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

(Abridged Version)

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Abstract

Only 22% of UK households hold stocks. Even among those with substantial savings, many keep the majority of their wealth in low-yield cash accounts. This paper argues that financial-literacy frictions, rather than monetary participation costs, are central to understanding who participates in equity markets and how they allocate wealth. Using the FCA Financial Lives Survey, we show that, conditional on wealth, stock-market participation is strongly increasing in financial literacy, while the share of the portfolio held in cash falls with literacy. We also document that large, early-life literacy gaps by gender and education narrow with the amount invested in non-cash assets, consistent with learning-by-doing. We develop a calibrated life-cycle model in which literacy is a non-monetary participation friction that accumulates endogenously through stock-market experience. The model reproduces the imperfect wealth–participation correlation observed in the data, with some high-literacy, low-wealth households entering and some high-wealth, low-literacy households remaining out. Policy experiments show that early-life literacy interventions and stock (rather than cash) transfers can raise long-term participation, literacy, and retirement consumption, enhancing resilience to income shocks while increasing exposure to financial shocks.

Keywords: Learning-by-doing, Financial Literacy, Stock Participation, Household Finance.

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1 Introduction

Over the past decade, global equities have delivered average annual returns of around 9%, compared with roughly 0.9% on UK cash deposit accounts. Yet only around one-in-five UK households hold stocks as part of their savings and investment portfolio. One might suspect that most households simply lack the balances required to invest in risky assets. However, among the roughly 40% of households with more than £10,000 in savings and investments, 38% keep the entirety of these assets in cash. These patterns suggest that many households, including relatively wealthy ones, systematically forgo the higher expected returns available on equity investments in favor of low-yield cash accounts.

A standard explanation for limited stock-market participation is the presence of fixed entry or per-trade costs, which can make stock-holding unattractive for households with modest wealth. In the current UK environment, however, this explanation is less compelling. Over the past decade, the expansion of commission-free trading platforms has sharply reduced direct participation costs. Trading 212 and Freetrade, for example, have offered commission-free trading accounts in the UK since 2018 and allow households to open an account with as little as £1.

In this paper, we will study the role of financial literacy frictions in shaping both the extensive and intensive margins of stock-market participation, and we analyze how learning-by-doing through stock-holding can narrow literacy gaps over the life cycle, improving household outcomes. We will embed our empirical findings on how financial literacy varies across households and how it interacts with stock-holdings into a life-cycle model with endogenous financial literacy, where literacy operates as a non-monetary participation friction and accumulates through experience in equity markets.

Financial literacy is highly heterogeneous across households and strongly related to investment behavior (see, e.g., van Rooij et al., 2011). We find large gaps by gender and education, in line with Cota et al. (2025), and these gaps are tightly linked to both stock-market participation and portfolio composition. Conditional on wealth, participation is monotonically increasing in the number of correct answers to the standard literacy questions, while the share of the portfolio held in cash declines. Among households with above £50,000 in assets, participation rises from roughly 20% when no literacy questions are answered correctly to more than 50% when all four are correct. On the intensive margin, even those with more than £250,000 in assets hold about 70% of their portfolio in cash when they score zero or one out of four, compared with roughly 45% when they score four out of four.

The notion of limited participation dates back to Mankiw and Zeldes (1991) and Haliassos and Bertaut (1995), with the latter emphasizing informational frictions. Much of the subsequent quantitative literature has modeled these frictions as monetary participation costs, either fixed entry fees or per-period holding costs (see, e.g., Alan, 2006; Vissing-Jorgensen, 2002). While such costs can rationalize low participation among low-wealth households, they struggle to explain why many high-wealth households still avoid equities or hold only small positions. They also imply a tight wealth–participation link that is at odds with the coexistence of low-wealth but high-literacy stockholders and high-wealth but low-literacy non-participants in the data.

A related strand of work endogenizes financial knowledge. Lusardi et al. (2017) develop an influential life-cycle model in which households spend monetary resources on financial knowledge that raises the return on sophisticated assets, amplifying wealth inequality; Cota et al. (2025) apply a similar framework to study gender gaps. In these settings, acquiring literacy is primarily a budgetary choice tightly linked to income and wealth, and learning-by-doing enters in reduced form, for example through an indicator for holding any risky asset. By contrast, empirical work (e.g., Frijns et al., 2014; Mandell, 2008) shows that hands-on experience with financial products and stock-market games can be especially effective in raising literacy, over and above classroom-style training. Cota et al. (2025) find that life-cycle events (such as divorce, spousal illness, or widowhood) raise women's literacy in a way consistent with learning-by-doing.

Our empirical evidence and modeling approach build on and extend these insights in three ways. First, we empirically document that, even after controlling for wealth and other observables, financial literacy is monotonically related to both stock-market participation and the share of wealth held in non-cash assets. Interestingly, literacy gaps by gender and education narrow with the amount invested in risky assets.

Second, we develop a partial-equilibrium life-cycle model in which households choose consumption, cash, and equity holdings, and financial literacy evolves endogenously through a learning-by-doing mechanism. Literacy acts as a non-monetary participation friction, entering the decision problem through the perceived costs and complexity of stock-market participation rather than through the budget constraint. Low-literacy households face high costs of entering or expanding stock positions, whereas high-literacy households find it easy to participate even when wealth is modest. Learning-by-doing raises literacy both from holding stocks and from increasing stock positions, making additional investment easier. We show that the model reproduces this imperfect correlation between wealth and participation.

Third, we use the model to study policy and aggregate implications of endogenous financial literacy, focusing on age-targeted literacy interventions, equal-sized cash versus stock transfers, and aggregate income and return shocks. Literacy programs that raise latent literacy by 25% have sizable participation and wealth effects over the life, and modest but systematically larger effects when delivered earlier in life, because they generate more years of participation and learning-by-doing. Cash transfers of have negligible long-run effects on participation and literacy, whereas stock transfers of equal size have powerful and persistent effects: they mechanically induce entry, push households along the learning-by-doing curve, and raise participation, literacy, and consumption at retirement. Higher literacy and participation also improve resilience to income shocks, as households enter downturns with higher wealth and smoother consumption, but at the cost of greater exposure to rare asset-price crashes and larger short-run consumption drops after adverse return shocks.

2 Data

Both the empirical analysis and model calibration draw on two UK household datasets. Our primary source is the FCA Financial Lives Survey 2022 (FLS; FCA, 2022), which is a repeated cross-section that records UK adults' financial products, behaviors, and attitudes. A key feature for our purposes is the inclusion of four standard financial literacy questions based on Lusardi and Mitchell (2008); correct responses indicate understanding of these topics (see Online Appendix A.1).

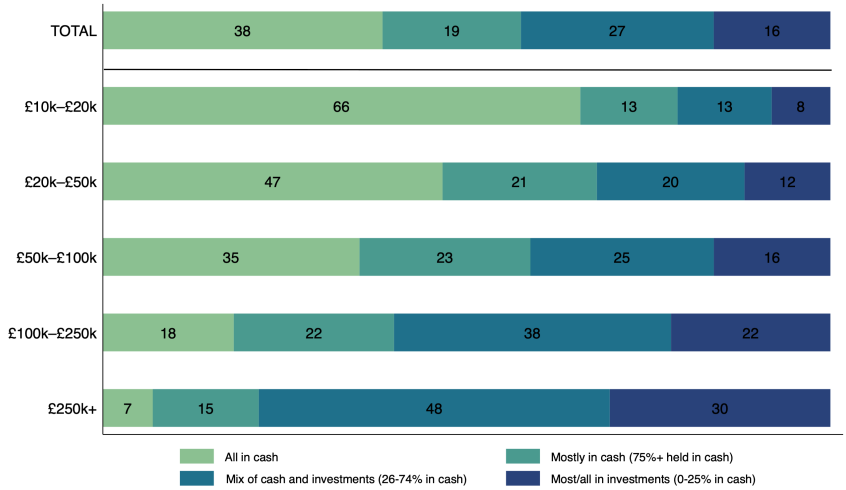
Around 38% of households report at least £10,000 in investable assets, while roughly 35% hold less than £1,000, suggesting limited financial resilience for a sizable group of households.[1] For households with investable assets above £10,000, the FLS asks about the "propensity to invest" in non-cash assets, that is, the percentage of investable assets held in cash. Figure 1 shows the distribution of responses by asset group. Even in this higher-wealth subsample, about 38% hold all of their investable assets in cash and a further 19% hold at least three quarters in cash, pointing to a strong inclination towards cash even among relatively wealthy households.

We complement the FLS data with the UK Wealth and Assets Survey (WAS; Office for National Statistics, 2023), a longitudinal survey with detailed information on asset, debt, and income amounts. As households can be followed across waves, the WAS is particularly useful for characterizing income dynamics and portfolio evolution. We use these moments to calibrate the income process and the split between cash and risky assets in our model (Section 4.1).[2]

[1] Investable assets are defined as the sum of liquid savings in current accounts and cash savings products, plus the current market value of any investment products held, excluding primary residences and defined contribution pensions but including investment properties (FCA, 2023). See Online Appendix Figure A1 for the full distribution of investable assets.

[2] Online Appendix Table A1 reports summary statistics for key income and wealth variables in Wave 7 (2020).

Figure 1: Propensity to Invest by Investable Assets Category



Notes: The figure reports, for each category of investable assets above £10,000, the fraction of households responding to each category of "propensity to invest": (1) All in cash, (2) Mostly in cash (75%+ in cash), (3) Mix of cash and investments (26–74% in cash), (4) Mostly in investments (0–25% in cash).

3 Financial Literacy and Learning-by-Doing

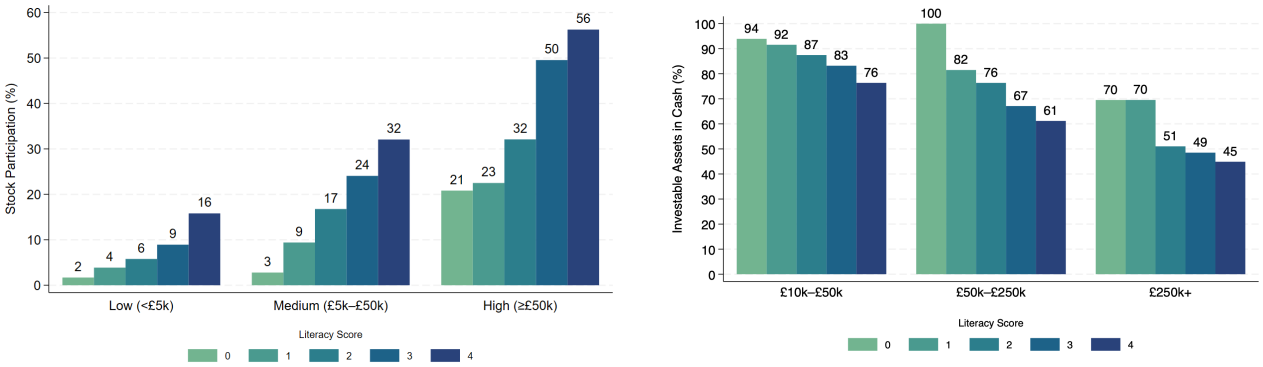
As has been widely documented in the literature, there is substantial heterogeneity in financial literacy across subgroups. In line with existing literature, we find that women display systematically lower financial literacy than men: on average, men answer 3.29 out of four questions correctly, compared with 2.80 for women. Furthermore, individuals with higher education have higher literacy (3.34 for those with tertiary education compared to 2.99 and 2.72 for upper and lower secondary education, respectively), and that the gender gap persists within each educational category. Furthermore, we see that stockholders have higher literacy than those without stocks (3.52 compared to 2.91). These can be seen in Online Appendix Table A2.

Figure 2a shows stock-market participation rates by aggregated investable-asset group and by financial literacy score. While participation increases monotonically across wealth groups, the more striking point, however, is the heterogeneity *within* asset groups. Among respondents with more than £50,000 in investable assets, only 21% of those who answer zero of the four financial literacy questions correctly hold stocks, compared with 56% among those who answer all four correctly. Similarly, participation rises from 2% to 16% in the low-asset group and from 3% to 32% in the medium-asset group as financial literacy increases from zero to four correct answers. Even among households with less than £1,000 in assets, 5% of those with the highest literacy scores hold stocks. While financial costs may plausibly deter stock-market entry among low-wealth households, they cannot, however, account for the persistently low participation among wealthy individuals with very low literacy. Instead, these patterns point to non-monetary frictions, most notably limited financial literacy, as a key barrier to stock-market participation.

We now turn to the intensive margin. Figure 2b tells a similar story to that of Figure 2a: average cash shares decline with the level of investable assets, but there is substantial within-group variation in cash holdings by financial literacy.[3] Households with higher financial literacy hold a smaller percentage of their portfolio in cash and, thus, a larger share in non-cash investments; higher financial literacy is related not only to the extensive margin of stock-holding but also to the intensive margin of portfolio risk-taking.

[3] As the FLS does not directly record the monetary value of households' non-cash investments, we construct an *approximation* using the available categorical information. For respondents with investable assets above £10,000, we interact the midpoints of the investable-asset categories with the midpoints of the reported "propensity to invest" categories. See Online Appendix A.5 for a more detailed description.

Figure 2: Participation and Non-Cash Investments by investable assets and financial literacy score



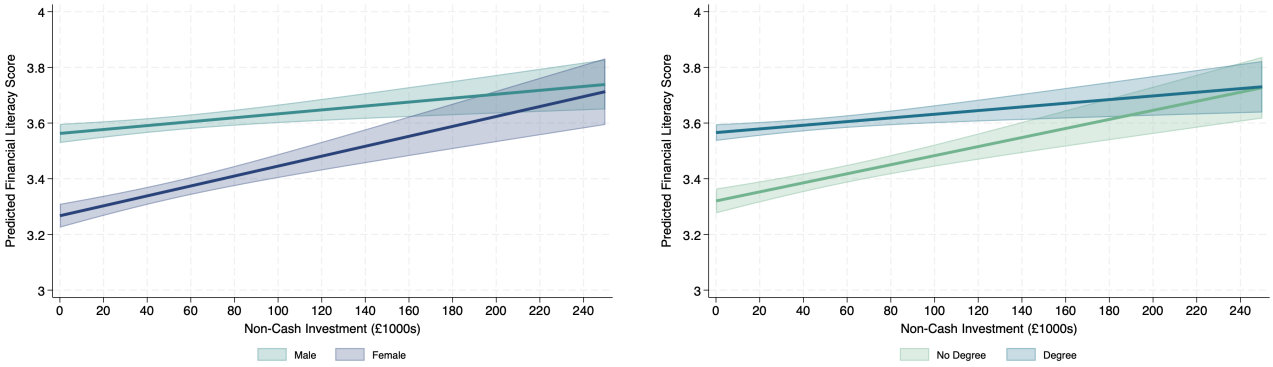
(a) Extensive margin

(b) Intensive margin

Notes: Panel (a) plots the stock-market participation rate in subgroups of investable assets by financial literacy score. Investable-asset groups are defined over all categories of investable assets. The average participation rates across groups are 6.2%, 26.2%, and 53.1%, respectively. The average financial literacy scores across groups are 2.7, 3.2, and 3.6, respectively. Panel (b) plots the average percentage of investable assets held in cash by investable-asset group (for redefined groups of households with above £10,000) and financial literacy score.

To study how literacy gaps evolve with investment intensity, we predict the financial literacy using non-cash investment amounts and their interactions with gender and education, controlling for wealth, education, income, and age group (Figure 3). At low levels of non-cash investment, there are substantial literacy gaps by gender and by education. As investment increases, the predicted gaps narrow, and, at higher levels of investment, the profiles for men and women and for degree and non-degree holders converge. These patterns are suggestive of a direct role for learning-by-doing: individuals who invest more appear to catch up in literacy, especially among groups that start from lower initial levels.

Figure 3: Predicted Financial Literacy by Non-Cash Investment



(a) By Gender

(b) By Degree

Notes: The figure plots predicted financial literacy scores as a function of estimated non-cash investment amounts. Panel (a) shows predictions by gender, Panel (b) by degree status. Predictions are based on linear regressions of financial literacy on non-cash investment, gender, degree, and their interactions, controlling for wealth, income, age group, and survey wave fixed effects.

4 Model

In this section, we will describe the setup of the finite-horizon partial-equilibrium life-cycle model with endogenous financial literacy accumulation and stochastic asset returns.

Agents live for T periods, in which they work for the first $T-R$ periods and are retired for the remaining R periods. When working, they supply one unit of labor inelastically and earn a labor income of $z_t w_t$, where z_t is their (stochastic) productivity and w_t is an age-dependent wage that is common to all agents of age t. z_t follows an AR(1) process. When agents are retired, they instead receive a fixed transfer, τ_t.

In each period, agents have the choice between saving in two assets: cash (or "money") and stocks.

The (gross) interest rate on cash, $R^m = 1 + r^m$, is constant, whereas the return on stocks, $R^s_t = 1 + r^s_t$, is stochastic and is i.i.d. in each period. There is a short-selling constraint on stocks, i.e., $s_t \geq 0$ for all t. Additionally, there is a borrowing constraint on cash such that, in each period, $m_t \geq \underline{m}$.

Increasing the level of stock-holdings from s_t to s_{t+1} incurs a utility cost, $\kappa(s_{t+1}, s_t, \lambda_t)$, that depends on the level of financial literacy, λ_t, and current stock-holdings. We impose an asymmetric cost function for which there is no cost of selling stocks, nor is there a cost of leaving stock-holdings unchanged, capturing the idea that it is mentally less costly choosing which stocks to sell than it is choosing which stocks to buy. We will assume that $\kappa(s_{t+1}, s_t, \lambda_t)$ takes the form

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

Thus, $\kappa(s_{t+1}, s_t, \lambda_t)$ is strictly positive only when $s_{t+1} > s_t$ and is decreasing in financial literacy.

Agents are endowed with an initial level of financial literacy that evolves according to:

$$\lambda_{t+1} = \delta_t \lambda_t + \left(\eta \max\{s_{t+1} - s_t, 0\}^{\psi} + \chi \mathbf{1}\{s_{t+1} > 0\}\right) \lambda_t^{\phi}, \tag{2}$$

where δ_t is an age-specific depreciation rate. The parameter ψ controls the single-period curvature of the learning-by-doing effect; η is the return on increasing stock-holdings; ϕ determines the returns-to-scale on financial literacy. One could imagine that changing the composition stocks of within a portfolio but leaving the overall amount of investment unchanged could also improve financial literacy; thus, χ measures the effect of having positive stock-holdings on literacy, allowing for unmodeled learning from portfolio adjustments.

Let us denote by $V_t(s_t, m_t, \lambda_t, z_t, R^s_t)$ the age t value function of agents given the states. The household chooses consumption (c_t), next period stocks (s_{t+1}), and next period cash (m_{t+1}) to maximize the following:

$$V_t(s_t, m_t, \lambda_t, z_t, R^s_t) = \max_{c_t, s_{t+1}, m_{t+1}} u(c_t) - \kappa(s_t, \lambda_t, s_{t+1}) + \beta \mathbb{E}\left[V_{t+1}(s_{t+1}, m_{t+1}, \lambda_{t+1}, z_{t+1}, R^s_{t+1})\right], \tag{3}$$

subject to the budget constraint and the short-selling and borrowing constraints. We will assume CRRA utility preferences. Agents die at the end of time T and, thus, $V_{T+1} = 0$.

Online Appendix B.1 explains in greater detail the method of solving the model using the Endogenous Gridpoints Methods (EGM; Carroll, 2006), based on the adaptions to discrete-continuous EGM non-convex adjustment costs by Fella (2014). Stocks and cash take discretized values on a double-exponentiated grid with 40 grid points ranging from 0 to 100; literacy is similarly distributed on a grid from the lowest literacy level, λ^0, to 25, taking 50 discrete values.

4.1 Calibration

A detailed description of the model's calibration is given in Online Appendix B.2. For brevity, we summarize the externally- and internally-calibrated parameters in Table 1; Table 2 reports the targeted moments and model fit. The initial distribution of latent financial literacy is calibrated to match the empirical distribution of observed literacy scores among 18–24 year-olds in the FLS, using the period-1 mapping from latent literacy to scores described in Online Appendix B.2 to match moments. Initial cash holdings take three values, $\{0.1, 0.6, 5\}$, with probabilities $\{0.45, 0.50, 0.05\}$, chosen to approximate the FLS distribution of investable assets for the same age group; households start with zero stock holdings.

The discount factor β is used to match the mass of households with zero investable assets in the FLS. The resulting two-year value $\beta = 0.568$ implies a quarterly factor of 0.93, in line with recent heterogeneous-agent models (e.g., Auclert et al., 2023), and delivers an average two-year marginal propensity to consume of

Table 1: Model Parameters, External and Internal Calibration

	Description	Value	Target / Source
Externally calibrated			
T	Number of life-cycle periods	29	Ages 18–75 in two-year steps
R	Number of retirement periods	5	Ages 66–75 in two-year steps
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 in value function	0.01	Externally imposed
Internally calibrated			
β	Discount factor	0.568	Internal calibration
σ	CRRA coefficient	3.250	Internal calibration
γ	Portfolio taste weight	1.000	Internal calibration
χ	Literacy return (holding)	58.000	Internal calibration
η	Literacy return (increase)	71.000	Internal calibration
ψ	Stock-increase curvature	0.065	Internal calibration
ϕ	Learning curvature	-1.630	Internal calibration
$\underline{\delta}$	Final depreciation rate	0.981	Internal calibration
λ^0	Initial literacy (lowest group)	2.500	Internal calibration
Λ	Literacy scaling factor	1.660	Internal calibration

Notes: External parameters are calibrated to empirical data on income and returns, as discussed in Section 4.1. Internal parameters are calibrated to match key empirical life-cycle moments of stock-market participation, portfolio composition, and financial literacy.

Table 2: 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

Notes: Table compares model-generated targeted moments to empirical values from the Financial Literacy Survey (FLS, 2022) and the Wealth and Assets Survey (WAS, 2020). "Model" values represent simulated outcomes under the calibrated parameterization.

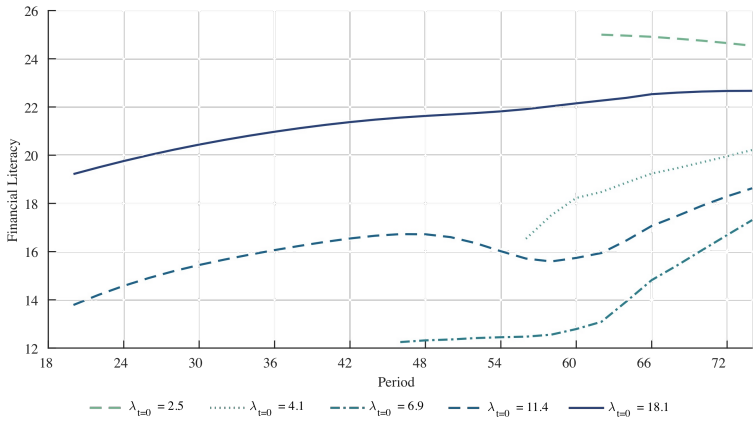
about 0.36, lower than the 0.7 in Fagereng et al. (2021) but perhaps unsurprising given that our calibration does not directly target short-run consumption responses. The coefficient of relative risk aversion $\sigma = 3.25$ is moderate relative to the very high levels often required in models without literacy frictions to match limited participation and wealth (e.g., Cocco et al., 2005; Fagereng et al., 2017).

5 Results

Figure 4 examines how learning-by-doing affects literacy gaps across cohorts, plotting the evolution of average latent literacy for the five initial cohorts, *conditional* on holding stocks. We see that literacy differences between cohorts narrow over the life cycle; the second-highest cohort ($\lambda_{t=0} = 11.4$), for example, starts with latent literacy around 63% of the highest group, but, among stockholders, this ratio rises to

77% at retirement and 84% by the end of life. Lower-literacy cohorts display a similar pattern: while only 3% of the lowest group ever enter the stock market, those who do so (after accumulating sufficient cash wealth) see large increases in literacy. Entry for these low-literacy cohorts occurs relatively late in the life cycle, which highlights the importance of initial literacy for extensive-margin participation: high-literacy households are willing to hold stocks even when liquid wealth is modest, whereas low-literacy households typically delay entry until they have built up sizable cash balances.

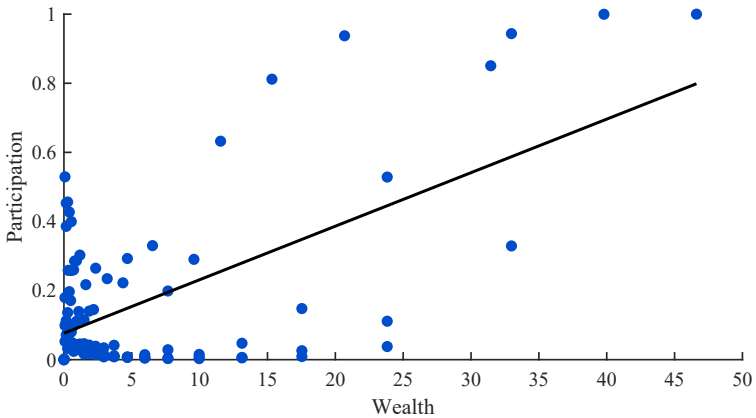
Figure 4: Financial Literacy of Cohorts, Conditional on stock-holding



Notes: The figure shows, for each initial cohort of financial literacy, the average financial literacy level *conditional* on holding stocks in that period of the model. This is the average across wealth, productivity, and stock returns in the distribution.

One of the key distinctions between monetary participation costs and the non-monetary literacy frictions in our framework is the implied relationship between wealth and stock-market participation. Figure 5 plots participation rates against wealth across all periods, revealing a strong but far from perfect relationship. The correlation between stock-holdings and total wealth is 0.59, indicating that richer households are more likely to participate and hold more stocks, but that wealth alone does not fully determine participation. This imperfect correlation arises because the effective cost of entering the stock market declines with financial literacy, not purely with wealth. High-literacy, low-wealth households face a low literacy cost and, therefore, begin participating at relatively modest wealth levels, while low-literacy households must accumulate substantial cash balances before it becomes optimal to pay the literacy cost of entry.

Figure 5: Model Wealth and Participation Rates



Notes: The figure plots a binned scatter (100 bins) of wealth against stock-market participation in the model, pooling all periods. The correlation between participation and wealth is 0.59.

6 Policy Analysis

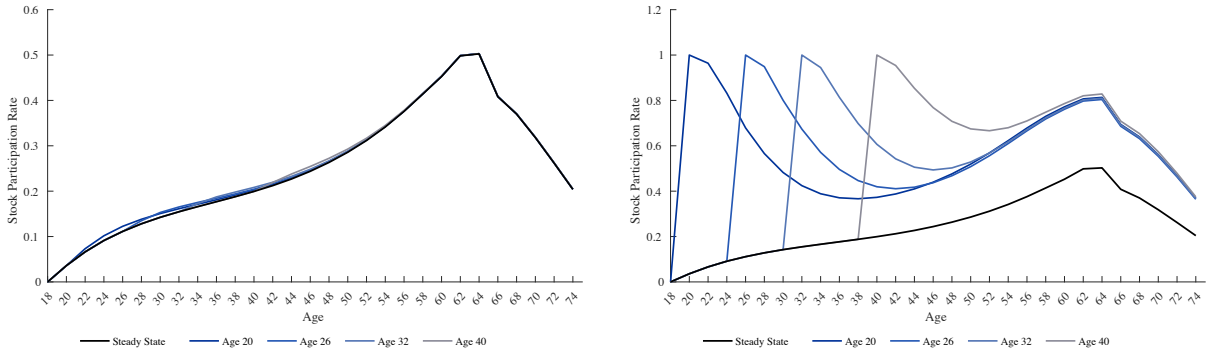
We now use the quantitative model to compare the effectiveness of alternative policies aimed at increasing financial literacy and stock-market participation.

We first consider a 25% increase in latent financial literacy, interpreted as a financial education program, delivered at different ages (20, 26, 32, and 40). Online Appendix Figure B1 plots the ratio of key moments under the policy to the baseline. Although the boost is identical, we find that average literacy ends up slightly, but persistently, higher when the program is delivered at age 20, reflecting stronger participation responses and more time for learning-by-doing; similarly, the largest proportional participation gains are for younger cohorts. Quantitatively, while the literacy boosts have sizable effects relative to the baseline (e.g., 10pp. increase in participation and a 2% increase in both wealth and consumption by retirement), the differences between the timing of shocks are modest (see Online Appendix Table B3): relative to an otherwise identical boost at age 40, a program at age 20 raises pre-retirement participation by about 1 percentage point and latent literacy by roughly 1%. Thus, the timing is of second-order importance quantitatively, but earlier programs have a mild advantage through additional yeaers of learning-by-doing.

We now compare the implications of transferring 0.25 units of either cash or stock to households at different points in the life cycle. Figure 6 illustrates the participation response. Cash transfers induce only a very modest increase in stock-market entry (panel (a)), mainly by bringing forward participation for households that were already close to their entry threshold; by retirement, the cash transfer has almost no remaining effect (see Online Appendix Table B4). In contrast, stock transfers (panel (b)) mechanically move recipients into the market in the period of the transfer and, even after some households subsequently disinvest and exit, participation remains persistently higher. In the pre-retirement period, participation is about 30 percentage points above the baseline, average literacy is roughly 40% higher, and both wealth and consumption are 4–5% above the no-transfer economy. The timing of stock transfers matters, but only moderately. A stock transfer at age 20 versus age 40 means that the younger cohort enters retirement with 3% higher stock-holdings, 2% higher latent literacy, and 0.5% higher consumption.

Overall, for a given fiscal cost, in-kind transfers in the form of equity are far more effective than cash at raising long-run participation, literacy, and retirement resources, and that targeting younger households yields slightly higher returns on such interventions.

Figure 6: Cash vs. Stock Transfer by Age: Participation Rates



(a) Cash transfer (b) Stock transfer

Notes: The figure shows the life-cycle participation rates following cash and stock transfers at ages 20,26, 32, and 40.

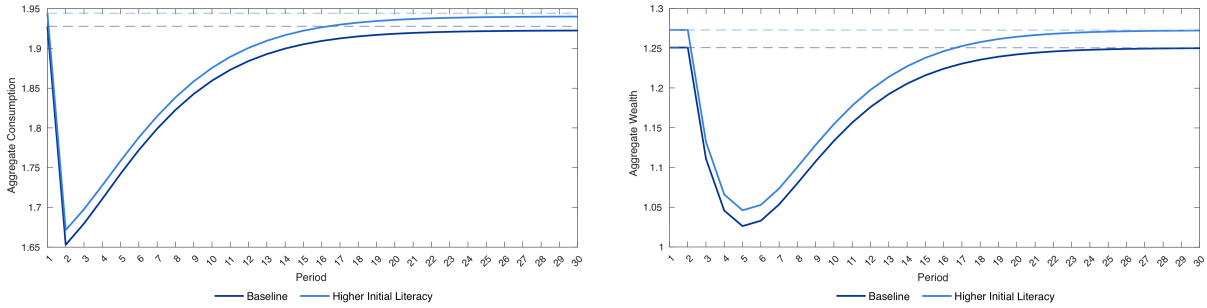
7 Aggregate Shocks in an Economy with Higher Financial Literacy

We now examine how aggregate dynamics change in an economy with higher financial literacy, namely, a counterfactual steady state in which newborns have latent financial literacy that is 25% higher than in the benchmark. Starting from this higher-literacy steady state, we compare the response of the economy to two one-off aggregate shocks. After each shock, we track the transition for 30 periods (60 years), where, in each period, agents of age T die and are replaced by newborns.

7.1 Shock to Household Income

As the model is partial equilibrium and labor supply is inelastic, we introduce an aggregate labor-income shock by shifting downward the idiosyncratic productivity component z_t for all households by one gridpoint (except for those already at the lowest point), while keeping the transition matrix for z_t unchanged. One can interpret this as a severe recession or pandemic episode that depresses earnings broadly. This generates an immediate fall of about 25% in average labor income and a gradual recovery; newborns draw productivity from the cross-sectional distribution prevailing at birth rather than from the stationary distribution. Figure 7 plots the transition of aggregate moments following the income shock in the baseline and higher-literacy economies.

Figure 7: Income Shock - Baseline vs Higher Initial Literacy: Aggregate Moments



(a) Consumption (b) Wealth

Notes: The figure plots the levels of (a) consumption and (b) wealth following a one-off fall in productivity in which all agents have their labor productivity, z_t, reduced by one grid point. The economy is then simulated for 30 subsequent periods. The dark blue line shows the baseline economy, calibrated in Section 4.1; the light blue line shows an economy in which agents born in period 1 have 25% higher initial financial literacy. Online Appendix Figure B2 shows the analogue of this figure for cash and stock levels.

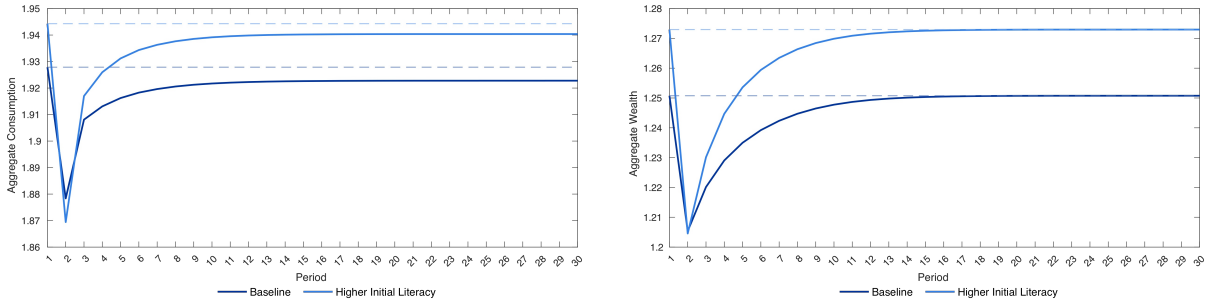
As higher literacy raises savings and participation in the steady state, both consumption and wealth start from higher levels before the shock and the troughs of consumption and wealth are higher when the shock hits. The subsequent recovery of each economy toward its own steady state is similar in speed, although the higher-literacy economy crosses the baseline equilibrium after roughly 16 periods and remains above thereafter. Thus, in this partial-equilibrium environment, higher literacy does not materially accelerate the rate at which the economy recovers from an income shock, but it does mitigate the level decline in consumption and wealth. We see that cash holdings fall by a similar amount across economies, while stock positions decline more in the higher-literacy case, serving as a buffer that helps smooth consumption during the shock (Online Appendix Figure B2).

7.2 Shock to Financial Returns

We now consider the effects of a stock-market shock in the two economies. Specifically, we impose a one-off shock in which the stock return takes the lowest value in our discrete grid, corresponding to a 27.5% fall in stock values (this realization would occur with probability 2.5% under our normal approximation), and then follows its stationary distribution afterwards. Figure 8 plots the expected transition paths of these economies over the many possible return values.

Higher literacy and portfolio allocation towards stocks means that the high-literacy economy is more exposed to a negative stock-market realization. Consistent with this, the drop in consumption is larger, both in levels and in percentage terms. Aggregate wealth in the two economies reaches a similar trough, but the high-literacy economy recovers much faster: its wealth path crosses the baseline level after about four periods, whereas it takes roughly fourteen periods for the baseline economy to reach the same level. Thus, higher literacy increases vulnerability to rare asset price crashes, yet it also speeds up the rebuilding of wealth once the shock has occurred.

Figure 8: Return Shock - Baseline vs Higher Initial Literacy: Aggregate Moments



(a) Consumption (b) Wealth

Notes: The figure plots the levels of (a) consumption and (b) wealth following a one-off negative shock to returns (-27.3%). The economy is then simulated for 30 subsequent periods. The dark blue line shows the baseline economy, calibrated in Section 4.1; the light blue line shows an economy in which agents born in period 1 have 25% higher initial financial literacy. Online Appendix Figure B3 shows the analogue of this figure for cash and stock levels.

Taken together, these two shocks highlight an important trade-off. Higher financial literacy brings more households into the stock market, raising average wealth and consumption and cushioning income shocks. At the same time, greater equity exposure makes the economy more vulnerable to adverse return realizations, leading to sharper drops in wealth and consumption when asset prices fall, even though wealth rebuilds more quickly in the high-literacy economy once the shock has occurred.

8 Conclusion

In this paper, we have studied how financial literacy frictions shape both the extensive and intensive margins of stock-market participation. We show that large early-life gaps in literacy by gender and education narrow among households that invest in non-cash assets, consistent with learning-by-doing through stock-market participation.

Empirically, we document that, among households with more than £10,000 in investable assets but held entirely in cash, the predicted literacy gap between men and women is around 0.3 correct answers; this gradually fades as invested assets rise to £250,000. We find stock-market participation increases sharply with the number of correct literacy answers, while the share of the portfolio held in cash falls. We embed these patterns in a partial-equilibrium life-cycle model in which financial literacy evolves via learning-by-doing. Calibrated to UK data, the model replicates key features of the joint distribution of the household wealth, literacy, and participation. Literacy acts as a non-monetary participation friction: low-literacy households rationally stay out despite high wealth, while high-literacy but low-wealth households enter due to relatively lower costs. The model delivers an imperfect wealth–participation correlation of 59%.

We use the model to compare equal-sized cash and stock transfers and to study aggregate shocks. Cash transfers have negligible effects on participation, mainly relaxing liquidity constraints for households that would have entered anyway. Stock transfers, by contrast, produce sizable and persistent increases in participation, literacy, and consumption, as initial exposure to stocks feeds back through learning-by-doing. Higher literacy and participation raise long-run wealth and consumption and soften the impact of income shocks, but they also make households more exposed to rare asset-price crashes, which generate larger short-run drops in consumption even as wealth subsequently recovers more quickly.

Overall, this paper highlights the importance of non-monetary literacy frictions and learning-by-doing for understanding who participates in stock markets, how portfolios are allocated, and how households respond to shocks and policy interventions. In future work, I will use richer administrative and panel data to sharpen causal estimates of learning-by-doing and embed this framework in general equilibrium to study the interaction between financial literacy, asset markets, and the broader macroeconomy.

References

Alan, S. (2006). Entry costs and stock market participation over the life cycle. *Review of Economic Dynamics*, *9*(4), 588–611. https://doi.org/10.1016/j.red.2006.06.003

Auclert, A., Bardóczy, B., & Rognlie, M. (2023). MPCs, MPEs, and Multipliers: A Trilemma for New Keynesian Models. *Review of Economics and Statistics*, *105*(3), 700–712. https://doi.org/10.1162/rest_a_01072

Carroll, C. D. (2006). The method of endogenous gridpoints for solving dynamic stochastic optimization problems. *Economics Letters*, *91*(3), 312–320. https://doi.org/10.1016/j.econlet.2005.09.013

Cocco, J. F., Gomes, F. J., & Maenhout, P. J. (2005). Consumption and Portfolio Choice over the Life Cycle. *Review of Financial Studies*, *18*(2), 491–533. https://doi.org/10.1093/rfs/hhi017

Cota, M., Frech, M., Morazzoni, M., & Tallent, M. (2025, May). Gender Differences in Savings Over the Life-Cycle: The Role of Financial Literacy.

Fagereng, A., Gottlieb, C., & Guiso, L. (2017). Asset Market Participation and Portfolio Choice over the Life-Cycle. *The Journal of Finance*, *72*(2), 705–750. https://doi.org/10.1111/jofi.12484

Fagereng, A., Holm, M. B., & Natvik, G. J. (2021). MPC Heterogeneity and Household Balance Sheets. *American Economic Journal: Macroeconomics*, *13*(4), 1–54. https://doi.org/10.1257/mac.20190211

FCA. (2022). Financial Lives Survey 2022. https://www.fca.org.uk/financial-lives/financial-lives-2022-survey

FCA. (2023, July). *Financial Lives 2022: Key findings from the FCA's Financial Lives May 2022 survey* (tech. rep.).

Fella, G. (2014). A generalized endogenous grid method for non-smooth and non-concave problems. *Review of Economic Dynamics*, *17*(2), 329–344. https://doi.org/10.1016/j.red.2013.07.001

Frijns, B., Gilbert, A., & Tourani-Rad, A. (2014). Learning by doing: The role of financial experience in financial literacy. *Journal of Public Policy*, *34*(1), 123–154. https://doi.org/10.1017/S0143814X13000275

Haliassos, M., & Bertaut, C. C. (1995). Why do so few hold stocks? *the economic Journal*, *105*(432), 1110–1129. Retrieved February 13, 2025, from https://academic.oup.com/ej/article-abstract/105/432/1110/5158961

Lusardi, A., Michaud, P.-C., & Mitchell, O. S. (2017). Optimal Financial Knowledge and Wealth Inequality. *Journal of Political Economy*.

Lusardi, A., & Mitchell, O. S. (2008). Planning and Financial Literacy: How Do Women Fare? *American Economic Review*, *98*(2), 413–417. https://doi.org/10.1257/aer.98.2.413

Mandell, L. (2008). Financial Literacy of High School Students. In J. J. Xiao (Ed.), *Handbook of Consumer Finance Research* (pp. 163–183). Springer New York. https://doi.org/10.1007/978-0-387-75734-6_10

Mankiw, N. G., & Zeldes, S. P. (1991). The consumption of stockholders and nonstockholders. *Journal of Financial Economics*, *29*(1), 97–112. https://doi.org/10.1016/0304-405X(91)90015-C

Office for National Statistics. (2023). *Wealth and Assets Survey, Waves 1-5 and Rounds 5-7, 2006-2020* [SN: 7215]. https://doi.org/10.5255/UKDA-SN-7215-18

van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, *101*(2), 449–472. https://doi.org/10.1016/j.jfineco.2011.03.006

Vissing-Jorgensen, A. (2002). Towards an explanation of household portfolio choice heterogeneity: Nonfinancial income and participation cost structures.