HOUSEHOLD PORTFOLIO RISK

ALESSANDRO BUCCIOL
University of Verona and Netspar

RAFFAELE MINIACI
University of Brescia

SUPPLEMENTARY APPENDIX:
ROBUSTNESS CHECKS

Content

S.1. Alternative Estimation methods
S.2. Alternative Risk Indicators
S.3. Human Capital
S.4. Asset Variances and Covariances
S.4.1. No Hedging
S.4.2. Fixed Moments
S.4.3. Business Wealth Return Series
S.4.4. Alternative Moment Estimates
S.4.5. Idiosyncratic Risk
S.5. Sample Composition and Equation Specification
S.5.1. Only Investors in Risky Assets
S.5.2. Wealthy Households

Note: for each robustness check we report the table with the regression output (equivalent to Table V in the main text) and the two figures with the second differences and the levels of the age, period and cohort effects (equivalent to Figures 7 and 8 in the main text). Only in Section S.1 we do not report such figures, as the robustness check shown in that case does not make use of second differences.

The risk indicators shown in the tables and in the figures are the same as in the main text, with two exceptions. We report alternative indicators in Section S.2 (“value at risk” and “expected shortfall”) and in Section S.4.5 (“idiosyncratic risk” and “total risk”).

S.1. Alternative Estimation methods

We replicate our benchmark analysis, on the same data and the same risk indicators, using three alternative approaches to the Data-Driven (DD) shown in the main text. The three approaches take the same specification as DD, with the exception of the age, period and cohort profile, which is modeled as follows:

- *Deaton-Paxson (DP)*: the specification includes age and cohort dummies, plus three variables derived from imposing orthogonality between time dummies and a linear time trend. This constraint was first used in Deaton and Paxson (2004).
- *Market History (MH)*: the specification includes age and cohort dummies, plus two variables on the historical returns and standard deviation of the stock market in the three years before data collection. This model mimics one used in Ameriks and Zeldes (2004).
- *Cohort History (CH)*: the specification includes age and period dummies, plus two variables on the historical return and standard deviation of the stock market when the individual was aged between 20 and 24. This model replicates one used in Malmendier and Nagel (2011).

Table S.1. Portfolio risk and observable characteristics: Deaton-Paxson

Note. The dependent variable is rescaled by its average in the sample. The "Deaton-Paxson conditions" are measured with three variables derived from the condition of orthogonality between time dummies and a linear trend. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.100***	0.065***	0.011*	0.197***
	(0.005)	(0.008)	(0.006)	(0.019)
Non-white	-0.094***	-0.082**	-0.112***	-0.009
	(0.020)	(0.039)	(0.039)	(0.076)
Female	-0.093***	-0.101**	-0.134***	-0.020
	(0.032)	(0.040)	(0.042)	(0.081)
College graduate	0.167***	-0.053*	0.047	-0.298***
	(0.019)	(0.027)	(0.031)	(0.053)
Married	-0.092***	-0.073*	-0.105**	0.005
	(0.028)	(0.037)	(0.040)	(0.082)
N. household members	-0.015	0.022	0.000	0.075
	(0.010)	(0.023)	(0.019)	(0.047)
With children	-0.009	0.056	0.094*	-0.038
	(0.027)	(0.042)	(0.047)	(0.080)
Self-employed	-0.162***	0.836***	-0.396***	3.853***
	(0.029)	(0.070)	(0.038)	(0.252)
Retired	-0.044	-0.025	-0.116***	0.198**
	(0.027)	(0.035)	(0.035)	(0.088)
N. financial institutions	0.036***	0.030***	0.054***	-0.028**
where doing business	(0.004)	(0.006)	(0.008)	(0.012)
With financial advisor	0.020	-0.018	-0.005	-0.049
	(0.018)	(0.027)	(0.028)	(0.053)
Works in financial sector	0.073***	0.031	0.030	0.035
	(0.027)	(0.052)	(0.043)	(0.114)
Good self-assessed health	0.067***	0.038	0.037	0.040
	(0.021)	(0.027)	(0.030)	(0.058)
Constant	-0.551***	-0.579***	0.117	-2.284***
	(0.127)	(0.137)	(0.110)	(0.329)
Age dummies	YES	YES	YES	YES
Deaton-Paxson conditions	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

Table S.2. Portfolio risk and observable characteristics: Market history

Note. The dependent variable is rescaled by its average in the sample. The "period market characteristics" are measured with two variables, informing on the historical return and standard deviation of the stock market in the three years before data collection. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.101***	0.065***	0.011*	0.196***
	(0.005)	(0.008)	(0.006)	(0.019)
Non-white	-0.092***	-0.082**	-0.111***	-0.010
	(0.021)	(0.039)	(0.039)	(0.076)
Female	-0.092***	-0.101**	-0.134***	-0.020
	(0.032)	(0.040)	(0.042)	(0.081)
College graduate	0.167***	-0.053*	0.047	-0.298***
	(0.019)	(0.027)	(0.031)	(0.053)
Married	-0.089***	-0.073*	-0.104**	0.002
	(0.028)	(0.037)	(0.040)	(0.082)
N. household members	-0.015	0.022	0.000	0.075
	(0.010)	(0.023)	(0.019)	(0.047)
With children	-0.011	0.056	0.093*	-0.035
	(0.027)	(0.042)	(0.047)	(0.080)
Self-employed	-0.164***	0.836***	-0.396***	3.855***
	(0.029)	(0.070)	(0.038)	(0.253)
Retired	-0.050*	-0.024	-0.116***	0.203**
	(0.027)	(0.035)	(0.035)	(0.088)
N. financial institutions	0.035***	0.030***	0.054***	-0.028**
where doing business	(0.004)	(0.006)	(0.008)	(0.012)
With financial advisor	0.019	-0.018	-0.005	-0.048
	(0.018)	(0.027)	(0.029)	(0.053)
Works in financial sector	0.083***	0.030	0.031	0.028
	(0.028)	(0.052)	(0.043)	(0.114)
Good self-assessed health	0.068***	0.037	0.037	0.039
	(0.021)	(0.027)	(0.030)	(0.057)
Constant	-1.195***	-1.438***	-0.452***	-3.851***
	(0.108)	(0.174)	(0.128)	(0.421)
Period market characteristics:				
Return	1.848***	2.165***	1.392***	4.060***
	(0.151)	(0.151)	(0.172)	(0.313)
Standard deviation	4.376***	6.497***	4.282***	11.921***
	(0.293)	(0.437)	(0.422)	(0.852)
Age dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

Table S.3. Portfolio risk and observable characteristics: Cohort history

Note. The dependent variable is rescaled by its average in the sample. The "cohort market characteristics" are measured with two variables, informing on the historical return and standard deviation of the stock market when the individual was aged between 20 and 24. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.100***	0.065***	0.012*	0.195***
	(0.005)	(0.008)	(0.006)	(0.018)
Non-white	-0.092***	-0.083**	-0.111***	-0.012
	(0.020)	(0.039)	(0.039)	(0.076)
Female	-0.092***	-0.100**	-0.129***	-0.030
	(0.032)	(0.040)	(0.042)	(0.079)
College graduate	0.167***	-0.052*	0.047	-0.293***
	(0.019)	(0.027)	(0.031)	(0.052)
Married	-0.093***	-0.073*	-0.107***	0.011
	(0.027)	(0.037)	(0.040)	(0.082)
N. household members	-0.016	0.022	-0.000	0.075
	(0.010)	(0.023)	(0.019)	(0.047)
With children	-0.008	0.055	0.098**	-0.048
	(0.027)	(0.042)	(0.048)	(0.080)
Self-employed	-0.162***	0.835***	-0.398***	3.857***
	(0.029)	(0.070)	(0.038)	(0.253)
Retired	-0.048*	-0.025	-0.119***	0.206**
	(0.027)	(0.035)	(0.035)	(0.088)
N. financial institutions	0.036***	0.030***	0.053***	-0.028**
where doing business	(0.004)	(0.007)	(0.008)	(0.012)
With financial advisor	0.020	-0.019	-0.008	-0.047
	(0.018)	(0.027)	(0.029)	(0.053)
Works in financial sector	0.077***	0.033	0.038	0.023
	(0.027)	(0.052)	(0.044)	(0.114)
Good self-assessed health	0.068***	0.038	0.039	0.037
	(0.021)	(0.027)	(0.030)	(0.058)
Constant	-0.226*	-0.104	0.722***	-2.128***
	(0.125)	(0.148)	(0.144)	(0.362)
Cohort market characteristics:				
Return	-0.189	-0.542**	-0.658**	-0.260
	(0.174)	(0.239)	(0.273)	(0.620)
Standard deviation	-0.007	-0.127	-0.423	0.598
	(0.264)	(0.329)	(0.460)	(0.755)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

S.2. Alternative Risk Indicators

Our analysis in the main text makes use of the variance of (financial and complete) portfolio returns as a risk indicator. Here we explore the effects of considering alternative risk indicators. Specifically, we deal with two measures focusing on the downside risk to earn negative or low returns: the value at risk and the expected shortfall. We compute both measures in a way consistent with our overall framework.

For each of the four risky asset categories (bond, stock, real estate, business wealth) in our environment, in year X we observe 80 annual excess returns at quarterly frequency from year X-19 to year X. From this observed multivariate time series we non-parametrically simulate a new time series of 1,000 asset excess returns using a block bootstrap technique with replacement and block size equal to 4 (e.g., we account for a serial correlation of one year).[1] Each simulated observation contains return realizations on the four asset categories, all originated in the same period.

Portfolios observed in the same year X share the same simulated distribution of asset excess returns, coherently with the risk indicators in the main text. For each household portfolio we then compute and sort excess returns realized with this simulated time series. The "value at risk" indicator is the negative of the 5th percentile of the portfolio excess return; the "expected shortfall" is the negative of the average excess return within the lowest 5% of realizations. These new measures are highly correlated with our benchmark variance (the correlation is never below 85%).

[1] We also tried with a different block size (0, 1, 2, 6). In all the cases our conclusions remain unchanged.

Table S.4. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

	Value at risk		**Expected shortfall**	
Measure	**Financial**	**Complete**	**Financial**	**Complete**
Ln(wealth)	0.113***	0.050***	0.101***	0.054***
	(0.004)	(0.006)	(0.004)	(0.005)
Non-white	-0.086***	-0.073***	-0.073***	-0.070***
	(0.021)	(0.024)	(0.018)	(0.021)
Female	-0.072**	-0.086***	-0.061**	-0.068***
	(0.029)	(0.028)	(0.026)	(0.026)
College graduate	0.156***	-0.012	0.137***	-0.003
	(0.019)	(0.021)	(0.016)	(0.019)
Married	-0.074***	-0.060**	-0.062***	-0.046**
	(0.025)	(0.025)	(0.022)	(0.022)
N. household members	-0.020**	-0.002	-0.018**	-0.003
	(0.009)	(0.015)	(0.008)	(0.013)
With children	-0.009	0.078**	-0.003	0.072**
	(0.024)	(0.034)	(0.021)	(0.029)
Self-employed	-0.180***	0.106***	-0.160***	0.073***
	(0.025)	(0.029)	(0.022)	(0.023)
Retired	-0.054**	-0.060**	-0.047**	-0.063***
	(0.026)	(0.024)	(0.023)	(0.020)
N. financial institutions where doing business	0.040***	0.034***	0.036***	0.033***
	(0.004)	(0.004)	(0.003)	(0.004)
With financial advisor	0.015	-0.008	0.015	-0.008
	(0.016)	(0.019)	(0.014)	(0.017)
Works in financial sector	0.066***	0.009	0.056***	0.004
	(0.025)	(0.031)	(0.022)	(0.027)
Good self-assessed health	0.056***	0.019	0.050***	0.021
	(0.020)	(0.019)	(0.018)	(0.017)
Constant	-0.401***	-0.047	-0.384***	-0.085
	(0.126)	(0.152)	(0.116)	(0.142)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

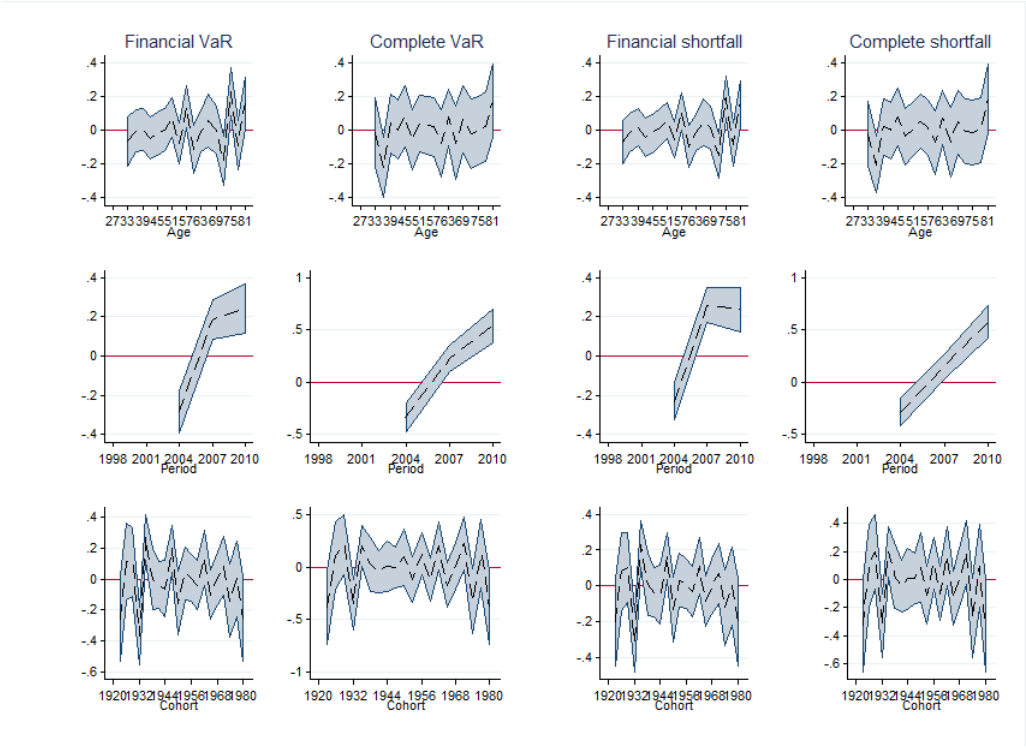

Figure S.1. Second difference of age, period and cohort effects

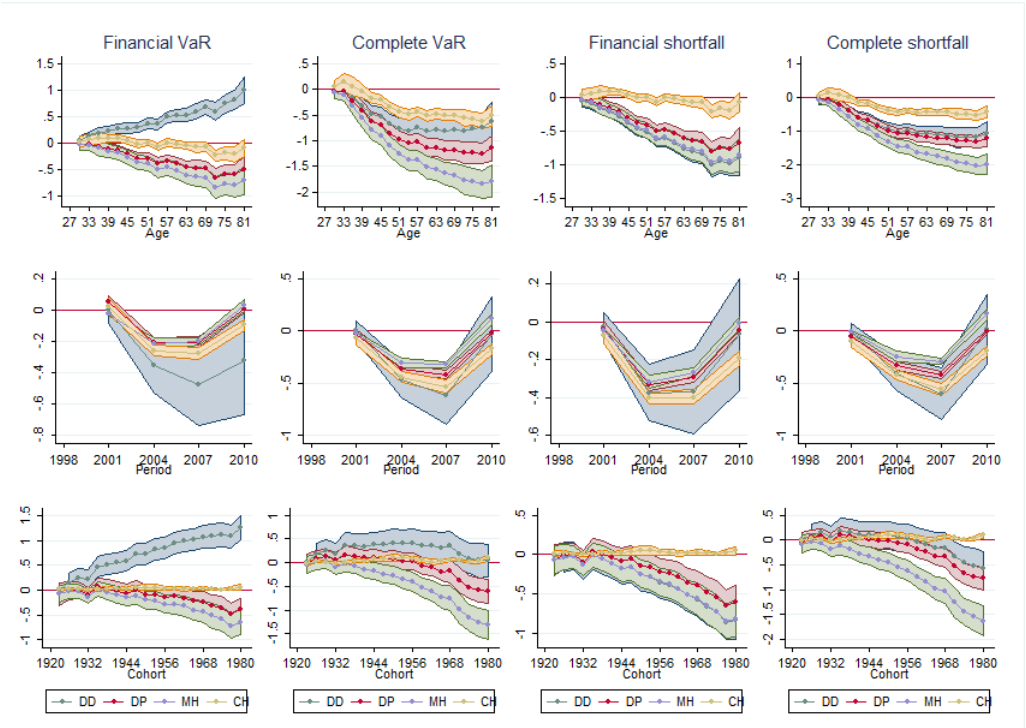

Figure S.2. Level of age, period and cohort effects

S.3. Human Capital

We extend our definition of complete portfolios to include human capital as further non-financial asset. We construct human capital using an approach similar to Jorgenson and Fraumeni (1989). The approach computes human capital as the net present value of the income flow that will be produced over an assumed lifetime, in the presence of survival probabilities. Expected future incomes are predicted from the observed incomes of the cross section of individuals.

For this purpose we use the waves 1998-2010 of the SCF, taking into account sampling weights. We assume that income arises from a process depending on gender (male, female), race (white, non-white) and education (college, high school or lower degree) of the head. We denote the realization of these three variables by group $x \in X$. The combination of the three variables gives rise to eight possible groups.

We describe human capital for household *i* at time *t*, whose head is aged *a* and belongs to group *x*, as follows:

$$HC_{it}^{a}(x) = y_{it}^{a}(x) + LI_{it}^{a}(x) \tag{S.1}$$

where $y_{it}^{a}(x)$ is the gross income obtained from the survey for the household head and spouse (if any), and $LI_{it}^{a}(x)$ is imputed household lifetime gross income. Gross income is calculated as the sum of (before taxes) family income from wages and salaries, business, unemployment compensation, worker's compensation, social security, supplemental social security, child support, other welfare and assistance programs, and total transfers (mainly help from relatives). Income is then expressed in 2010 USD after correcting for inflation using the Consumer Price Index (CPI) for all urban consumers (source: Federal Reserve Bank of St. Louis). On average in our data, income is between 4 and 6% of human capital. Lifetime income is imputed from predictions of future income realizations, and is defined as follows:

$$LI_{it}^{a}(x) = \sum_{b=a+1}^{T} \pi_{it}^{a,b}(x)\, y_{it}^{b}(x) \left(\frac{1}{1+r_t}\right)^{b-a}. \tag{S.2}$$

That is, lifetime income is the sum of the predicted income levels, $y_{it}^{b}(x)$, conditional on age *b* and group *x*, weighted by a survival probability $\pi_{it}^{a,b}(x)$ of being alive at age *b* condi-

tional on being alive at age *a* and time *t*, for individual *i* belonging to group x[2], and corrected by a discount rate $(1+r_t)$, computed as the average over the 20 years before *t* of real risk free returns (3-month T-bill yields net of CPI growth).

We separate the prediction of income for the workers (assumed to be in age 25-64) from the prediction of income for the retired (since age 65). In both cases we compute two estimates, one for the subsample of college graduates, and one for the subsample of those with lower education (mainly high school degree). The distinction by education level is made necessary because the empirical literature typically finds the age-income profile to vary significantly with education. In fact, our estimates support this evidence.[3]

Income predictions up to age 64 are derived, separately for each education group, with the "data-driven" approach described in Section 6.1 of the main text. We regress income over gender and race dummies, three-year age and three-year cohort dummies, together with constrained period coefficients. The constraints are such that the second-order period difference is always equal to zero, as observed in the data. The sample is made of 9,999 genuine observations on low-education individuals, and 7,962 genuine observations on high-education individuals. As one may expect, projected income is flatter for less highly educated individuals, and the highest for households with a male, white and more highly educated head.

Income predictions since age 65 are computed as the prediction at age 64 times a replacement rate. The rate is given by the ratio of average observed income between 65 and 69 to average observed income between 60 and 64, and it is again computed separately by education groups; in this case the sample is made of around 800 genuine observations on low-education individuals, and around 700 genuine observations on high-education individuals. We estimate an average replacement rate of 85.02% for the low-education group, and 66.85% for the high-education group. We take these estimated profiles as input to compute human capital in the households' complete portfolios for each wave, after reporting them to the level of USD in the wave.

[2] To be precise, in our calculation survival probabilities differ by gender only and not also by race and education, because no such data are available.

[3] In contrast, splitting the sample according to other demographic variables such as gender or race seems to provide just a shift in the size of income rather than a change in the income profile. For this reason we account for these characteristics by just including the relevant dummy variables in the specification.

Returns on human capital are derived as for business wealth, from Equation (9) in the main text:

$$r_t^{HC} = \frac{P_t^{HC} - P_{t-1}^{HC} + E_t^{HC}}{P_{t-1}^{HC}} = \frac{E_t^{HC}}{E_{t-1}^{HC}} \frac{1}{PE_{t-1}^{HC}} \left(1 + PE_t^{HC}\right) - 1. \tag{S.3}$$

This approach allows us to incorporate returns from both earnings and capital. Earnings E^{HC} are taken from a Bureau of Economic Analysis (BEA) time series of labor income consistent with the definition we used to compute the stock of human capital from SCF data.[4] The price-earnings ratio PE^{HC} is assumed to be fixed over time and equal to the ratio between income and the stock of human capital. We compute it from our SCF dataset, as the ratio between average income and average human capital. This amounts to 4.929% in the sample.

Note: In this setting, the financial risk indicator coincides with the one in the main text by construction.

[4] We take the difference between personal income and earnings from rents, dividends, and capital gains. The resulting time series incorporates wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation and capital consumption adjustments, and personal current transfer receipts, net of contributions for public social insurance. Since BEA data refer to the whole US population, they already incorporate unemployment spells and job-to-job mobility.

Table S.5. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. Comp.**	**Real comp.**
Ln(wealth)	0.100***	0.241***	0.322***	0.220***
	(0.005)	(0.016)	(0.030)	(0.016)
Non-white	-0.095***	0.082**	0.020	0.098**
	(0.020)	(0.033)	(0.043)	(0.041)
Female	-0.092***	0.166***	0.139*	0.173***
	(0.032)	(0.040)	(0.084)	(0.047)
College graduate	0.166***	-0.092***	0.180***	-0.162***
	(0.020)	(0.032)	(0.065)	(0.039)
Married	-0.094***	-0.014	-0.174**	0.028
	(0.028)	(0.035)	(0.078)	(0.040)
N. household members	-0.016	0.037**	-0.013	0.050***
	(0.010)	(0.015)	(0.020)	(0.019)
With children	-0.006	-0.079*	-0.127**	-0.067
	(0.027)	(0.045)	(0.063)	(0.055)
Self-employed	-0.164***	1.691***	0.018	2.121***
	(0.029)	(0.112)	(0.072)	(0.140)
Retired	-0.042	-0.152**	0.277	-0.262***
	(0.027)	(0.074)	(0.168)	(0.086)
N. financial institutions where doing business	0.037***	0.007	0.107***	-0.018**
	(0.004)	(0.008)	(0.021)	(0.009)
With financial advisor	0.018	0.054	0.249***	0.004
	(0.018)	(0.035)	(0.058)	(0.043)
Works in financial sector	0.069**	0.151**	0.105	0.163**
	(0.027)	(0.062)	(0.085)	(0.070)
Good self-assessed health	0.066***	0.136***	0.288***	0.097**
	(0.021)	(0.037)	(0.078)	(0.042)
Constant	-0.164	-1.532***	-0.509	-1.795***
	(0.164)	(0.321)	(0.634)	(0.357)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

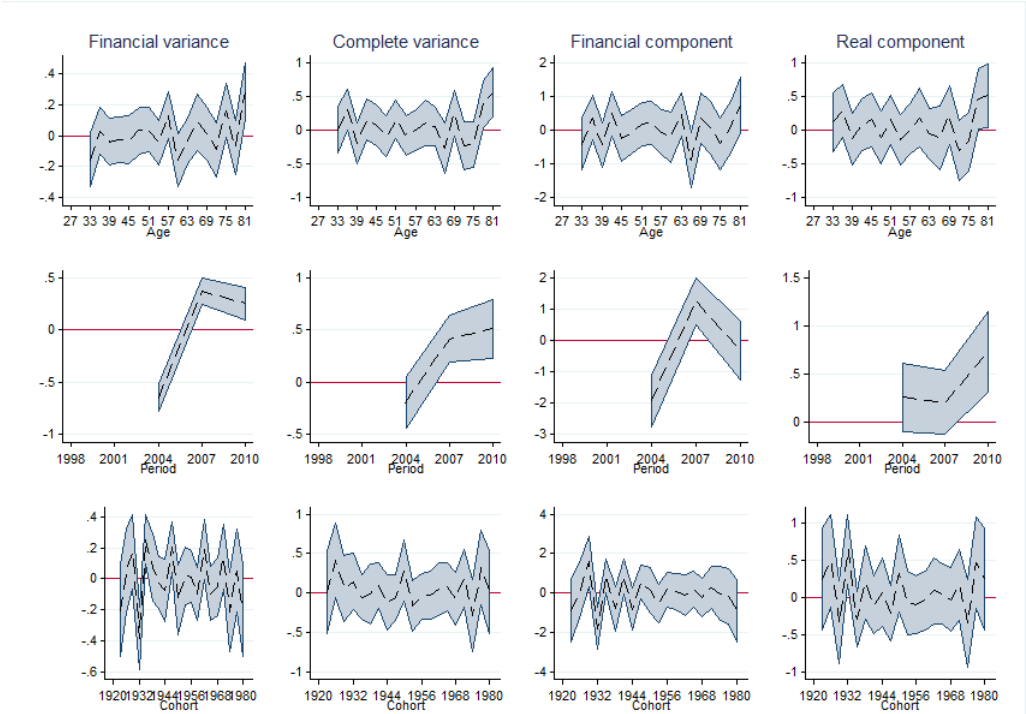

Figure S.3. Second difference of age, period and cohort effects

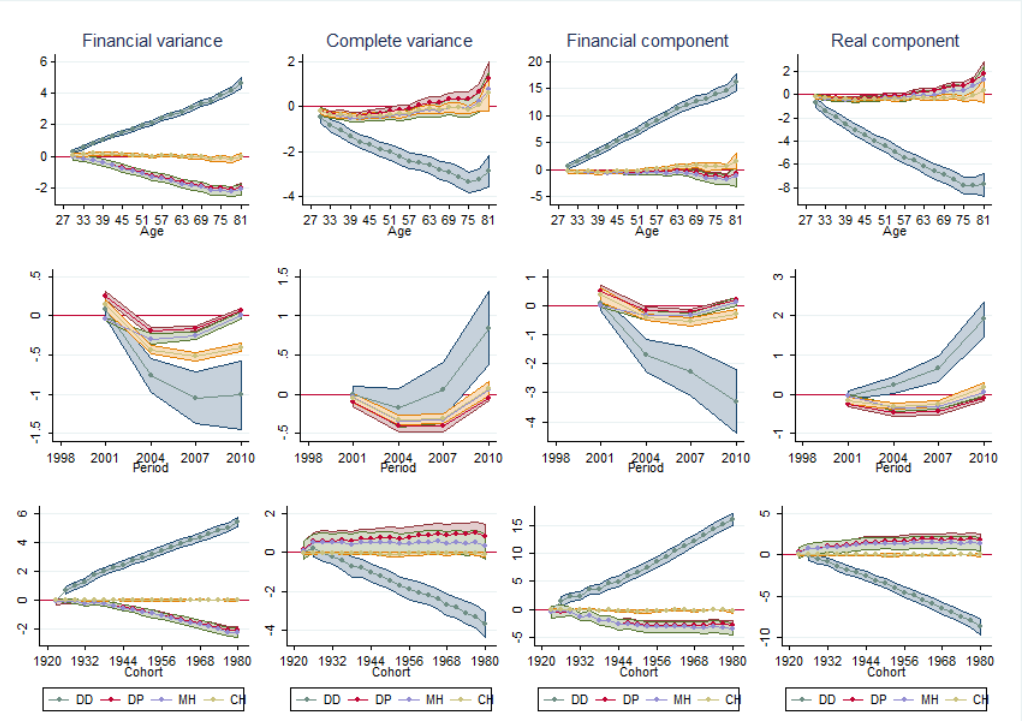

Figure S.4. Level of age, period and cohort effects

S.4. Asset Variances and Covariances

S.4.1. NO HEDGING

The covariances between financial and non-financial asset returns vary largely over time (see Figure 3 in the main text). However, findings in the literature agree on neither the size nor even the sign of these covariances. In particular some works find such covariances to be null (for instance see Flavin and Yamashita, 2002, for real estate). In our analysis, this would imply that the variance of the complete portfolio is the sum of a variance involving only financial assets, and a variance involving only non-financial assets; no longer it would include hedging opportunities resulting from the interrelation between the two asset types.

Here we repeat our benchmark analysis by setting to zero all the covariances between financial assets (bond, stock) and non-financial assets (business wealth, real estate). The covariance between bonds and stocks instead remains different from zero, and coincides with our benchmark estimates.

Note: In this setting, the financial risk indicator coincides with the one in the main text by construction.

Table S.6. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.100***	0.061***	0.010	0.173***
	(0.005)	(0.008)	(0.007)	(0.017)
Non-white	-0.095***	-0.087**	-0.115***	-0.025
	(0.020)	(0.041)	(0.040)	(0.070)
Female	-0.092***	-0.101**	-0.132***	-0.033
	(0.032)	(0.042)	(0.043)	(0.074)
College graduate	0.166***	-0.064**	0.034	-0.286***
	(0.020)	(0.028)	(0.031)	(0.047)
Married	-0.094***	-0.067*	-0.100**	0.008
	(0.028)	(0.037)	(0.041)	(0.073)
N. household members	-0.016	0.022	0.001	0.071
	(0.010)	(0.023)	(0.020)	(0.044)
With children	-0.006	0.066	0.100**	-0.014
	(0.027)	(0.043)	(0.048)	(0.074)
Self-employed	-0.164***	0.760***	-0.395***	3.414***
	(0.029)	(0.070)	(0.038)	(0.230)
Retired	-0.042	-0.032	-0.115***	0.163**
	(0.027)	(0.036)	(0.036)	(0.080)
N. financial institutions where doing business	0.037***	0.033***	0.056***	-0.017
	(0.004)	(0.007)	(0.008)	(0.011)
With financial advisor	0.018	-0.024	-0.011	-0.051
	(0.018)	(0.028)	(0.029)	(0.049)
Works in financial sector	0.069**	0.026	0.024	0.029
	(0.027)	(0.053)	(0.044)	(0.106)
Good self-assessed health	0.066***	0.034	0.033	0.034
	(0.021)	(0.029)	(0.031)	(0.053)
Constant	-0.164	-0.408***	0.285**	-1.881***
	(0.164)	(0.135)	(0.130)	(0.285)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

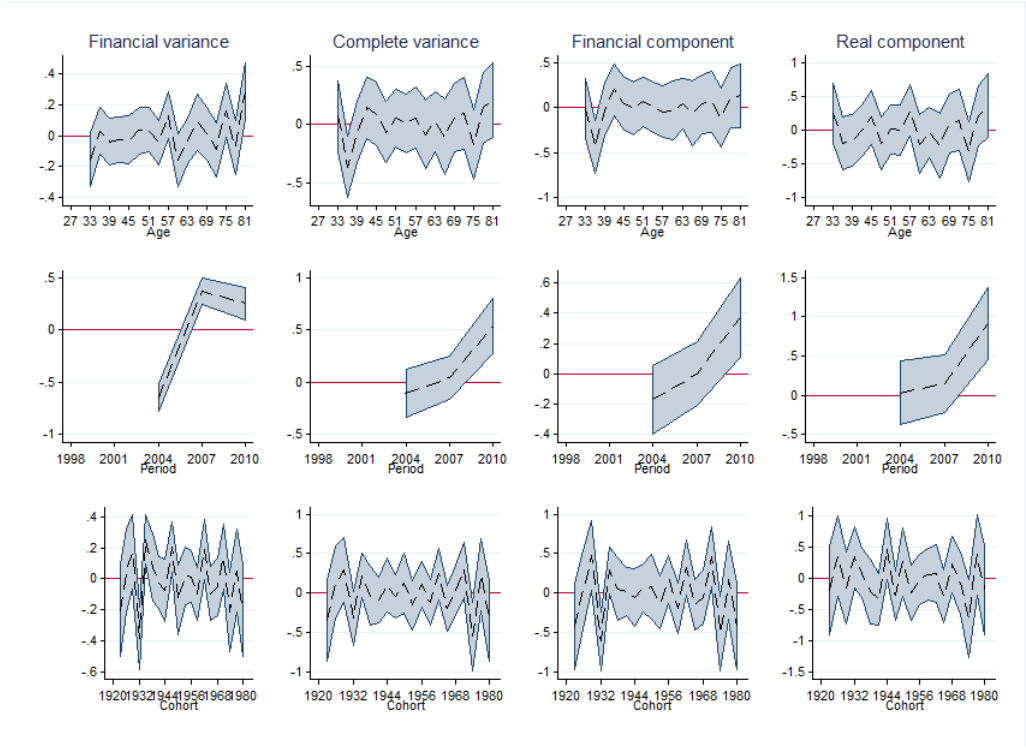

Figure S.5. Second difference of age, period and cohort effects

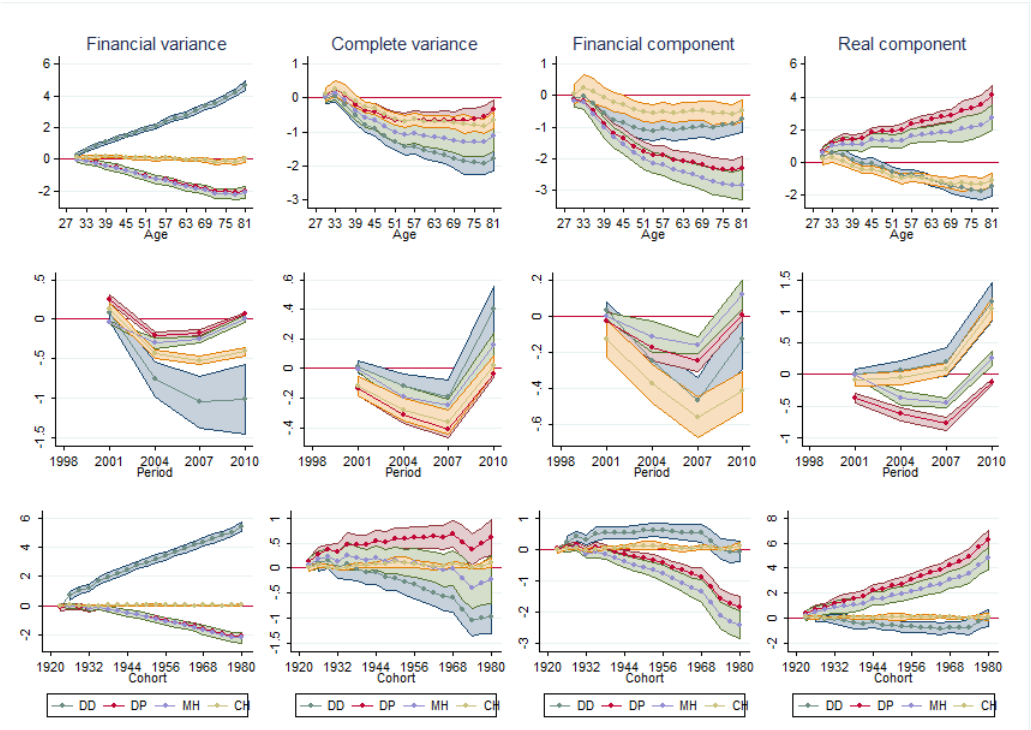

Figure S.6. Levels of age, period and cohort effects

S.4.2. FIXED MOMENTS

In our benchmark analysis, the variation in the risk indicators reflects a change in two dimensions: portfolio composition, and the moments of the asset returns. To isolate the contribution of each change, here we repeat the benchmark analysis keeping the moments of the excess returns constant over time. Using the same moments for all the waves allows us to determine the genuine variation due only to changes in portfolio composition.

Specifically, for all the waves we consider the moments computed for wave 1998 in the benchmark analysis. Compared to the moments we derived for the other waves, these moments show relatively smaller excess returns for bonds and real estate, relatively larger excess returns for stocks, relatively larger volatility of bonds and positive and large correlation between bonds and stocks, and between stocks and business wealth. All the moment estimates contribute to determine the size and the trend of our risk indicators.

Table S.7. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.097***	0.058***	0.007	0.182***
	(0.005)	(0.009)	(0.011)	(0.012)
Non-white	-0.083***	-0.108**	-0.150**	-0.006
	(0.019)	(0.049)	(0.060)	(0.059)
Female	-0.064**	-0.110*	-0.132*	-0.056
	(0.028)	(0.058)	(0.071)	(0.068)
College graduate	0.151***	-0.083**	-0.014	-0.250***
	(0.018)	(0.036)	(0.047)	(0.046)
Married	-0.072***	-0.069	-0.082	-0.038
	(0.024)	(0.049)	(0.063)	(0.071)
N. household members	-0.016*	0.019	0.009	0.046
	(0.009)	(0.029)	(0.036)	(0.036)
With children	-0.004	0.117*	0.176**	-0.030
	(0.025)	(0.062)	(0.084)	(0.075)
Self-employed	-0.138***	0.650***	-0.561***	3.614***
	(0.027)	(0.051)	(0.062)	(0.171)
Retired	-0.033	-0.064	-0.197***	0.262***
	(0.026)	(0.047)	(0.055)	(0.074)
N. financial institutions where doing business	0.036***	0.050***	0.083***	-0.030***
	(0.004)	(0.010)	(0.014)	(0.010)
With financial advisor	0.030*	-0.009	-0.004	-0.023
	(0.017)	(0.036)	(0.046)	(0.046)
Works in financial sector	0.067***	0.052	0.043	0.074
	(0.026)	(0.073)	(0.086)	(0.097)
Good self-assessed health	0.060***	0.049	0.051	0.043
	(0.020)	(0.037)	(0.048)	(0.048)
Constant	-0.226*	-0.331**	0.338*	-1.965***
	(0.129)	(0.149)	(0.175)	(0.220)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

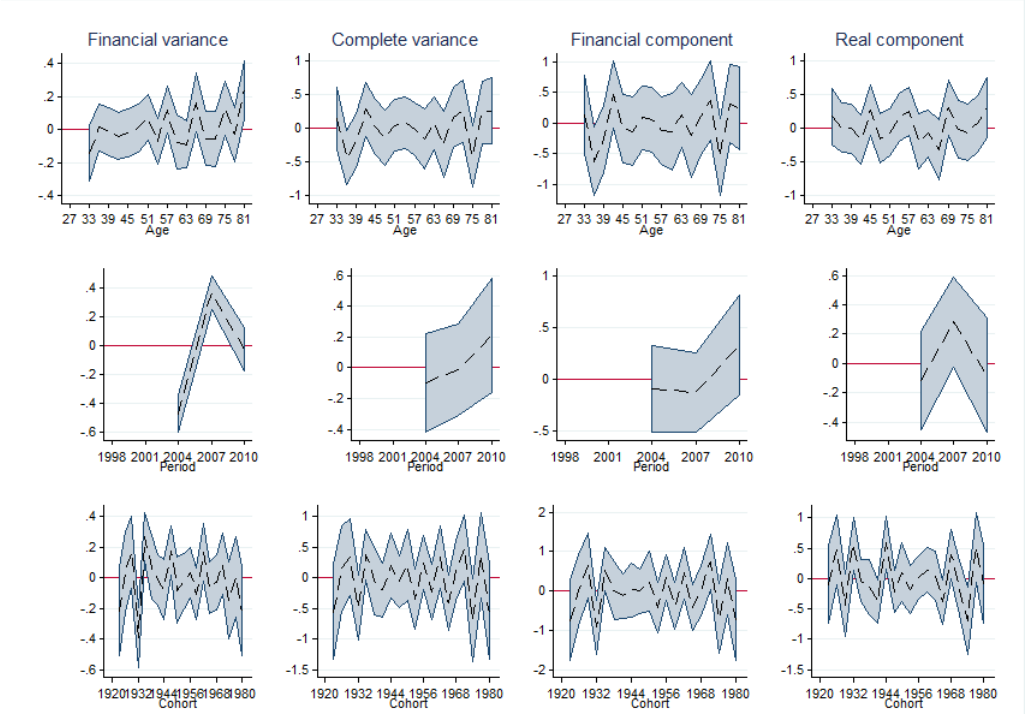

Figure S.7. Second difference of age, period and cohort effects

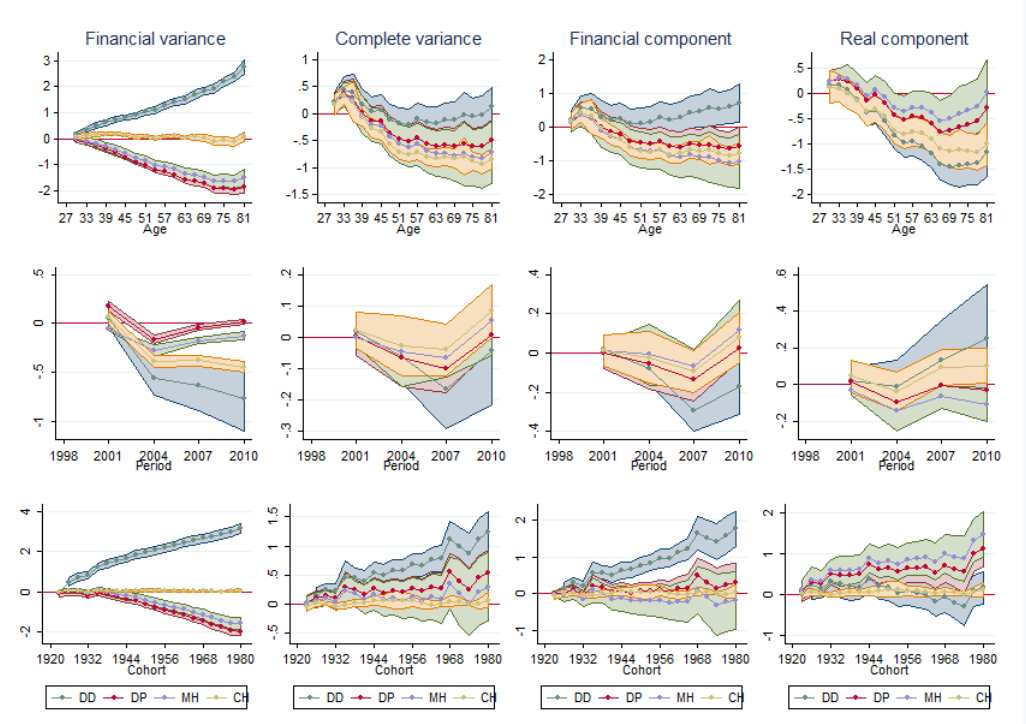

Figure S.8. Levels of age, period and cohort effects

S.4.3. BUSINESS WEALTH RETURN SERIES

Our benchmark time series on business wealth returns is constructed from different data sources: the national income account and the stock market index. This approach assumes, in particular, that the price-earnings ratio of small firms coincides with the one of larger firms (i.e., those listed in the stock market). Here we repeat our benchmark analysis using an alternative time series on business wealth returns.

The new series is entirely drawn from the National Income and Product Accounts (NIPA) table computed by the US Bureau of Economic Analysis (BEA), and incorporates returns from capital gains and earnings (like the benchmark series). We compute returns from capital gains using the annual series on current-cost net stock of private residential and non-residential fixed assets in proprietorships and partnerships. Returns are the annual variation of the stock, corrected for the variation in a corresponding quantity index to control for possible stock changes due to investments. We compute returns from earnings using the quarterly series on proprietor's income with inventory valuation and capital consumption adjustments. Returns are the ratio between income and the previous-year stock of assets defined above.

The new series on business wealth returns is then the sum of the two components. Compared to the benchmark one, it presents advantages and disadvantages. The advantages are two:

- It is entirely derived from the same data source
- It does not assume that the price-earnings ratio of small and large firms is identical

There are also two disadvantages:

- Earnings are observed quarterly, but prices are observed only annually
- By focusing on physical assets, it ignores goodwill and other intangible assets that are likely to represent a large part of the total firm price

In fact, the returns observed in this series, in excess from the risk free rate, show a pattern largely different from our benchmark series (the correlation is -0.24 over the period

1979-2010). In particular the new series is much less volatile (the standard deviation is on average 0.078 as opposed to 0.266) and does not climb in year 2010.

Note: In this setting, the financial risk indicator coincides with the one in the main text by construction.

Table S.8. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.100***	0.026***	0.011*	0.124***
	(0.005)	(0.007)	(0.007)	(0.017)
Non-white	-0.095***	-0.109***	-0.114***	-0.081
	(0.020)	(0.040)	(0.039)	(0.079)
Female	-0.092***	-0.110**	-0.129***	0.014
	(0.032)	(0.043)	(0.042)	(0.084)
College graduate	0.166***	-0.009	0.039	-0.327***
	(0.020)	(0.031)	(0.031)	(0.054)
Married	-0.094***	-0.072*	-0.104***	0.133*
	(0.028)	(0.040)	(0.040)	(0.071)
N. household members	-0.016	0.011	0.001	0.073*
	(0.010)	(0.021)	(0.020)	(0.044)
With children	-0.006	0.112**	0.095**	0.223**
	(0.027)	(0.050)	(0.047)	(0.087)
Self-employed	-0.164***	-0.221***	-0.381***	0.822***
	(0.029)	(0.037)	(0.037)	(0.078)
Retired	-0.042	-0.111***	-0.111***	-0.102*
	(0.027)	(0.034)	(0.034)	(0.060)
N. financial institutions	0.037***	0.054***	0.055***	0.054***
where doing business	(0.004)	(0.008)	(0.008)	(0.013)
With financial advisor	0.018	-0.017	-0.008	-0.071
	(0.018)	(0.029)	(0.029)	(0.046)
Works in financial sector	0.069**	0.026	0.024	0.032
	(0.027)	(0.046)	(0.042)	(0.100)
Good self-assessed health	0.066***	0.034	0.035	0.025
	(0.021)	(0.031)	(0.030)	(0.056)
Constant	-0.164	0.081	0.311**	-1.162***
	(0.164)	(0.131)	(0.142)	(0.241)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

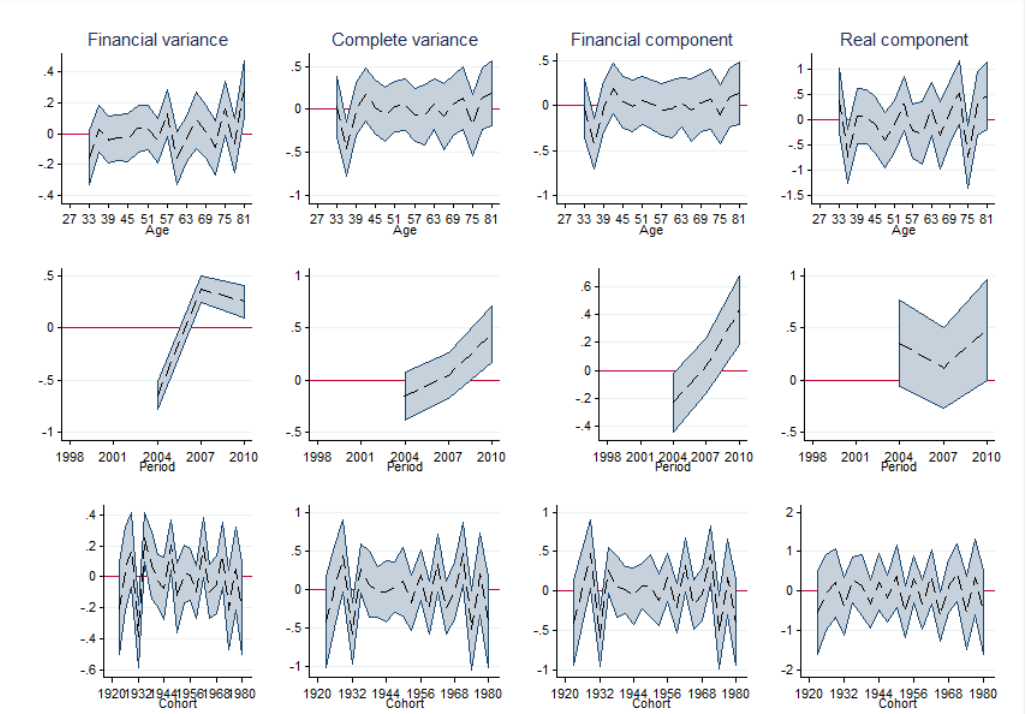

Figure S.9. Second difference of age, period and cohort effects

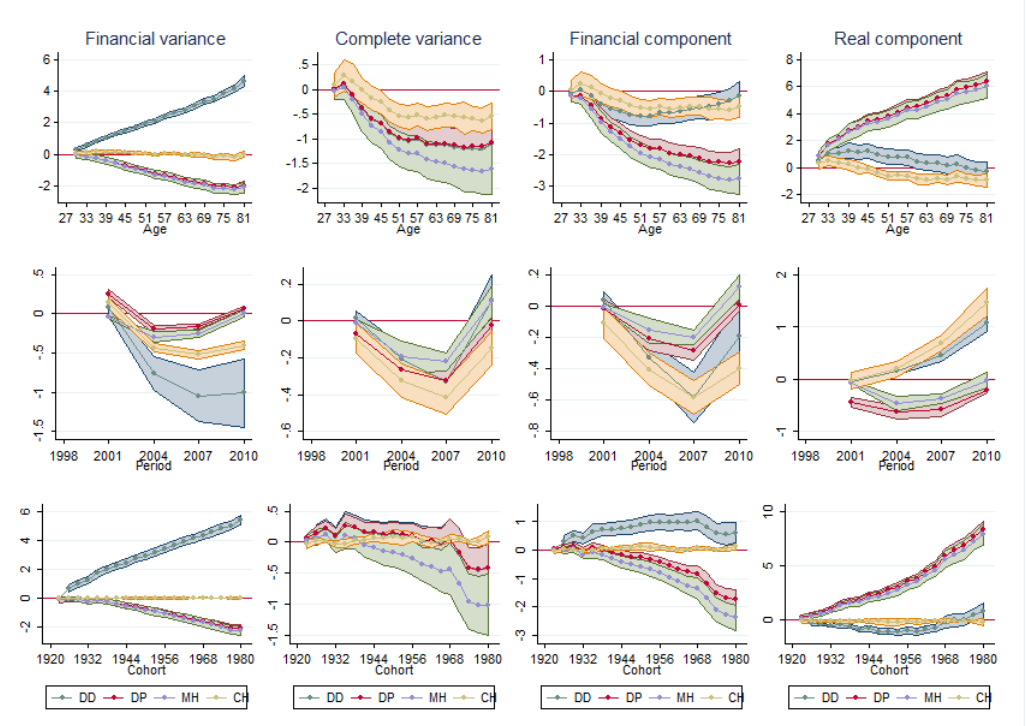

Figure S.10. Levels of age, period and cohort effects

S.4.4. ALTERNATIVE MOMENT ESTIMATES

In the benchmark case we compute historical variance-covariance matrices of excess returns based on a 20-year history of past return realizations (80 observations at a quarterly frequency). Here we replicate the same analysis, but computing risk measures from different moments.

Specifically, for each wave we derive the moments from the 15 previous years of historical excess returns (60 observations); the raw time series of asset returns are the same as in the benchmark case. Compared to the benchmark analysis, the standard deviation of excess returns is now generally lower for all the assets, especially in the first two waves.

Table S.9. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Measure	Financial	Complete	Fin. comp.	Real comp.
Ln(wealth)	0.125***	0.099***	0.024***	0.245***
	(0.005)	(0.012)	(0.007)	(0.028)
Non-white	-0.135***	-0.093*	-0.140***	0.001
	(0.027)	(0.048)	(0.040)	(0.106)
Female	-0.135***	-0.109**	-0.172***	0.012
	(0.044)	(0.049)	(0.047)	(0.107)
College graduate	0.223***	-0.041	0.123***	-0.369***
	(0.026)	(0.032)	(0.032)	(0.072)
Married	-0.131***	-0.101**	-0.161***	0.022
	(0.039)	(0.048)	(0.047)	(0.112)
N. household members	-0.022*	0.029	-0.011	0.111*
	(0.013)	(0.029)	(0.021)	(0.066)
With children	-0.014	0.017	0.073	-0.102
	(0.035)	(0.048)	(0.052)	(0.101)
Self-employed	-0.205***	1.270***	-0.502***	4.897***
	(0.036)	(0.128)	(0.041)	(0.408)
Retired	-0.060*	-0.026	-0.147***	0.225*
	(0.036)	(0.049)	(0.038)	(0.129)
N. financial institutions	0.045***	0.031***	0.066***	-0.041**
where doing business	(0.005)	(0.008)	(0.009)	(0.016)
With financial advisor	0.013	-0.021	-0.000	-0.055
	(0.023)	(0.032)	(0.031)	(0.070)
Works in financial sector	0.093***	0.043	0.072	-0.018
	(0.035)	(0.070)	(0.054)	(0.150)
Good self-assessed health	0.081***	0.056*	0.057*	0.056
	(0.029)	(0.032)	(0.033)	(0.079)
Constant	-0.446***	-0.733***	0.238*	-2.573***
	(0.163)	(0.208)	(0.142)	(0.502)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

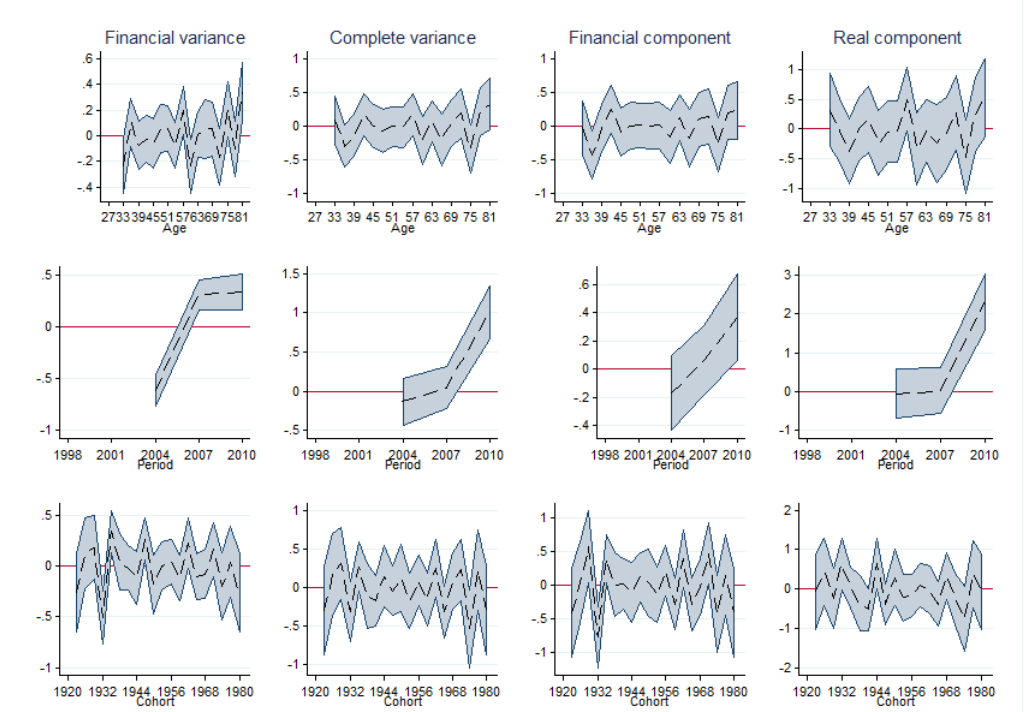

Figure S.11. Second difference of age, period and cohort effects

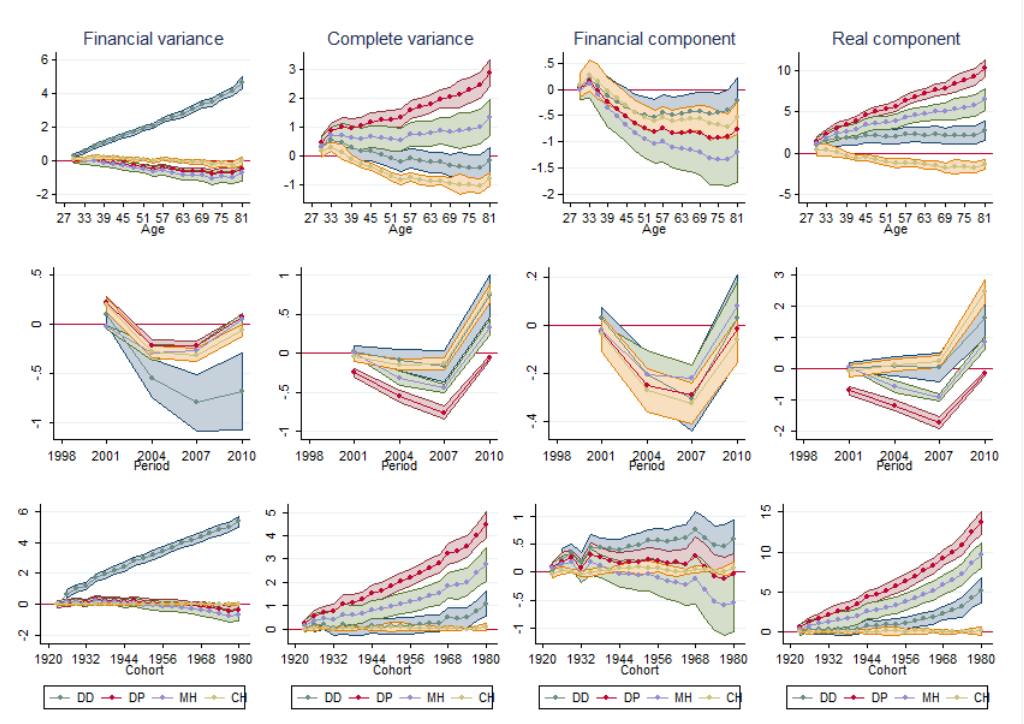

Figure S.12. Levels of age, period and cohort effects

S.4.5. IDIOSYNCRATIC RISK

Households face both market and idiosyncratic risk. One may assume that idiosyncratic risk can be removed through diversification when investing in bonds and stocks; however, likely it is still present in the non-financial assets – whose investment cannot be properly diversified because of their large size. As a result, the variance-covariance matrix of the non-financial assets, Σ_t^{nn}, should include a component reflecting the idiosyncratic risk of these assets. By definition, idiosyncratic risks are uncorrelated with any other source of risk and we can decompose the overall variance-covariance matrix of non-financial asset returns as $\bar{\Sigma}_t^{nn} = \Sigma_t^{nn} + \tilde{\Sigma}_t^{nn}$, where Σ_t^{nn} is the market variance-covariance matrix at time *t* of the excess returns for our non-financial assets (the matrix used in the benchmark analysis) and $\tilde{\Sigma}_t^{nn}$ is the diagonal matrix of idiosyncratic variances at time *t*, $\tilde{\Sigma}_t^{nn} = diag\left\{\left(\tilde{\sigma}_{t,k}^{nn}\right)^2\right\}$, with $k = 1,2,3$.

We repeat the benchmark analysis by explicitly treating the idiosyncratic variance,

$$\tilde{\sigma}_{it}^{n} = \omega_{it}^{n\prime}\,\tilde{\Sigma}_t^{nn}\,\omega_{it}^{n}. \tag{S.4}$$

Furthermore, we also consider the complete portfolio "total" variance, $\bar{\sigma}_{it}$, which is made of the complete portfolio variance σ_{it}^{c}, already discussed, plus the idiosyncratic variance:

$$\bar{\sigma}_{it} = \sigma_{it}^{c} + \tilde{\sigma}_{it}^{n}. \tag{S.5}$$

Properly measuring idiosyncratic risk would require time series of the asset returns on firm sectors and regional real estate. This would allow us to compute different sets of variance-covariance matrices, and associate the relevant one to each household. Unfortunately, we do not have such information. Previous studies, mainly focusing on the distinction between permanent and transitory income shocks, find that idiosyncratic risk can be very large compared to market risk, and the total variance can be even ten times as large as the market one (e.g., Meghir and Pistaferri, 2004; Cocco et al., 2005). For this reason, in the analysis we set the idiosyncratic variance-covariance matrix $\tilde{\Sigma}_t^{nn} = \theta\, diag\left\{\Sigma_t^{nn}\right\}$, i.e., as a diagonal matrix including the market variance of business wealth and real estate, multiplied by a factor $\theta = 9$. In our intention, this choice should represent an upper bound for idiosyncratic variance. Choosing a different constant value of θ, or a value differentiated by asset category, would not alter our conclusions.

Note: In this setting, the financial risk and complete risk indicators coincide with the ones in the main text by construction.

Table S.10. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Idiosyncratic**	**Total**
Ln(wealth)	0.100***	0.066***	0.180***	0.094***
	(0.005)	(0.008)	(0.018)	(0.010)
Non-white	-0.095***	-0.083**	-0.025	-0.069
	(0.020)	(0.039)	(0.073)	(0.045)
Female	-0.092***	-0.098**	-0.029	-0.081*
	(0.032)	(0.040)	(0.078)	(0.046)
College graduate	0.166***	-0.055**	-0.294***	-0.112***
	(0.020)	(0.027)	(0.049)	(0.030)
Married	-0.094***	-0.074**	0.007	-0.054
	(0.028)	(0.037)	(0.075)	(0.043)
N. household members	-0.016	0.021	0.076*	0.034
	(0.010)	(0.022)	(0.045)	(0.027)
With children	-0.006	0.057	-0.022	0.038
	(0.027)	(0.042)	(0.075)	(0.046)
Self-employed	-0.164***	0.832***	3.552***	1.481***
	(0.029)	(0.071)	(0.250)	(0.112)
Retired	-0.042	-0.024	0.161*	0.019
	(0.027)	(0.035)	(0.086)	(0.044)
N. financial institutions	0.037***	0.031***	-0.018	0.019***
where doing business	(0.004)	(0.006)	(0.011)	(0.007)
With financial advisor	0.018	-0.021	-0.052	-0.028
	(0.018)	(0.027)	(0.051)	(0.030)
Works in financial sector	0.069**	0.029	0.022	0.028
	(0.027)	(0.052)	(0.112)	(0.064)
Good self-assessed health	0.066***	0.036	0.030	0.035
	(0.021)	(0.027)	(0.055)	(0.031)
Constant	-0.164	-0.410***	-1.952***	-0.792***
	(0.164)	(0.151)	(0.304)	(0.173)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	18,372	18,372	18,372	18,372

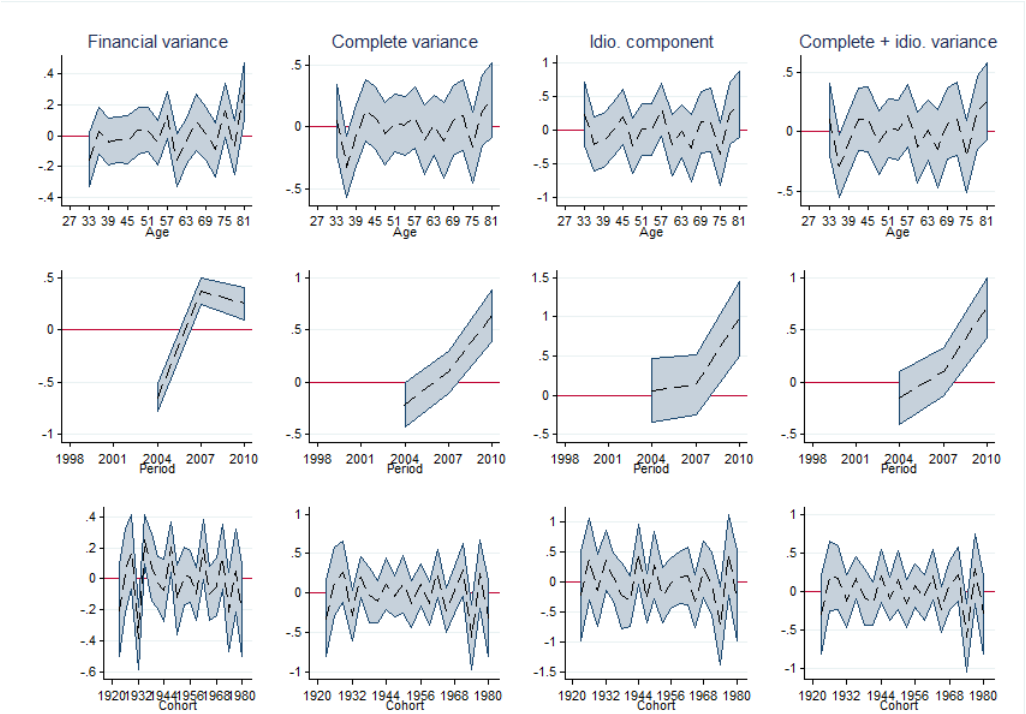

Figure S.13. Second difference of age, period and cohort effects

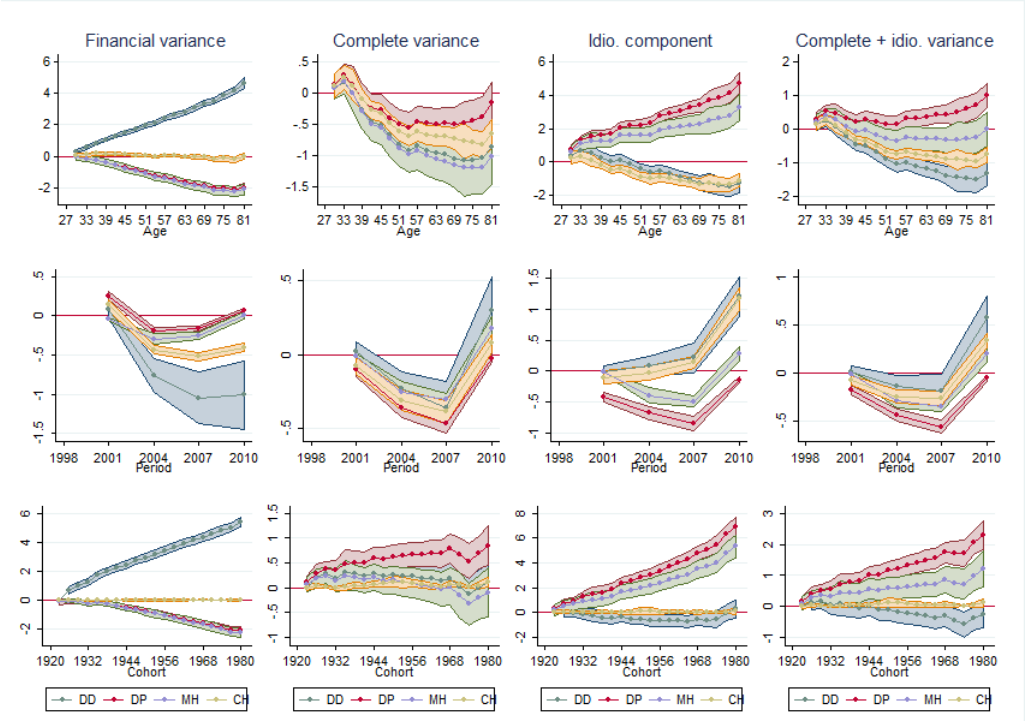

Figure S.14. Levels of age, period and cohort effects

S.5. Sample Composition

S.5.1. ONLY INVESTORS IN RISKY ASSETS

Individuals who hold neither bonds nor stocks might be intrinsically different from those who choose to make an even small investment in risky financial assets. For this reason, we repeat the analysis excluding from the dataset the 4,095 observations (28.10% of the sample after accounting for sampling weights) without holdings of risky financial assets.

Compared to the full sample, households in this sub-sample are on average more frequently headed by a white, male, and college graduate individual. Overall these households are wealthier and more likely to make use of financial advisors.

Table S.11. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.077***	-0.038***	-0.158***	0.253***
	(0.008)	(0.015)	(0.016)	(0.026)
Non-white	-0.107***	-0.094**	-0.128**	-0.014
	(0.027)	(0.047)	(0.050)	(0.084)
Female	-0.116**	-0.156***	-0.232***	0.029
	(0.046)	(0.047)	(0.046)	(0.097)
College graduate	0.150***	0.004	0.134***	-0.312***
	(0.023)	(0.034)	(0.039)	(0.054)
Married	-0.150***	-0.076*	-0.129***	0.057
	(0.039)	(0.040)	(0.039)	(0.090)
N. household members	0.001	0.053*	0.017	0.145**
	(0.013)	(0.027)	(0.027)	(0.059)
With children	-0.059	0.035	0.077	-0.070
	(0.037)	(0.051)	(0.063)	(0.095)
Self-employed	-0.088***	0.745***	-0.265***	3.227***
	(0.033)	(0.058)	(0.033)	(0.205)
Retired	-0.015	-0.010	-0.080**	0.166**
	(0.032)	(0.033)	(0.035)	(0.080)
N. financial institutions where doing business	0.011***	0.028***	0.052***	-0.029**
	(0.004)	(0.006)	(0.008)	(0.012)
With financial advisor	-0.013	0.022	0.029	0.007
	(0.022)	(0.030)	(0.033)	(0.051)
Works in financial sector	0.072**	0.018	0.036	-0.026
	(0.033)	(0.050)	(0.047)	(0.111)
Good self-assessed health	0.074***	0.063**	0.070**	0.047
	(0.024)	(0.032)	(0.034)	(0.060)
Constant	0.454***	1.020***	2.645***	-2.832***
	(0.141)	(0.227)	(0.237)	(0.397)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	14,277	14,277	14,277	14,277

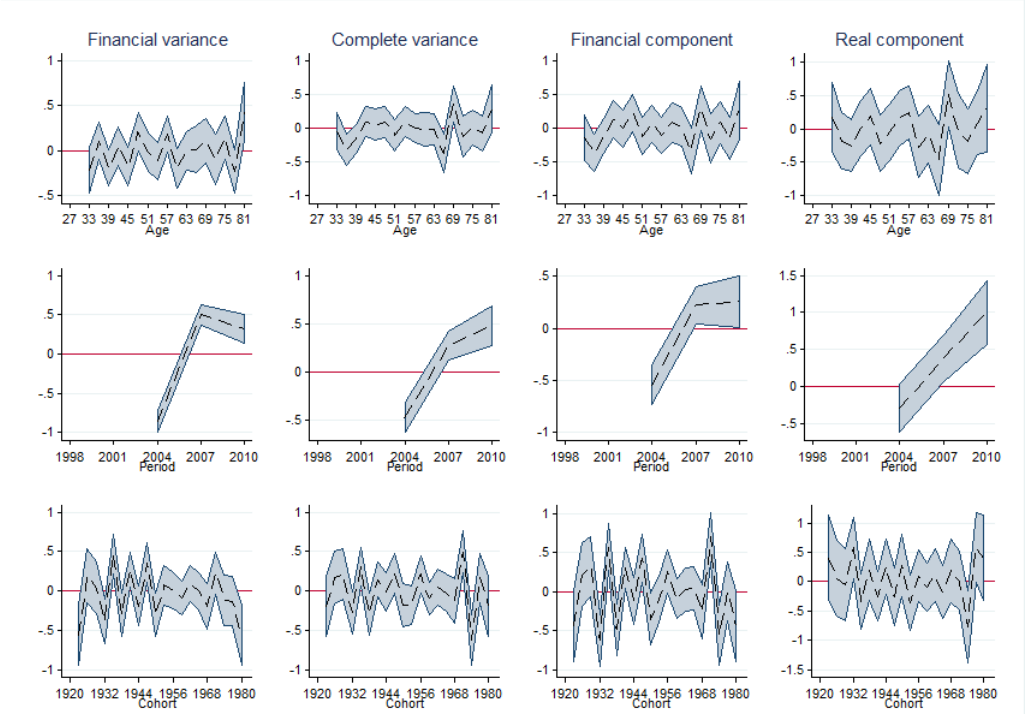

Figure S.15. Second difference of age, period and cohort effects

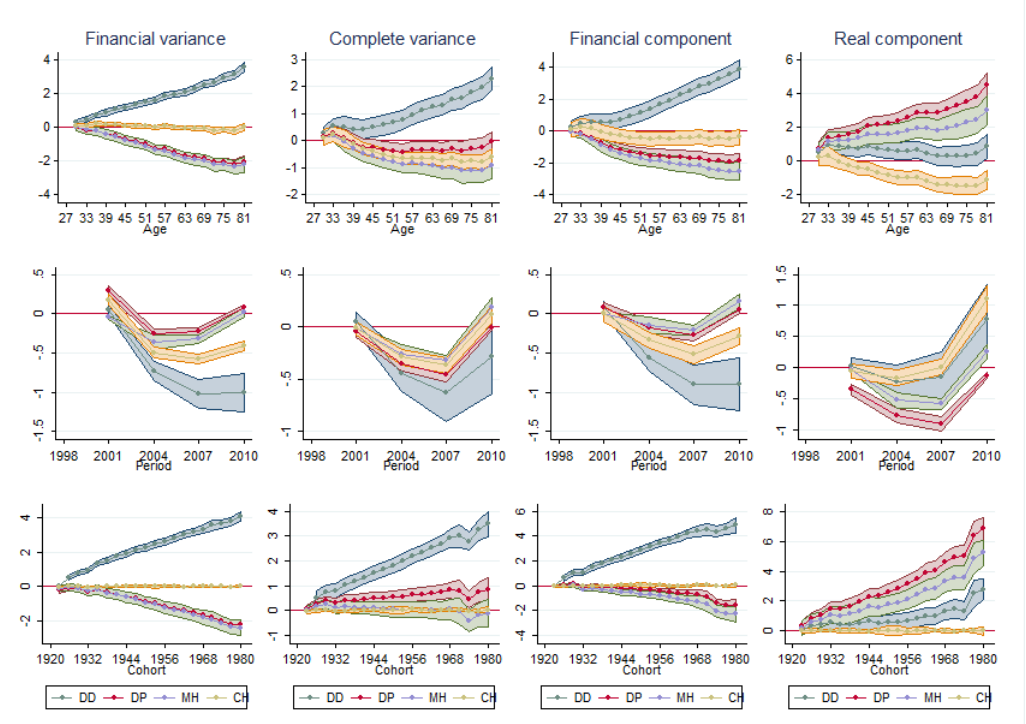

Figure S.16. Levels of age, period and cohort effects

S.5.2. WEALTHY HOUSEHOLDS

The portfolios of wealthy households are likely less heavily influenced by market entry barriers and transaction costs. We therefore consider only the sub-sample of the 33% wealthiest households in each wave and for each cohort. We identify the wealthiest households in the sample using the SCF sampling weights; since the SCF oversamples wealthy households, the actual number of households we isolate is larger than 33% of the overall sample. In fact, this sub-sample includes 51.39% of our genuine observations (9,441 out of 18,372).

Compared to the full sample, households in this sub-sample on average hold more stocks in their portfolio, are more highly educated, earn a higher income, and they are generally more financially sophisticated: they do business with more financial institutions, and it is more likely that they work in the finance sector.

Table S.12. Portfolio risk and observable characteristics

Note. The dependent variable is rescaled by its average in the sample. The regression is constrained to the second-order differences of the period dummy variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Measure	**Financial**	**Complete**	**Fin. comp.**	**Real comp.**
Ln(wealth)	0.102***	0.440***	0.131***	0.688***
	(0.012)	(0.027)	(0.020)	(0.052)
Non-white	-0.176***	-0.072	-0.167***	0.004
	(0.029)	(0.054)	(0.051)	(0.101)
Female	-0.141**	-0.126*	-0.334***	0.051
	(0.058)	(0.070)	(0.072)	(0.136)
College graduate	0.180***	-0.180***	0.261***	-0.545***
	(0.025)	(0.040)	(0.038)	(0.074)
Married	-0.102**	-0.153**	-0.282***	-0.039
	(0.042)	(0.063)	(0.061)	(0.121)
N. household members	-0.019	0.054	-0.064***	0.155*
	(0.014)	(0.045)	(0.019)	(0.086)
With children	-0.004	-0.164**	-0.034	-0.277*
	(0.033)	(0.075)	(0.053)	(0.148)
Self-employed	-0.161***	1.009***	-0.437***	2.228***
	(0.033)	(0.082)	(0.047)	(0.151)
Retired	-0.015	0.071	-0.037	0.166*
	(0.031)	(0.054)	(0.047)	(0.093)
N. financial institutions where doing business	0.013***	-0.017***	0.028***	-0.054***
	(0.004)	(0.006)	(0.006)	(0.011)
With financial advisor	0.038**	-0.013	0.036	-0.054
	(0.018)	(0.034)	(0.031)	(0.059)
Works in financial sector	0.028	-0.008	0.036	-0.048
	(0.035)	(0.063)	(0.049)	(0.116)
Good self-assessed health	0.029	0.007	0.043	-0.023
	(0.025)	(0.038)	(0.032)	(0.067)
Constant	-0.209	-5.159***	-0.388	-8.916***
	(0.251)	(0.377)	(0.412)	(0.695)
Age dummies	YES	YES	YES	YES
Period dummies	YES	YES	YES	YES
Cohort dummies	YES	YES	YES	YES
Genuine observations	9,441	9,441	9,441	9,441

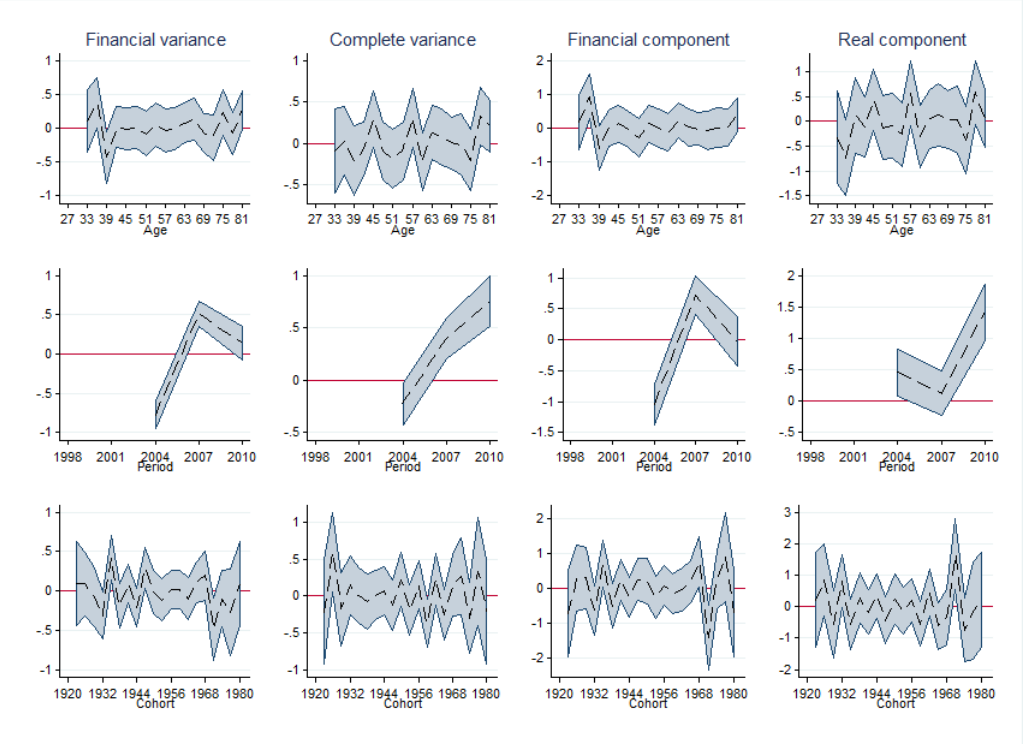

Figure S.17. Second difference of age, period and cohort effects

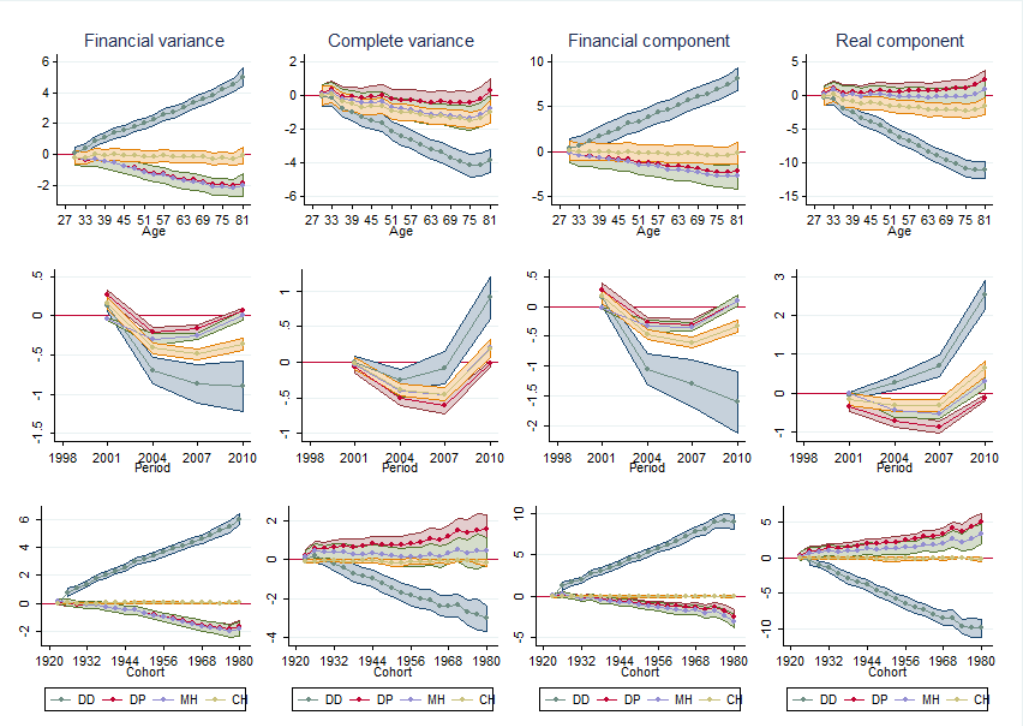

Figure S.18. Level of age, period and cohort effects