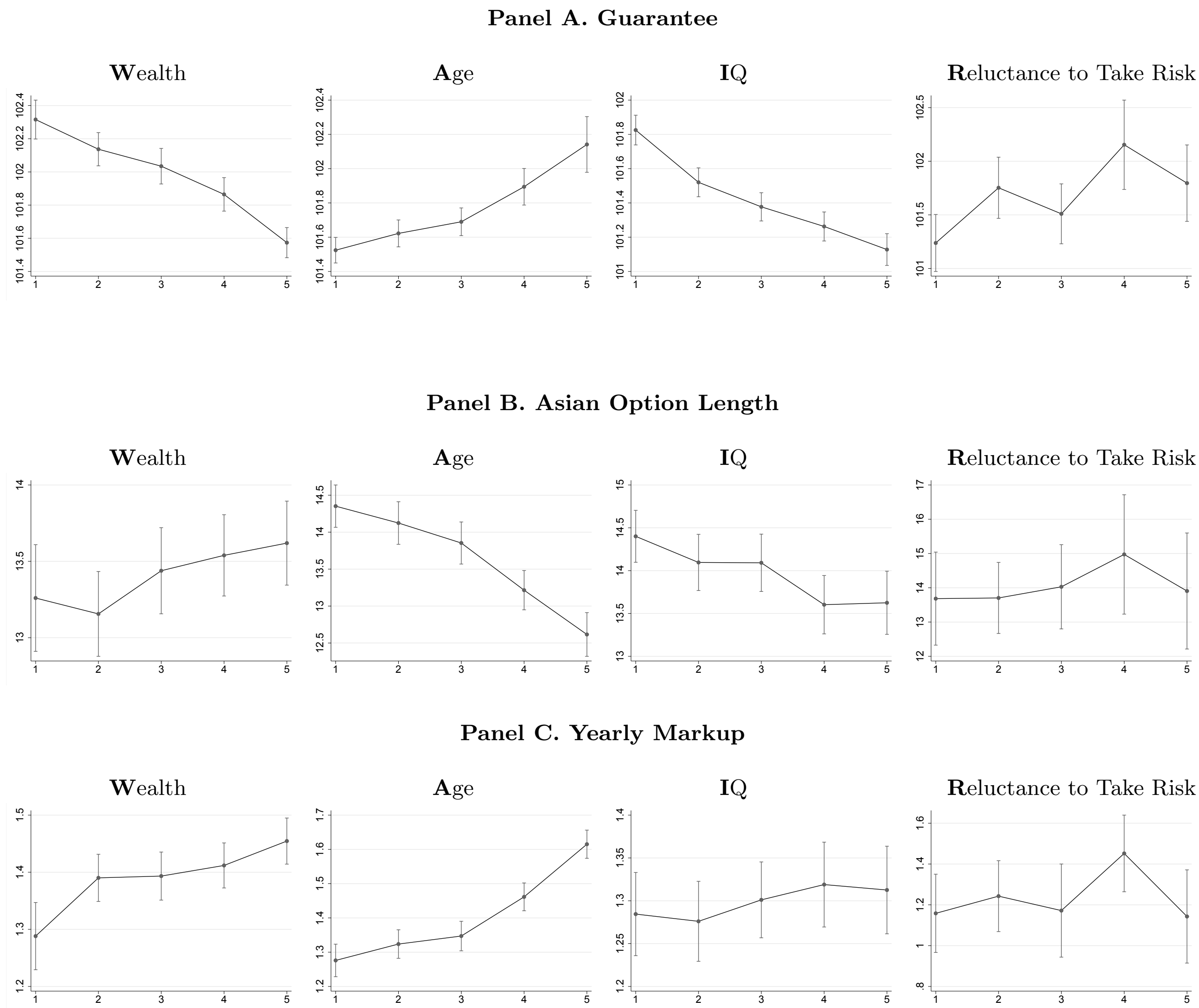
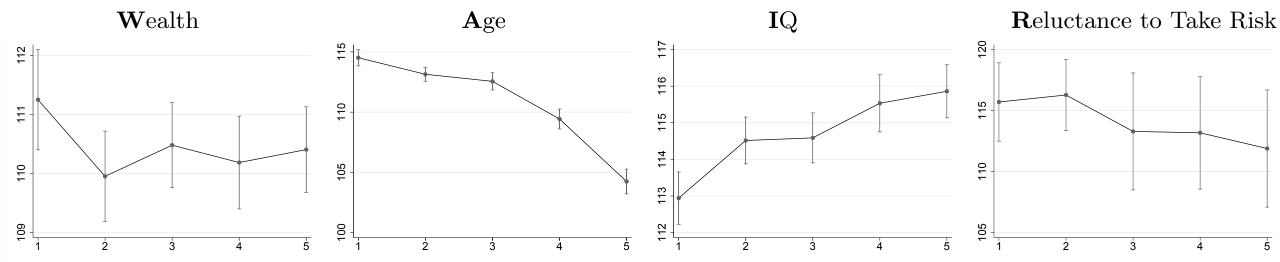
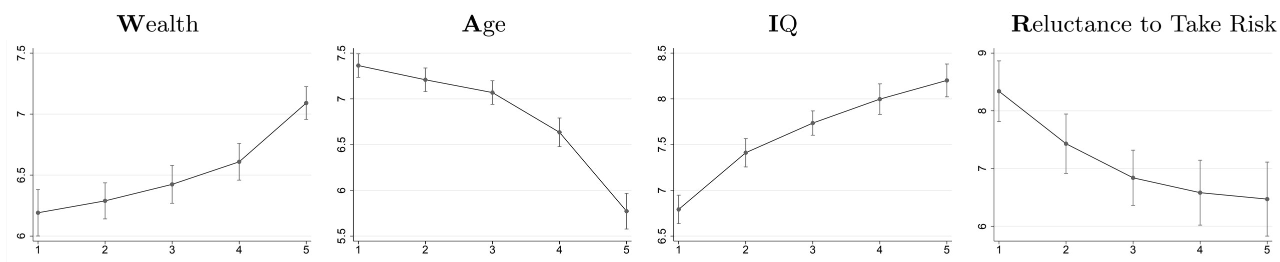


Figure IA.4. Product Design and Investor Characteristics. This figure displays coefficients from OLS regressions where the dependent variables are the guarantee level g, the length of the Asian Option$t_n - t_1$, and the yearly markup, as defined in section III. All regressions include the same explanatory variables: financial wealth deciles, IQ score levels (from 0 to 9), age categories, the number of adults in the household, the number of children in the households, and indicator variable for living in an urban area, and the gender of the household head. The sample is restricted to capital-protected investment participants.

Panel A. Participation Rate



Panel B. Initial Fee



Panel C. Excess Expected Return

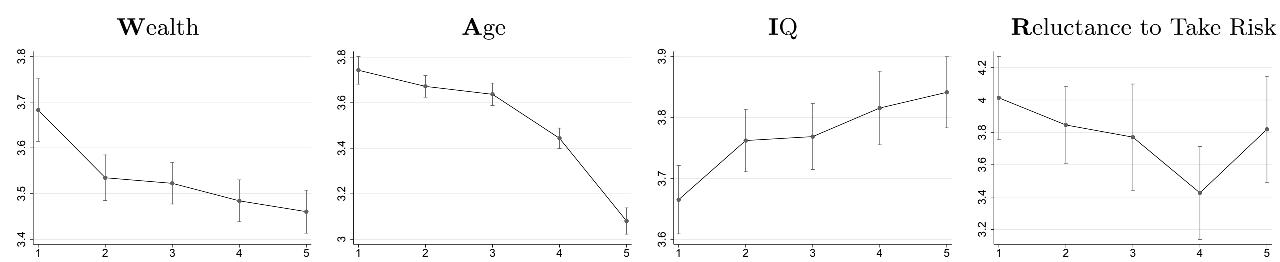


Figure IA.4. (cont.) Product Design and Investor Characteristics. This figure displays coefficients from OLS regressions where the dependent variables are the participation rate p, the initial fee, and the excess expected returns, as defined in section III. All regressions include the same explanatory variables: financial wealth deciles, IQ score levels (from 0 to 9), age categories, the number of adults in the household, the number of children in the households, and indicator variable for living in an urban area, and the gender of the household head. The sample is restricted to capital-protected investment participants.

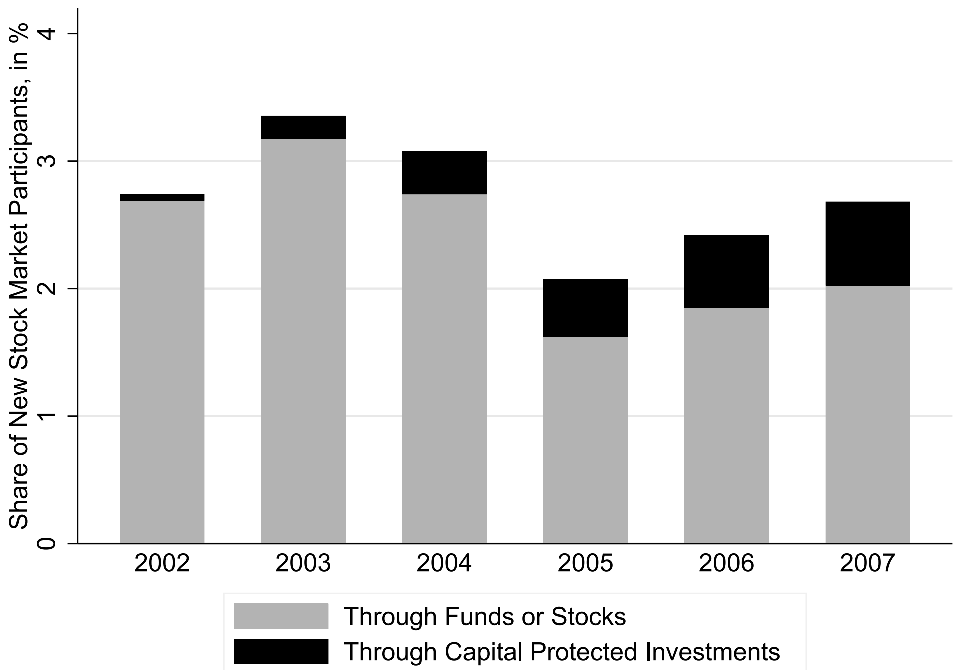


Figure IA.5. Evolution of the share of new participants through equity funds and stocks, and through capital-protected investments. This figure shows the evolution of the share of households that start participating in risky asset markets. These new participants are broken down between the one that start participating through equity funds and stocks, and the ones that do so through capital-protected investments. New participants are defined as households that were not participating in equity funds, stocks or capital-protected investments during in the four precedeing years.

Table IA.1. Market Share (in Volume) of Capital-protected Investment Distributors

	Market Share (1)	Cumulated Market Share (2)	Entry Date (3)
Swedbank	30.5%	30.5%	April 2002
Handelsbanken	20.7%	51.1%	May 2002
Nordea	14.7%	65.9%	September 2002
SEB	14.6%	80.5%	April 2003
Hq bank	5.4%	85.9%	March 2003
Acta	4.4%	90.4%	January 2002
Erik Penser	2.7%	93%	January 2004
Danske Bank	2.6%	95.7%	March 2002
Avanza	1.6%	97.3%	October 2004
Kaupthing Bank	1.1%	98.3%	November 2005
Garantum	0.7%	99%	
E-trade	0.4	99.5%	
Ohman	0.2	99.7%	
Others	0.3%	100%	

This table reports the market share of each distributor, in volumes of product sold, over our sample period.

Table IA.2. Sensitivity Analysis

Upward Adjustment to Underlying Asset Volatility	**+1%**	**+ 2%**	**+3%**	**+4%**	**+5%**
Resulting Average Underlying Asset Volatility	0.19	0.20	0.21	0.22	0.23
Yearly Mark-up (in %)	1.32	1.14	0.96	0.77	0.59
Yearly Excess Expected Return					
with Risk Premium=4%	1.85	2.01	2.16	2.32	2.48
with Risk Premium=5%	2.66	2.80	2.95	3.10	3.25
with Risk Premium=6%	3.50	3.64	3.77	3.91	4.05
with Risk Premium=7%	4.38	4.50	4.63	4.76	4.89
with Risk Premium=8%	5.29	5.40	5.52	5.64	5.76
Exposure to the Risk Premium					
with Risk Premium=4%	46.4	50.2	54.1	58.0	61.9
with Risk Premium=5%	53.2	56.1	59.0	61.9	64.9
with Risk Premium=6%	58.4	60.6	62.9	65.2	67.5
with Risk Premium=7%	62.6	64.3	66.1	68.0	69.9
with Risk Premium=8%	66.1	67.5	69.0	70.5	72.0

Table IA.3. Links between Capital-protected Investment Characteristics

	Participation Rate in % (1)	Yearly Markup in % (2)	Excess Expected Return in % (3)	Exposure to the Risk Premium in % (4)
Participation rate, in %		-0.02***	0.05***	0.75***
		(0.00)	(0.00)	(0.05)
Guarantee , in %	-4.31***	-0.03*	-0.10***	-1.71***
	(0.49)	(0.02)	(0.03)	(0.47)
Initial Fee, in %	5.03***	0.16***	-0.09***	-1.58***
	(0.18)	(0.02)	(0.02)	(0.39)
Length of the Asian Options (in months)	0.31***	0.03***	-0.08***	-1.25***
	(0.09)	(0.00)	(0.00)	(0.08)
Term, in months	0.32***	-0.00	0.03***	0.46***
	(0.08)	(0.00)	(0.01)	(0.10)
Year FE	Yes	Yes	Yes	Yes
Observations	906	906	906	906
R^2	0.552	0.281	0.528	0.528

Note: This table displays coefficients from OLS regressions. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IA.4. Change in Risky Share and Participation in Capital-protected Investments

Panel A: IQ Sample					
Sample		Quartiles of 2002 Risky Share			
	All	Q1	Q2	Q3	Q4
	(1)	(2)	(3)	(4)	(5)
CPInv participation dummy	3.415***	8.510***	4.739***	1.872***	-0.373***
	(0.079)	(0.142)	(0.123)	(0.129)	(0.127)
Province fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	734,797	177,355	192,865	192,483	172,094
R^2	0.063	0.065	0.069	0.052	0.096

Panel B: Controlling for IQ					
Sample		Quartiles of 2002 Risky Share			
	All	Q1	Q2	Q3	Q4
	(6)	(7)	(8)		
CPInv participation dummy	3.424***	8.514***	4.738***	1.860***	-0.364***
	(0.079)	(0.143)	(0.124)	(0.129)	(0.127)
Province fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	735,276	177,501	192,992	192,590	172,193
R^2	0.062	0.064	0.068	0.052	0.096

This table displays OLS regression coefficients. The dependent variable is the absolute change in the risky share from 2002 to 2007, in p.p. of financial wealth. The risky share includes equity funds, stocks and retail capital-protected investments. *Capital-protected Investment Participant* is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The sample is restricted to household participating in stock markets in 2002. The coefficient in column 1 means that the increase in stock market exposure over the 2002 to 2007 period was 4.2 percentage points higher for households who participated in capital-protected investments than for the ones that did not. Standard errors are clustered at the kommun level. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IA.5. Active Change in Risky Share and Participation in Capital-protected Investments

Sample	Active Change in Risky Share, in p.p.							
		Quartiles of 2002 Risky Share				All		
	All	Q1	Q2	Q3	Q4	All	IQ Restricted	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CPInv participation dummy	2.94***	9.73***	5.67***	1.83***	-2.33***	5.79***	2.81***	-2.50***
	(0.10)	(0.15)	(0.17)	(0.15)	(0.16)	(1.01)	(0.44)	(0.53)
CPInv participation dummy interacted with:								
- financial wealth						-0.28***		
						(0.10)		
- IQ score							-0.02	
							(0.07)	
- age								0.11***
								(0.01)
Controls								
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,106,010	273,919	279,289	278,373	274,429	1,106,010	562,324	1,106,010
R^2	0.074	0.080	0.085	0.058	0.077	0.065	0.071	0.065
Corresponding Summary Statistics	All	Q1	Q2	Q3	Q4			
2002 Risky Share, in %								
Range	[0 ; 96]	[0 ; 9]	[9 ; 23]	[23 ; 44]	[44 ; 96]			
Mean	28.8	3.8	15.3	32.4	63.8			
Median	22.7	3.7	15.1	32.0	60.8			
Change in Risky Share, in pp								
Mean	4.1	9.3	11.0	5.9	-9.9			
Median	2.6	2.2	7.2	5.9	-4.5			

This table displays OLS regression coefficients. The dependent variable is the active change in the risky share from 2002 to 2007, in p.p. of financial wealth. The risky share includes equity funds, stocks and retail capital-protected investments. *Capital-protected Investment Participant* is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The sample is restricted to household participating in stock markets in 2002. The coefficient in column 1 means that the increase in stock market exposure over the 2002 to 2007 period was 2.9 percentage points higher for households who participated in capital-protected investments than for the ones that did not. Standard errors are clustered at the kommun level. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IA.6. Change in Risky Share and Participation in Capital-protected Investments: Control Group Restricted to Active Participants

Sample	Change in Risky Share (p.p.)							
		Quartiles of 2002 Risky Share				All		
	All	Q1	Q2	Q3	Q4	All	IQ Restricted	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CPInv participation dummy	2.616***	5.329***	3.014***	0.752***	-1.201***	0.978	2.746***	-0.854**
	(0.060)	(0.094)	(0.085)	(0.081)	(0.087)	(0.733)	(0.235)	(0.400)
CPInv participation dummy interacted with:								
- financial wealth						0.137*		
						(0.071)		
- IQ Score							-0.024	
							(0.038)	
- Age								0.061***
								(0.008)
Province fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,132,591	202,963	269,798	318,866	340,964	1,132,591	449,814	1,132,591
R^2	0.049	0.048	0.052	0.041	0.068	0.040	0.051	0.040
Summary Statistics	All	Q1	Q2	Q3	Q4			
2002 Risky Share (%)								
- Range	[0;96]	[0;9]	[9;23]	[23;44]	[44;96]			
- Mean	24.06	3.8	15.3	32.4	63.8			
- Median	22.7	3.7	15.1	32.0	60.8			
Change in Risky Share (p.p.)								
- Mean	2.9	6.9	8.1	4.3	-7.4			
- Median	2.2	1.9	5.4	4.2	-7.5			

This table displays OLS regression coefficients. The control group is restricted to households that have bought a fund over the 2002-2007 period. The dependent variable is the absolute change in the risky share from 2002 to 2007, in p.p. of financial wealth. The risky share includes equity funds, stocks and retail capital-protected investments. *Capital-protected Investment Participant* is a dummy variable equal to one if the household invested at least once in capital-protected investments over the 2002 to 2007 period. The sample is restricted to household participating in stock markets in 2002. The coefficient in column 1 means that the increase in stock market exposure over the 2002 to 2007 period was 3.6 percentage points higher for households who participated in capital-protected investments than for the ones that did not. Standard errors are clustered at the kommun level. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IA.7. Substitution Effects and Household Characteristics

	Share of Financial Wealth Invested in Cash, in %			
	(1)	(2)	(3)	(4)
CPInv Share of Financial Wealth	-0.620***	-2.115***	-0.738***	-1.147***
	(0.002)	(0.022)	(0.012)	(0.010)
CPInv Share of Financial Wealth × Financial Wealth (log)		0.117***		
		(0.002)		
CPInv Share of Financial Wealth × IQ Score			0.012***	
			(0.002)	
CPInv Share of Financial Wealth × Age				0.010***
				(0.000)
Controls				
Household FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	16,547,797	16,547,797	5,252,612	16,547,797
R^2	0.0470	0.0489	0.0470	0.0471

This table displays OLS panel regression coefficients with household and year fixed effects. The dependent variable is the share of financial wealth invested in cash. Sample period is 2002-2007. Standard errors are clustered at the household level. We display t-statistics below their coefficients of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.