

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

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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.

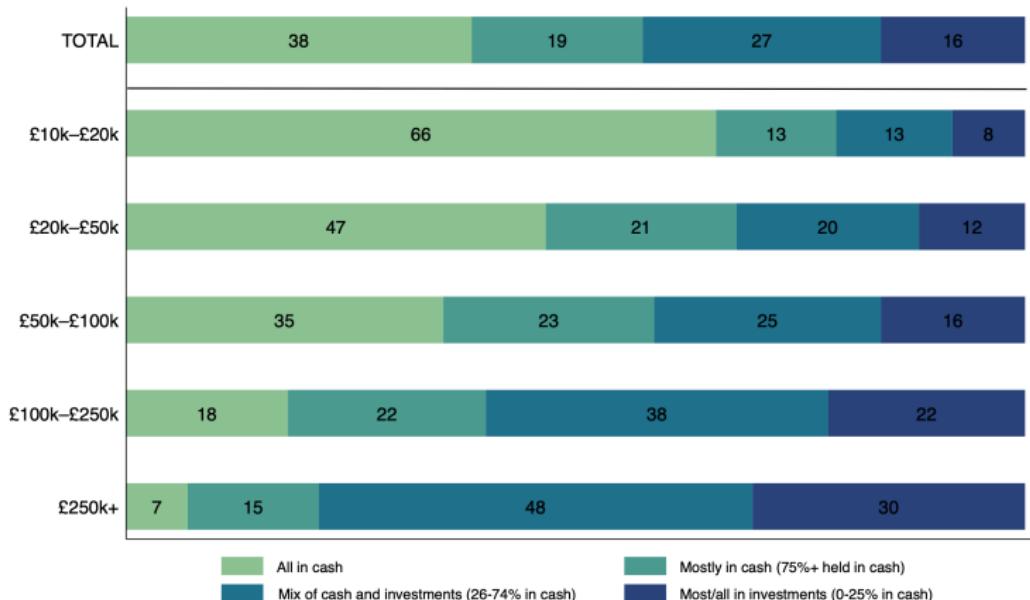
Data

- **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 investable assets.



Source: FLS, 2022

Figure: Proportion investing by level of investable assets.

Extensive Margin

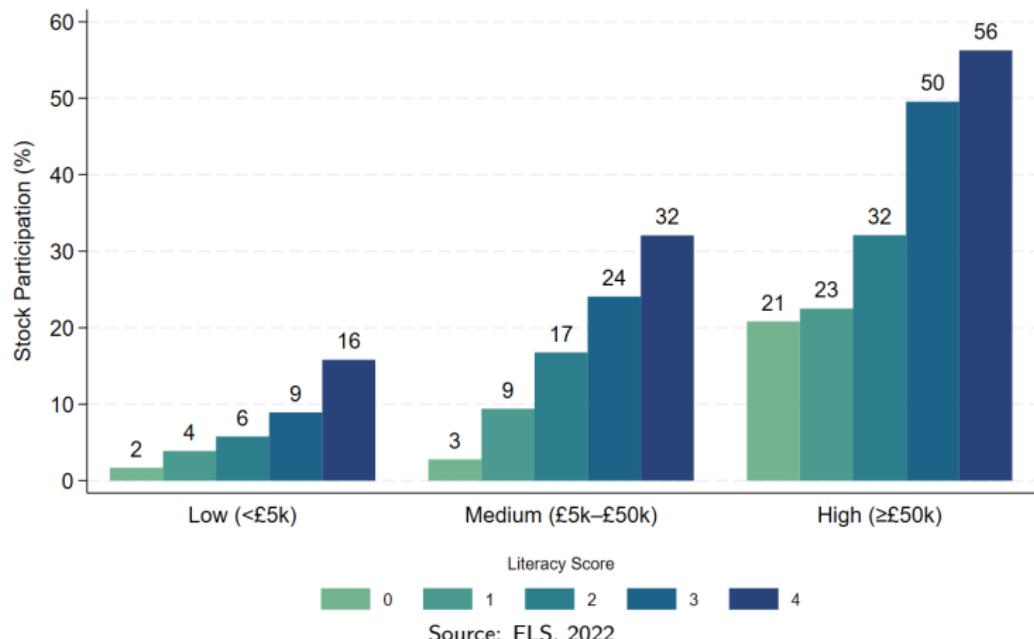


Figure: Stock participation by assets and financial literacy.

Average participation rates: 6.2%, 26.2%, and 53.1%.

Average financial literacy scores: 2.7, 3.2, and 3.6.

Intensive Margin

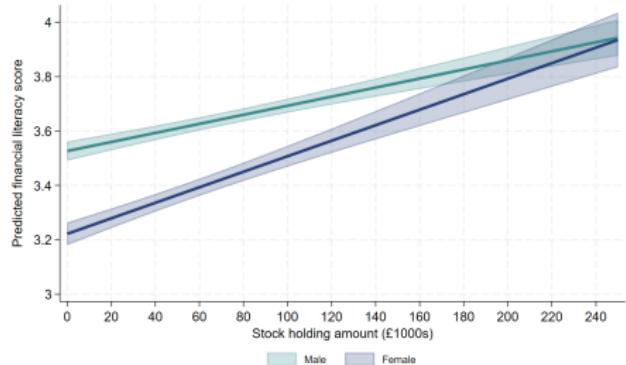


Source: FLS, 2022

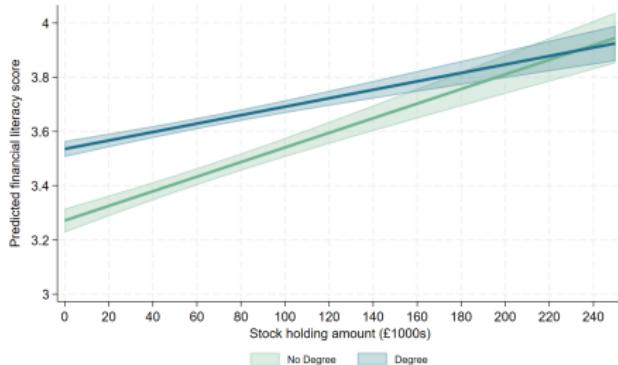
Figure: Share of cash assets by assets and financial literacy.

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.

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:

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

- 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

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

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

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

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

- $\text{OwnsStocks}_i = 1$ if $\text{OwnsStocks}_i^* > 0$.
- 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*** (0.09)	1.36*** (0.12)	1.31*** (0.11)	0.85** (0.37)	0.87*** (0.27)
Female	-0.35*** (0.03)	-0.40*** (0.03)	-0.39*** (0.03)	-0.51*** (0.06)	-0.47*** (0.04)
Has Degree		0.36*** (0.03)	0.34*** (0.03)	0.51*** (0.06)	0.46*** (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.
<i>Overall Sample</i>		
All individuals	0.3574	0.0184
<i>By Gender</i>		
Male	0.3181	0.0140
Female	0.3998	0.0406
<i>By Education (Degree)</i>		
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.

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

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:

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

- 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:

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

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:

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

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

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

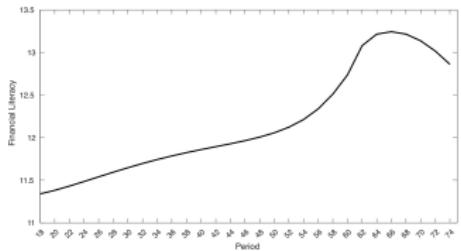
	Description	Value	Target / Source
<i>External Parameters</i>			
r^m	Cash return (two-year)	0.0183	Average deposit rate, 2011–2025
$\mathbb{E}[r^s]$	Mean equity return (two-year)	0.2090	FTSE All-World, 2003–2025
σ^s	Std. dev. of equity returns	0.2410	FTSE All-World, 2003–2025
ρ_0^z	Constant in log-productivity	-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
<i>Internal Parameters</i>			
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
δ	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

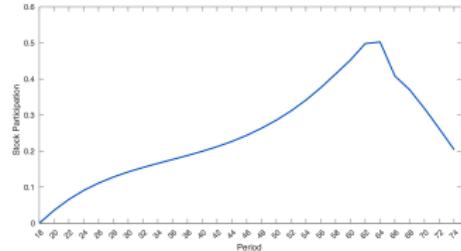
Table: Model Performance – Targeted Moments

	Model	Target	Source
<i>A. Stock Market Participation</i>			
Overall participation rate	24%	22%	FLS – 2022
Participation rate (Under age 25)	7%	7%	FLS – 2022
Participation rate (Retirees)	34%	28%	FLS – 2022
<i>B. Wealth Distribution</i>			
Households with zero financial assets	11%	12%	FLS – 2022
Cash-to-stock asset ratio	7.48	9.88	WAS 2020
<i>C. Financial Literacy Ratios</i>			
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

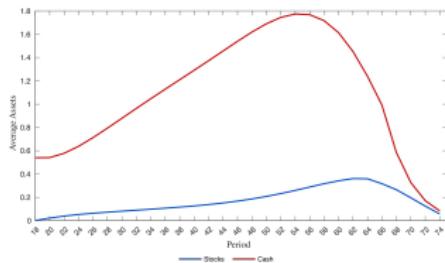
Steady-state Results



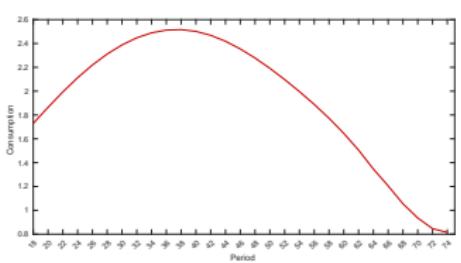
(a) Financial literacy



(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 .

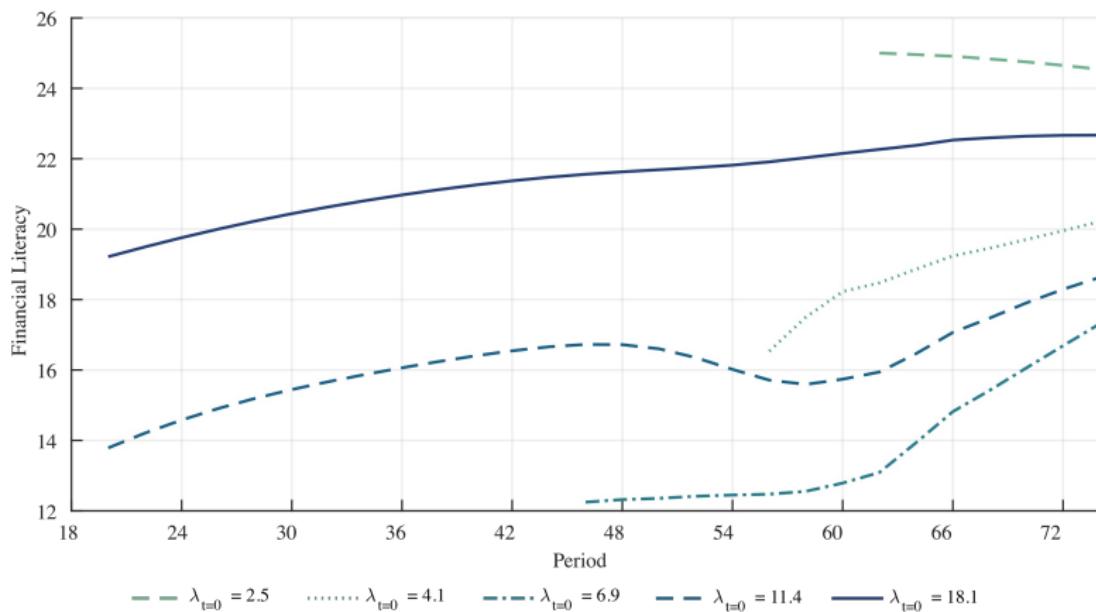


Figure: Financial literacy across cohorts conditional on stock-holding

Results (II)

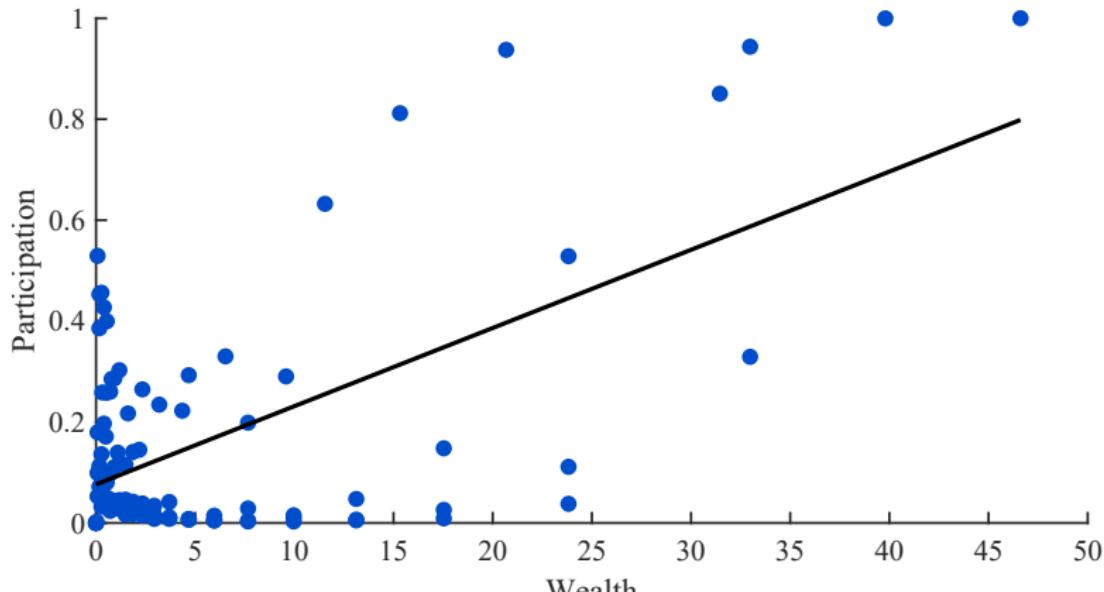
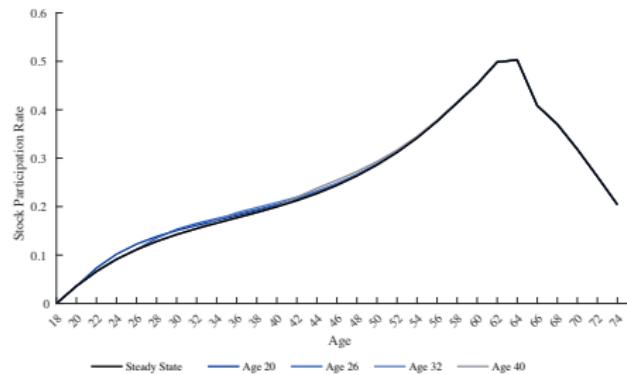


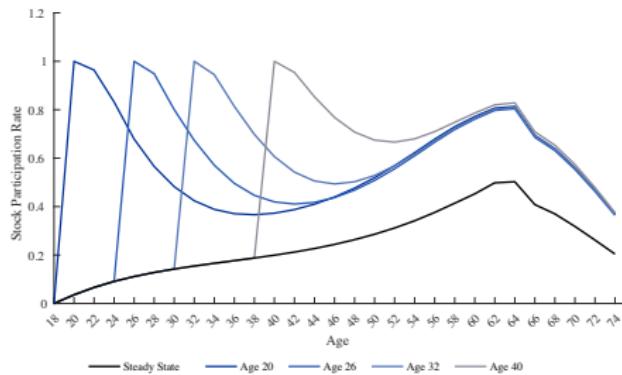
Figure: Model-implied Wealth vs Participation

- $\text{Corr}(\text{Wealth}, \text{Participation}) = 0.59$.

Policy Implications



(a) Cash transfer



(b) Stock transfer

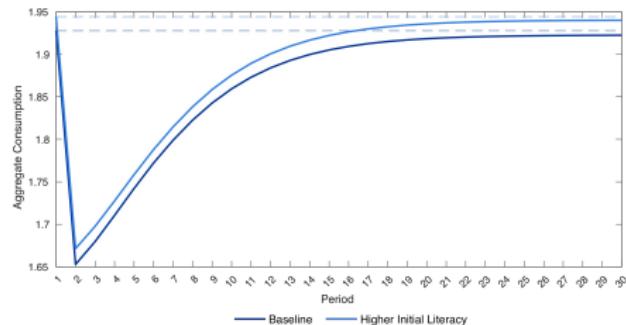
Figure: Cash vs. Stock Transfer by Age: Participation Rates

- 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.

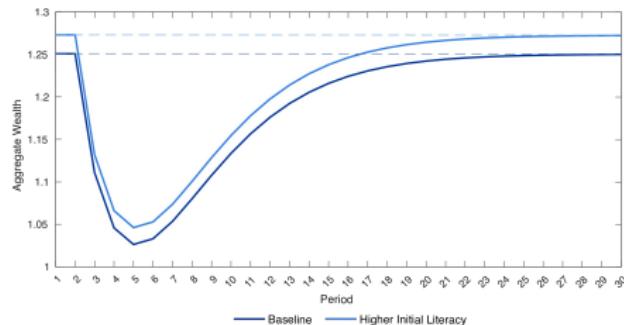
Macroeconomic Shocks

- 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.

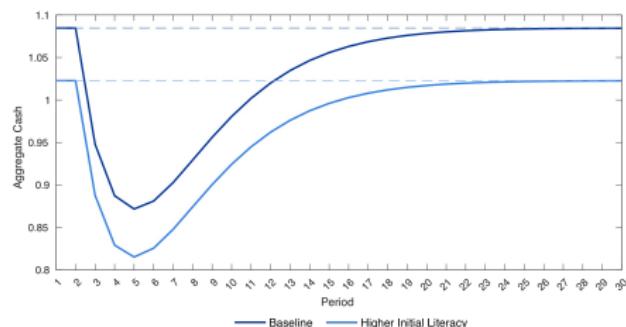
Macroeconomic Dynamics - Income Shock



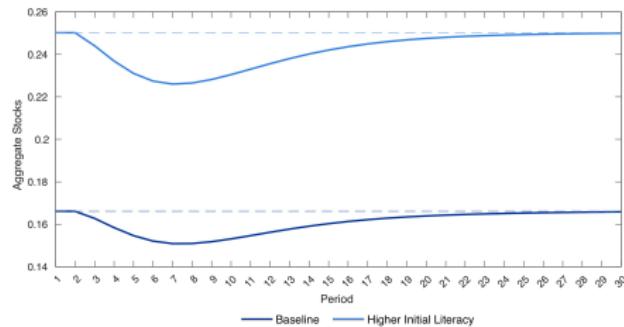
(a) Consumption



(b) Wealth



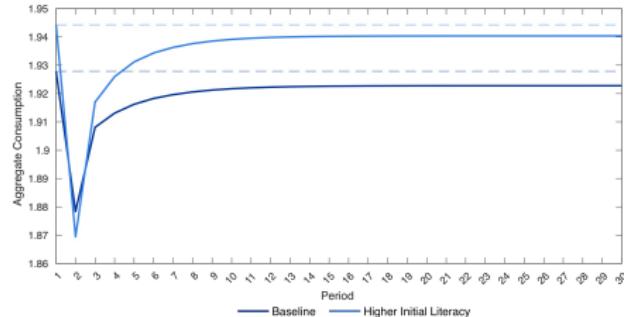
(c) Cash



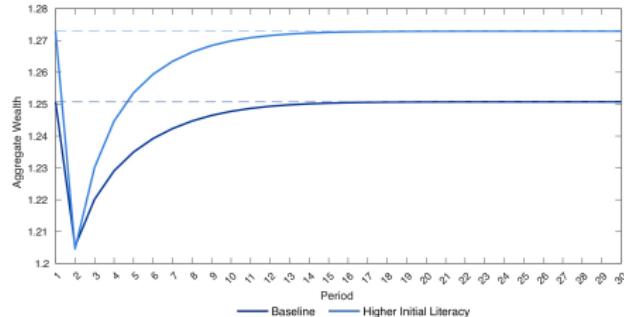
(d) Stocks

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

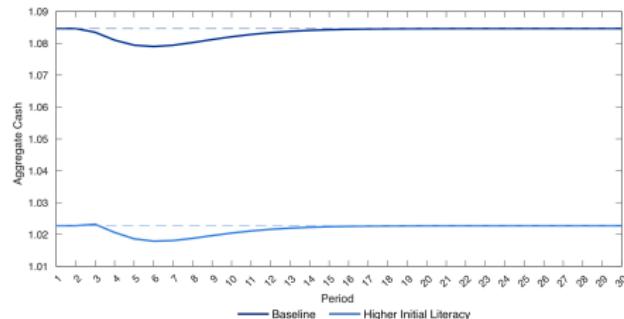
Macroeconomic Dynamics - Financial Shock



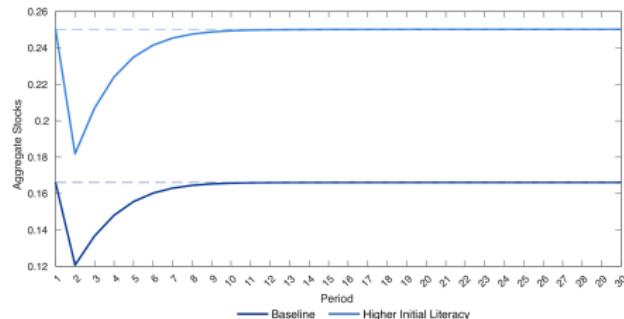
(a) Consumption



(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

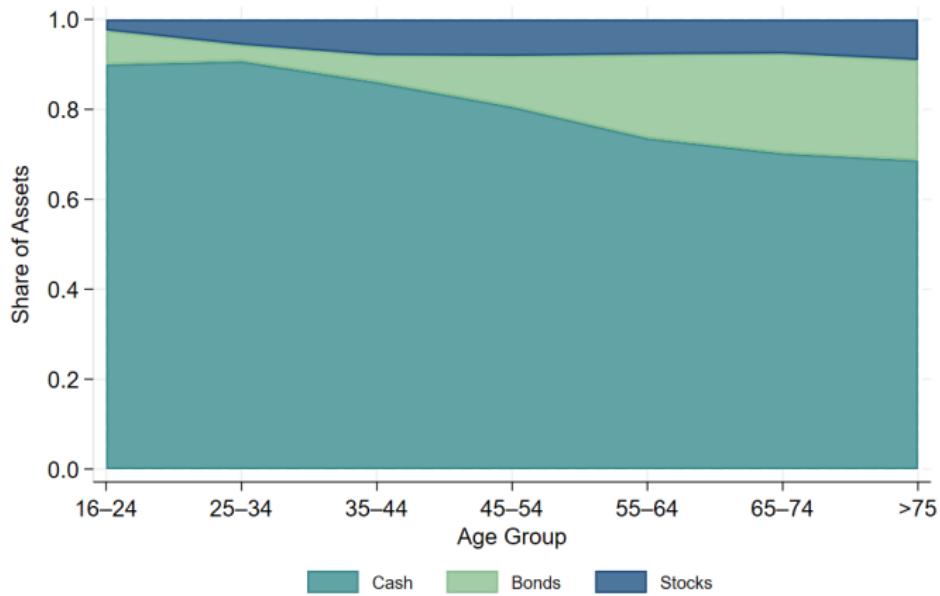
Wealth & Asset Survey - Descriptive Statistics

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

	Mean	Std. Dev.	P10	P50	P90	N
<i>Income</i>						
Gross income	44.1	41.3	13.0	33.7	85.3	11,341
<i>Net Wealth</i>						
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
<i>Financial Assets</i>						
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

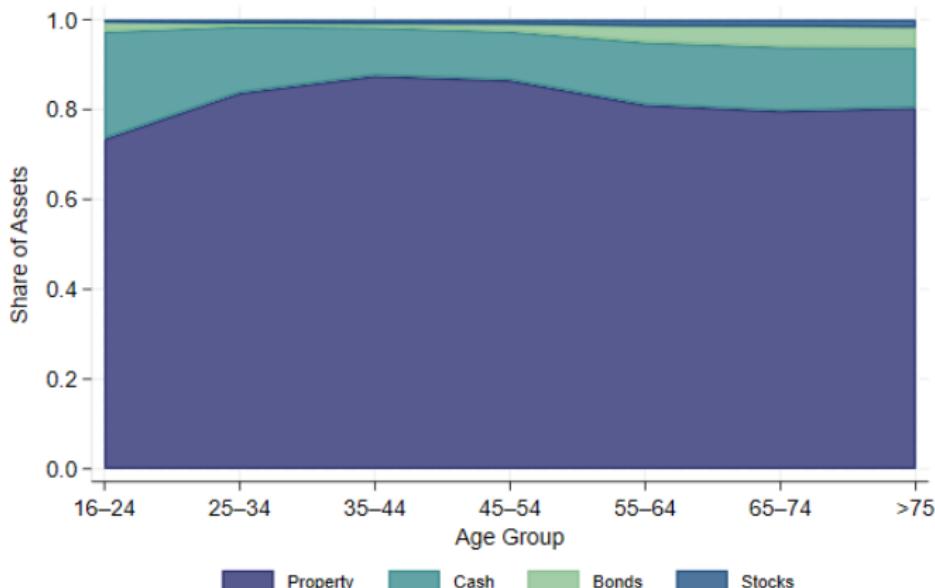


Source: Wealth and Assets Survey (2020)

► 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)

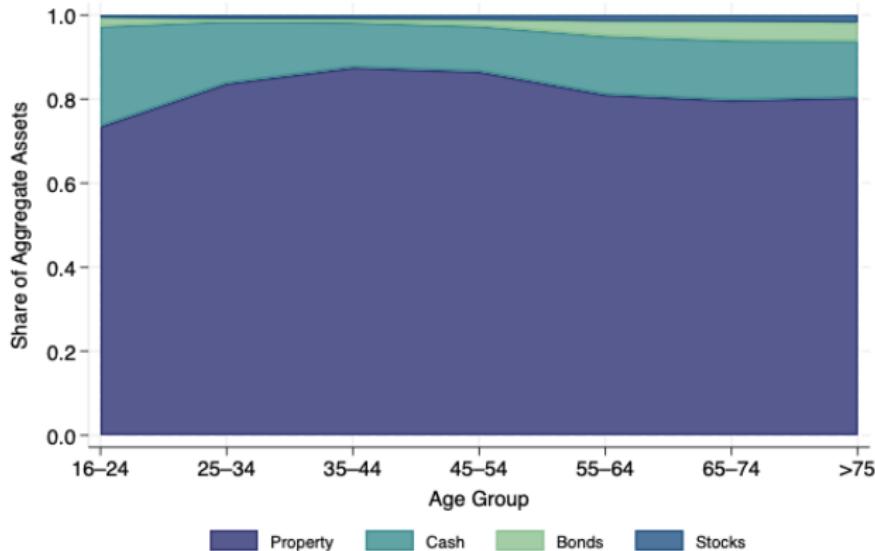


Figure: Share of Aggregate Household Assets by Age Group (Including Property)

Source: Wealth and Assets Survey (2020)

Literacy Scores by Group

Table: Mean Financial Literacy Scores by Demographic Group and Interactions

	Mean	Std. Dev.	N
<i>Gender</i>			
Male	3.29	0.95	14,717
Female	2.80	1.09	13,340
<i>Gender × Education Level</i>			
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
<i>Stock Ownership</i>			
No Stocks	2.91	1.08	20,467
Has Stocks	3.52	0.76	7,824
<i>Inheritance (last 12 months)</i>			
Received Inheritance	3.38	0.90	949
No Inheritance	3.04	1.05	27,369

Source: FLS, 2022