Can Financial Innovation Solve Household Reluctance to Take Risk?

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ABSTRACT

Using a large administrative panel of Swedish households, we document the fast and broad adoption of retail structured products, an innovative class of contracts offering non-linear exposures to equity markets. We first estimate the markup and expected returns of such products, and find them to be comparable to equity mutual funds. Households investing in structured products, however, differ from traditional stock market participants on key characteristics such as age and IQ. Household investing in retail structured products also significantly increase the risky share of their financial wealth over the sample period, especially for households with an initially low risky share, lower wealth and IQ, and of older age. A simple portfolio choice model shows that risk aversion cannot explain the demand for structured products and the empirical facts we observe, while loss aversion or misperception over their design can. Our results illustrate how security design can mitigate household reluctance to take financial risk.

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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). This phenomenon illustrates the reluctance of households to participate in risky asset markets, which has large economic and welfare effects. Households with low exposures to compensated risk 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. 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). The issue of low stock market participation is more pronounced for certain sub-groups of the population: households with low-to-median financial wealth (Calvet, Campbell, and Sodini, 2007), low-to-median IQ (Grinblatt, Keloharju, and Linnainmaa, 2011), or loss-averse preferences.

This paper investigates whether financial innovation, in the form of products offering non-linear exposure to risk assets, can increase household portfolio allocation to risky asset markets. If so, through which economic mechanism? And are households better off as a result? To address these questions, we study the introduction of retail structured products in Sweden and its impact on household portfolio allocation. While Célérier and Vallée (2017) describe how banks use the design of these products to cater to yield-seeking investors, this study takes a different view and explores the potential benefits of retail structured products.

By offering a pre-packaged risk profile compatible with household preferences, retail structured products may increase household willingness to participate in risky asset markets. Retail structured products marketed in Sweden typically offer downside protection, and hence allow households to gain exposure to a risky asset market while capping the maximum loss.[1] Buying downside protection, for instance by buying put options or implementing portfolio insurance, is often difficult or costly to do for households, especially for long investment horizons.

We exploit Swedish micro data with granular information on both household characteristics and financial holdings (see Calvet et al. (2007)) that we merge with a dataset with detailed information

[1] A typical product offers the following cash flows: investor pays 110 initially, and gets 100 times (1 + 80% of the positive performance of an equity index over the period) four years later.

on all structured products sold in Europe since market inception (see Célérier and Vallée (2017)). The combined panel dataset is unique on many dimensions. First, the dataset offers a comprehensive coverage of the first five years of the development of the retail market for structured products for the whole population of Sweden.[2] Second, the dataset allows us to investigate how a rich set of household characteristics, such as wealth, IQ or age, relate to participation in this new asset class. Third, we can observe the whole portfolio composition of households and how the introduction of these innovative products impact household holdings in both safe and risky assets. Last, the data allow us to explore the link between household characteristics and the design of these products. More broadly, our research setting offers a unique opportunity to study how the introduction and the development of a financial innovation can impact retail investors portfolio decisions, while also shedding light on what drives the success of an innovation in household finance.

Our main results are the following. First, we implement an asset pricing exercise and establish several facts about structured product design and the implied exposure they offer. We find that the markups of structured products sold in Sweden between 2002 and 2007 are around 1.4% per year on average, which makes their cost comparable to the one of mutual funds marketed to Swedish households at that time. We also find that their expected returns are significantly higher than the risk free rate. We then estimate their "upside beta", e.g. the share of the excess market return the investor earns when the guarantee is not exercised, and find them to be in the [0.5 -0.7] range. These results are consistent with structured products allowing households to share in the risk premium.

Second, we document that the adoption of these products is fast and broad, with 13% of all Swedish households buying at least one of these products within five years of the introduction. For these participating households, retail structured products represent more than 15% of their financial wealth. This speed of development contrasts with the slow adoption of other innovative financial products offering equity exposure, such as exchange traded funds (ETFs). Importantly, households participating in structured products differ from owners of traditional risky assets, equity funds and stocks along the following dimensions: IQ and age. The probability of participating in retail structured products is a hump-shaped function of IQ, while the probability of owning stocks and equity funds monotonically increases with IQ. The probability of participating in retail structured

[2]The market developed from 2002 in Sweden. Since the end of the 1990s, European financial institutions have sold more than 2 trillion euros of structured products. More recently in the US, equity-linked certificates of deposit, one category of retail structured products, are becoming increasingly popular.

products increases with age, while age reduces the probability of owning equity funds and stocks. These relationships suggest that structured products attract specific groups of households that are less likely to invest in traditional risky assets.

Third, among participants, the share of financial wealth invested in structured products is decreasing with wealth and increasing with age. Poor and old households traditionally have a low risky share, as the share of stocks and funds in financial wealth exhibit the reverse relationships: they are both increasing in wealth and decreasing in age. On the other hand, the share of wealth held in cash relates to wealth and age similarly than for structured products. The relationship between household characteristics and product design suggests that less sophisticated households predominantly look for protection, while sophisticated households look for design associated with higher "upside beta". This mapping between household characteristics and product design suggests an heterogeneity in preferences across households.

Fourth, participation in retail structured products is associated with an increase in households' risky share. We focus on the allocation of household portfolio to the four asset classes that compose financial wealth: cash, equity mutual funds, stocks, and structured products, and consider the latter three classes as risky assets.[3] We compute the risky share as the ratio of the total exposure to the risk premium over household financial wealth. We measure the exposure to the risk premium by adjusting the holdings of structured product by their "upside beta" as computed in the asset pricing exercise. Over the five years following the introduction of structured products, we find that the risky share increases twice as much for households that participate in these products than for households that do not. The effect is larger for households in the lowest quartile of risky share in 2002: participating in structured products lead to an additional 10 percentage point increase in their risky share, which amounts to less than 4% in 2002. Retail structured products, therefore, mostly complement other risky assets.

We implement an instrumental variable analysis to mitigate potential sources of endogeneity when studying the effect of investing in structured products. Investment in structured products over our sample period might be correlated with a higher demand for risky assets over that period that our large set of controls does not capture. We therefore use household proximity to banks offering structured products to instrument the supply of structured products. This instrumental

[3]We do not study corporate bonds as they represent a negligible fraction of household portfolios.

variable analysis confirms the positive impact of structured product supply on the risky share of households.

The increase in the risky share is especially pronounced for households with low financial wealth, and of older age. Households use cash to fund 63% of investments in structured products: when a household invests 1% percent of their financial wealth in retail structured products, it therefore increases its risky share by 0.63%. When adjusting for the "upside beta" of structured products, the gain in exposure to risky assets remains consequent: when investing 1% of their financial wealth in structured products while selling 0.37% of a traditional risky asset, a household increases its exposure to risky assets by 0.3%.

Finally, we develop a portfolio-choice model to investigate the theoretical mechanisms possibly explaining our empirical results on the impact of structured product introduction on household portfolio allocation. In this model, the investor can invest in three distinct assets: a risk-free bond, a stock market index and a structured product offering a guaranteed return and a participation in the performance of a stock market index. We find that loss aversion or misperception about the design of structured products are the most likely mechanism to explain the data. By contrast, the strong demand for structured products cannot be explained by a constant relative risk aversion (CRRA) utility alone, while habit formation can only generate a moderate appetite for guaranteed products.

This study 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, Huang, and Thaler, 2006; Kuhnen and Miu, 2015), our work focuses on possible solutions that can 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, Shleifer, and Vishny, 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), par-

ticularly 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. This mechanism differs from and complements the more traditional role of financial innovation to improve risk-sharing and complete markets (Calvet, Gonzalez-Eiras, and Sodini, 2004). 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.

The paper is organized as follows. Section II provides background on retail structured products and presents the data. Section III describes the asset pricing exercise. Section IV documents the adoption of retail structured products in Sweden, and explores the relationship between household characteristics and both the likelihood and extent of structured product investments. In Section V, we study the impact of these products on households' risky share. In Section VI, we develop a theoretical framework of portfolio allocation for an investor that can access products paying a risk premium while offering a capital protection, and interpret our empirical results in light of the model predictions. Section VII concludes. An Internet Appendix provides additional empirical results.

II. Background and Data

The study relies on combining two main datasets: one comprising detailed information on structured products issuance in Sweden and other European countries, the other one covering comprehensive information on individual portfolios at the asset level and household characteristics for the whole Swedish population. Both datasets are merged through the unique International Security Identification Number (ISIN) of each financial asset.

A. The Development of Retail Structured Products

Retail structured products include any investment products marketed to retail investors and possessing a payoff function that varies automatically and non-linearly with the performance of an

underlying financial asset.[4] Typically designed with embedded options, these products leave no room for discretionary investment decisions during the life of the investment. These products are based mainly on equity indices and individual stocks but may also offer exposure to commodities, fixed income, or alternative indices.

For illustration purpose, we provide below an example of a Swedish best-seller named *Spax Pension 284d* sold by Swedbank in 2004 (ISIN: SE0001242983):

> *The product has a maturity of 8 years and a fee of 1.5% is charged at issuance. The product return is linked to the performance of the OMX 30 index, as follows: at maturity the product offers a minimum capital return of 100% plus 105% 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 13 months, and does not include dividends.*

The retail market for structured products emerged in Europe at the beginning of the 2000s and has subsequently experienced steady growth. In 2012, with 770 billion euros of assets under management, the retail market for structured products stood at 3% of all European financial savings, one-eighth of the mutual fund assets under management in Europe, and double the assets under management of the hedge fund industry. The European market is the largest market in the world, with more than half of the global volume. The US and Asian markets, however, have been growing fast: retail structured product assets under management exceeded 400 billion US dollars in 2015 in the US.

In Europe, retail structured products are available to any household and are under the same regulatory framework as stocks or mutual funds during our sample period. Specific rules to regulate the distribution of these products are rare: while Italy in 2009, France in 2010, and Belgium in 2011 tightened the conditions under which certain categories of structured products could be sold to retail investors, Norway was the only country that placed a ban on selling structured products to retail investors and did so in 2008.

The Swedish market for structured products is an ideal laboratory for our research question because most of the products offer a capital protection (98%), and the overall level of product

[4]Exchange traded funds, which have payoffs that are a linear function of a given underlying financial index, are not retail structured products.

complexity is moderate. Potentially exploitative behaviors by banks, such as cater to reaching-for-yield investors by shrouding risk, are therefore less of a concern in this market, as opposed to France, Germany or Italy for example (Célérier and Vallée, 2017).

B. Data

B.1. Structured Products

The first dataset, which is developed in Célérier and Vallée (2017), contains detailed information on all the retail structured products that have been sold in Europe since 2002. A comprehensive pay-off description, information on distributors, and volume sold are available at the issuance level. The database also includes the list of each features embedded in each product, obtained through a text analysis of the pay-off description.[5]

Figures IA1 in the online appendix illustrates the evolution of the Swedish market for structured products over the 2002-2007 period. The market is still dynamic in the recent period: 3.2 billion euros of retail structured products have been issued in 2015 in Sweden, which makes it comparable to 2007.[6]

Our sample includes 1,510 structured products linked to equity underlying assets that have been issued in Sweden over the 2002 to 2007 period, for a total volume of 8 billion dollars.[7] Table I reports summary statistics on the main characteristics of these products.

In terms of design, products offering a capital guarantee, and therefore presenting a limited downside, are overwhelmingly dominant. Hence, 98% of the products issued over the period offer a minimum payoff of at least 100% of face value at maturity. The majority of these products, however, are issued at a price that is higher than face value, as an initial fee is added to calculate the issuance price. This feature leads to an actual level of capital protection below 100%, or 91.3% on average in the sample. In more than half of the issuances, representing 60% of the volume, the capital protection is associated with a participation in the rise of the underlying asset coupled with an Asian option. We label such a payoff design as the representative design in the market, and focus the asset pricing exercise of Section III on these products.

[5]See Célérier and Vallée (2017) for the precise methodology.
[6]SRP 2015 annual report
[7]In Sweden, the large majority of products offer equity exposure (87% of the products)

Finally, almost all products have a structured bond format (98% of issuances), and therefore bear credit risk.[8] This format can be pensionable through Individual Pension Savings (IPS) status eligibility, and the average term is 3.5 years.

B.2. Household Portfolios and Characteristics

The second dataset, described in Calvet et al. (2007), consists in panel data of financial wealth and income covering all Swedish households over the period 2000 to 2007. This data provides us with the detailed breakdown of financial wealth between cash, equity mutual funds, stocks and structured products.[9] This panel has been used to study household portfolio diversification (Calvet et al., 2007), rebalancing behavior (Calvet, Campbell, and Sodini, 2009), financial risk-taking (Calvet and Sodini, 2014) and value investing (Betermier, Calvet, and Sodini, 2017). The data are available because the Swedish government levied a wealth tax over the 2000 to 2007 period. To collect this tax, the government assembles records of financial assets. The records are available at the individual security level and are based on statements from financial institutions that are verified by taxpayers. In addition, the data contains a high diversity of individual socio-demographic and financial characteristics, in addition to a number of proxies for sophistication, such as IQ and educational attainment.

The merge of the two datasets is done using the unique ISIN identifiers of financial assets. Household portfolio data are disaggregated at the security level, with the corresponding ISIN of each security, including retail structured products. The dataset resulting from merging the two previous sources represents an ideal setting to investigate how the development of structured products affected household investment decisions, as the overlap of the datasets occurs during the launch and subsequent high growth period of the retail market for structured products.

Table II presents demographic and financial characteristics for the different sample used in our empirical analysis. The IQ data, resulting from military tests, is only available for men who were born 1945.[10]

[8] Credit spread are close to zero in the period we study, and no Swedish banks defaulted during the financial crisis.

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

[10] Our analysis being conducted at the household level, we use the man's IQ as a proxy of the average IQ in the household.

III. Characteristics and Pricing of Structured Products

This section describes the design and pricing of the representative product in our sample, and develops a measure of the exposure to the risk premium it offers to investors.

A. Characteristics of a Structured Product

While there is substantial heterogeneity in the design of structured products, the representative contract in the Swedish market is defined by the following parameters:

1. an initial fee *init* charged when the product is originated at date 0,
2. a maturity date T,
3. an underlying asset or index, S_t,
4. a benchmark return R_T^* based on the underlying,
5. a participation rate p,
6. a guaranteed rate of return g.

The benchmark return is computed by recording the value of the underlying at prespecified dates $t_0 < t_1 < \cdots < t_n$. It is the average performance measure:

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

where S_{t_0} is the initial reference level of an index or asset at t_0, typically a few days after issuance. The representative structured product therefore embeds an Asian option.

The gross return on the structured product between issuance and maturity is

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

The initial fee is deducted from the initial investment at the initial date. For example if $init = 0.1$, a \$110 investment in the guaranteed product is worth

$$\$100[1 + \max(p\, R_T^*; g)]$$

at maturity.

B. Pricing Model

B.1. Benchmark Return

We develop a pricing model for the representative product based on the absence of arbitrage. We assume that under the risk-adjusted measure $\mathbb{Q}$, the underlying 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.

Under these dynamics of the underlying, the benchmark return, defined by equation (1), has first and second moments:

$$M_1^{\mathbb{Q}} = \mathbb{E}_0^{\mathbb{Q}}(1 + R_T^*) = \frac{1}{n}\sum_{i=1}^{n} e^{(r_f - q)(t_i - t_0)}, \tag{4}$$

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

where $\mathbb{E}_0^{\mathbb{Q}}$ denotes the expectation operator conditional on the information available at date 0. In the Appendix, we derive equations (4) and (5) and also provide more compact expressions for $M_1^{\mathbb{Q}}$ and $M_2^{\mathbb{Q}}$ for contracts such that the index S_t is recorded at a fixed frequency.

In order to price the structured product, 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

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

which follows from the properties of the lognormal distribution.

B.2. Pricing of Structured Product

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 structured product, $\mathbb{E}_0^{\mathbb{Q}}(1 + R_{g,T})$, is therefore given by a Black-Scholes type formula.

Proposition 1 (Expected return on the structured product under $\mathbb{Q}$). *The mean return on the structured product under the risk-adjusted measure is given by*

$$\mathbb{E}_0^{\mathbb{Q}}(1 + R_{g,T}) = \frac{1 + g + pM_1^{\mathbb{Q}}N(d_1) - (p + g)N(d_2)}{1 + init}, \tag{6}$$

where

$$d_1 = \frac{1}{w^{\mathbb{Q}}}\left[\ln\left(\frac{p}{p+g}\right) + \ln(M_1^{\mathbb{Q}}) + \frac{(w^{\mathbb{Q}})^2}{2}\right] \tag{7}$$

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

Under the risk-adjusted measure $\mathbb{Q}$, the mean return on the structured product is equal to the risk-free rate, $\mathbb{E}_0^{\mathbb{Q}}(1 + R_{g,T}) = e^{r_f T}$, which implies the following pricing result.

Proposition 2 (Fair pricing of structured product). *The fair initial fee is given by:*

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

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 structured product 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.

Proposition 3 (Fair price of structured product 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

$$e_1 = \frac{1}{w^{\mathbb{Q}}}\left[\ln\left(\frac{p}{p+cap}\right) + \ln(M_1^{\mathbb{Q}}) + \frac{(w^{\mathbb{Q}})^2}{2}\right] \tag{8}$$

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

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

B.3. Expected Return Under the Physical Measure

We now derive the expected return of the representative product under the physical measure $\mathbb{P}$. We assume that the underlying follows:

$$\frac{dS_t}{S_t} = (\mu - q)dt + \sigma dZ_t.$$

The benchmark return, $1 + R_T^*$, is approximately log normal under $\mathbb{P}$ with moments:

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

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

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

$$(w^{\mathbb{P}})^2 = \mathrm{Var}_0^{\mathbb{P}}[\ln(1 + R_T^*)] = \ln\left[M_2^{\mathbb{P}}/(M_1^{\mathbb{P}})^2\right]. \tag{12}$$

We then derive the following result.

Proposition 4 (Expected return of the guaranteed product under $\mathbb{P}$). *The expected return*

on the guaranteed product under the physical measure is

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

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* $e_2^{\mathbb{P}} = e_1^{\mathbb{P}} - w^{\mathbb{P}}$.

B.4. Exposure to the Market Risk Premium: "Upward Beta"

We then develop a measure of the exposure to the market risk premium for a structured product investor: the share of the market return the investor earns when the guarantee is not exercised.[11] We label this quantity "Upward Beta".

We first 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 1 (Joint distribution of the underlying and the benchmark). *The vector* $(r_T^*, r_{m,T})'$ *is Gaussian with mean* $[(\mu-\sigma^2/2)T\,;\mu^{\mathbb{P}}]'$ and variance-covariance matrix

$$\begin{bmatrix} \sigma^2\,T & \sigma_{m,b} \\ \sigma_{m,b} & (w^{\mathbb{P}})^2 \end{bmatrix}, \tag{13}$$

where

$$\sigma_{m,b} = \ln\left[\frac{\sum_{i=1}^n e^{(\mu-q+\sigma^2)(t_i-t_0)}}{\sum_{i=1}^n e^{(\mu-q)(t_i-t_0)}}\right]. \tag{14}$$

and $w^{\mathbb{P}}$ *is defined by* (12).

We consider the linear decomposition:

$$r_{m,T} = a + b\,r_T^* + \varepsilon_t, \tag{15}$$

[11] When the guarantee is exercised, the exposure to market risk is by design close to zero.

where

$$b = \sigma_{m,b}/(w^{\mathbb{P}})^2 \tag{16}$$

$$a = (\mu - \sigma^2/2)T - b\,\mu^{\mathbb{P}}, \tag{17}$$

$$\sigma_\varepsilon^2 = \sigma^2\,T - (b\,w^{\mathbb{P}})^2. \tag{18}$$

Proposition 5. *Conditional on no exercise, the expected return on the guaranteed product is*

$$\mathbb{E}\left(1 + R_{g,T} | pR_T^* \geq g\right) = \frac{1}{1 + init}\left[1 + p\,M_1^{\mathbb{P}}\frac{N(d_1^{\mathbb{P}})}{N(d_2^{\mathbb{P}})} - p\right].$$

The conditional expectation of the market return is

$$\mathbb{E}\left(1 + R_{m,T} | pR_T^* \geq g\right) = \exp\left[a + \sigma_\varepsilon^2 + b\,\mu^{\mathbb{P}} + \frac{1}{2}(b\,w^{\mathbb{P}})^2\right]\frac{N(f_1^{\mathbb{P}})}{N(f_2^{\mathbb{P}})}$$

where

$$f_1^{\mathbb{P}} = \frac{1}{w^{\mathbb{P}}}\left[\mu^{\mathbb{P}} + b\,(w^{\mathbb{P}})^2 + \ln\frac{p}{p+g}\right]$$

and $f_2^{\mathbb{P}} = f_1^{\mathbb{P}} - b\,w^{\mathbb{P}}$.

We define the exposure to the market risk premium, or "Upward Beta" as:

$$\beta_g^+ = \frac{\mathbb{E}\left(1 + R_{g,T} - e^{r_f T} | pR_T^* \geq g\right)}{\mathbb{E}\left(1 + R_{m,T} - e^{r_f T} | pR_T^* \geq g\right)}$$

This ratio corresponds to the share of the risk premium of the underlying asset that is earned by an investor in the structured product in good states of the world, i.e. in which the guarantee is not exercised.

C. Empirical Application

We use this pricing model to derive the markups, the expected returns under the physical probability, and the exposure to the market risk premium for a large fraction of the products issued during our sample period.

C.1. Structured Product Issuances and Design Parameters

Panel A of Table I provides summary statistics on the issuance of all structured products in Sweden during the 2002-2007 period, as well as on the sub-sample of products defined by the representative contract.

The representative contract represents 55% of the retail structured products issued during our sample period in Sweden, and 60% of the corresponding volumes. Table I also shows summary statistics of the six parameters that define the contract for this sub-sample of products: the maturity T, the capital guarantee g, the initial fee $init$, the participation rate p, the market premium μ and volatility σ of the underlying asset, and the length of the Asian option $t_n - t_1$.

C.2. Pricing Inputs

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

- We estimate the risk premium of a given underlying asset μ by applying the World CAPM at a monthly frequency over the longest time-series available, with a risk premium on the World CAPM of 4%. This calculation provides us with an empirical estimate of $R_{m,t}$, which we convert into our model input μ as follows:

$$\mathbb{E}(1 + R_{m,t}) = e^{\mu\, t}$$

  Hence

$$\mu = \frac{\ln[1 + \mathbb{E}(R_{m,t})]}{t}$$

  where $\mathbb{E}(R_{m,t})$ is the expected monthly return and t represents a month ($t = 1/12$ 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 structured product issuance for q;
- We use the SEK Swap Rate for the product maturity as the risk free rate r_f in the pricing model.

C.3. Pricing Outputs

We compute the product markup as the difference between the fair initial fee that we derive from Proposition 2 and the actual initial fee we observe in our data. To obtain a yearly markup that can be easily compared to mutual fund yearly fees, we scale this markup by the product maturity in year.

We then derive the excess expected return the investor earns. A product expected return is calculated as per Proposition 4. The excess expected return is obtained by annualizing this expected return and subtracting the risk-free rate (T-bill rate).

Finally, the exposure to the market risk premium of a product is calculated as per Proposition 5. This quantity is key for our empirical analysis of household portfolio allocation, as it represents the "conversion rate" between structured products and a direct participation in stock markets.

Table I displays the results from this pricing exercise, i.e. the product markup, excess expected returns and the exposure to the market risk premium.

INSERT TABLE I

There are several important take-aways from this exercise. First, the cost to households/ the profitability to the banks of retail structured products - 1.4% of the invested amount per year on average - is comparable to the one for mutual funds available to the same population.[12] This finding suggests that banks have comparable financial incentives to market equity mutual funds and retail structured products.

Second, yearly excess expected returns for these products are significantly positive with an average of 4.9%. This confirms that retail structured products allow households to earn part of the risk premium. Third, we find that under the prevailing market conditions in Sweden at that time, the "upward beta", which measures the exposure to the market risk premium, is significant: 52.7% on average. The fact that it is below one results from the cost of the capital guarantee, which varies with the level of interest rate, and the markups.

[12]The average equity mutual fund fee in Sweden over the period 2000-2007 is 1.80%.

IV. Who Buys Structured Products and To Which Extent?

Having empirically established that the retail structured products marketed to Swedish households allow them to share in a large fraction of the risk premium, we turn to their portfolio data to study who buys such products and to which extent.

A. Adoption of Retail Structured Products

Despite the usual reluctance of households to invest in equity funds and stocks, the retail market for structured products developed within a few years in Sweden. At the end of 2007, 11% of Swedish households participated in this new asset class and invested a significant fraction of their financial wealth in these products.

The top half of Figure 1 shows the evolution of the share of households participating in structured products and in other stock market products over the 2002 to 2007 period.[13] Household participation in traditional stock market products, while high in Sweden compared to other countries, is slightly declining over the sample period. Conversely, the share of household investing in structured products significantly increases from 2000 to 2007, reaching 11% in 2007. Retail structured products, therefore, play an increasing role in households' access to stock markets over the period.

INSERT FIGURE 1

B. Characteristics of Structured Product Participants

We turn to exploring the characteristics of households that invest in retail structured products. In Table II, we compare financial and demographic characteristics of households investing in structured products with the characteristics of the whole Swedish population, and of households investing in equity funds and stocks.

INSERT TABLE II

[13] 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.

These unconditional summary statistics points at structured products participants being wealthier than the overall population and fund and stock participants, but also significantly older, and less invested in risky assets than equity fund and stock participants.

To further explore the determinants of structured product participation, we implement logit regressions to estimate the probability that a household invests in structured products at least once during the 2002 to 2007 period. We focus on the three main characteristics that identify households with lower participation in risky asset markets: financial wealth, IQ and age.

We run the following specification for participating in retail structured products, equity funds, or stocks:

$$\text{logit}(p_h) = \log\left(\frac{p_h}{1-p_h}\right) = \alpha + \beta\, x_h,$$

where p_h is the probability that the household participate at least once in a given type of investment over the 2002-2007 period, and x_h is a vector of household characteristics in 2007. Figure 2 displays the predicted probability of participation for each financial wealth decile, IQ level, and age category. Each regression includes financial wealth, IQ, and age fixed effects in this non-parametric specification as explanatory variables as well as controls for the number of children in the household, household size, a urban dummy and a household head gender dummy.

INSERT FIGURE 2

The likelihood to participate increases with financial wealth for all three asset classes. However, there are notable differences between retail structured products, and equity fund and stocks, on the two other dimensions. The likelihood of participating in retail structured products is a hump-shaped function of IQ, while it is a monotonically increasing function for equity funds and stock markets. The different pattern is even more pronounced for age: while likelihood of participating in retail structured products increases with age (except at the end of life), the opposite is true for equity funds and stocks. We also implement the same analysis on years of education, and find results consistent with the ones for IQ that we include in the Internet Appendix.

These differences point to retail structured products appealing differently than equity funds and stocks to specific sub-groups of the population: these products appear in relative higher demand

from mature households, but in lower demand from households with the highest IQs.

C. Share of Financial Wealth Invested in Structured Products

The bottom half of Figure 1 displays the evolution of the composition of the financial wealth of households that participate in retail structured products as of end 2007. The figure shows how these households build up a significant share of their wealth invested in retail structured product in a matter of five years: from 0% in 2002 to more than 15% in 2007. This increases contrasts with how they reduce over the same period their share of wealth held in cash, as well as the share invested in stocks and equity fund.

We then explore whether household characteristics relate to the extent to which households invest in structured products, as well as in other financial assets: cash, equity funds, and stocks. For this purpose, we run cross-sectional OLS regressions on the share of financial wealth invested in a given financial asset as of end of 2007. We use the following specification on the sample restricted to structured product participants:

$$\omega_{j,h} = \alpha_j + \beta_j \, x_h + \varepsilon_{h,j},$$

where $\omega_{j,h}$ is the share of financial wealth invested in asset class j. As previously, the vector of characteristics, x_h, consists of financial wealth, IQ and age, as well as the number of children, household size, a urban dummy and a household head gender dummy. Figure 4 plots regression coefficients on fixed effects for each financial wealth decile, IQ level, and age category. We also report the regression coefficient in Table III for assessing the economic magnitudes.

There are three key take-aways from this analysis. First, household with lower financial wealth invest a larger share of their wealth in retail structured products. Second, older households invest a larger share of their wealth in retail structured products than younger households. Last, these relationships are the opposite for traditional equity products, but are similar for cash. These results suggest a complementarity between structured products, and equity funds and stocks. The relationship between IQ and the share invested in structured product appear unclear, while it is strongly positive for equity funds and stocks.

INSERT FIGURE 4 AND TABLE III

D. Product Design and Household Characteristics

We finally investigate whether and how the design of retail structured products varies with household characteristics. We explore the four main parameters of the representative design: (i) participation rate p, (ii) initial fee $init$, (iii) length of the Asian option $t_n - t_1$, and (iv) capital guarantee g.

We run OLS regressions using each of these four parameters as the dependent variable, and financial wealth deciles, IQ levels, and age categories as explanatory variables. Figure 5 plots the coefficients of these regressions. We observe that while the participation rate and the initial fee vary with household characteristics, the length of the Asian option and the guarantee are largely insensitive to them. Household with lower financial wealth, lower IQ and older are more likely to invest in products offering lower participation rate and a lower initial fee, which corresponds to a higher level of guarantee. The magnitude are however modest. The length of the Asian option decreases with IQ, but again the magnitude is small.

INSERT FIGURE 5

This mapping between household characteristics and product design suggests some heterogeneity in preferences among the population. In addition, this result does not support a predatory view of the market, where one design parameter, such as the initial fee, is shrouded for the low sophistication households.

V. The Impact on Portfolio Allocation

While participating in risky asset markets is a necessary condition for earning the risk premium, this benefit might be small if only a small amount of household wealth is directed towards risky assets. In this section, we therefore study how portfolio allocation varies with household characteristics, and whether the introduction of structured products affects the relationships between household characteristics and their risky share of financial wealth.

A. Impact on Household Risky Asset Markets Participation

We define new participants to risky asset markets as households that were not participating in equity funds or stocks during the four years before 2002 and that start investing in equity funds, stocks or structured products during the 2003-2007 period.

Figure 3 shows the evolution of new participants, and their breakdown between new participants who start investing in equity funds or stocks, and new participants who start investing in structured products. We observe that the share of new participants through structured products substantially increases over time. While new participants through structured products only represent 3.6% of new participants through traditional products in 2002, this proportion reaches 17% in 2007.

INSERT FIGURE 3

We then reproduce the logit regressions from Figure 2, while restricting our sample to households that hold neither equity funds nor stocks in 2002, before the development of the structured product market.

We thus explore whether certain demographics are more likely to start investing in stock markets through structured retail products, rather than through stocks or equity funds. We do not observe meaningful differences in that regard. Results are displayed in Figure B.4 of the Internet Appendix. We interpret this lack of pronounced effect on the extensive margin of stock market participation as likely resulting from the high level of initial participation in Sweden.

B. Effect on the Risky Share of Households' Financial Wealth

We now explore whether investing in structured products is associated with an increase in the risky share of households' financial wealth. This analysis requires one important adjustment when comparing the risky share of households before and after the introduction of retail structured products. While we include structured products in the risky share - as they allow earning a fraction of the risk premium - we adjust the portfolio weight of structured products by the "upside beta" we compute in our pricing excercies.

We then restrict our sample to households participating in equity funds or stocks in 2002 and compare the change between 2002 and 2007 in their risky share, expressed in percentage points of

financial wealth, for households that have invested in structured products during that period versus households that have not. The exact specification is:

$$\Delta_{[2002,2007]} w_h = \alpha + \beta \times \mathbb{1}_{Participation(SP)_h} + \eta X_h + \varepsilon_h$$

where x_h is a vector of household characteristics that include the number of children, household size, urban and gender dummies, the change in income and the change in financial wealth over the period, as well as wealth and income decile and IQ or years of education fixed effects.

Column (1) in Table IV displays the regression coefficients for the total sample. The coefficient of the variable $\mathbb{1}_{Participation(SP)_h}$ suggests that structured product participants increased their risky share by an additional 3.7 pp over the 2002-2007 period compared to non participants. This increase represents more than 10% of their initial risky share, and doubles the average increase for the whole population.

Figure 6 shows that the effect of participating in structured products is higher on households with ex-ante low risky share. We split the sample into 8 categories base on the level of risky share in 2002 and interact indicators for each of these categories with the indicator variable for participating in structured products.

Table IV confirms this results: participating in structured products is associated with an additional active increase in risky share of 10 percentage points for household in the lowest quartile of risky share who initially have less than 4% of risky share. To obtain this result, we split the sample in quartiles of risky share in 2002. Households with a risky share of 3.3% ex ante experienced a growth in their risky share 10.1 pp higher when they participated in structured products. The coefficient of the dummy variable $\mathbb{1}_{Participation(SP)_h}$ is decreasing as household ex-ante risky share increases.

INSERT TABLE IV

INSERT FIGURE 6

Finally, we interact the indicator variable for participating in structured products with financial wealth decile, IQ levels, and age categories to identify heterogeneity in this change along our key characteristics. Figure 7 displays the OLS regression coefficients. This figure illustrates how

structured product participants have increased significantly more their risky share, and how this increase is more pronounced for households with lower financial wealth, and for older households.

INSERT FIGURE 7

Columns (6) to (9) in Table IV displays the regression coefficients with linear specifications for the explanatory variables.

TABLE IV

C. Active Change in Risky Share

We now look at changes in the risky shares induced by household active behaviour: we therefore adjust for any "passive" changes in the risky share that would only result from changes in asset prices assuming that the household does not trade over the period.

To adjust for the passive change in the risky share, we define the active change in the risky share over the period $[t-n,t]$ as:

$$\Delta_{[t-n,t]} w_h^a = w_{h,t} - w_{h,t}^{p,n},$$

where $w_{h,t}$ is the observed risky share in year t and $w_{h,t}^{p,n}$ is the passive risky share after an inactivity period of n years. More precisely, $w_{h,t}^{p,n}$ is the risky share at the end of year t if the household does not trade between years $t-n$ and t, and is calculated by applying to each asset of the household portfolio the realized returns of this asset over the period $[t-n,t]$.

The exact specification is now:

The exact specification is:

$$\Delta_{[2002,2007]} w_h^a = \alpha + \beta \times \mathbb{1}_{Participation(SP)_h} + \eta X_h + \varepsilon_h$$

Table IA6 in the online appendix displays the results: the effect of participating in structured products on household risky share is almost unchanged.

D. Controlling for Endogenous Selection into Structured Product Investment: Instrumental Variable Analysis

Because investment in structured products is an endogenous decision which might correlate with a willingness to increase household risky share independently of the introduction of structured products, our analysis requires an exogenous variation in the supply of retail structured products For this purpose, we exploit the fact some Swedish banks did not market structured products to their client base during our sample period, and that these banks are un-evenly distributed geographically, which generates geographic variation in the supply intensity of retail structured products.

We collect the list of bank branches in each parish and build a proxy for the household exposure to retail structured product supply by calculating the ratio of branches in their parish that market retail structured product during our study period.

This strategy alleviates concerns that households might have several banking relationships, or could shop around. It relies on the assumption that shopping banking services is a local market. which is supported by the existing literature (Beck, Demirguc-Kunt, and Peria, 2007).

A natural concern is that household from parishes with few or no banks distributing retail structured products differ fundamentally from the other parishes, which could result in a different trend in the evolution of their portfolio allocation. This concern is mitigated by the richness and the size of our dataset, which allows us to control for a comprehensive set of household characteristics, as well as their evolution, in non-parametric specifications.

Figure 8 illustrates the geographic distribution of supply intensity.

INSERT FIGURE 8

Table V shows the result of this analysis. Column 1 displays the coefficients of the first stage, and shows that a higher share of branches offering structured products in a given parish significantly increases the probability to invest in structured products for the households of this parish, even when controlling for household characteristics. Column 2 presents the coefficients from the second stage, which regresses change in the risky share on participation in retail structured products, where participation in retail structured product is instrumented. The positive and significant coefficient on the indicator variable for participating in retail structured products confirms our initial result. The larger magnitude of the coefficient suggests that the endogeneity issue is biasing

our results downwards, which suggests that households participating in structured products would have actually reduced their risky share in the absence of these products.

E. Portfolio Rebalancing

To rationalize this increase in their risky share, we study how households that invest in structured products fund these purchases, and more specifically whether they do so with cash or by selling stock market instruments they own. We can measure this substitution between financial assets thanks to the panel structure of our data.

We estimate the rate of substitution between structured products and cash at a yearly frequency. We run the following OLS regression in a panel model:

$$CashShare_{h,t} = \alpha_h + \delta_t + \beta \times SPshare_{h,t} \times x_h + \varepsilon_{h,t},$$

where $CashShare_{h,t}$ is the share of financial wealth held as cash by household h in year t, $SPshare_{h,t}$ is the share of financial wealth invested in **structured products** indexed to equity by household h in year t, and x_h is either the decile of financial wealth, the level of IQ, or the age category. α_h is a household fixed effect and δ_t is a year fixed effect.

Table VI reports the regression coefficients. The coefficient on $SPshare_{h,t} \times x_h$ shows how structured products purchase are predominantly funded with cash, with an average substitution rate of 62%. Substitution with cash appears to be even higher for household with lower financial wealth, lower IQ, and younger households, which is consistent with the larger increase in stock market exposure for these sub-groups of the population.

INSERT TABLE VI

When we adjust for the return elasticity to the underlying asset performance, the average increase in exposure to risky assets resulting from household investing 1% of their financial wealth in structured products is therefore around 0.3%. As structured product participants invest on average 15% of their financial wealth into these products, this translates into an increase in the exposure to risky assets of around 5% of their financial wealth.

VI. Theoretical Framework for Portfolio Choice

This section investigates the theoretical mechanisms that can explain the impact on household portfolios of the introduction of structured products we observe in our data. We develop a portfolio-choice model with three assets: a risk-free bond, a stock-market index, and a structured product based on the index. Structured product distribution of returns is derived from the previous asset pricing exercise of Section III. We compute the portfolio choice of an investor with CRRA, habit formation, or loss aversion preferences.[14] We finally calculate the increase in utility brought by the access to the structured product, and determine the increase in the risk-free rate that would provide the same utility gain for the agent.

A. Portfolio Choice and Corresponding Utility

The agent is endowed with initial wealth W_t that she can invest in the riskless asset, the stock, and the guaranteed product. Let α_t denote the portfolio weight of the stock and β_t the portfolio weight of the structured product. The agent chooses the values of α_t and β_t that maximize the expected value of its utility. We compute the portfolio choice α_t and β_t of an investor with CRRA, habit formation, and loss aversion preferences, as well as the increase in interest rate that would correspond to the same gain in utility.

A.1. CRRA Investor

We consider an agent with CRRA utility $\mathbb{E}_t\left[u(C_{t+1})\right]$, where

$$u(C) = \frac{C^{1-\gamma}}{1-\gamma}.$$

The agent chooses the values of α_t and β_t that maximize

$$\mathbb{E}\left\{u\left[W_t(1 + R_f + \alpha_t\, R^e_{m,t+1} + \beta_t\, R^e_{g,t+1})\right]\right\} = W_t^{1-\gamma} v(\alpha_t, \beta_t),$$

[14] We also interact these utility functions with the presence of human capital in the appendix.

where

$$v(\alpha_t, \beta_t) = \frac{1}{1-\gamma}\mathbb{E}\left[(1 + R_f + \alpha_t R^e_{m,t+1} + \beta_t R^e_{g,t+1})^{1-\gamma}\right]$$

denotes the expected utility from one unit of initial wealth.

When the investor can only invest in the bond and the stock, the optimal share invested in the stock is given by Merton's formula:

$$\alpha_t = \frac{\mu + \sigma^2/2}{\gamma\sigma^2},$$

as we verify in the Appendix.

When the investor can invest in all three assets, the optimal solution can be computed numerically. For a given $z = \ln(1 + R_{m,t})$, the net arithmetic return on the portfolio is

$$R_p(z; \alpha, \beta) = (1 - \alpha - \beta)R_f + \alpha(e^z - 1) + \beta \max[p(e^z - 1); g].$$

The objective function is

$$v(\alpha_t, \beta_t) = \frac{1}{1-\gamma}\int_{-\infty}^{+\infty} [1 + R_p(z; \alpha, \beta)]^{1-\gamma} \ \phi(z; \mu + r_f, \sigma^2)\ dz,$$

where $\phi(\ \cdot\ ; m, \sigma^2)$ denotes the p.d.f. of a Gaussian with mean m and variance σ^2.

In a second step, we compute the increase in interest rate that would correspond to the same gain in utility.

A pure bond portfolio achieves the utility level $W_t^{1-\gamma} v(\alpha_t, \beta_t)$ if and only if

$$1 + R^*_f = \left[(1-\gamma)\ v(\alpha_t, \beta_t)\right]^{1/(1-\gamma)}.$$

If the investment period contains n years, the gross yearly interest rate is

$$(1 + R^*_f)^{1/n} - (1 + R_f)^{1/n}$$

in annual units.

A.2. Habit Formation

We now consider an agent with habit formation with utility

$$u(C) = \frac{(C-X)^{1-\gamma}}{1-\gamma}.$$

Let $\xi = X/W$ denote the habit to wealth ratio. The objective function is

$$v(\alpha,\beta) = \frac{1}{1-\gamma}\int_{-\infty}^{+\infty} \left[1 + R_p(z;\alpha,\beta) - \xi\right]^{\,1-\gamma} \phi(z;\mu + r_f, \sigma^2)\, dz.$$

A strategy is admissible if $C - X \geq 0$ for all realizations of the stock return. That is

$$[1 + (1-\alpha_t-\beta_t)R_f + \alpha_t(e^z - 1) + \beta_t \max[p(e^z-1); g] \geq \xi$$

for all $z \in \mathbb{R}$, which holds if and only if $1 + (1-\alpha_t-\beta_t)R_f - \alpha_t + \beta_t \max(-p; g) \geq \xi$. Therefore, a portfolio is admissible if and only if

$$(1+R_f)\alpha_t + \left[R_f - \max(-p; g)\right]\beta_t \leq 1 + R_f - \xi.$$

We compute the increase in interest rate that would lead to the same utility gain as follows. A pure bond portfolio achieves the utility level $W_t^{1-\gamma} v(\alpha_t, \beta_t)$ if and only if $(1 + R_f^* - \xi)^{1-\gamma}/(1-\gamma) = v(\alpha_t, \beta_t)$, or equivalently

$$1 + R_f^* = \left[(1-\gamma)v(\alpha_t,\beta_t)\right]^{1/(1-\gamma)} + \xi.$$

If the investment period contains n years, the welfare gain is quantified by the difference $(1 + R_f^*)^{1/n} - (1+R_f)^{1/n}$.

A.3. Loss Aversion

We now consider an agent with loss aversion. The expected utility becomes

$$u(W; W_R) = \begin{cases} (W - W_R)^{1-\gamma}/(1-\gamma) & \text{if} \quad W \geq W_R, \\ -\lambda(W_R - W)^{1-\gamma}/(1-\gamma) & \text{if} \quad W < W_R. \end{cases}$$

Let $\omega_R = W_R/W_t$ denote the ratio of the reference point to initial wealth.

The objective function is $W_t^{1-\gamma} v(\alpha_t, \beta_t)$, where

$$v(\alpha_t, \beta_t) = \frac{1}{1-\gamma} \int_{-\infty}^{+\infty} u\left[1 + R_p(z; \alpha, \beta); \omega_R\right] \ \phi(z; \mu + r_f, \sigma^2) \ dz.$$

A pure bond portfolio achieves the utility level $W_t^{1-\gamma} v(\alpha_t, \beta_t)$ if and only if $(1+R_f^*-\omega_R)^{1-\gamma}/(1-\gamma) = v(\alpha_t, \beta_t)$, or equivalently

$$1 + R_f^* = [(1-\gamma) v(\alpha_t, \beta_t)]^{1/(1-\gamma)} + \omega_R.$$

If the investment period contains n years, the welfare gain is quantified by the difference $(1 + R_f^*)^{1/n} - (1 + R_f)^{1/n}$.

A.4. Misperception on the Fraction of Risk Premium the Investor Receives

We finally consider the misperception of the product design as a potential mechanism for our empirical results. We assume that investors do not understand the asian option, and therefore believe that their return conditional on the guarantee not being exercised is p times the underlying asset positive return of the product maturity. We study the demand for such a misperceived product. Alternatively, we study the demand for a product that do not We study the portfolio allocation impact of such a belief. The rationale for considering such a variation is that retail structured products design frequently relies on payoff designs that translate into a higher percentage of the index performance the investor receives than a vanilla call option would provide. Asian options, for instance, mechanically reduce the index performance during bullish periods. If household do not distinguish between vanilla call options and Asian options, they misperceive p.

B. Model Estimation

B.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 4% 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 structured product, of 51.27%.

We use the investment universe with only the riskfree asset as our initial benchmark. For each of the framework specification, we then sequentially introduce the stock index and the structured product, 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.

B.2. Results

Portfolio Allocation

We present a summary of the model allocation outputs and welfare gains in Table VII.

INSERT TABLE VII

They are several key take-aways from this exercise. First, we observe that CRRA and habit formation utilities are unlikely to explain our data, as they generate negligible appetite for the guaranteed product.

Second, loss aversion, and misperception on the fraction of the index performance the investor will receive, generate significant appetite for the guaranteed product. Third, the risky share expands significantly under both these specifications, which is consistent with the data.

Under the loss-aversion mechanism, structured product would mitigate this behavioral bias and thereby foster households to participate more often and in a larger extent to risky asset markets. On the other hand, the misperception mechanism suggests a possible interaction between behavioral and rational motivation. To generate appetite for risk, banks may need to partly obfuscate its cost.

VII. Conclusion

This study provides empirical evidence suggesting that innovative financial products can help alleviate the low participation of households in risky asset markets. We use a large administrative

dataset to characterize the demand for structured products, an innovative class of retail financial products with option-like features.

The micro-evidence in this paper suggests that the introduction of retail structured products increases significantly stock market participation and the risky share of specific subgroups of the population, in particular households with lower financial wealth, with low to median IQ, and older. Both empirical and theoretical evidence is most consistent with these innovative products being successful at alleviating loss aversion among households.

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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 (5) 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 $i = 1, ..., Yf$. 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 (4), (5), (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 $n = Yf$.

A.2. Proof of Proposition 1

The average return on the structured product can be written as

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

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 (7) and $d_2 = d_1 - w^{\mathbb{Q}}$. . The expected return on the guaranteed product therefore satisfies (6).

The monotonicity of the expected return, $\mathbb{E}_0^{\mathbb{Q}}\left(1+R_{g,T}\right)$, 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.[15]

A.3. Proof of Proposition 3

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.

A.4. Proof of Lemma 1

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

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

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

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

[15] A similar derivation implies that

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

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 (14).

A.5. Proof of Proposition 5

Let $K = (p+g)/p$. The linear decomposition in equation (15) implies

$$\begin{aligned}\mathbb{E}\left(1+R_{m,T}|pR_T^* \geq g\right) &= \mathbb{E}\left(e^{r_{m,T}}|r_T^* \geq \ln K\right)\\ &= e^{a+\sigma_\varepsilon^2/2}\,\mathbb{E}\left(e^{b\,r_T^*}|r_T^* \geq \ln K\right).\end{aligned}$$

The random variable $X = (1+R_T^*)^b = e^{b\,r_T^*}$ satisfies $\ln(X) \sim \mathcal{N}[b\,\mu^{\mathbb{P}}, (b\,w^{\mathbb{P}})^2]$. The lognormality of X implies that

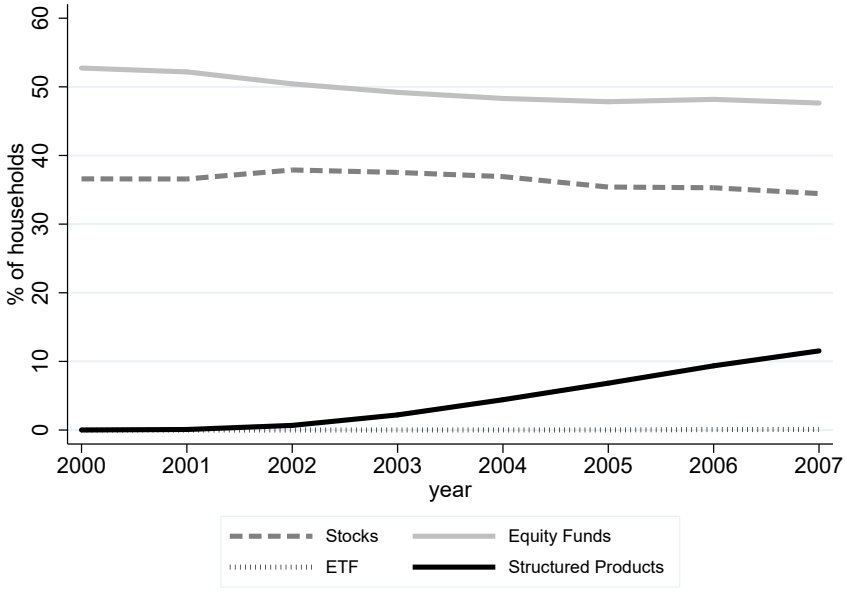
$$\begin{aligned}\mathbb{E}\left(1+R_{m,T}|pR_T^* \geq g\right) &= e^{a+\sigma_\varepsilon^2/2}\,\mathbb{E}\left(X|X \geq K^b\right)\\ &= e^{a+\sigma_\varepsilon^2/2+b\,\mu^{\mathbb{P}}+(b\,w^{\mathbb{P}})^2/2}\,\frac{N(f_1^{\mathbb{P}})}{N(f_2^{\mathbb{P}})}\end{aligned}$$

where

$$f_1^{\mathbb{P}} = \frac{b\,\mu^{\mathbb{P}} + (b\,w^{\mathbb{P}})^2 - b\,\ln(K)}{b\,w^{\mathbb{P}}} = \frac{\mu^{\mathbb{P}} + b\,(w^{\mathbb{P}})^2 - \ln(K)}{w^{\mathbb{P}}}$$

and $f_2^{\mathbb{P}} = f_1^{\mathbb{P}} - b\,w^{\mathbb{P}}$.

Panel A. Fraction of Households Participating in Structured Products, Stocks, and Equity Funds



Panel B. Share of Financial Wealth Invested in Structured Products, Stocks, and Equity Funds

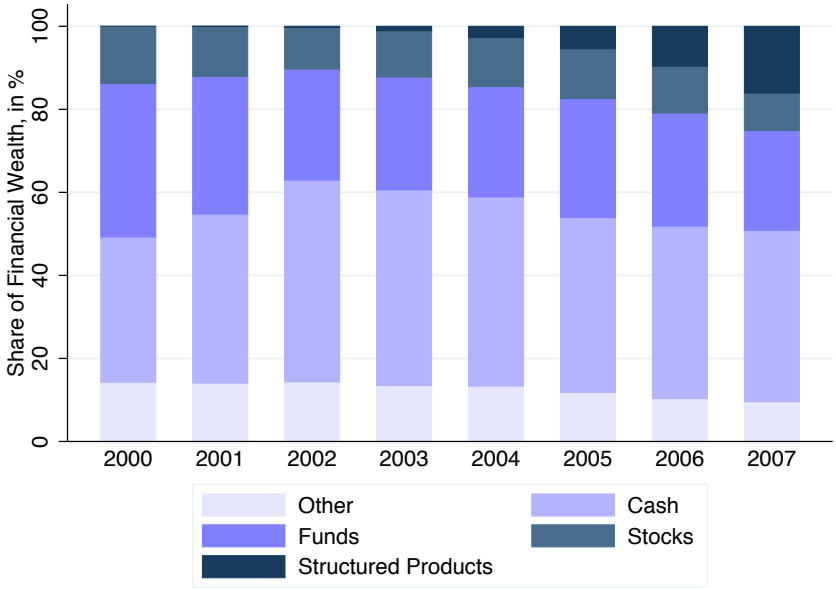


Figure 1. Adoption of Structured Products in Sweden (2000-2007)

Panel A shows the evolution of the share of Swedish households investing in equity markets through either stocks, funds or structured products (blue line), in equity funds (dot line), in stocks (grey line), in structured products (red line) and in ETFs (dashed line). Swedish banks started distributing retail structured products in 2000, the beginning of our sample period. Panel B displays the evolution of the composition of the financial wealth of households that participate in retail structured products as of end 2007.

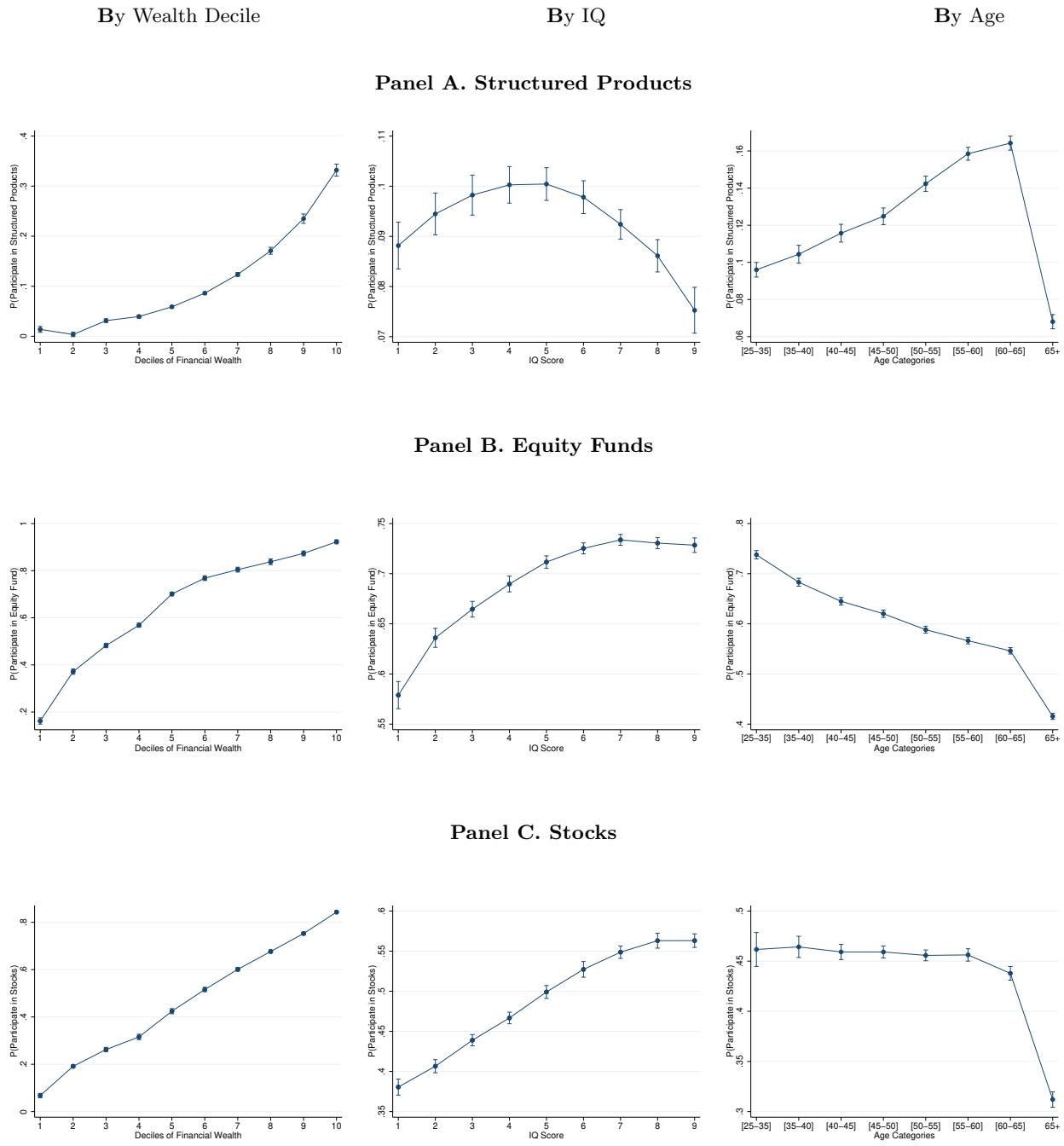


Figure 2. Likelihood of Participation in Structured Products, Equity Funds and Stocks
This figure shows predicted probabilities estimated from logit regressions, where the dependent variable is an indicator variable for investing in a given investment products at least one year during the 2002-2007 period. 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 a urban area, and the gender of the household. All explanatory variables are defined in 2002.

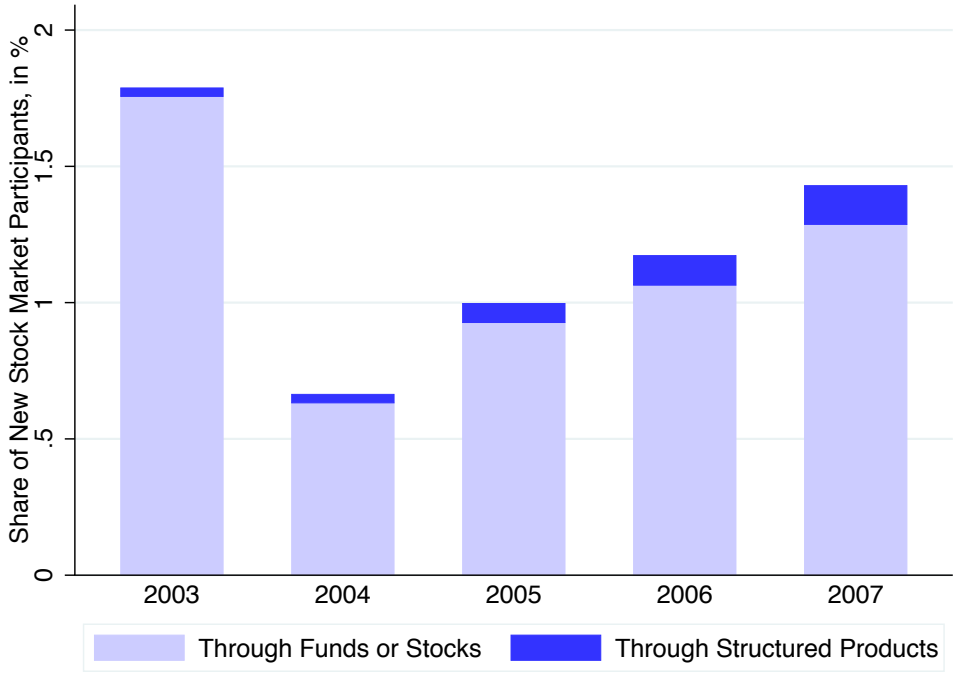


Figure 3. Evolution of the share of new participants through equity funds and stocks, and through structured products.

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 structured products. New participants are defined as households that were not participating in equity funds, stocks or structured products during in the four precedent years.

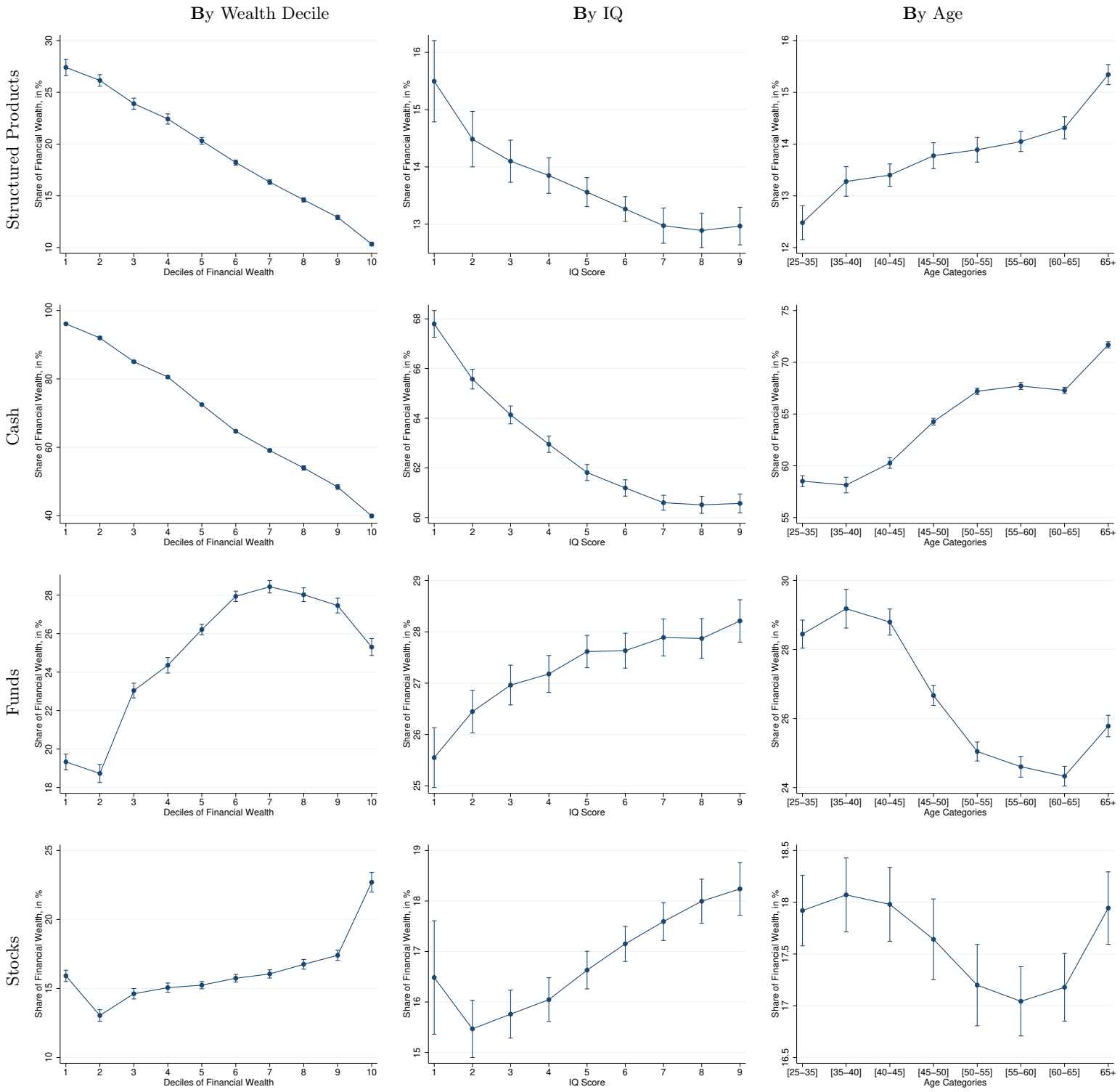


Figure 4. Portfolio Composition: Share of Financial Wealth Invested in Structured Products, Equity Funds, Stocks and Cash

This figure displays regression coefficients from OLS regressions, where the dependent variable is the share of financial wealth invested in a given investment products as of end of 2007. 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 a urban area, and the gender of the household head. The sample is restricted to participants in each asset category

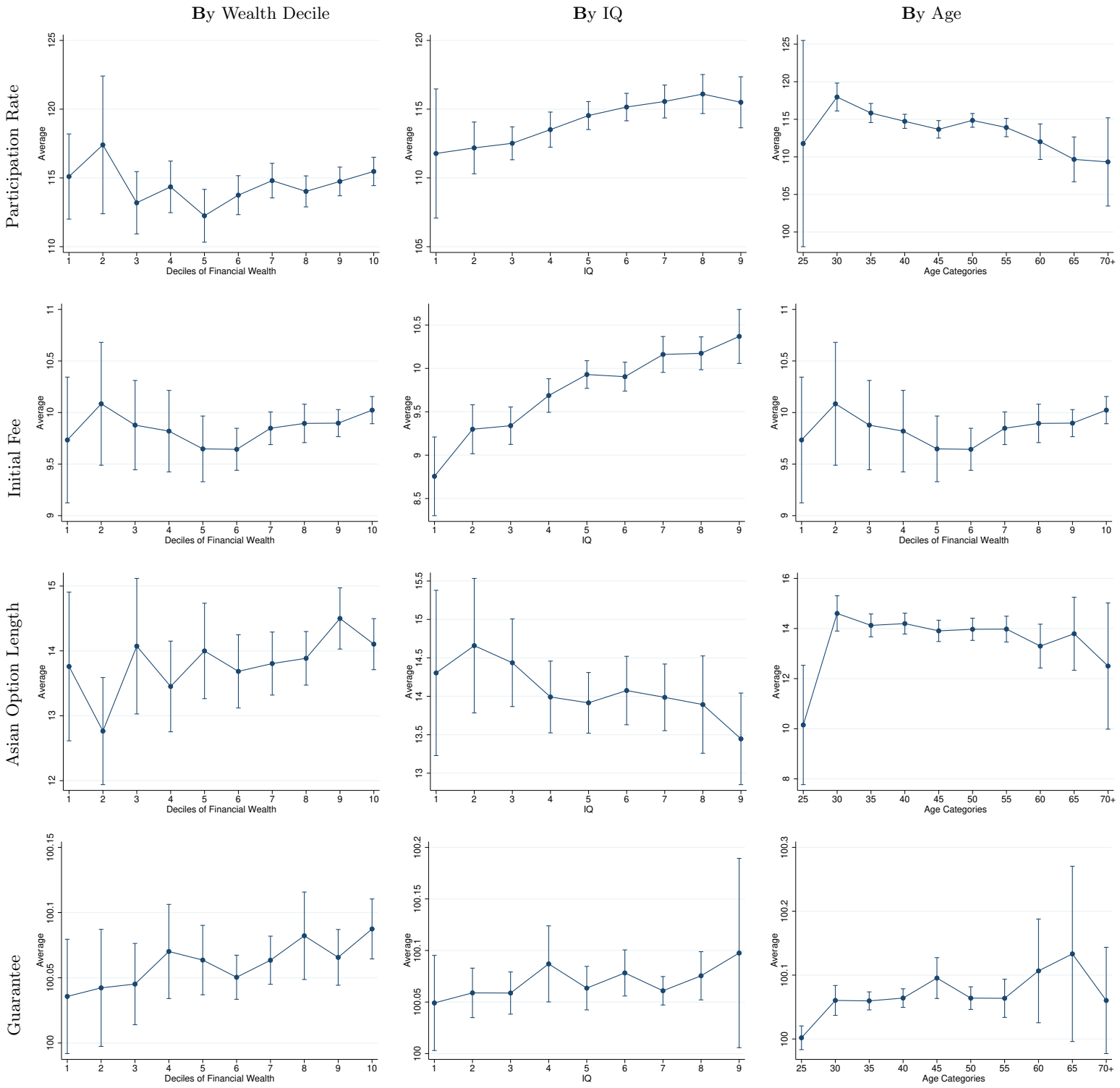


Figure 5. Product Design and Investor Characteristics.

This figure displays coefficients from OLS regressions where the dependent variables are the participation rate p, the initial fee $init$, the asian option length $t_n - t_1$, and the guarantee g, 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 a urban area, and the gender of the household head. The sample is restricted to structured product participants.

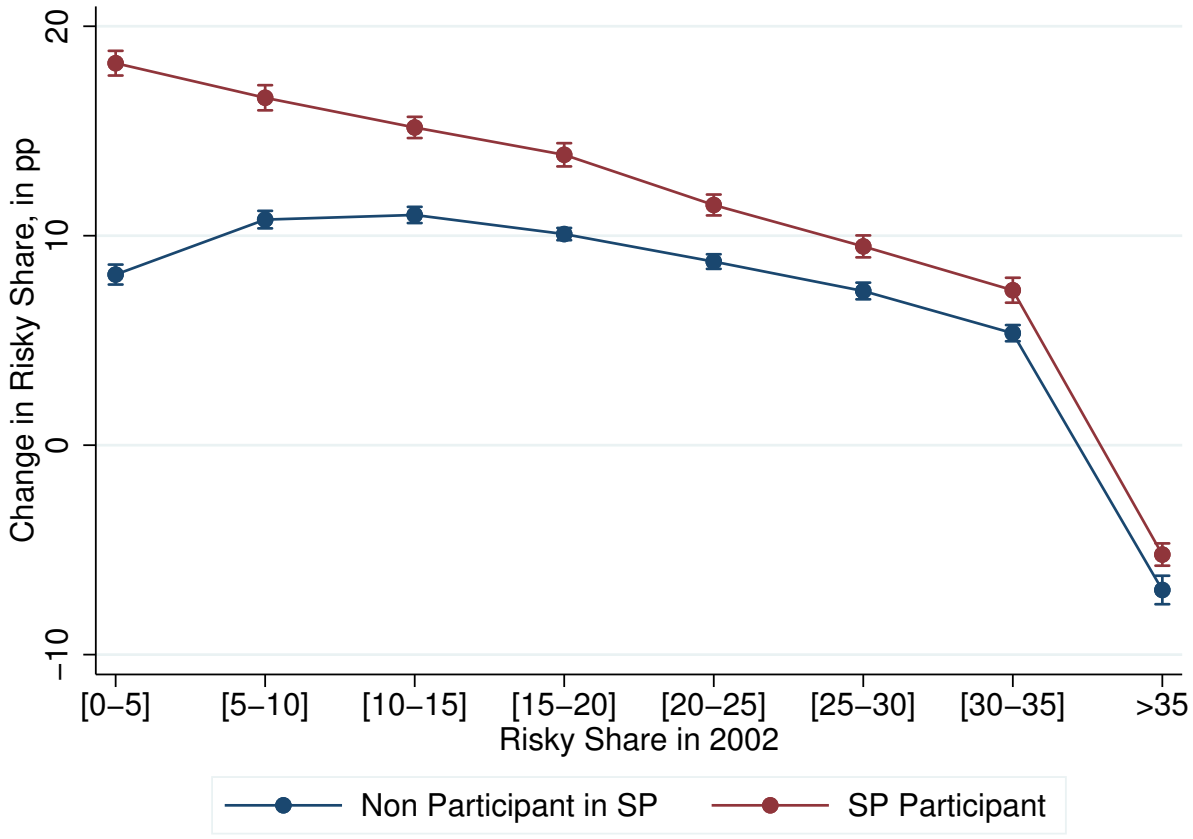


Figure 6. Change in the risky share over the 2002-2007 period for participants in equity funds, stocks or structured products across risky shre in 2002

This figure displays within in Swedish parish the share of branches offering structured products over the 2002-2007 period. We use this measure to instrument household likelihood to participate in structured products.

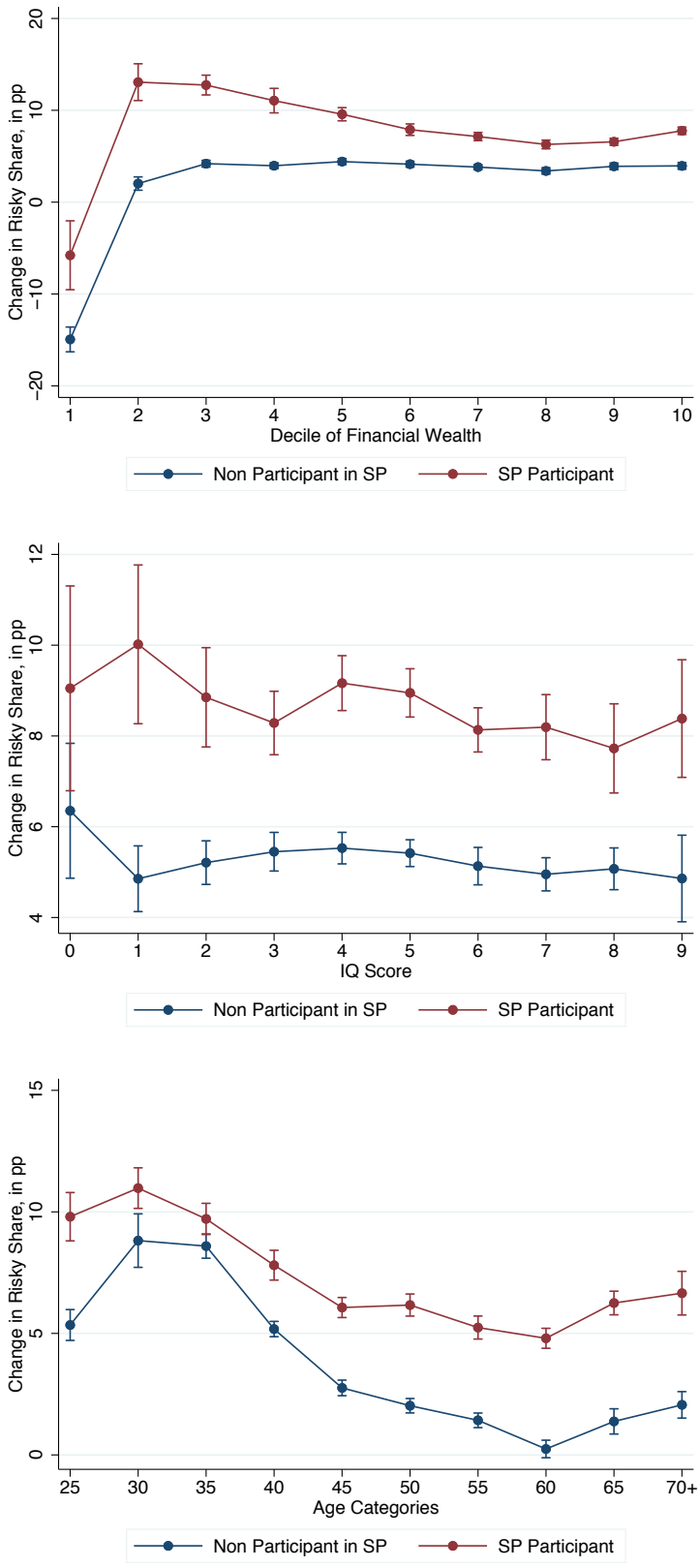


Figure 7. Change in the risky share over the 2002-2007 period for participants in equity funds, stocks or structured products.

This figure shows the change in the risky share, in p.p. of financial wealth, over the 2002-2007 period for 2007 structured product participants versus equity fund or stock participants (that do not participate in structured products), broken down by wealth decile, IQ levels and age categories. The risky share includes equity funds, stocks and retail structured products. The sample includes all households that participate in equity funds or stocks in 2002.

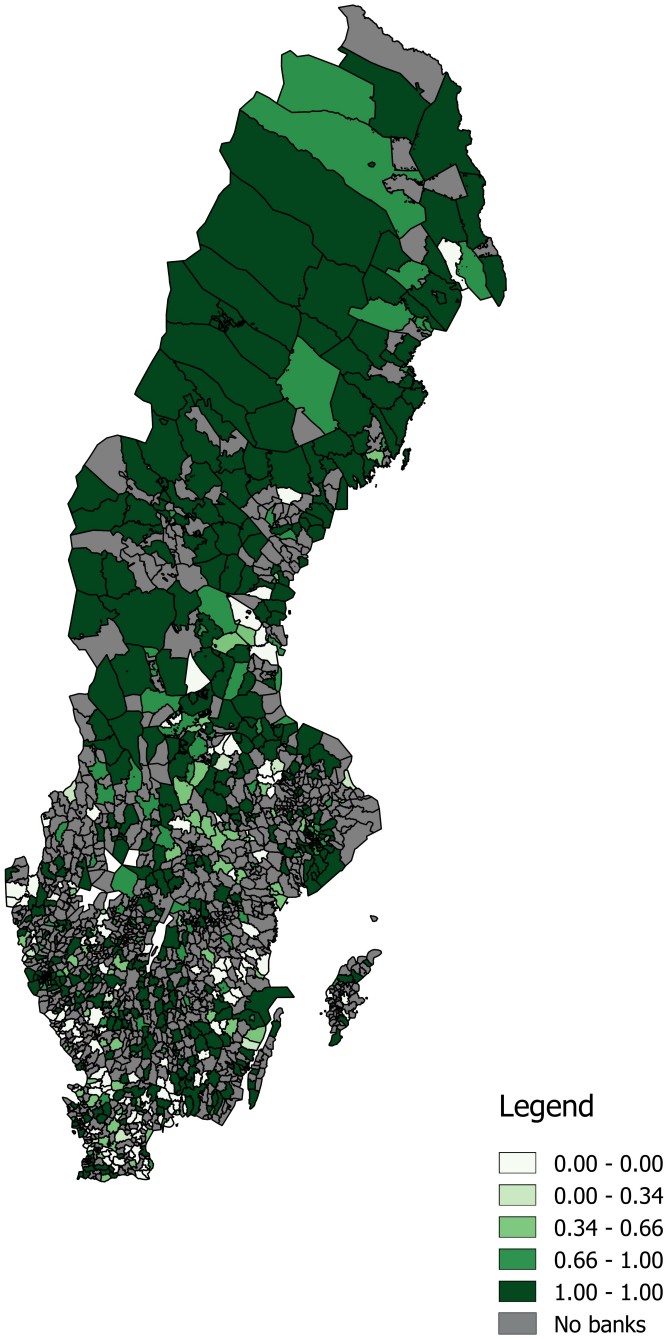


Figure 8. Within Parish Share of Bank Branches Offering Structured Products over the 2002-2007 Period

This figure displays within in Swedish parish the share of branches offering structured products over the 2002-2007 period. We use this measure to instrument household likelihood to participate in structured products.

Table I. Structured Product Summary Statistics and Pricing Outputs

	Mean	p1	p10	p50	p90	p99
Panel A: Summary Statistics						
Total Sample (N=1,510)						
Issuance year	2006	2002	2004	2006	2007	2007
Volumes, in m$	5.2	0.0	0.5	2.6	13.0	29.1
Term, in months	40.1	12.0	17.9	37.6	60.5	72.5
Capital guarantee, in %	100.3	100.0	100.0	100.	100.0	109.0
Initial Fee, in %	8.7	0.0	2.0	11.0	13.0	22.0
Representative Products (N=749)						
Issuance year	2006	2002	2004	2006	2007	2007
Volumes, in m$	4.9	0.0	0.4	2.9	12.1	27.5
Design Parameters						
Term, in months	44.7	12.0	24.5	48.1	60.5	95.8
Capital guarantee, in %	100.3	100.0	100.0	100.0	100.0	109.0
Initial Fee, in %	8.7	0.0	2.0	11.0	13.0	22.0
Participation rate, in %	114.6	30.0	65.0	110.0	160.0	210.0
Market Premium, in %	9.7	3.0	3.0	7.7	20.0	38.7
Asian Option Length (in months)	14.8	0.0	4.0	13.0	36.0	60.5
Panel B: Pricing Output - Representative Products (N=749)						
Yearly Markup, in %	1.4	-5.0	-0.4	1.5	3.1	6.2
Yearly Excess Expected Return, in %	4.9	-2.4	1.0	4.4	9.8	14.0
Exposure to the Risk Premium, in %	52.7	0.0	17.2	50.6	90.0	131.1

Table II. Structured Product Participants: Summary Statistics

Sample	All N= 3,994,605				Structured Participants N= 437,529				Fund Participants N= 1,976,083				Stock Participants N= 1,420,638			
	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %
Financial characteristics (in 2000 $):																
Yearly Income	25,934	22,037	11,593	38,227	34,055	25,681	14,150	50,836	28,338	24,338	13,484	40,775	31,459	25,378	13,077	45,795
Total Wealth	197,406	110,988	3,360	432,605	346,187	230,402	47,060	667,465	237,692	149,645	9,758	480,133	311,789	196,238	22,072	591,023
Financial Wealth	55,408	15,961	2,123	114,733	133,490	71,221	17,198	262,902	64,636	22,015	3,898	121,055	95,704	34,015	6,184	167,691
Total Liability	56,602	23,152	0	150,737	52,440	18,225	0	139,576	72,869	40,042	0	180,713	76,895	37,509	0	192,445
Traditional Equity Products	23,534	1,492	0	36,957	49,983	13,847	47	102,411	34,035	6,124	428	50,311	53,106	9,132	592	75,388
Equity Products Incl. Structured Products	24,500	1,773	0	39,914	58,578	21,244	3,251	116,837	34,035	6,124	428	50,311	53,106	9,132	592	75,388
Stocks	14,628	0	0	10,371	25,902	1,184	0	41,243	20,358	0	0	14,707	38,646	2,374	159	37,247
Funds	11,119	909	0	28,156	31,452	12,548	0	76,641	15,999	5,361	341	37,899	17,205	4,289	0	42,861
Equity Funds	8,170	134	0	20,418	21,760	6,923	0	55,832	12,855	4,112	229	30,381	13,527	2,661	0	34,405
Allocation Funds	712	0	0	1,400	2,279	0	0	6,088	792	0	0	1,869	882	0	0	2,065
ETFs	23	0	0	0	41	0	0	0	31	0	0	0	52	0	0	0
Structured Products	1,486	0	0	979	13,223	5,873	979	29,364	0	0	0	0	0	0	0	0
Residential Real Estate	118,573	73,129	0	303,687	168,655	119,613	0	384,111	144,924	102,415	0	340,818	172,737	123,618	0	393,422
Non Residential Real Estate	23,426	0	0	6,955	44,043	0	0	54,547	28,133	0	0	18,171	43,349	0	0	51,425
Demographics																
Household Head Age	52.5	52.0	31.0	76.0	56.3	58.0	36.0	73.0	48.8	46.0	30.0	70.0	52.2	51.0	32.0	73.0
Family Size	2.1	2.0	1.0	4.0	2.2	2.0	1.0	4.0	2.5	2.0	1.0	4.0	2.3	2.0	1.0	4.0
Number of Dep.Children	0.6	0.0	0.0	2.0	0.6	0.0	0.0	2.0	0.9	0.0	0.0	2.0	0.7	0.0	0.0	2.0
Stockholm Area in (in %)	0.2	0.0	0.0	1.0	0.2	0.0	0.0	1.0	0.2	0.0	0.0	1.0	0.2	0.0	0.0	1.0
Years of Schooling	12.1	12.0	9.0	16.0	12.3	12.0	8.0	16.0	12.5	12.0	9.0	16.0	12.6	12.0	9.0	16.0
IQ Score	5.1	5.0	2.0	8.0	5.4	5.0	3.0	8.0	5.3	5.0	3.0	8.0	5.5	6.0	3.0	8.0
Household Head Male (in %)	0.6	1.0	0.0	1.0	0.6	1.0	0.0	1.0	0.7	1.0	0.0	1.0	0.7	1.0	0.0	1.0
Number of Structure Products	0.3	0.0	0.0	1.0	2.6	2.0	1.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table II. Structured Product Participants: Summary Statistics - Continued

Sample	All N= 3,994,605				Structured Participants N= 437,529				Fund Participants N= 1,976,083				Stock Participants N= 1,420,638			
	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %	Mean	Median	10^{th} %	90^{th} %
Share of financial wealth in (%):																
Traditional Equity Products	22.0	10.5	0.0	64.0	27.7	23.3	0.1	61.8	36.7	33.0	4.8	75.0	37.4	33.6	3.6	78.3
Equity Products Incl. Structured Products	23.1	12.5	0.0	65.1	37.3	34.9	10.2	68.1	36.7	33.0	4.8	75.0	37.4	33.6	3.6	78.3
Stocks	6.6	0.0	0.0	22.6	8.9	1.6	0.0	29.2	8.0	0.0	0.0	27.8	18.4	8.9	0.8	53.2
Equity Funds	13.9	1.1	0.0	46.6	16.7	11.2	0.0	43.1	26.9	21.1	2.1	61.7	17.6	8.9	0.0	50.4
Allocation Funds	1.5	0.0	0.0	4.7	2.1	0.0	0.0	7.0	1.8	0.0	0.0	6.1	1.4	0.0	0.0	4.7
ETFs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Structured Products	1.7	0.0	0.0	2.3	14.8	10.0	2.1	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash	66.6	72.8	19.3	100.0	41.4	38.7	11.5	76.2	53.1	52.9	15.2	91.9	52.3	51.5	13.2	93.4
Participate in (%):																
Traditional Equity Products	67.8	100.0	0.0	100.0	90.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Equity Products Incl. Structured Products	68.9	100.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Stocks	37.3	0.0	0.0	100.0	62.1	100.0	0.0	100.0	47.0	0.0	0.0	100.0	100.0	100.0	100.0	100.0
Equity Funds	53.3	100.0	0.0	100.0	77.8	100.0	0.0	100.0	100.0	100.0	100.0	100.0	69.1	100.0	0.0	100.0
Allocation Funds	25.0	0.0	0.0	100.0	44.3	0.0	0.0	100.0	33.1	0.0	0.0	100.0	30.3	0.0	0.0	100.0
ETFs	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Structured Products	11.2	0.0	0.0	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Participated at least once in (%):																
Stocks	45.3	0.0	0.0	100.0	70.9	100.0	0.0	100.0	55.1	100.0	0.0	100.0	100.0	100.0	100.0	100.0
Equity Funds	64.3	100.0	0.0	100.0	88.3	100.0	0.0	100.0	100.0	100.0	100.0	100.0	78.9	100.0	0.0	100.0
ETFs	0.2	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0
Allocation Funds	31.3	0.0	0.0	100.0	54.8	100.0	0.0	100.0	39.5	0.0	0.0	100.0	37.5	0.0	0.0	100.0
Structured Products	13.3	0.0	0.0	100.0	100.0	100.0	100.0	100.0	3.2	0.0	0.0	0.0	3.9	0.0	0.0	0.0
Equity Products Including Structured Products	77.1	100.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Traditional Equity Products	76.5	100.0	0.0	100.0	95.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Cash	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2002-2007 pp change in share of financial wealth invested in (%):																
Traditional Equity Products	2.6	0.0	-17.7	26.5	-1.9	0.0	-27.1	20.7	8.3	6.6	-17.6	37.2	5.3	3.9	-21.1	33.5
Equity Products Including Structured Products	3.7	0.0	-16.3	28.3	7.3	7.8	-18.4	32.3	8.3	6.6	-17.6	37.1	5.3	3.8	-21.1	33.5
Equity Funds	1.6	0.0	-13.0	19.3	-2.3	0.0	-22.0	14.6	6.8	4.1	-14.3	32.3	1.8	0.0	-14.6	20.5
Stock	0.0	0.0	-5.4	5.5	-0.9	0.0	-10.1	7.2	0.3	0.0	-6.7	8.0	2.7	0.7	-11.8	20.8
Income (Log)	0.1	0.1	-0.3	0.4	0.1	0.1	-0.3	0.6	0.1	0.1	-0.2	0.4	0.1	0.1	-0.3	0.5
Financial Wealth (Log)	0.3	0.3	-0.7	1.3	0.7	0.6	0.0	1.6	0.4	0.4	-0.5	1.3	0.5	0.5	-0.4	1.4

This table reports summary statistics of the main financial and demographic characteristics of Swedish households at the end of 2007. The first sample is the total population of Swedish households, the second sample is structured product participants, the third sample is fund participants and the last sample is stock participants.

Table III. Portfolio Allocation across Household Characteristics

	Share of Financial Wealth Invested in:			
	Structured Products	Stocks	Funds	Cash
	(1)	(2)	(3)	(4)
Financial Wealth (Log)	-0.036***	0.044***	0.014***	-0.041***
	(0.001)	(0.001)	(0.001)	(0.001)
IQ score	-0.001	0.004***	0.005***	-0.007***
	(0.000)	(0.000)	(0.001)	(0.001)
Age (years)	0.000	-0.001***	-0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Controls				
Province FE	Yes	Yes	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes
Observations	80,315	80,315	80,315	80,315
R^2				

This table displays OLS regression coefficients. The dependent variable is the share of financial wealth invested in structured products (column 1), stocks (column 2), equity mutual funds (column 3), and cash (column 4) as of 2007. The sample is restricted to structured product participants as of 2007. Standard errors are clustered at the kommun level. Individual controls include a urban area dummy, a household head gender dummy, the size of the household and the number of children. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IV. 2002-2007 Change in Risky Share and Participation in Structured Products

Sample	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)
$\mathbb{1}$_*Participation*(SP)	3.49***	9.99***	5.65***	1.66***	-1.77***	8.46***	3.51***	-1.67***
	(0.07)	(0.12)	(0.12)	(0.09)	(0.09)	(0.58)	(0.24)	(0.46)
$\mathbb{1}$_*Participation*$(SP)\times$ Financial Wealth						-0.51***		
						(0.05)		
$\mathbb{1}$_*Participation*$(SP)\times$ IQ Score							-0.08*	
							(0.04)	
$\mathbb{1}$_*Participation*$(SP)\times$ Age								0.09***
								(0.01)
Controls								
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2033646	508,092	508,555	508,604	508,395	2033646	735,278	2033646
R^2	0.057	0.092	0.082	0.055	0.092	0.045	0.061	0.045
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 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 structured products. *Structured Product Participant* is a dummy variable equal to one if the household invested at least once in structured products over the 2002-2007 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 2002-2007 period was 3.6 percentage points higher for households who participated in structured products 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 V. 2002-2007 Change in Risky Share and Participation in Structured Products: Instrumental Variable Analysis

	First Stage	IV
	Structured Product Participant	Change in Risky Share (in p.p.)
	(1)	(2)
Supply Intensity	0.128***	
	(0.022)	
Structured Product Participant		17.928***
		(0.917)
Controls		
Individual Controls	Yes	Yes
Observations	735,859	735,859

This table displays the results of our IV analysis. In the first stage, the dependent variable, *Structured Product Participant*, is a dummy variable equal to one if the household invested at least once in structured products over the 2002-2007 period. The independent variable is a measure of structured product supply at the parish level, i.e. the share of branches in a given parish that offers structured product. In the second stage, 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 structured products. The sample is restricted to household participating in stock markets in 2002. Control variables include years of schooling, wealth decile and age category fixed effects, as well as a urban dummy, number of children, household size and household head gender dummy. The coefficient in column 2 means that the increase in stock market exposure over the 2002-2007 period was 18 percentage points higher for households who participated in structured products than for the ones that did not. 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.

Table VI. Substitution Effects and Household Characteristics

	Share of Financial Wealth Invested in Cash, in %			
	(1)	(2)	(3)	(4)
Structured Product Share of Financial Wealth	-0.620***	-2.115***	-0.738***	-1.147***
	(0.002)	(0.022)	(0.012)	(0.010)
Structured Product Share of Financial Wealth × Financial Wealth (log)		0.117***		
		(0.002)		
Structured Product Share of Financial Wealth × IQ Score			0.012***	
			(0.002)	
Structured Product 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. T-statistics are displayed below their coefficient of interest. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table VII. Model Outputs

	CRRA RRA g =5	Habit formation Curvature g = 2 Habit = 0.7 x initial wealth	Loss aversion Curvature g = 0.5 Kink coefficient l = 2 Ref point = initial wealth
Riskless asset			
- Portfolio return (annualized)	4.00%	4.00%	4.00%
Riskless asset and stock			
- Share of stock	0.1933	0.2008	0.2248
- Gain in utility: Corresponding interest rate increase (annualized)	0.40%	0.42%	0.59%
Riskless asset, stock, and guaranteed product			
- Share of stock	0.1933	0.2008	0.1418
- Share of guaranteed product	0.0000	0.0000	0.1785
- Gain in utility: Corresponding interest rate increase (annualized)	0.40%	0.42%	0.62%
Riskless asset, stock, and guaranteed product		Misperception: p perceived as 10% higher	
- Share of stock	0.1933	0.0611	0.0109
- Share of guaranteed product	0.0000	0.1982	0.4059

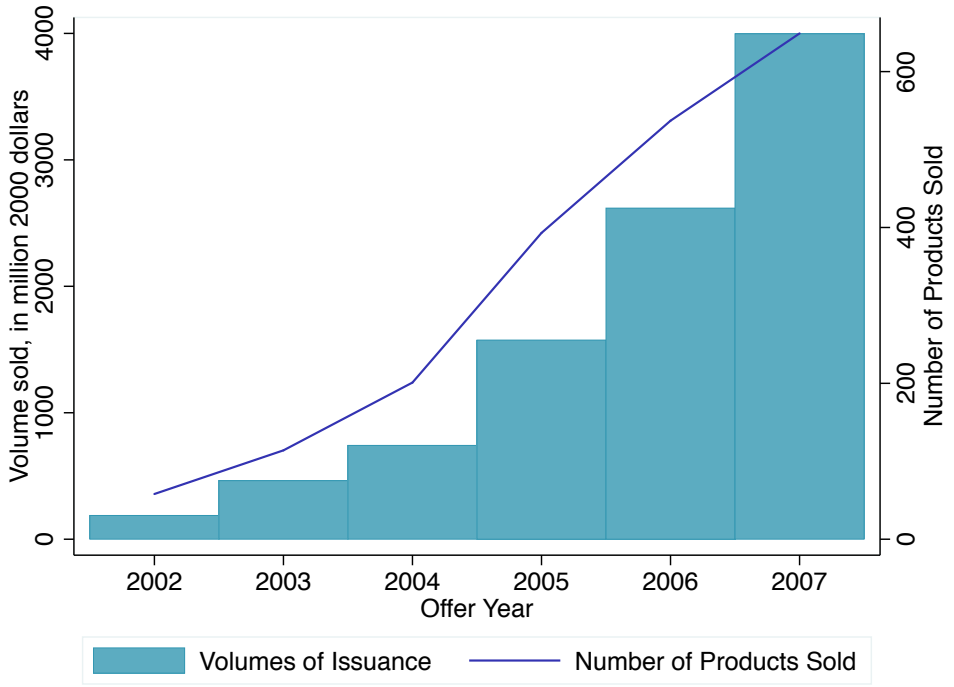


Figure IA.1. Volume and Number of Products Sold per Year

This figure shows volume issuance in millions of 2000 USD of retail structured products over the 2002-2007 period in the Swedish market.

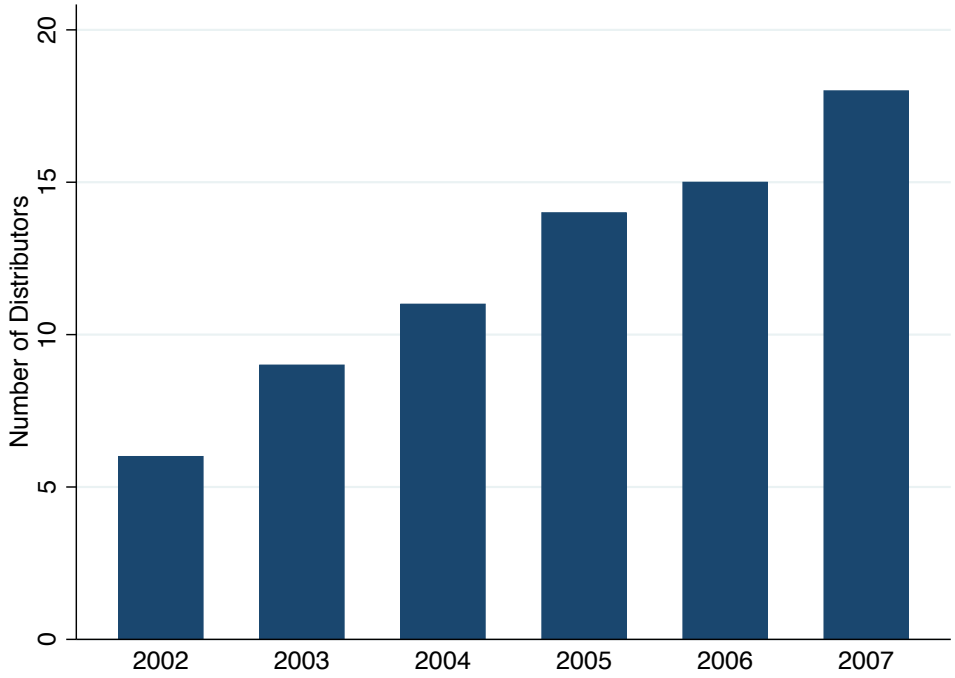


Figure IA.2. Number of Distributors per Year

This figure shows the evolution of the number of structured product distributors over the 2002-2007 period.

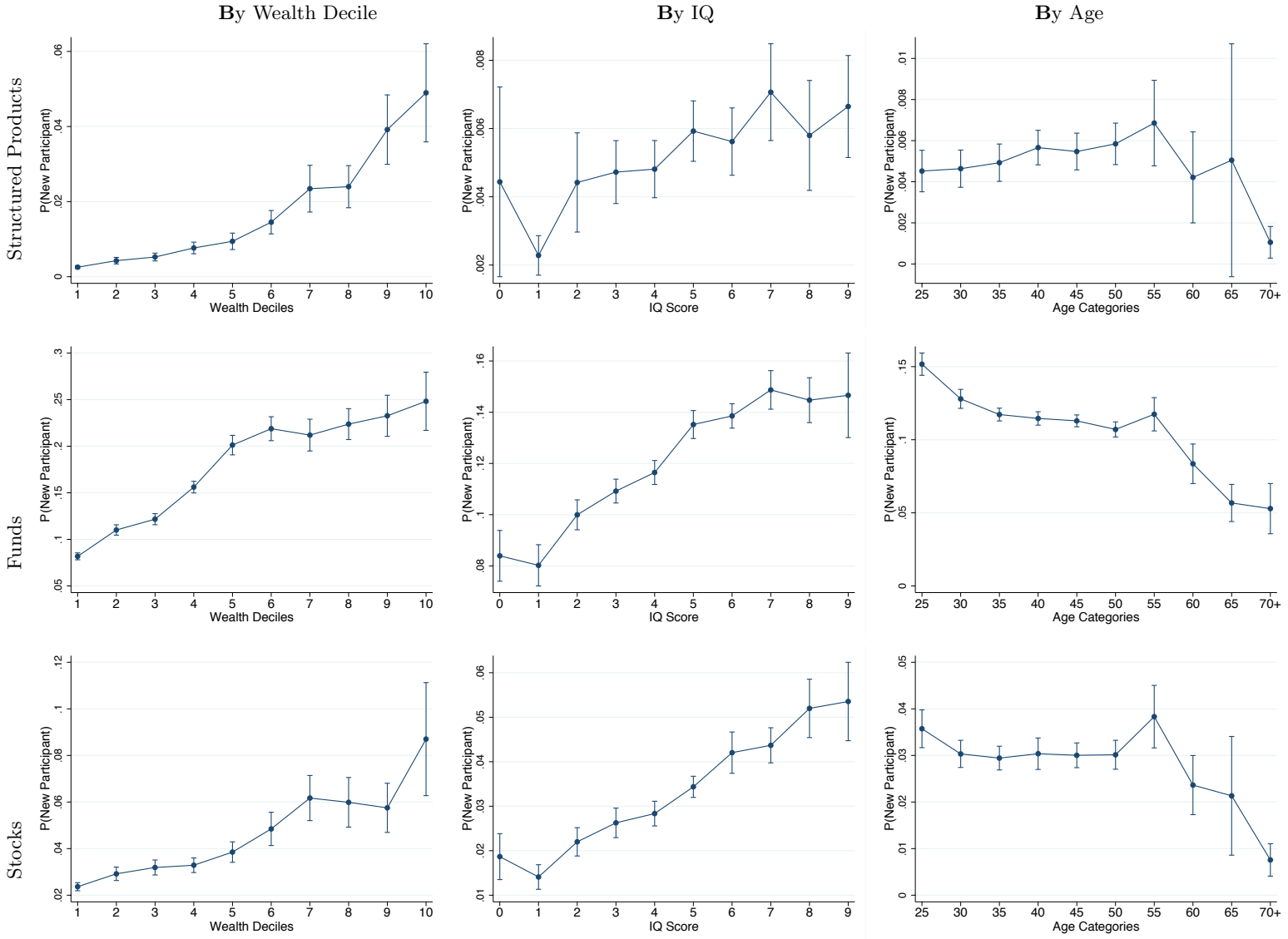


Figure IA.3. Likelihood of Participation in Structured Products, Equity Funds and Stocks for Households Not Participating to Risky Asset Markets as of 2000-2001.

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 2002-2007 period, and the sample is restricted to households that were not invested in risky assets in 2000 and 2001. 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 a urban area, and the gender of the household. All explanatory variables are defined in 2002.

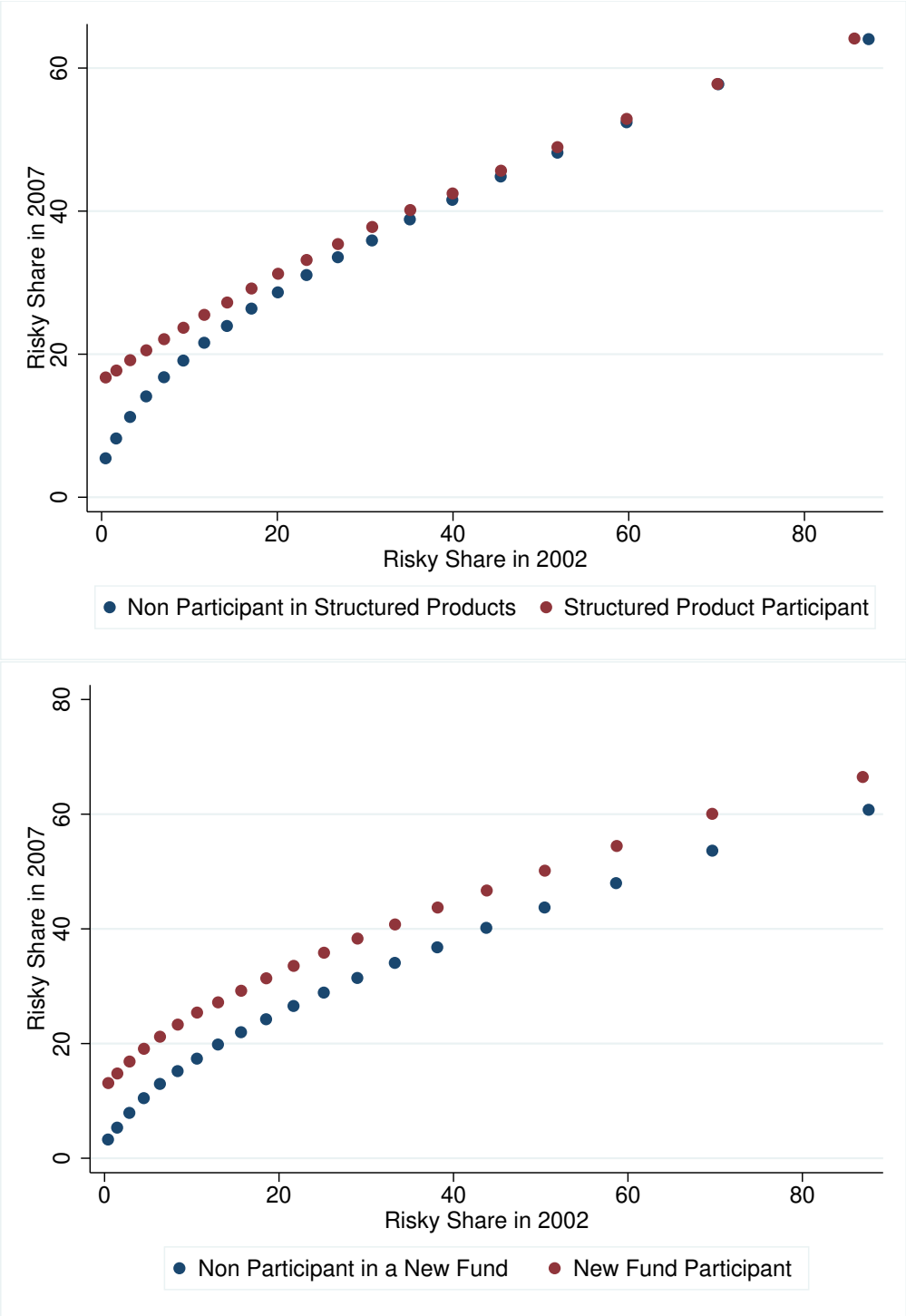


Figure IA.4. The Effect of Participating in Structured Products or Any New Fund on the Risky Share (2002 - 2007)

This figure shows the evolution of the number of structured product and new fund distributors over the 2002-2007 period.

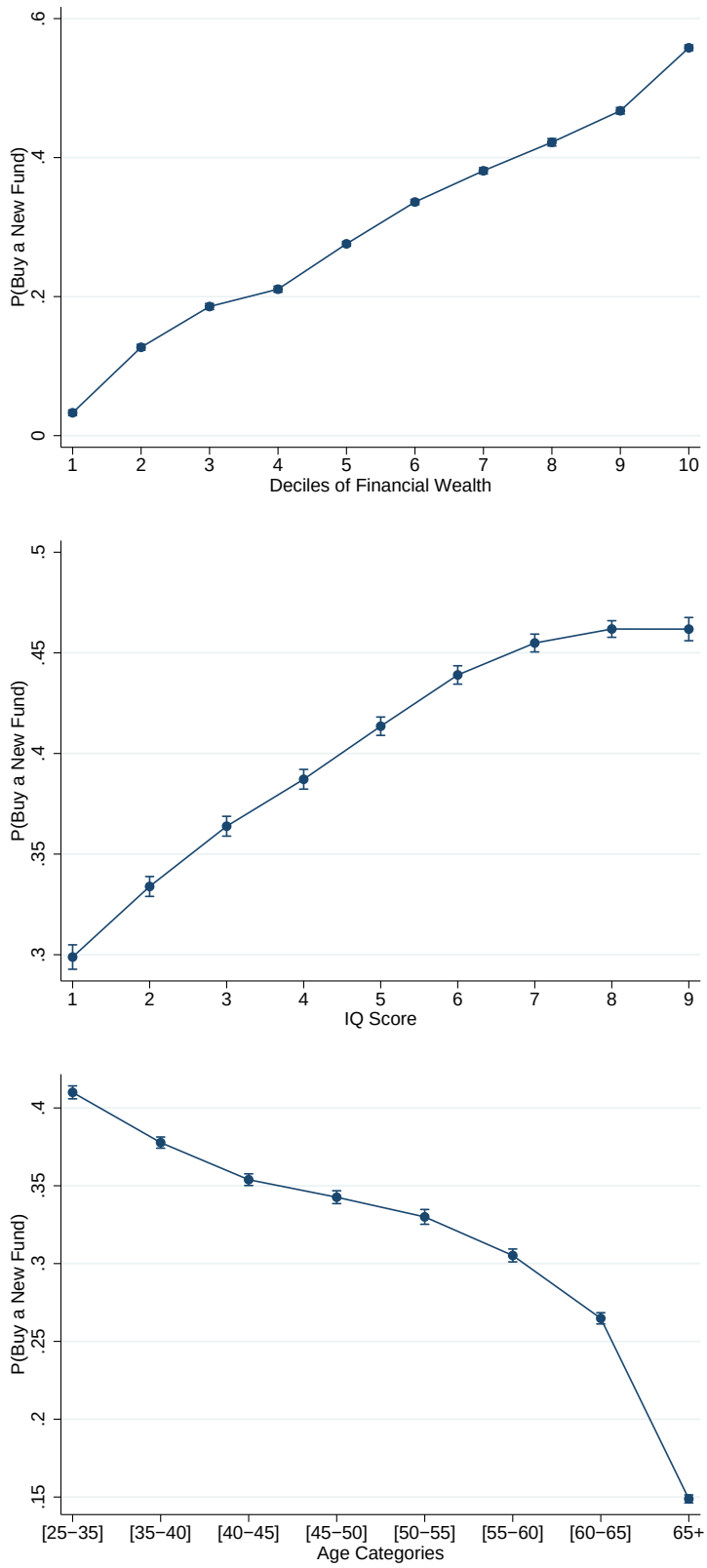


Figure IA.5. Likelihood of Buying a New Fund

This figure shows predicted probabilities estimated from logit regressions, where the dependent variable is an indicator variable for buying a new fund at least one year during the 2002-2007 period. The sample is restricted to stock market participants in 2002. 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 a urban area, and the gender of the household. All explanatory variables are defined in 2002.

Table IA.1. Market Share (in volumes) of the Structured Product Distributors

	Market Share	Cumulated Market Share	Entry Date
	(1)	**(2)**	**(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 Summary Statistics

Total (N=1,510)	**mean**	**min**	**p10**	**p50**	**p90**	**max**
Term, in months	40.1	12.0	17.9	37.6	60.5	120.1
Volumes, in m$	5.2	0.0	0.5	2.6	13.0	282.3
Year	2,005.5	2,002.0	2,004.0	2,006.0	2,007.0	2,007.0
Call product with an Asian option, in %	56.1	0.0	0.0	100.0	100.0	100.0
Call products, in %	2.6	0.0	0.0	0.0	0.0	100.0
Call Cap Asian, in %	2.5	0.0	0.0	0.0	0.0	100.0
Call Cap, in %	1.7	0.0	0.0	0.0	0.0	100.0
Other payoff	37.1	0.0	0.0	0.0	100.0	100.0
Call product with an Asian option (N=847)						
Term, in months	44.8	12.4	24.5	48.0	60.5	97.3
Volumes, in m$	4.8	0.0	0.5	2.8	11.7	60.2
Year	2,005.6	2,002.0	2,004.0	2,006.0	2,007.0	2,007.0
Capital guarantee, in %	100.2	100.0	100.0	100.0	100.0	115.5
Participation rate, in %	115.1	30.0	63.0	110.0	160.0	475.0
Length of the Asian Option (in months)	15.5	1.0	4.0	13.0	35.9	60.5
Issue price, in %	108.7	100.0	101.0	111.0	113.0	182.0
Call products (N=40)						
Term, in months	31.6	12.0	12.5	30.4	48.7	60.0
Volumes, in m$	1.5	0.0	0.1	0.8	3.4	8.4
Year	2,005.5	2,002.0	2,003.5	2,005.0	2,007.0	2,007.0
Capital guarantee, in %	100.3	100.0	100.0	100.0	100.0	104.5
Participation rate, in %	106.4	30.0	62.5	100.0	147.5	200.0
Length of the Call Products (in months)	0.0	0.0	0.0	0.0	0.0	0.0
Issue price, in %	107.1	100.0	101.0	106.0	112.0	117.0
Call Cap Asian (N=38)						
Term, in months	48.3	24.5	41.0	48.5	60.2	60.2
Year	2,004.2	2,002.0	2,002.0	2,003.0	2,007.0	2,007.0
Volumes, in m$	6.7	0.3	0.7	3.0	20.9	54.3
Call Cap (N=25)						
Term, in months	38.4	12.5	13.7	36.0	60.5	61.2
Year	2,005.9	2,004.0	2,004.0	2,007.0	2,007.0	2,007.0
Volumes, in m$	4.6	0.2	0.4	3.1	13.1	13.7

Table IA.3

	Participation rate, in % (1)
Length of the Asian Option (in months)	0.325*** (4.03)
Issue price, in %	5.287*** (32.21)
Term, in months	0.353*** (4.71)
Year	0.091*** (0.12)
Observations	887
R^2	0.545

Note: This table displays coefficients from OLS regressions where the dependent variable is participation rate, in %. T-statistics are reported below the coefficients. *, **, and *** represent statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

Table IA.4. Retail Structured Products: Who are the New Participants through Structured Products?

	=1 if the new participant joins with...					=1 if structured product has...		
	Structured Products	Stock Markets	Single Stocks	Equity Funds	ETF	Capital Protection	Developed Economy	Simple Payoff
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Age	-0.003	-0.014***	-0.003	-0.020***	0.185***	-0.005	-0.001	-0.002
	(0.005)	(0.001)	(0.004)	(0.002)	(0.067)	(0.008)	(0.005)	(0.006)
Log(years of schooling)	0.784***	0.741***	1.071***	0.622***	-2.171	0.403	0.675***	0.590**
	(0.223)	(0.069)	(0.137)	(0.094)	(4.635)	(0.367)	(0.228)	(0.288)
Gender Income Weight	-0.475***	-0.196***	0.359***	-0.187***	-1.305***	-0.710***	-0.526***	-0.682***
	(0.141)	(0.031)	(0.088)	(0.052)	(0.349)	(0.182)	(0.155)	(0.189)
Urban Area Dummy	-0.146	-0.019	0.023	-0.063	17.541***	-0.160	-0.126	-0.331*
	(0.105)	(0.039)	(0.069)	(0.050)	(1.569)	(0.276)	(0.114)	(0.189)
Log(Disposable Income)	0.572***	0.620***	0.565***	0.778***	-0.191	0.444**	0.479***	0.487***
	(0.124)	(0.060)	(0.111)	(0.078)	(0.253)	(0.186)	(0.138)	(0.136)
Log(Financial Wealth)	0.357***	0.225***	0.145***	-0.037*	0.305	0.444***	0.404***	0.382***
	(0.055)	(0.018)	(0.035)	(0.022)	(0.245)	(0.084)	(0.059)	(0.074)
Log(RealEstate)	0.028***	0.029***	0.033***	0.030***	0.113	0.025**	0.030***	0.021**
	(0.009)	(0.002)	(0.005)	(0.003)	(0.085)	(0.012)	(0.010)	(0.010)
Log(Leverage)	-0.453***	-0.002	-0.011	0.065***	1.579***	-0.280*	-0.423***	-0.412***
	(0.095)	(0.018)	(0.035)	(0.023)	(0.071)	(0.168)	(0.117)	(0.120)
Controls								
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	50,355	50,355	50,355	50,355	12,733	50,024	50,355	50,024
R^2	0.058	0.052	0.038	0.051	0.373	0.059	0.060	0.058

This table reports logit regression coefficients where the dependent variable is a dummy equal to one if the household gains exposure through stock markets during the 2003-2007 period through a specific instrument (structured product, basic structured product: with domestic underlying assets and simple payoff formulas, stocks and equity mutual funds). Explanatory variables are as per 2002. The analysis is restricted to household that are not participating in stock markets in 2002 and the 4 year before. Standard errors are clustered at the parish level.

Table IA.5. 2002-2007 Change in Risky Share and Participation in Structured Products

Sample	Model 1: IQ Sample					Model 2: Controlling for IQ				
		Quartiles of 2002 Risky Share					Quartiles of 2002 Risky Share			
	All	Q1	Q2	Q3	Q4	All	Q1	Q2	Q3	Q4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
$\mathbb{1}_Participation(SP)$	3.254***	9.681***	5.054***	1.311***	-1.212***	3.254***	9.707***	5.076***	1.329***	-1.220***
	(0.147)	(0.276)	(0.266)	(0.253)	(0.267)	(0.147)	(0.276)	(0.266)	(0.255)	(0.267)
Controls										
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	467,718	113,372	121,997	122,076	110,273	467,718	113,372	121,997	122,076	110,273

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 structured products. *Structured Product Participant* is a dummy variable equal to one if the household invested at least once in structured products over the 2002-2007 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 2002-2007 period was 4.2 percentage points higher for households who participated in structured products 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. 2002-2007 Active Change in Risky Share and Participation in Structured Products

Sample	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)
$\mathbb{1}$_*Participation*(SP)	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)
$\mathbb{1}$_*Participation*$(SP)\times$ Financial Wealth						-0.28***		
						(0.10)		
$\mathbb{1}$_*Participation*$(SP)\times$ IQ Score							-0.02	
							(0.07)	
$\mathbb{1}$_*Participation*$(SP)\times$ Age								0.11***
								(0.01)
Controls								
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1106010	273,919	279,289	278,373	274,429	1106010	562,324	1106010
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 structured products. *Structured Product Participant* is a dummy variable equal to one if the household invested at least once in structured products over the 2002-2007 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 2002-2007 period was 2.9 percentage points higher for households who participated in structured products 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. Change in Risky Share and Participation in Structured Products - Sample Restricted to Fund Buyers

	Change in Risky Share, in p.p.							
Sample		Quartiles of 2002 Risky Share				All		
	All	Q1	Q2	Q3	Q4	All	IQ Restricted	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}$_*Participation*(SP)	2.07***	5.13***	2.58***	-0.25***	-2.73***	-7.15***	1.67***	-4.50***
	(0.08)	(0.12)	(0.12)	(0.09)	(0.10)	(0.90)	(0.25)	(0.46)
$\mathbb{1}$_*Participation*$(SP)\times$ Financial Wealth						0.86***		
						(0.09)		
$\mathbb{1}$_*Participation*$(SP)\times$ IQ Score							0.01	
							(0.04)	
$\mathbb{1}$_*Participation*$(SP)\times$ Age								0.12***
								(0.01)
Controls								
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1133058	195,683	269,162	319,639	348,574	1133058	449,905	1133058
R^2	0.055	0.046	0.061	0.047	0.070	0.045	0.058	0.045
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 change in the risky share from 2002 to 2007, in p.p. of financial wealth. The risky share includes equity funds, stocks and retail structured products. *Structured Product Participant* is a dummy variable equal to one if the household invested at least once in structured products over the 2002-2007 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 2002-2007 period was 2.9 percentage points higher for households who participated in structured products 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.