Twin Picks: Disentangling the Determinants of Risk-Taking in Household Portfolios

Laurent E. Calvet, Paolo Sodini

Presented by 吳孟諺, 林庚遠, 王博奕

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Outline

Three Quick Questions

- Does **financial wealth** drive the share of risky assets in the portfolios of individual?
- Is the financial wealth elasticity of the risky share homogenous across investors or does it **vary with their demographic, financial and portfolio characteristics**?
- How does the aggregate demand for risky assets respond to **changes in the wealth distribution**?

Implication of the Portfolio Choice Theory

- Richer households allocate a higher fraction of their financial wealth to risky investments.
- The financial wealth elasticity of the risky share should vary with household characteristics.
- The empirical household finance literature provides only partial evidence on these mechanism.
  - Richer and more educated investors allocate a higher proportion of their financial wealth to risky assets.
  - Risky share has a negative cross-sectional relation to real estate holdings, leverage, and internal consumption habit.
- **However, It is unclear that whether the variables directly impact portfolio choice, or simply the proxy for latent traits such as ability, genes, risk aversion, or upbringing.**

Data Source: Swedish Twin Registry and Swedish Wealth Registry

- The Swedish Twin Registry (STR) was founded to study the impact of smoking and alcohol consumption on the health of Swedish residents.
  - Zygosity (fraternal or identical), intensity of communication between the twins, and lifestyle variables.
- STR allows us to identify twin pairs in the Swedish Wealth Registry.
  - Three main categories: demographic characteristics, income, and disaggregated wealth
  - Demographic information: age, gender, marital status, nationality, birthplace...
  - Income: disposable income, income reported by individual source
  - Disaggregated wealth: worldwide assets owned by each resident, including bank accounts, mutual funds and stocks
- Merged the Swedish Twin Registry with the Swedish Wealth Registry.
  - Because financial theory suggests that investment decisions should be studied at the household level, the results presented in this paper are based on households with an adult twin during the 1999-2002 period.
  - Conditions like age, sex, and upbringing is controlled so we can focus on the effect of wealth.

Table 1: Summary Statistics

	TWINS			RANDOM SAMPLE	
	Mean	Standard deviation	Pairwise correlation	Mean	Standard deviation
Financial and Portfolio Characteristics					
Risky share	0.543	0.291	0.185	0.513	0.296
Financial wealth ($)	46,782	72,718	0.312	45,067	73,774
Real estate wealth ($)	120,135	123,011	0.289	112,925	119,133
Leverage ratio	0.778	2.381	0.148	0.936	3.128
Total liability ($)	50,800	55,935	0.248	49,658	56,126
Private pension premia/income	0.043	0.094	0.058	0.042	0.211
Sharpe ratio of risky portfolio	0.289	0.056	0.001	0.285	0.061
Beta of risky portfolio	0.930	0.321	0.104	0.932	0.340
Demographic Characteristics					
High school dummy	0.843	0.364	0.365	0.807	0.395
Post-high school dummy	0.371	0.483	0.470	0.358	0.479
Number of adults	1.728	0.445	0.147	1.733	0.442
Number of children	1.005	1.107	0.403	0.992	1.096
Wealth-weighted gender index	0.542	0.325	0.135	0.547	0.324
Human Capital and Income Risk					
Human capital ($)	759,461	513,832	0.484	772,455	639,964
Permanent income risk	-0.002	0.089	0.029	-0.001	0.113
Transitory income risk	0.060	0.365	0.042	0.068	0.381
Correlation of income innovation and portfolio return	-0.003	0.308	0.040	-0.003	0.308
Entrepreneur dummy	0.036	0.186	0.128	0.037	0.190
Unemployment dummy	0.084	0.277	0.109	0.072	0.258
Habit					
Internal habit ($)	36,052	16,901	0.291	35,338	16,664
External habit ($)	26,135	3,319	0.449	26,215	3,328

Notes: The table reports summary statistics of the financial, portfolio, demographic, income, and habit characteristics of participating Swedish households. The first set of columns is based on the set of twin pairs in which both siblings participate in risky asset markets, and the last set of columns on a random sample of participating households. For each characteristic, we report the cross-sectional mean and standard deviation in each sample, as well as the correlation within twin pairs. The education, entrepreneur and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Internal habit is proxied by the household's three-year average of disposable income, excluding private pension savings from consideration. External habit is proxied by the three-year average household income in the municipality. All nominal variables are winsorized at the 99th percentile.

Analyzing the Determinants of Risk-Taking - Definitions

- Definitions
  - Cash: bank account balances and money market funds
  - Risky financial assets: stocks and risky mutual funds
  - *Risky portfolio*: the portfolio of risky financial assets
  - *Financial wealth* $F_{h,t}$: sum of holdings in cash, risky financial assets, capital insurance products, and directly held bonds, excluding from consideration illiquid assets and mortgage or other household debt
  - *Risky share* $w_{h,t}$: weight of risky assets in the household's portfolio of cash and risky financial assets at date t
- The *financial wealth elasticity of the risky share* is defined as:

$$\eta_{h,t} = \frac{dln(w_{h,t})}{df_{h,t}},$$

where $f_{h,t} = ln(F_{h,t})$ denotes the household's log financial wealth.

Construction of Variables

- Portfolio choice theory suggests that the elasticity $\eta_{h,t}$:
  - is zero if the household has isoelastic utility and there are no market frictions.
  - greater than zero if the household exhibits decreasing relative risk aversion (DRRA) or faces leverage constraints.
- Portfolio characteristics, family composition, human capital, and habit formation can also impact the risky share and its elasticity (Table 1):
  - Gender index: share of the household's gross financial and real estate wealth owned by adult men; close to unity if gross wealth is primarily controlled by men
  - Internal habit: proxy by its average disposable income in years $t-2$, $t-1$ and t, excluding private pension savings from consideration
  - External habit: proxy by the three-year average household income in household $h's$ municipality

Cross-Sectional Evidence

- Consider pooled cross-sections of the risky share:

$$ln(w_{h,t}) = \delta_t + \eta f_{h,t} + \gamma' x_{h,t} + \varepsilon_{h,t},$$

  where δ_t is a time fixed effect, $f_{h,t}$ is the log financial wealth, and $x_{h,t}$ is a vector of characteristics.

- The first two columns of Table 2:
  - Regress the log risky share on log financial wealth and yearly fixed effects.
  - The financial wealth coefficient η is highly significantly positive and estimated at 0.212; regression has an R^2 coefficient of 0.097.
  - Excluding financial wealth will get a mere 0.016 R^2.
  - Financial wealth therefore explains most of the predicted variation in the risky share!

Cross-Sectional Evidence

- Including additional financial variables and demographic characteristics:
  - η increases slightly to 0.223.
  - Real estate wealth, which represents a large fraction of the overall wealth of most households, is negatively related to the risky share in the cross-section.
  - Households with high leverage ratios tend to select conservative portfolios.
- Demographic characteristics:
  - The level of education has a positive cross-sectional relation with the risky share.
  - Larger households take less financial risk.
- Human capital, income risk and habit:
  - Expected human capital has a positive but insignificant coefficient.
  - Income risk is negatively related to financial risk-taking.
  - Entrepreneurs tend to invest less aggressively than the rest of the population.
  - A high correlation between income innovation and the household's risky portfolio return is associated with a high risky share.

Table 2: Pooled Cross-Sectional Regressions of the Log Risky Share

	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Financial and Portfolio Characteristics								
Log financial wealth	0.212	43.20	0.223	39.80	0.234	36.50	0.233	36.60
Log real estate wealth			-0.005	-2.67	-0.004	-2.09	-0.003	-1.75
Leverage ratio			-0.021	-6.69	-0.020	-6.34	-0.020	-6.26
Log total liability			0.018	9.96	0.019	10.30	0.019	10.30
Private pension premia/income			0.108	1.05	0.154	1.31	0.148	1.29
Sharpe ratio of risky portfolio			0.027	16.50	0.027	16.10	0.027	16.40
Beta of risky portfolio			-0.093	-3.90	-0.083	-3.42	-0.081	-3.39
Demographic Characteristics								
High school dummy			0.109	5.01	0.105	4.84	0.110	5.14
Post-high school dummy			0.064	4.61	0.061	4.33	0.065	4.28
Number of adults			-0.207	-11.30	-0.175	-8.35	-0.180	-8.49
Number of children			-0.056	-8.32	-0.055	-7.21	-0.051	-6.55
Wealth-weighted gender index			-0.030	-1.42	-0.023	-1.10	-0.022	-1.06
Human Capital and Income Risk								
Log human capital					0.018	1.41	0.012	0.86
Permanent income risk					-0.116	-1.10	-0.079	-0.76
Transitory income risk					-0.061	-2.36	-0.052	-2.11
Correlation of income innovation and portfolio return					0.052	2.31	0.054	2.40
Entrepreneur dummy					-0.236	-5.82	-0.175	-4.23
Unemployment dummy					-0.078	-3.43	-0.071	-3.13
Habit								
Log internal habit					-0.091	-3.99	-0.095	-4.17
Log external habit					-0.036	-0.63	-0.365	-1.19
Municipality and Industry Dummies							Included	
Number of observations	55,898		55,898		55,898		55,898	
Number of twin pairs	8,394		8,394		8,394		8,394	
R^2	9.70%		13.70%		14.01%		15.81%	
Adjusted R^2	9.70%		13.68%		13.97%		15.31%	

Notes: This table reports pooled cross-sectional regressions of the log risky share on financial wealth and other characteristics. The estimation is based on participating households with an adult twin. Yearly fixed effects are included in the cross-sectional regressions. The education, entrepreneur and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Log human capital and the leverage ratio are winsorized at the 99th percentile.

Cross-Sectional Evidence

- Limited interpretation:
  - These results are diffcult to interpret because financial wealth and household characteristics play a dual role in the pooled cross sectional regressions.
  - The regressors may have a direct impact on risk-taking, as financial theory would predict.
  - Household characteristics can be viewed as proxies for a latent fixed effect.
- How to fix it:
  - Including a household fixed effect.
  - However, it is difficult to do in practice because important variables such as gender and education are either constant or very persistent, and therefore difficult to distinguish from a fixed effect.
  - The Swedish twin dataset offers the possibility of an alternative estimation strategy.

Twin Regressions

- We assume that for every twin pair i, the risky share of twin j's household, $j \in \{1, 2\}$, can be expressed as:

$$ln(w_{i,1,t}) = \alpha_{i,t} + \eta f_{i,1,t} + \gamma' x_{i,1,t} + \varepsilon_{i,1,t},$$
$$ln(w_{i,2,t}) = \alpha_{i,t} + \eta f_{i,2,t} + \gamma' x_{i,2,t} + \varepsilon_{i,2,t}.$$

- $\alpha_{i,t}$: fixed effect specific to twin pair i in year t, capturing the common impact of time, stock market performance, genes, shared background, common upbringing, and expected inheritance, among others, on the twin's risky shares.
- η: assumed to be the same for all households and can therefore be viewed as the average elasticity in the population.

Twin Regressions

- Using standard panel techniques, we can difference the two equations and estimate by least squares:

$$\Delta_j ln(w_{i,j,t}) = \eta \Delta_j(f_{i,j,t}) + \gamma' \Delta_j(x_{i,j,t}) + \varepsilon_{i,t},$$

- where $\Delta_j(f_{i,j,t}) = y_{i,2,t} - y_{i,1,t}$ denotes the twin difference of a variable y, and $\varepsilon_{i,t} = \varepsilon_{i,2,t} - \varepsilon_{i,1,t}$.
- The two methods provide nearly identical estimates and $t-$statistics of η and γ, but different R^2 coefficients.
- Twin difference regressions have substantially lower R^2 coefficients than the regressions in levels, as one would expect if pair fixed effects are important.

Brief Conclusion from the Twin Regressions

- The first two columns of Table 3:
  - η increases slightly to 0.196 (compared to 0=212 in the pooled regression reported in Table 2).
  - The adjusted R^2 coefficient increase from 0.097 to 0.1799.
- Yearly twin pair fixed effects and financial wealth explain most of the predicted variation in the risky share.
- Households with real estate holdings, leverage, large family size, a risky portfolio with high systematic exposure, or a high habit, tend to invest conservatively.
- Diversification and proxies for financial experience and sophistication are positively related to the risky share.
- Still have controlled for individual fixed effects that are specific to each twin and impact the risky share and the pair fixed effect.

Table 3: Twin Regressions of the Log Risky Share

TABLE 3. TWIN REGRESSIONS OF THE LOG RISKY SHARE
Yearly twin pair fixed effects

	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Financial and Portfolio Characteristics								
Log financial wealth	0.196	24.60	0.212	24.00	0.220	23.60	0.217	23.10
Log real estate wealth			-0.006	-2.56	-0.006	-2.28	-0.005	-1.95
Leverage ratio			-0.034	-4.85	-0.032	-4.58	-0.031	-4.45
Log total liability			0.017	6.52	0.018	6.95	0.017	6.64
Private pension premia/income			0.101	1.04	0.143	1.31	0.122	1.18
Sharpe ratio of risky portfolio			0.029	14.30	0.029	14.20	0.029	14.30
Beta of risky portfolio			-0.126	-3.90	-0.120	-3.70	-0.114	-3.55
Demographic Characteristics								
High school dummy			0.046	1.36	0.037	1.08	0.038	1.11
Post-high school dummy			0.043	1.77	0.035	1.43	0.032	1.29
Number of adults			-0.153	-6.01	-0.112	-3.74	-0.102	-3.34
Number of children			-0.069	-6.10	-0.058	-5.11	-0.057	-4.95
Wealth-weighted gender index			-0.074	-2.46	-0.061	-2.03	-0.054	-1.75
Human Capital and Income Risk								
Log human capital					-0.036	-1.19	-0.045	-1.47
Permanent income risk					-0.128	-0.97	-0.121	-0.93
Transitory income risk					-0.027	-0.93	-0.012	-0.42
Correlation of income innovation and portfolio return					0.069	2.34	0.068	2.27
Entrepreneur dummy					-0.292	-5.70	-0.252	-4.72
Unemployment dummy					-0.066	-2.25	-0.057	-1.97
Habit								
Log internal habit					-0.063	-1.81	-0.067	-1.89
Log external habit					0.035	0.39	-0.350	-0.65
Municipality and Industry Dummies							Included	
Number of observations	27,949		27,949		27,949		27,949	
Number of twin pairs	8,394		8,394		8,394		8,394	
Adjusted R^2 of twin difference regression	5.46%		9.43%		9.80%		11.25%	
R^2 with yearly twin pair fixed effects	59.00%		60.71%		60.88%		61.92%	
Adjusted R^2 with yearly twin pair fixed effects	17.99%		21.38%		21.69%		22.96%	

Notes: This table reports pooled twin difference regressions of the log risky share on financial wealth and other characteristics. The estimation is based on participating households with an adult twin. We report the adjusted R^2 of the twin difference regressions, and the R^2 and adjusted R^2 of the corresponding linear panel regressions with yearly fixed effects specified by equation (3.5). The education, entrepreneur, and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Differences in log human capital and the leverage ratio are winsorized at the 1st and 99th percentile.

Difference Between the Pooled and Twin Regressions

- The education level and income risk are significantly related to the risky share in the cross-section, but are insignificant in the twin regression.
- These results indicate that education and income risk proxy for a fixed effect in traditional cross-sectional regressions
  - For instance, education could capture the impact of ability and upbringing, while income risk could be correlated with risk tolerance.
  - Able, risk-tolerant individuals may have a propensity to choose both aggressive financial portfolios and risky and skilled professions, but the panel regressions indicate that income risk and education have no direct bearing on the risky share.

What Drives the Financial Wealth Elasticity of the Risky Share?

- Economic theory suggests that the financial wealth elasticity of the risky share can vary with wealth and other household characteristics:

$$\Delta_j ln(w_{i,j,t}) = \eta_{i,t}\Delta_j(f_{i,j,t}) + \gamma'\Delta_j(x_{i,j,t}) + \varepsilon_{i,t},$$

  where $\eta_{i,t}$ is specific to the pair and may be a function of its characteristics.
- From Table 4, we can see that the elasticity $\eta_{i,t}$ is a decreasing function of financial wealth $f_{i,t}$.
  - 0.29 in the first financial wealth quartile, 0.22 in the second quartile, 0.15 in the third quartile, and 0.10 in the fourth quartile
- From Table 5, we allow the elasticity to depend on the full set of demographic and financial characteristics:
  - The elasticity decreases with financial wealth and human capital, and increases with real estate wealth and leverage.

Table 4: Twin Regressions of the Log Risky Share

TABLE 4. TWIN REGRESSIONS OF THE LOG RISKY SHARE
Financial wealth elasticity computed for quartiles of financial wealth

	Estimate	t-stat	Estimate	t-stat
Financial and Portfolio Characteristics				
Log financial wealth				
First quartile	0.289	18.10	0.308	17.30
Second quartile	0.224	15.80	0.232	15.90
Third quartile	0.150	10.90	0.173	12.30
Fourth quartile	0.101	7.68	0.147	10.40
Log real estate wealth			-0.004	-1.62
Leverage ratio			-0.019	-2.66
Log total liability			0.015	5.84
Private pension premia/income			0.148	1.33
Sharpe ratio of risky portfolio			0.028	14.20
Beta of risky portfolio			-0.108	-3.37
Demographic Characteristics				
High school dummy			0.033	0.97
Post-high school dummy			0.029	1.16
Number of adults			-0.134	-4.35
Number of children			-0.065	-5.61
Wealth-weighted gender index			-0.047	-1.56
Human Capital and Income Risk				
Log human capital			-0.047	-1.54
Permanent income risk			-0.109	-0.83
Transitory income risk			0.002	0.06
Correlation of income innovation and portfolio return			0.063	2.09
Entrepreneur dummy			-0.249	-4.67
Unemployment dummy			-0.050	-1.74
Habit				
Log internal habit			-0.029	-0.80
Log external habit			-0.351	-0.66
Adjusted R^2 of twin difference regression	6.12%		11.69%	
Number of observations	27,949		27,949	
Number of twin pairs	8,394		8,394	

Notes: This table reports the pooled twin difference regressions of the log risky share on: (1) financial wealth interacted with dummies for financial wealth quartiles (first set of columns), and (2) other characteristics (second set of columns). The education, entrepreneur and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Differences in log human capital and the leverage ratio are winsorized at the 1st and 99th percentile.

Table 5: Financial Wealth Elasticity of the Risky Share

TABLE 5. FINANCIAL WEALTH ELASTICITY OF THE RISKY SHARE
Households with an adult twin

	Regression (1)				Regression (2)			
	Direct Effect		Interacted		Direct Effect		Interacted	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Financial and Portfolio Characteristics								
Log financial wealth	0.212	23.00	-0.090	-10.20	0.216	23.80	-0.083	-8.59
Log real estate wealth	-0.003	-1.37			-0.003	-1.14	0.008	2.91
Leverage ratio	-0.015	-2.11			-0.012	-1.30	0.011	1.91
Log total liability	0.014	5.57			0.013	5.07	0.004	1.38
Private pension premia/income	0.156	1.37			0.299	2.79	-0.260	-2.36
Sharpe ratio of risky portfolio	0.028	14.20			0.028	14.00	-0.003	-1.62
Beta of risky portfolio	-0.108	-3.39			-0.119	-3.75	-0.047	-1.44
Demographic Characteristics								
High school dummy	0.035	1.03			0.033	0.96	0.020	0.74
Post-high school dummy	0.026	1.06			0.021	0.85	-0.017	-0.80
Number of adults	-0.126	-4.05			-0.127	-4.11	0.130	3.95
Number of children	-0.065	-5.63			-0.077	-6.58	0.067	6.05
Wealth-weighted gender index	-0.043	-1.41			-0.031	-1.01	0.046	1.42
Human Capital and Income Risk								
Log human capital	-0.041	-1.33			-0.037	-1.23	-0.046	-2.95
Permanent income risk	-0.114	-0.87			-0.038	-0.28	-0.152	-0.88
Transitory income risk	0.003	0.10			0.018	0.58	-0.011	-0.25
Correlation of income innovation and portfolio return	0.062	2.07			0.056	1.86	0.067	1.94
Entrepreneur dummy	-0.256	-4.81			-0.239	-4.50	-0.045	-0.91
Unemployment dummy	-0.053	-1.84			-0.042	-1.47	0.021	0.65
Habit								
Log internal habit	-0.037	-1.03	0.130	5.61	0.002	0.06	0.030	1.00
Log external habit	-0.361	-0.68			-0.395	-0.75	-0.066	-0.81
Adjusted R^2 of twin difference regression	12.03%				12.89%			
Number of observations	27,949				27,949			
Number of twin pairs	8,394				8,394			

Notes: This table reports the pooled twin difference regressions of the log risky share on financial wealth, other household characteristics, and financial wealth interacted with characteristics. The education, entrepreneur and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Differences in log human capital and the leverage ratio are winsorized at the 1st and 99th percentiles.

Brief Conclusion of Financial Wealth Elasticity

- The result shows that there is substantial heterogeneity in the financial wealth elasticity of the risky share, which tends to strongly decrease with financial wealth itself.

The Impact of Measurement Error

- Financial wealth and the risky share are observed with measurement error. For instance because of high-frequency variation in cash balances at the end of the year.
- One solution used in paper is that estimating separate values of the elasticity η in different financial wealth quartiles:
  - Consistent with above, the measured elasticity strongly decreases with financial wealth.
  - The impact of other characteristics is qualitatively unchanged, but internal habit now has a negative significant impact on the risky share.

Reverse Causality between the Risky Share and Financial Wealth

- We have hitherto viewed the positive empirical cross-sectional correlation between financial wealth and risk-taking as evidence that richer households tend to select a higher risky share.
- At the end of the bull market of the nineties, investors with high equity investments happened to have larger financial wealth than other households.
  - In an economy populated with CRRA investors, we would observe a positive cross-sectional correlation between the risky share and financial wealth.
- In order to distinguish between the risky share and financial wealth, they define the passive risky share $w^p_{h,t}$ as the risky share at the end of year t if the household does not trade during the year. It is given by:

$$w^p_{h,t} = \frac{w_{h,t-1}(1+r_{h,t})}{w_{h,t-1}(1+r_{h,t})+(1-w_{h,t-1})(1+r_f)}$$

Table 7: Lagged Financial and Portfolio Characteristics

TABLE 7. LAGGED FINANCIAL AND PORTFOLIO CHARACTERISTICS
Twin pair fixed effects

	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Financial and Portfolio Characteristics								
Log financial wealth in 99	0.132	15.50			0.132	15.50		
First quartile			0.173	10.10			0.172	10.10
Second quartile			0.113	8.16			0.112	8.11
Third quartile			0.149	10.60			0.150	10.70
Fourth quartile			0.096	8.22			0.095	8.19
Log risky share in 99	0.562	35.40	0.560	35.30	0.557	31.70	0.554	31.50
Log passive financial wealth change since 99					0.067	1.43	0.060	1.30
Log passive risky share change since 99					0.144	2.51	0.145	2.54
Log real estate wealth	-0.001	-0.35	-0.001	-0.37	-0.001	-0.44	-0.001	-0.45
Leverage ratio	-0.008	-0.90	-0.004	-0.40	-0.007	-0.86	-0.003	-0.38
Log total liability	0.008	3.86	0.008	3.65	0.008	3.85	0.008	3.63
Private pension premia/income	-0.012	-0.29	-0.007	-0.16	-0.012	-0.29	-0.007	-0.16
Sharpe ratio of risky portfolio	0.014	7.88	0.014	7.81	0.014	7.85	0.014	7.78
Beta of risky portfolio	-0.141	-4.06	-0.139	-3.99	-0.108	-2.93	-0.106	-2.90
Demographic Characteristics								
High school dummy	-0.010	-0.39	-0.010	-0.39	-0.010	-0.38	-0.010	-0.38
Post-high school dummy	0.045	2.22	0.043	2.08	0.045	2.22	0.043	2.09
Number of adults	-0.013	-0.50	-0.023	-0.86	-0.014	-0.55	-0.024	-0.90
Number of children	-0.016	-1.62	-0.018	-1.87	-0.015	-1.59	-0.018	-1.83
Wealth-weighted gender index	-0.049	-1.96	-0.047	-1.86	-0.050	-2.00	-0.048	-1.89
Human Capital and Income Risk								
Log human capital	-0.014	-0.53	-0.014	-0.54	-0.012	-0.44	-0.012	-0.44
Permanent income risk	-0.158	-1.07	-0.149	-1.00	-0.174	-1.18	-0.165	-1.12
Transitory income risk	-0.015	-0.56	-0.007	-0.28	-0.017	-0.64	-0.010	-0.36
Correlation of income innovation and portfolio return	0.022	0.87	0.022	0.86	0.024	0.92	0.023	0.91
Entrepreneur dummy	-0.078	-1.57	-0.080	-1.60	-0.079	-1.59	-0.080	-1.62
Unemployment dummy	-0.046	-1.86	-0.045	-1.83	-0.045	-1.80	-0.044	-1.78
Habit								
Log internal habit	-0.113	-3.64	-0.102	-3.24	-0.113	-3.62	-0.102	-3.23
Log external habit	-0.274	-0.31	-0.273	-0.31	-0.319	-0.36	-0.316	-0.35
Adjusted R^2 of twin difference regression	45.09%		45.21%		45.18%		45.30%	
Number of observations	17,355		17,355		17,355		17,355	
Number of twin pairs	6,312		6,312		6,312		6,312	

Notes: This table reports the IV regression of changes in the log risky share on lagged financial and portfolio characteristics. The estimation is based on households that participate in risky asset markets at the end of two consecutive years. Yearly fixed effects are included in all the regressions.

Interpretation of Table 7 and Conclusion

- The passive change in the log risky share is the difference $ln(w^p_{h,t} - ln(w_{h,t-1})$.
- The lagged risky share and the passive change both have significantly positive coefficients, which confirms that the propensity to take risk is persistent and that there is inertia in portfolio rebalancing.
- Lagged financial wealth has a positive and significant coefficient.
  - Households with larger financial wealth in 1999 have a higher risky share in 2002, even though we control for the risky share at the end of 1999.
- This result is important because one would not expect it to hold if investors have CRRA utilities, with or without inertia.
- Table 7 suggests that individual investors exhibit both decreasing relative risk aversion and inertia.
- Conclusion of Robust Checks
  - We have skipped the section of health and lifestyle and dynamic panel estimation.
  - However, the paper have confirmed that the financial wealth elasticity of the risky share has a positive average and strongly decreases with financial wealth among participants.

Determinants of Risky Asset Market Participation

- Investigate the decision to participate in risky assets markets:
  - Begin by measuring the cross-sectional relation between risky asset market participation, financial wealth, and other characteristics (Table 10).
  - Richer households with high human capital and education are more likely to own risky assets.
  - Large households that have a high leverage ratio, a high external or internal habit, or high income risk are less likely to own risky assets.
  - Financial wealth, human capital, and proxies for financial experience all have strong positive coefficients, while leverage, income risk and external habit have negative coefficients.
  - Some of these variables, such as external habit, have stronger magnitudes than in the cross-sectional regression.

Table 10: Participation in Risky Asset Markets

TABLE 10. PARTICIPATION IN RISKY ASSET MARKETS
Logit regressions

	POOLED CROSS-SECTION *Yearly Fixed Effects*				TWIN REGRESSION *Yearly Twin Pair Fixed Effects*			
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Financial Characteristics								
Log financial wealth	1.180	73.90	1.163	57.80	1.086	34.40	1.038	28.80
Log real estate wealth			0.006	1.45			0.006	0.80
Leverage ratio			-0.018	-5.14			-0.016	-2.21
Log total liability			0.059	10.50			0.047	4.81
Private pension premia/income			1.924	2.98			1.216	0.99
Demographic Characteristics								
High school dummy			0.243	5.17			0.115	1.14
Post-high school dummy			0.131	2.78			0.098	0.98
Number of adults			-0.195	-3.44			-0.096	-0.93
Number of children			-0.079	-3.42			-0.017	-0.41
Wealth-weighted gender index			-0.163	-3.10			-0.176	-1.82
Human Capital and Income Risk								
Log human capital			0.358	9.91			0.235	2.03
Permanent income risk			-1.002	-4.08			-1.226	-2.85
Transitory income risk			-0.207	-3.24			-0.171	-1.58
Entrepreneur dummy			-0.185	-1.60			-0.114	-0.52
Unemployment dummy			-0.038	-0.74			0.039	0.43
Habit								
Log internal habit			-0.221	-3.36			0.099	0.73
Log external habit			-0.705	-4.21			-0.895	-2.45
Number of observations	85,532		85,532		23,132		23,132	
Number of twin pairs	11,721		11,721		11,721		11,721	
Number of pairs with different participation decisions	.		.		4,477		4,477	

Notes: This table reports the pooled logit regression of a household's decision to participate in risky asset markets. The cross-sectional regressions are based on all Swedish households with an adult twin, and are run without and with characteristics (first two sets of columns). In the last sets of columns, we report a logit regression with a twin pair fixed effect. Yearly fixed effects are included in all regressions. The education, entrepreneur and unemployment dummies are computed for the twin in the household. All other characteristics are computed at the household level. Log human capital and the leverage ratio are winsorized at the 99th percentile.

Aggregate Implication

- The micro findings on participation and the risky share reported in earlier sections allow us to assess how exogenous changes in household financial wealth can impact the aggregate demand for risky assets.
- Take security prices as fixed and neglect general equilibrium effects, local interactions, and habit changes.
  - Fixed Set of Participants: the heterogeneous elasticity specification is consistent with micro evidence, and generates an aggregate demand for risky assets that can be approximately represented by, but does not exactly coincide with, the demand of a CRRA representative investor.
  - Endogenous Participation: participation turnover is limited and has only a modest impact on the aggregate elasticity.

Brief Conclusion of Participation and Aggregate Implications

- This section illustrates the benefits of considering a risky share specification in which the elasticity $\eta(fh, xh)$ decreases with financial wealth is beneficial.
- The aggregate elasticity is remarkably stable, whether one considers homogenous or concentrated shocks.
- The aggregate demand for risky assets is close to, but does not exactly coincide with, the demand of a representative agent with CRRA utility.
- It is an open question whether the deviations from the CRRA representative agent benchmark are negligible or could instead be used to provide support for alternative specifications.

Conclusion

- The average financial wealth elasticity of the risky share is strongly significant and estimated at 22%.
- The majority of the cross-sectional results obtained in the earlier literature are robust to the inclusion of twin pair fixed effects.
- The risky share is positively related to diversification and financial experience, and negatively related to leverage, entrepreneurship, the risky portfolio's beta, household size and a measure of habit.
- One interesting difference is that income risk and education, which are significantly related to the risky share in pooled cross sections, become insignificant in the twin difference regressions.

Features of this paper

- Twin pair fixed effects control for factors such as genes, ability, risk aversion, common upbringing, or expected inheritance.
- Substantial heterogeneity in the financial wealth elasticity of the risky share across households.
- By regressing time variations of a household's log risky share on time variations of its log financial wealth, twin difference regressions will not be contaminated by fixed effects specific to each twin in the pair.
- Considered exogenous shocks to the wealth distribution, the aggregate demand for risky assets behaves close to, but does not coincide with, the aggregate demand of a representative investor with CRRA utility.