From Learning to Earning: Financial Literacy and Wealth Accumulation in the UK

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November 2025

[1]The data for this research have been provided by the Geographic Data Service, a Smart Data Research UK Investment, under project ID GeoDS 2495, ES/Z504464/1.

Overview

1. Idea of financial literacy as a barrier to extensive and intensive margins of stock-holding.
2. Role of "learning-by-doing" in closing literacy gaps.
3. Life-cycle model with financial literacy frictions and learning-by-doing.
4. Effect of cash vs stock transfers on long-term participation and wealth.
5. Effect of higher participation on macroeconomic shocks.

UK Stock Market Participation

- Over the last 10 years, global equities have yielded an average annual return of **approx. 9%** while UK cash accounts have averaged 0.9%.
- Yet, only 22% of the UK population directly owns stocks.
- For every £1 in stocks, U.K. households hold £10 in cash.
- For individuals with above £10,000 in assets and savings, 38% hold it all in cash. A further 20% hold at least 75% in cash.
- 1-in-3 individuals with above £10,000 but no stocks say they "do not know enough" to invest.

Data

- **UK Financial Lives Survey 2022 (FCA)**
  - ➢ Representative survey of UK adults covering financial products, balances, literacy, and demographics.

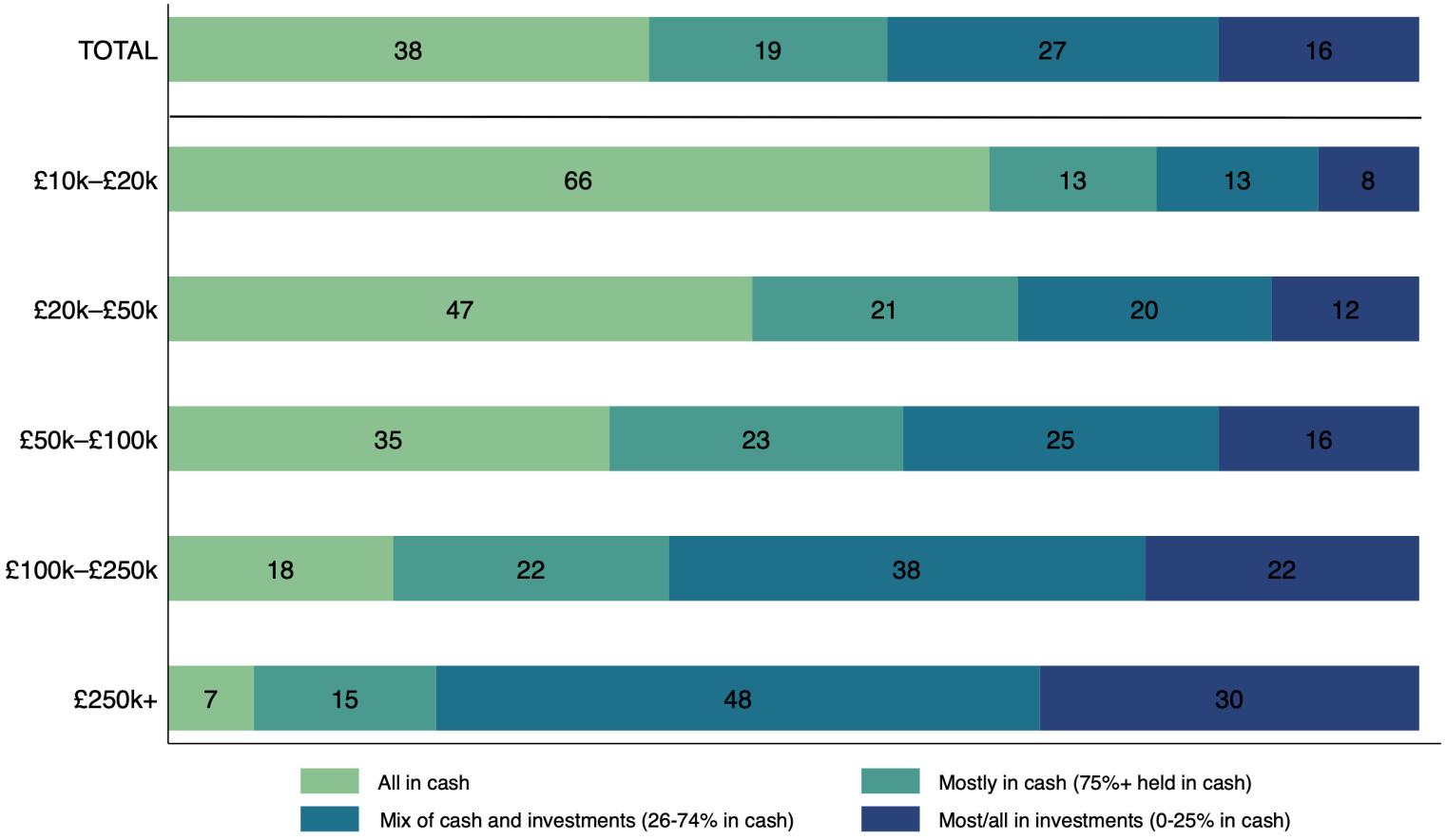
- **Investable Assets**
  - ➢ Self-reported value of liquid savings (current and cash savings accounts) plus investment products (e.g. funds, shares, investment property).
  - ➢ Excludes main residence and DC pensions.
  - ➢ Excludes cash that's not in savings - i.e., cash for current spending.

- **Financial Literacy Score**
  - ➢ Number of correct answers (0–4) to four FLS questions on interest compounding, inflation, and risk diversification.

▸ Financial literacy questions

Cash Holdings

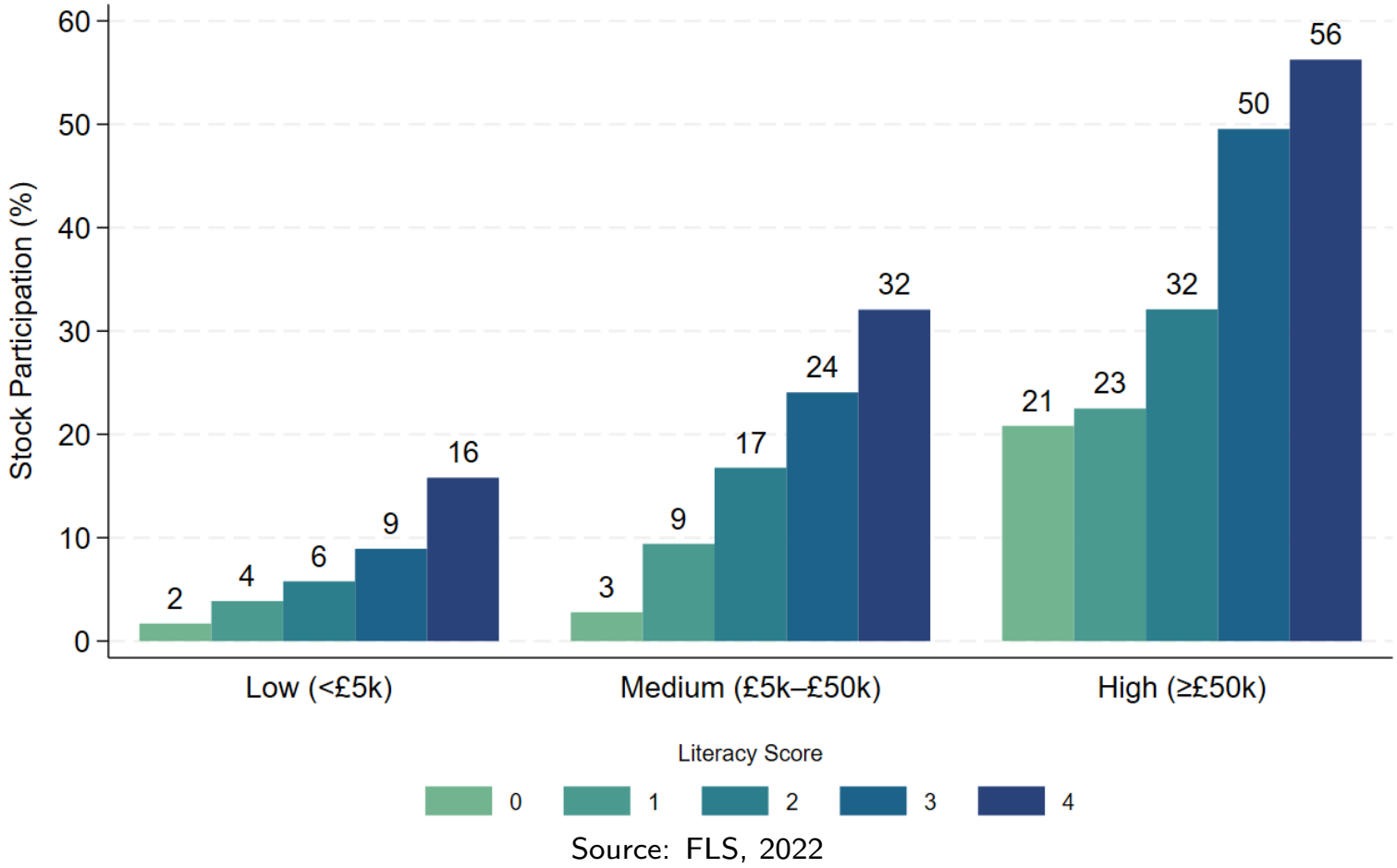
42% of UK adults have at least £10,000 in investible assets.



Source: FLS, 2022

Figure: Proportion investing by level of investable assets.

Extensive Margin



Source: FLS, 2022

Figure: Stock participation by assets and financial literacy.

Average participation rates: 6.2%, 26.2%, and 53.1%.
Average financial literacy scores: 2.7, 3.2, and 3.6.

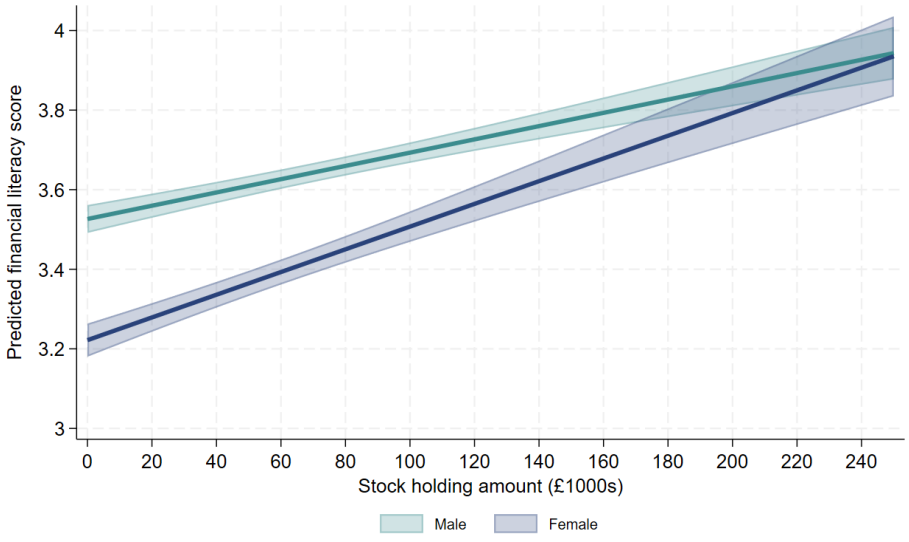
Intensive Margin

Source: FLS, 2022

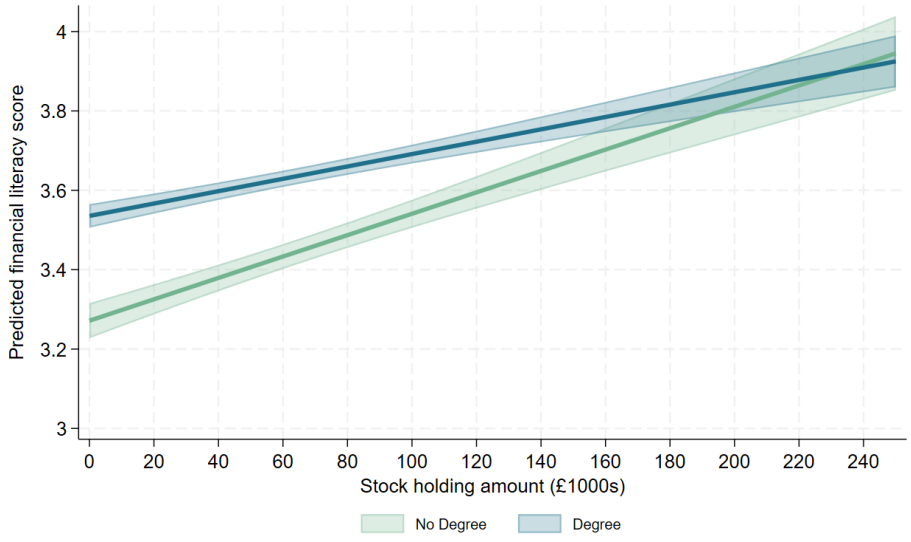
Figure: Share of cash assets by assets and financial literacy.

Learning-by-Doing

- Financial literacy increases with non-cash investments.
- Gender and education gaps narrow as investment levels rise.



(a) By gender.



(b) By degree.

Source: FLS, 2022

Figure: Predicted financial literacy by stockholding and demographics.

▸ Literacy score means

Existing Literature

- **Life-Cycle Models with Portfolio Choice**
  - ➢ Active choice to invest in financial literacy that affects returns (Cota et al., 2025; Jappelli and Padula, 2013; Lusardi et al., 2017)
- **Limited Stock Market Participation**
  - ➢ Limited financial literacy (Thomas and Spataro, 2018; van Rooij et al., 2011) and cognitive abilities (Christelis et al., 2010).
- **Participation Costs**
  - ➢ Investors face entry and per-period costs, particularly affecting households *with low financial wealth* (Alan, 2006; Fagereng et al., 2017; Galaasen and Raja, 2024; Vissing-Jorgensen, 2002).
- **Learning-by-Doing**
  - ➢ Financial experience boosts literacy (Frijns et al., 2014; Mandell, 2008).

This paper: *Non-monetary literacy frictions, Learning-by-doing, Policy implications & macroeconomic dynamics*.

Motivation and Identification Strategy

- Estimating the causal relationship between **stock ownership** and **financial literacy** is complicated by endogeneity:
  - ➢ Financially literate individuals are more likely to participate in equity markets.
  - ➢ Those that participate are likely to have higher literacy from learning-by-doing.

- Instrument for stock-holding:

$$Z_i = \texttt{nonImmediateInheritance}.$$

- The instrument equals one if the respondent received an inheritance in the past 12 months **without** reporting:
  - ➢ the death of a parent or spouse, or
  - ➢ a serious accident of a close family member.
  - ➢ $N = 886$.

Model Specification

$$FL_i^* = \gamma\, OwnsStocks_i + \mathbf{X}_i'\boldsymbol{\beta} + \varepsilon_{1i},$$
$$OwnsStocks_i^* = \pi_1 Z_i + \mathbf{X}_i'\boldsymbol{\pi}_2 + \varepsilon_{2i},$$

where $(\varepsilon_{1i}, \varepsilon_{2i})$ are jointly normal with $corr(\varepsilon_{1i}, \varepsilon_{2i}) = \rho$.

- FL_i^* is a latent continuous measure of financial literacy; observed as ordered categories:

$$FL\_Score_i = j \quad \text{if } \kappa_{j-1} < FL_i^* \leq \kappa_j.$$

- $OwnsStocks_i = 1$ if $OwnsStocks_i^* > 0$.
- ρ captures the residual correlation between unobserved determinants of financial literacy and stockholding.

Estimation: Joint maximum likelihood (FIML) provides consistent estimates of (γ, ρ) and the cutpoints $\{\kappa_j\}$.

Endogenous Ordered Probit Estimation

Table: Endogenous Ordered Probit – Financial Literacy and Stock Ownership

	Dependent Variable: Financial Literacy Score (Ordered)				
	(1)	(2)	(3)	(4)	(5)
Owns Stocks	1.50***	1.36***	1.31***	0.85**	0.87***
	(0.09)	(0.12)	(0.11)	(0.37)	(0.27)
Female	-0.35***	-0.40***	-0.39***	-0.51***	-0.47***
	(0.03)	(0.03)	(0.03)	(0.06)	(0.04)
Has Degree		0.36***	0.34***	0.51***	0.46***
		(0.03)	(0.03)	(0.06)	(0.04)
Income Controls			Yes		Yes
Age Controls				Yes	Yes
ρ	-0.53	-0.46	-0.46	-0.19	-0.24
Pr($\rho = 0$)	0.00	0.00	0.00	0.41	0.16
First-stage Wald χ^2	20.8	14.9	9.5	16.6	10.7
N	27,925	26,899	22,742	26,899	22,742

Average Marginal Effects

Table: Average Marginal Effect of Stockholding on Expected Financial Literacy Score

Group	AME	Std. Err.
Overall Sample		
All individuals	0.3574	0.0184
By Gender		
Male	0.3181	0.0140
Female	0.3998	0.0406
By Education (Degree)		
No Degree	0.3872	0.0312
Degree	0.3095	0.0131

Notes: Each effect reflects the average change in expected financial literacy score when stockholding status changes from 0 to 1, controlling for other covariates and accounting for endogeneity via instrumental variables. Standard errors computed from nonparametric bootstrapping with 200 iterations.

Model Overview

- Finite-horizon life-cycle model with endogenous financial literacy accumulation.
- Agents live for $T = 29$ (two-year) periods: work for $T - R$ years and retire for the remaining $R = 5$.
- Two assets: cash (m_t) and stocks (s_t).
- Stochastic stock returns R_t^s and idiosyncratic labor productivity z_t.
- Investing in stocks incurs a *literacy-dependent* utility cost.
- Financial literacy evolves via learning-by-doing.

Labor Income and Returns

Labor Income Process:

- Inelastically supply 1 unit of Labor.
- Earn labor $z_t w_t$, where w_t is the (age-dependent) wage rate and z_t is an AR(1) idiosyncratic productivity process.

$$z_{t+1} = \rho_0^z + \rho_1^z z_t + \varepsilon_{t+1}^z, \tag{1}$$

Asset Returns:

- Cash: $R^m = 1 + r^m$ (constant)
- Stocks: $R_t^s = 1 + r_t^s$, i.i.d. over time (partial-equilibrium)

Agents face:

- Short-selling constraint: $s_t \geq 0$
- Borrowing constraint: $m_t \geq \underline{m}$

Investment Costs and Financial Literacy

Utility Cost of Investing:

$$\kappa(s_{t+1}, s_t, \lambda_t) = \begin{cases} \dfrac{\max\{s_{t+1} - s_t, 0\}}{s_{t+1}\lambda_t}, & \text{if } s_{t+1} > 0, \\ 0, & \text{if } s_{t+1} = 0. \end{cases} \tag{2}$$

- Captures utility cost of increasing stock-holdings.
- No cost of selling stocks or leaving holdings unchanged.
- Decreases in financial literacy, λ_t.

Financial Literacy Accumulation

Learning-by-Doing:

$$\lambda_{t+1} = \delta_t \lambda_t + \left(\eta \max\{s_{t+1} - s_t, 0\}^{\psi} + \chi \mathbf{1}\{s_{t+1} > 0\} \right) \lambda_t^{\phi}, \qquad (3)$$

where:

- δ_t: age-specific depreciation rate,
- ψ: curvature of learning-by-doing,
- ϕ: returns-to-scale in learning,
- η: effect of *increasing stocks*,
- χ: effect of *holding stocks*.

Interpretation: literacy rises with active investment experience; higher λ_t *amplifies* future learning if $\phi > 0$ or *dampens* if $\phi < 0$.

The Household Problem

Objective:

$$V_t(s_t, m_t, \lambda_t, z_t, R_t^s) = \max_{c_t, s_{t+1}, m_{t+1}} \Big[u(c_t) - \kappa(s_{t+1}, s_t, \lambda_t) + \beta \mathbb{E}[V_{t+1}(s_{t+1}, m_{t+1}, \lambda_{t+1}, z_{t+1}, R_{t+1}^s)] \Big] \quad (4)$$

CRRA: $u(c_t) = \dfrac{c_t^{1-\sigma} - 1}{1 - \sigma}$.

Budget Constraint:

$$c_t + s_{t+1} + m_{t+1} = w_t z_t + \tau_t + R_t^s s_t + R^m m_t \quad (5)$$

Constraints:

$$s_{t+1} \geq 0, \quad m_{t+1} \geq \underline{m}.$$

Calibration Results

Table: Model Parameters – Internal and External Calibration

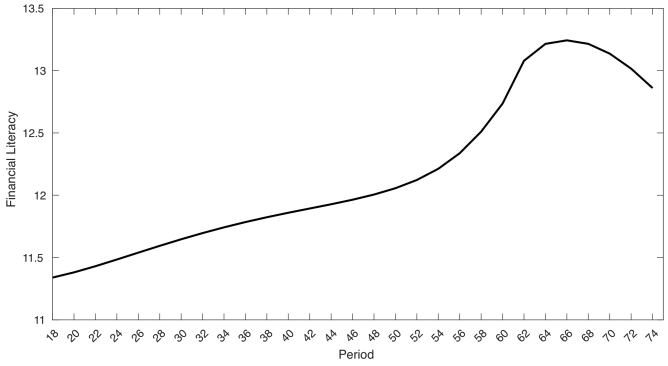
	Description	Value	Target / Source
External Parameters			
r^m	Cash return (two-year)	0.0183	Average deposit rate, 2011–2025
$\mathbb{E}[r^s]$	Mean equity return (two-year)	0.2090	FTSE All-World, 2003–2025
σ^s	Std. dev. of equity returns	0.2410	FTSE All-World, 2003–2025
ρ_0^z	Constant in log-productivity	-0.06	WAS household panel
ρ_1^z	Persistence of log-productivity	0.75	WAS household panel
σ_{ε^z}	Shock std. dev.	0.46	WAS household panel
$\underline{m}$	Borrowing limit	0	No borrowing
τ	Retiree transfer	0.66	30% replacement rate
ξ	Taste shock	0.01	Externally imposed
Internal Parameters			
β	Discount factor (two-year)	0.568	Internally calibrated
χ	Literacy return (holding)	58.000	Internally calibrated
η	Literacy return (increase)	71.000	Internally calibrated
σ	CRRA coefficient	3.250	Internally calibrated
ψ	Stock-increase curvature	0.065	Internally calibrated
ϕ	Learning curvature	-1.630	Internally calibrated
$\underline{\delta}$	Final depreciation rate	0.981	Internally calibrated
λ^0	Initial literacy (lowest group)	2.500	Internally calibrated
Λ	Literacy scaling factor	1.660	Internally calibrated

Model Performance – Targeted Moments

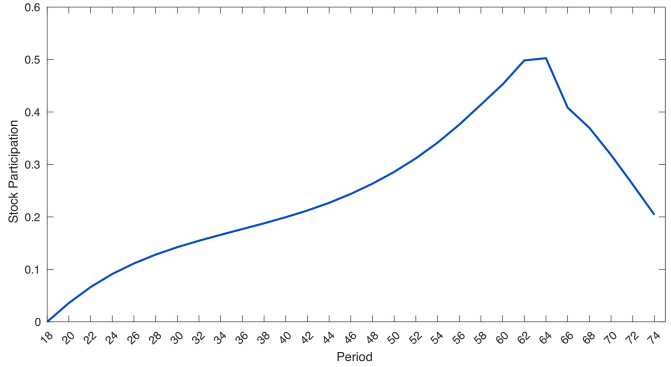
Table: Model Performance – Targeted Moments

	Model	**Target**	**Source**
A. Stock Market Participation			
Overall participation rate	24%	22%	FLS – 2022
Participation rate (Under age 25)	7%	7%	FLS – 2022
Participation rate (Retirees)	34%	28%	FLS – 2022
B. Wealth Distribution			
Households with zero financial assets	11%	12%	FLS – 2022
Cash-to-stock asset ratio	7.48	9.88	WAS 2020
C. Financial Literacy Ratios			
Stockholders vs. non-stockholders	1.67	1.22	FLS – 2022
75th-to-25th percentile of stock-holdings	1.04	1.07	FLS – 2022
End-of-life vs. retirement period	0.94	0.93	FLS – 2022
Ages 35–44 vs. Ages 18–24	1.01	1.30	FLS – 2022

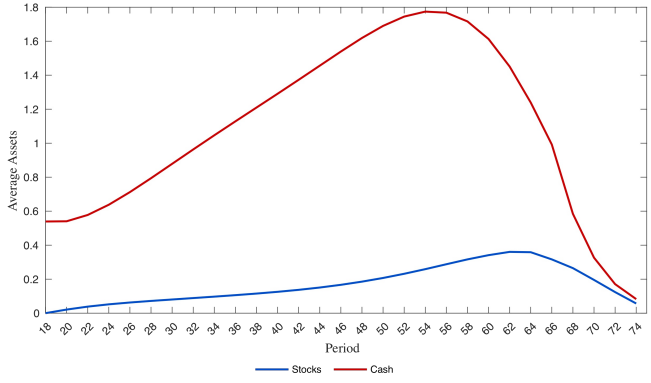
Steady-state Results



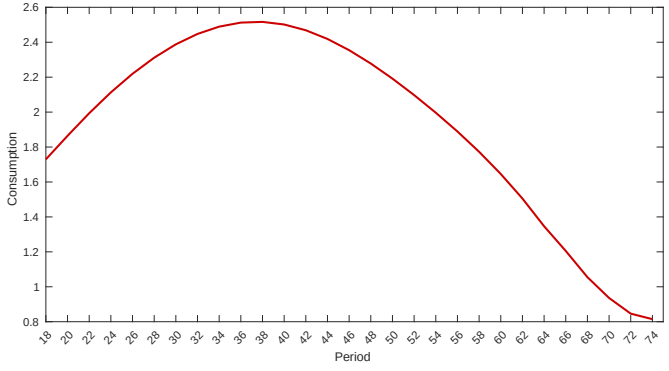
(a) Financial literacy



(b) Stock participation



(c) Average assets



(d) Average consumption

Figure: Model outcomes by age

Results (I)

- Cohort 4 vs 5: 64% at $t = 0 \rightarrow$ 77% at $T - R \rightarrow$ 84% at T.

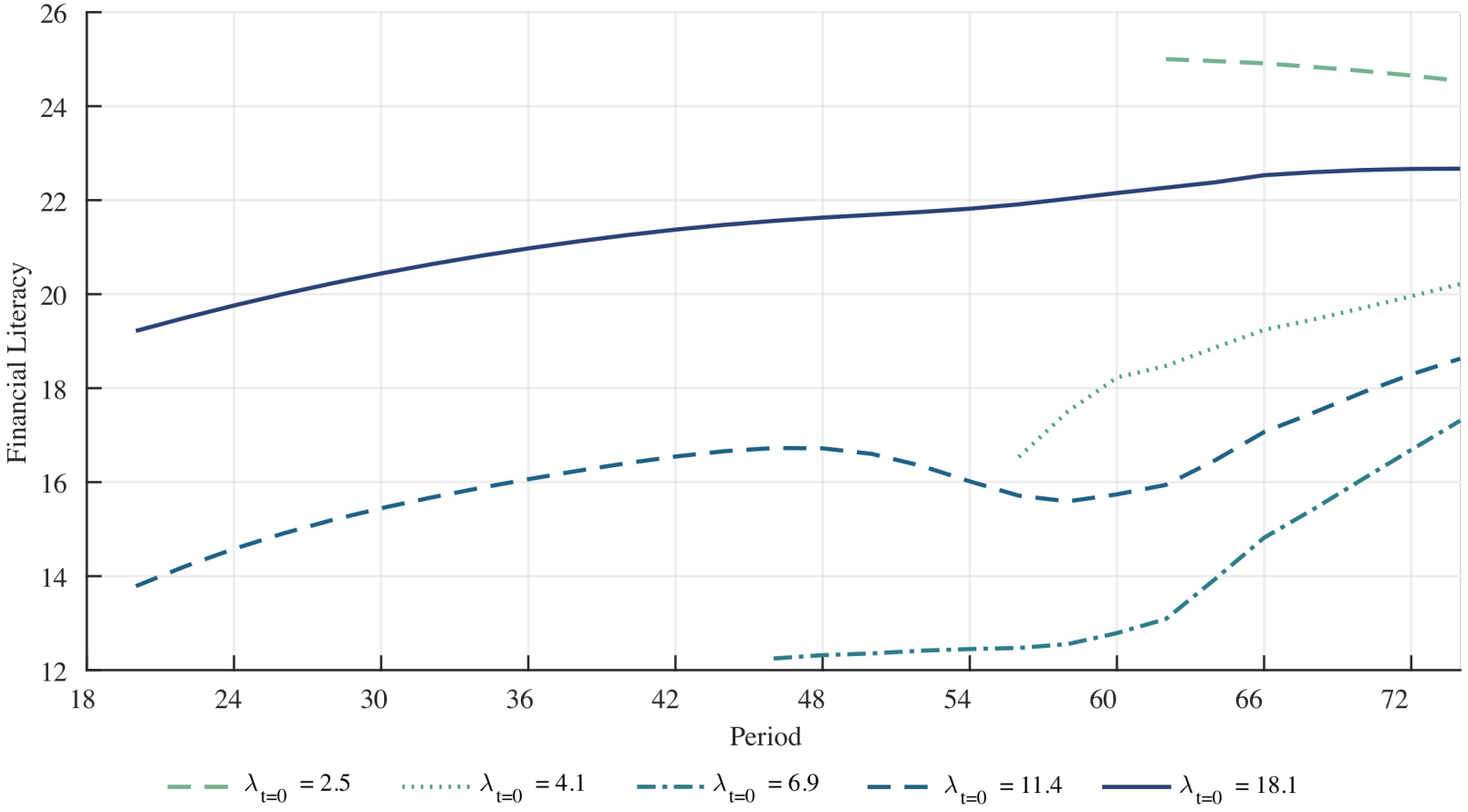


Figure: Financial literacy across cohorts conditional on stock-holding

▸ Steady state

Results (II)

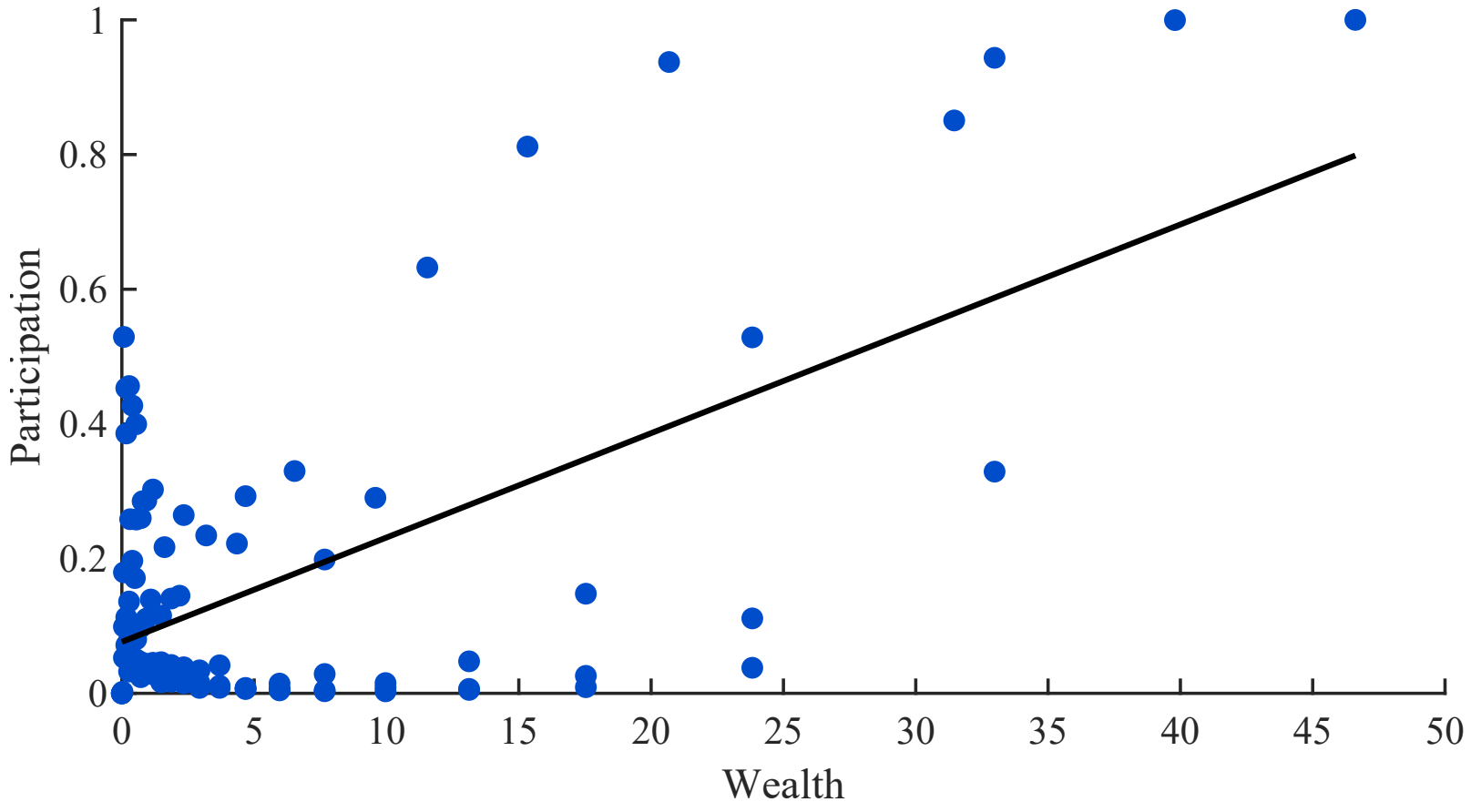
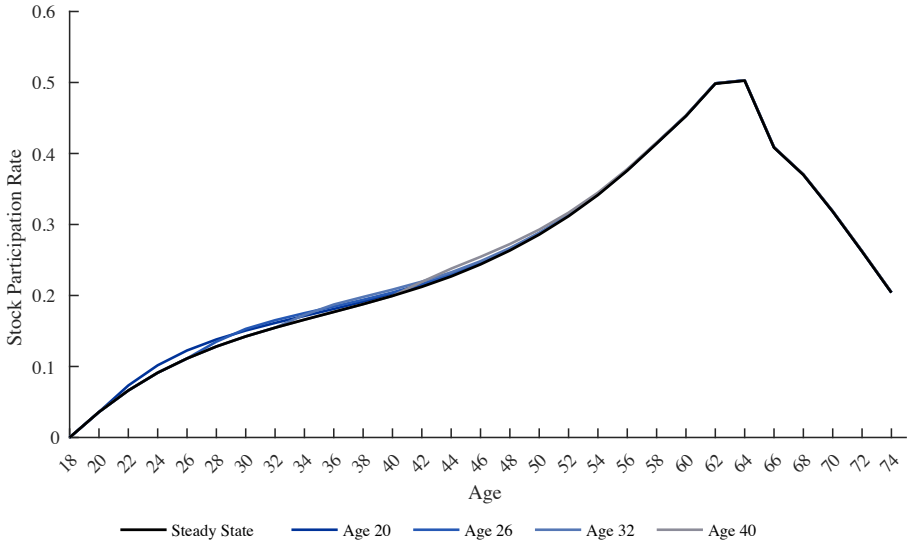


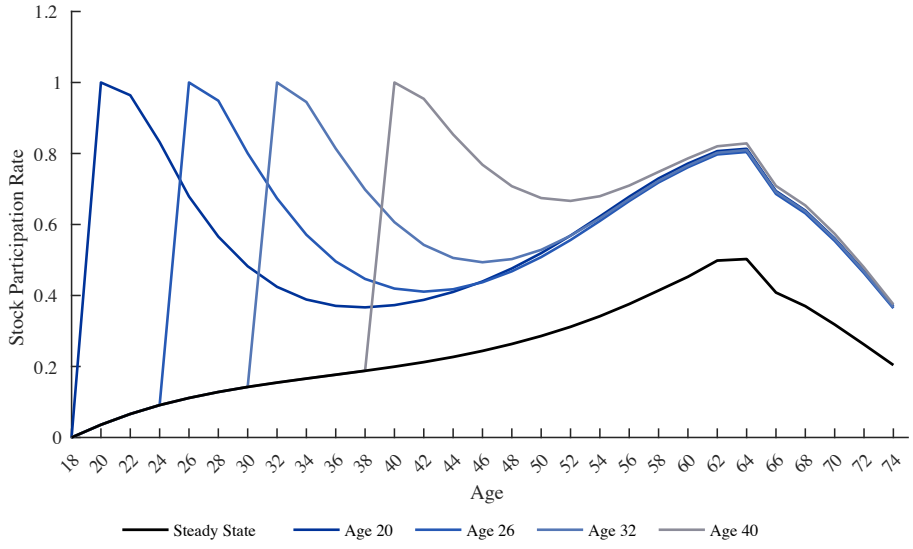
Figure: Model-implied Wealth vs Participation

- Corr(Wealth, Participation) $= 0.59$.

Policy Implications



(a) Cash transfer



(b) Stock transfer

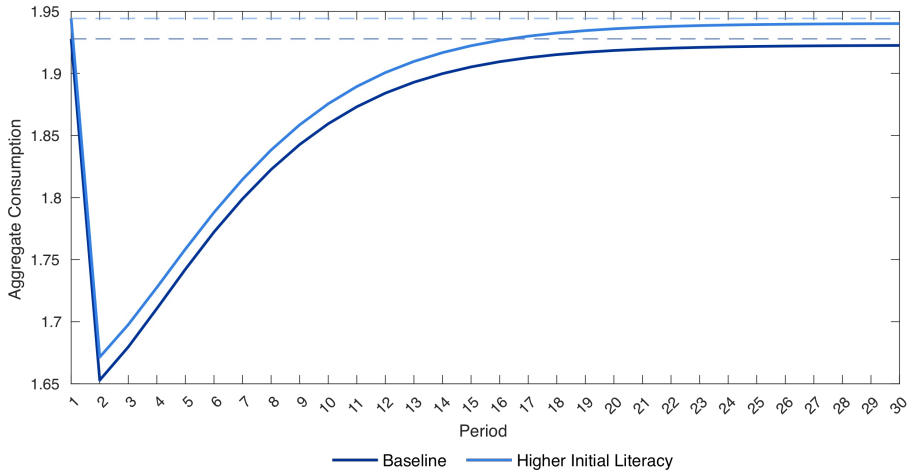
Figure: Cash vs. Stock Transfer by Age: Participation Rates

- Transfers of 0.25 units in cash or stocks.
- By retirement:
  - ➢ Cash transfer: +0.1pp. participation, +0.2% literacy, +0.1% consumption.
  - ➢ Stock transfer: +30pp. participation, +40% literacy, +4.5% consumption.

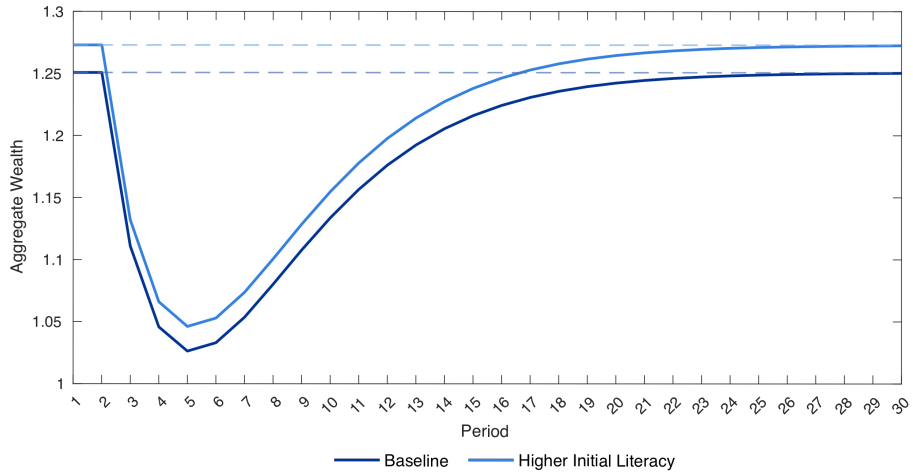
Macroeconomic Shocks

- Consider recessions/shocks in two economies:
  - ➢ Calibrated baseline
  - ➢ Economy where agents start with +25% literacy
- Simulate shocks and recovery through time:
  - ➢ Household income shock - Lower z_t for all agents
  - ➢ One-off 28% drop in stock prices
- Future work: General equilibrium recessions with correlated income and financial shocks.

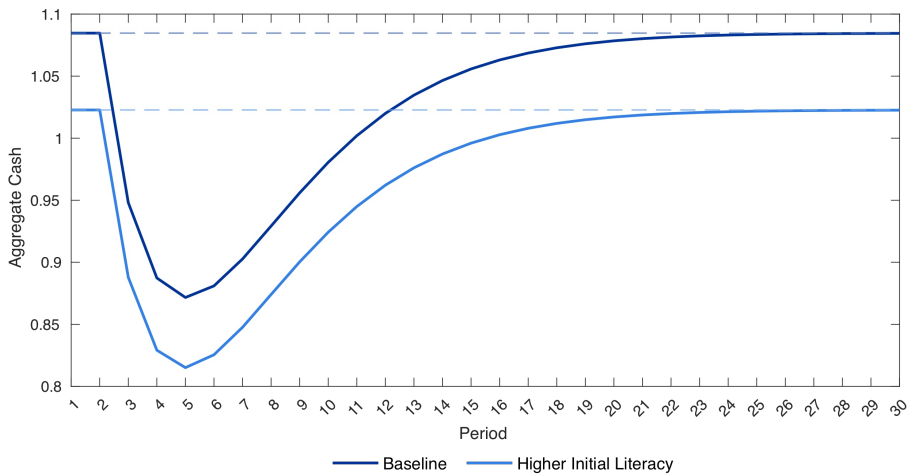
Macroeconomic Dynamics - Income Shock



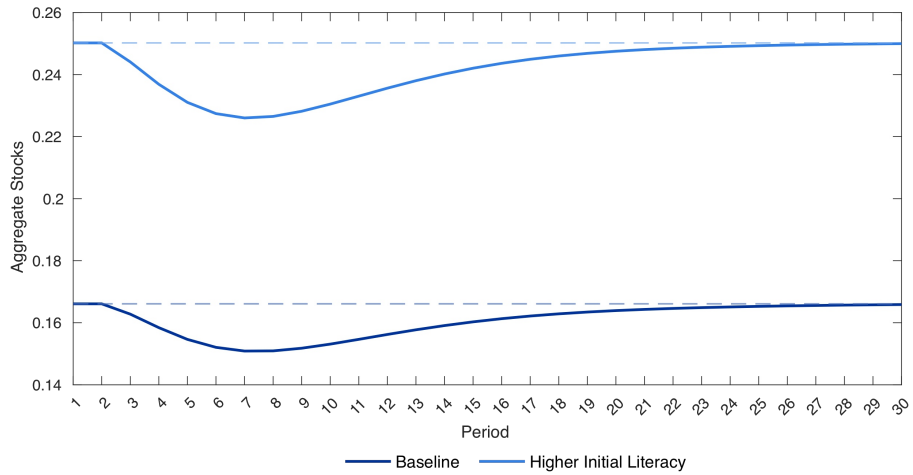
(a) Consumption



(b) Wealth



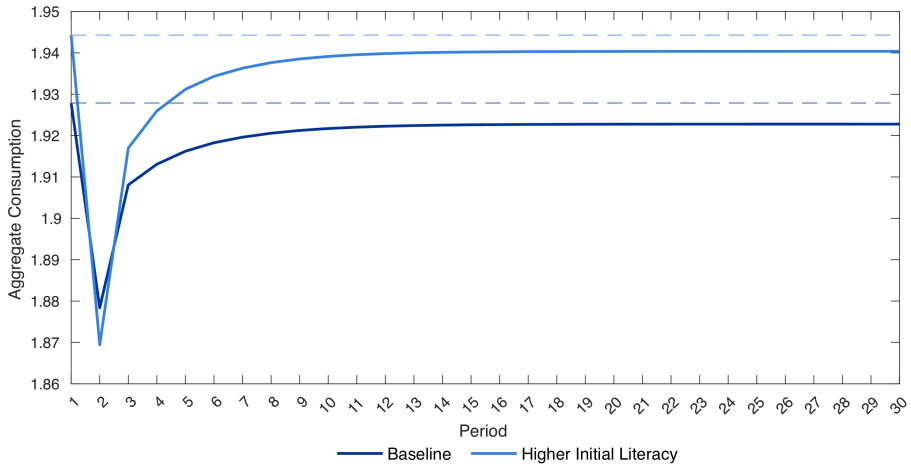
(c) Cash



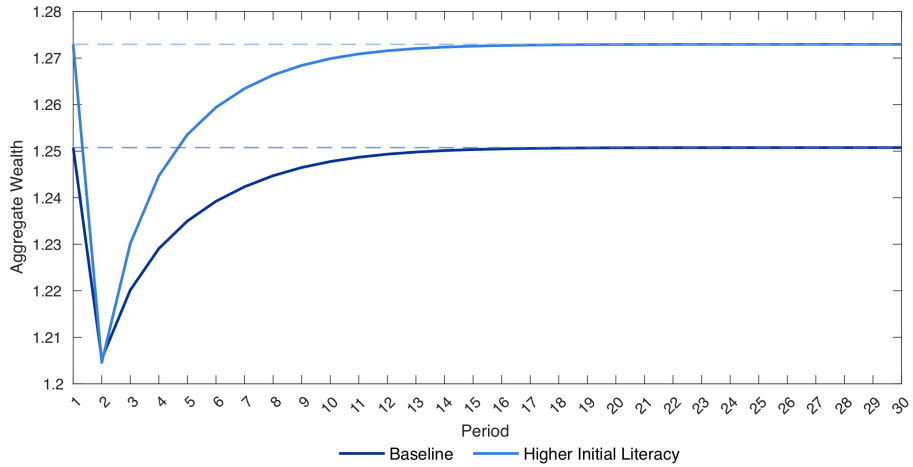
(d) Stocks

Figure: Income Shock - Baseline vs Higher Initial Literacy: Aggregate Moments

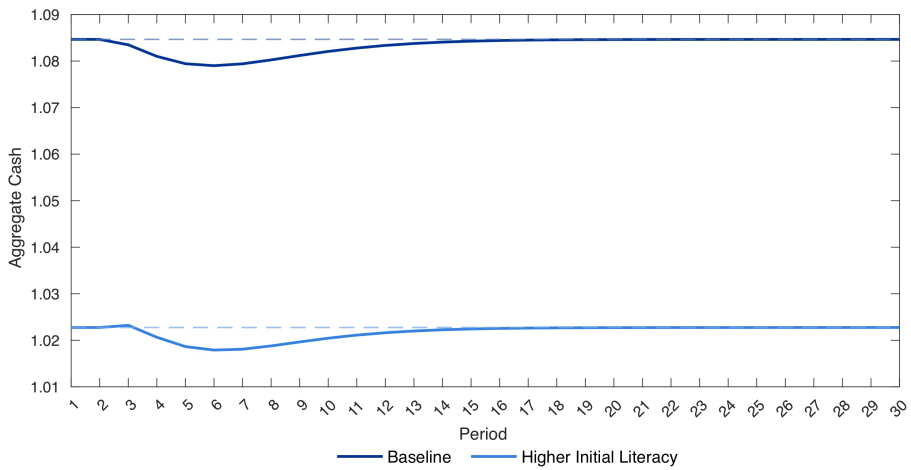
Macroeconomic Dynamics - Financial Shock



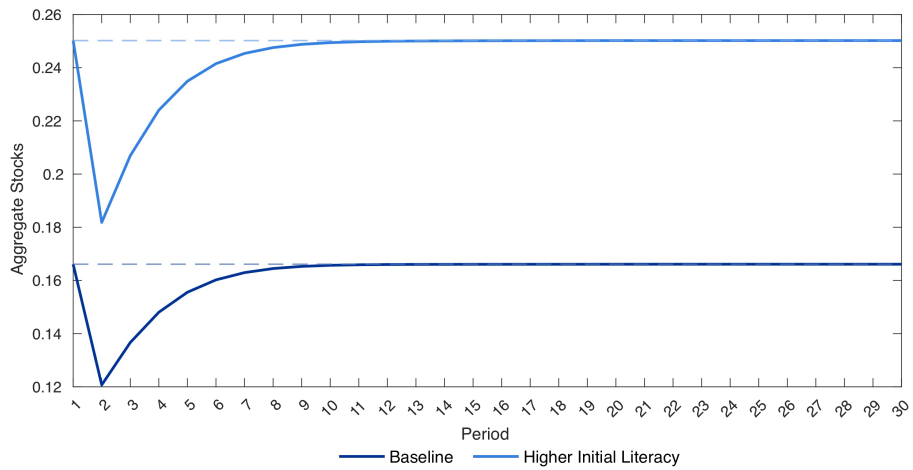
(a) Consumption



(b) Wealth



(c) Cash



(d) Stocks

Figure: Financial Shock - Baseline vs Higher Initial Literacy: Aggregate Moments

Summary

1. **Facts**: UK households hold large cash balances; participation is low even among wealthy households.
2. **Mechanism**: Limited *financial literacy* acts as a non-monetary cost of entering and *scaling up* stock positions.
3. **Model**: Life-cycle model with financial-literacy frictions and endogenous *learning-by-doing*.
4. **Results**:
   - ➢ Matches imperfect wealth–participation gradient.
   - ➢ learning-by-doing narrows gender and education literacy gaps.
   - ➢ Stock (not cash) transfers generate large, persistent gains.
   - ➢ Higher literacy raises wealth and smooths income shocks, but increases exposure to rare asset-price crashes.
5. **Future work**: Embed in general equilibrium with endogenous prices and policy to study macro and distributional effects of higher literacy.

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Appendix

Financial Literacy Questions (FLS 2022)

1. Suppose you put £100 into a savings account with a guaranteed interest rate of 2% per year (with no fees or tax to pay). How much would be in the account at the end of the first year, once the interest payment is made? **72%**

   (Numeric response)

2. And how much would be in the account at the end of five years? **56%**

   More than £110 Exactly £110 Less than £110 Do not know

3. If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have more, less, or the same amount of buying power in a year's time? **63%**

   More The same **Less** Do not know

4. Is the following statement true or false?
   "Buying shares in a single company usually provides a safer return than buying shares in a range of companies." **58%**

   True **False** Do not know

back

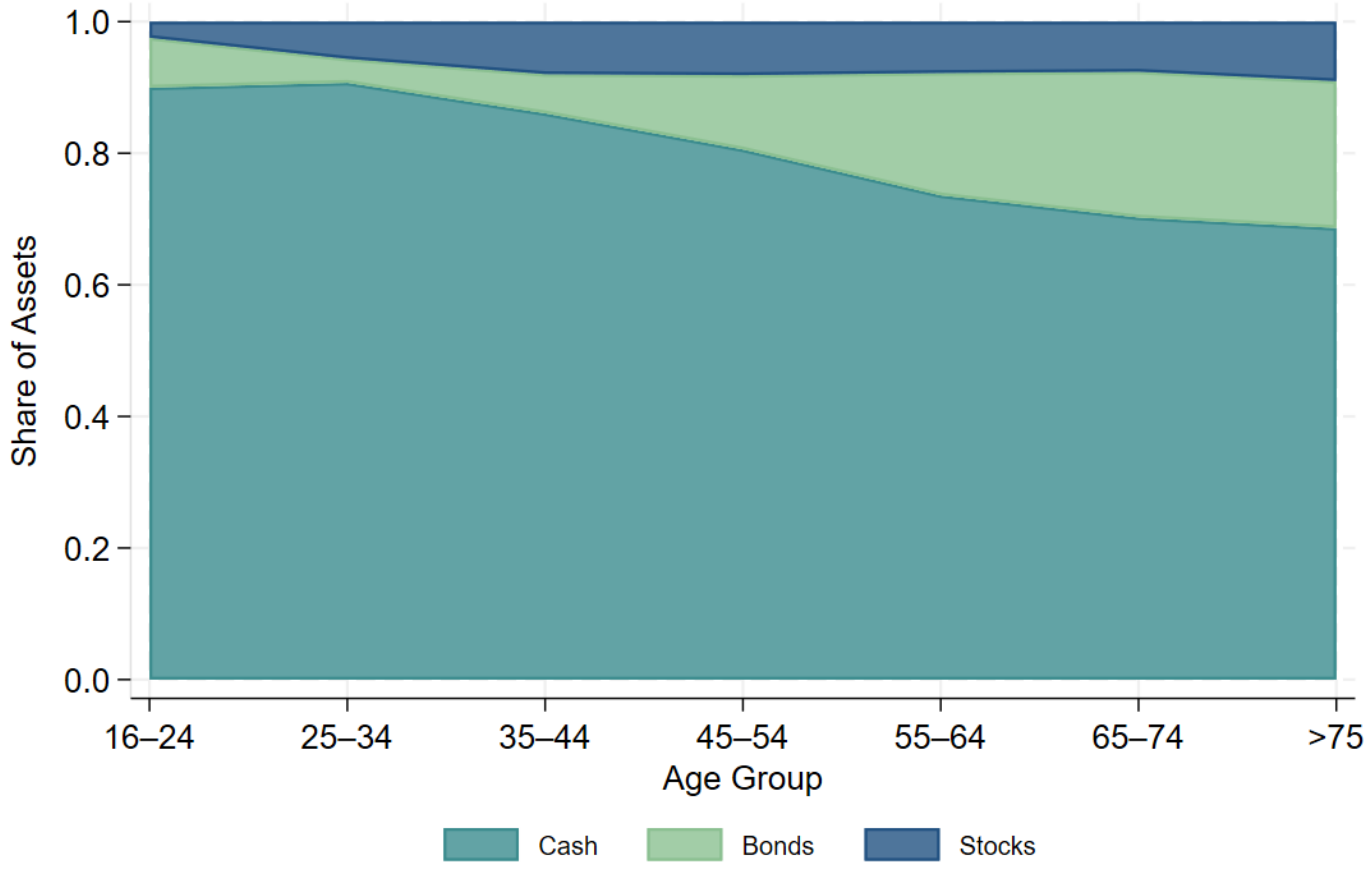
Wealth & Asset Survey - Descriptive Statistics

Table: Descriptive Statistics of Household Income and Wealth Variables in 2020 (in £000's)

	Mean	**Std. Dev.**	**P10**	**P50**	**P90**	**N**
Income						
Gross income	44.1	41.3	13.0	33.7	85.3	11,341
Net Wealth						
Property wealth	264.2	327.4	0.0	190.0	600.0	11,341
Financial wealth	100.5	244.9	-2.0	25.6	284.0	11,340
Financial Assets						
Stocks	4.5	20.5	0.0	0.0	5.0	11,341
Bonds	8.5	53.9	0.0	0.0	10.5	11,341
Cash and deposits	44.5	86.4	0.3	14.0	118.8	11,341

Portfolio Allocation

Figure: Share of Average Portfolio

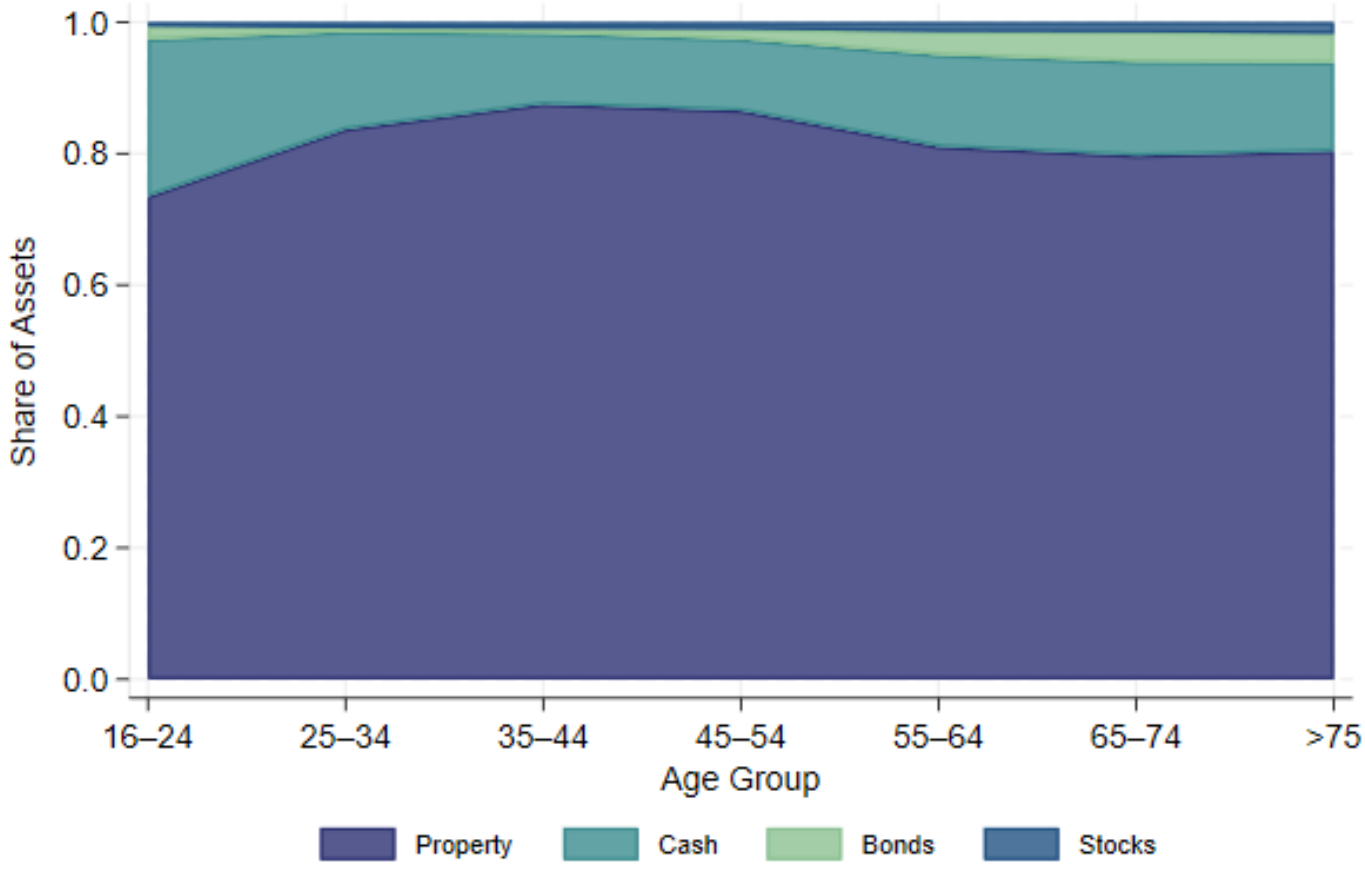


Source: Wealth and Assets Survey (2020)

▸ Include Property

Portfolio Allocation incl. Property

Figure: Share of Average Portfolio (Including Property)



Source: Wealth and Assets Survey (2020)

Portfolio Allocation incl. Property (Aggregate Share)

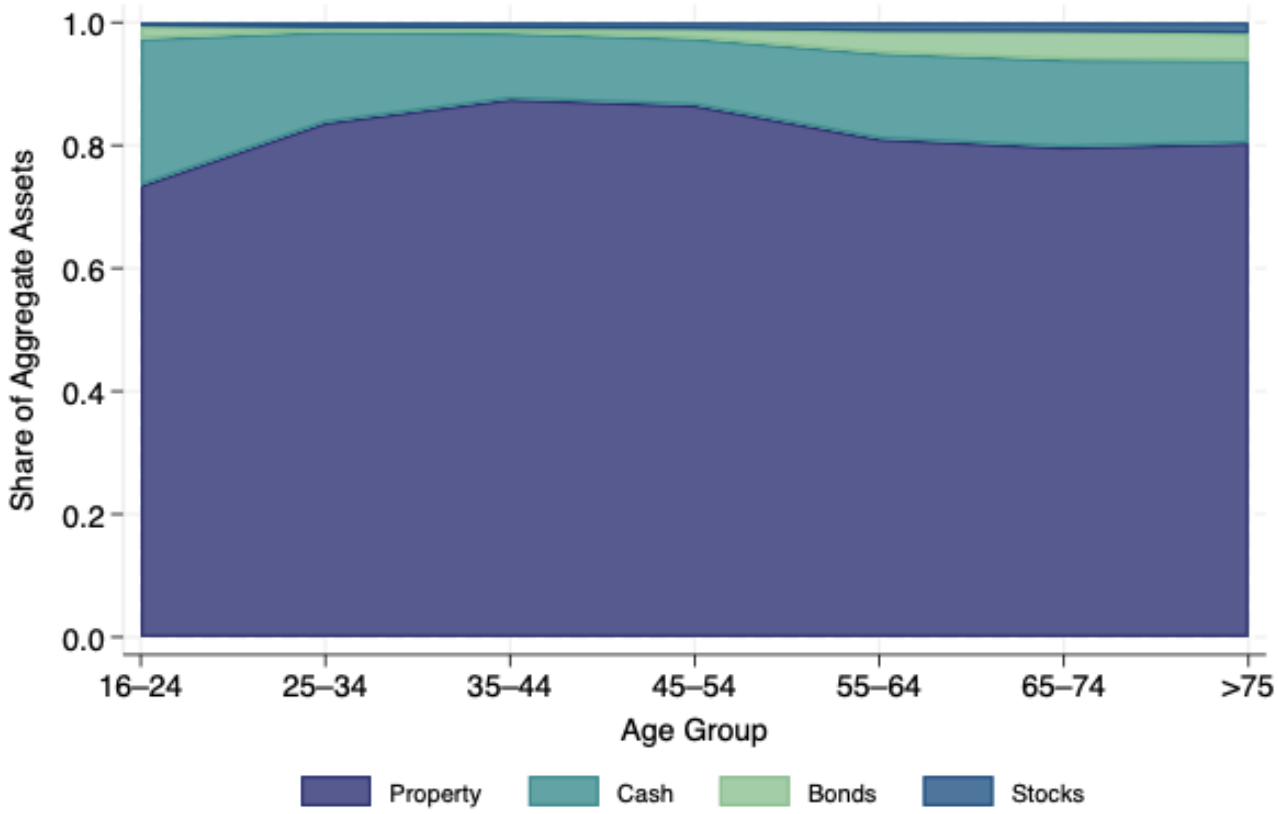


Figure: Share of Aggregate Household Assets by Age Group (Including Property)

Source: Wealth and Assets Survey (2020)

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Literacy Scores by Group

Table: Mean Financial Literacy Scores by Demographic Group and Interactions

	Mean	Std. Dev.	N
Gender			
Male	3.29	0.95	14,717
Female	2.80	1.09	13,340
Gender × Education Level			
Lower Secondary			
Male	2.93	1.07	2,016
Female	2.54	1.11	2,290
Upper Secondary			
Male	3.22	0.95	4,280
Female	2.71	1.09	3,427
Tertiary			
Male	3.58	0.75	7,667
Female	3.07	1.01	6,949
Stock Ownership			
No Stocks	2.91	1.08	20,467
Has Stocks	3.52	0.76	7,824
Inheritance (last 12 months)			
Received Inheritance	3.38	0.90	949
No Inheritance	3.04	1.05	27,369

Source: FLS, 2022

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