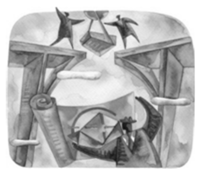
Financial Knowledge and Wealth Inequality



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1

Our Research Agenda:

- What's link between financial knowledge and economic decisions?
- What are consequences of financial illiteracy?
- What are cost-effective policy options?

➔ Today: Calibrated LC Model of Financial Knowledge and Wealth, & Implications for Program Evaluation

Optimal Financial Knowledge & Wealth Inequality (Lusardi/Michaud/Mitchell2017)

- Traditional saving models have a hard time fitting:
  - Heterogeneity in wealth accumulation (HSZ 1994; Cagetti, 2003; Gourinchas/Parker, 2002; Venti/Wise 2001)
  - Low % in equity and individual retirement accounts and heterogeneity in wealth by education (Cocco, Gomes and Maenhout, 2005)
- Financial knowledge strongly related to wealth holdings and both very heterogeneous

  Lusardi /Mitchell, 2007a/ 2007b; Moore/Mitchell, 2000; Venti/Wise, 2000; Lusardi, Mitchell and Curto, 2010.
- How does that relationship arise?
  - The wealthy enjoy higher asset returns.

  (Yitzhaki 1987; Clark/Lusardi/Mitchell 2016)

We propose:

- Financial knowledge is a form of human capital :
  - Raises expected return on saving, lowers borrowing rate, may help lower variance (diversification);
  - Is expensive to acquire in money, time, & utility terms.
- May explain wealth heterogeneity:
  - Diff's in income paths by education groups create different incentives for investment;
  - In turn, produces differences in return exacerbating wealth inequality.
- Policy importance:
  - Policies that shift responsibility to consumers in a world of imperfect literacy could be harmful;
  - Policies that improve FK may have economic & welfare benefits.

4

Brief Model Overview:

- Calibrated stochastic LC model w/ endogenous Fin Knowledge decisions.
- Use model to simulate Fin Knowledge & wealth inequality.

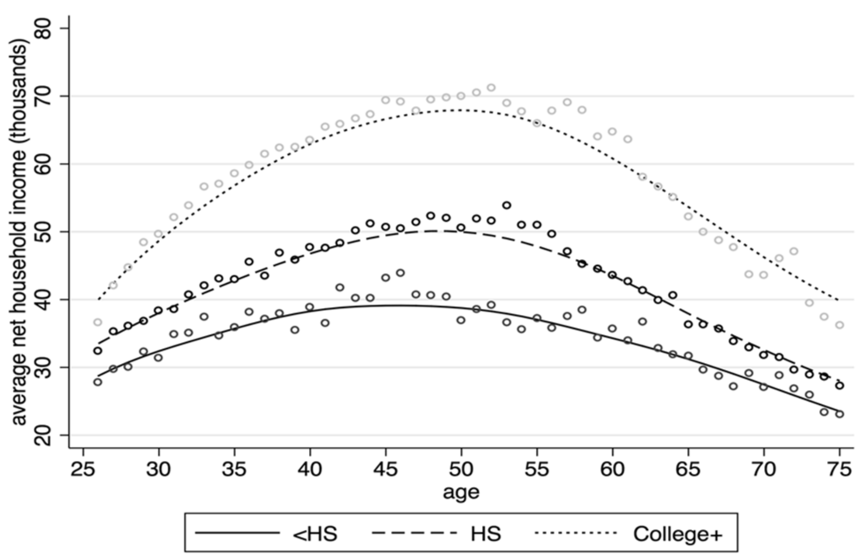
→ Explore responses to policy: how FK responds to mean-tested transfers, etc.

→ Use for program evaluation.

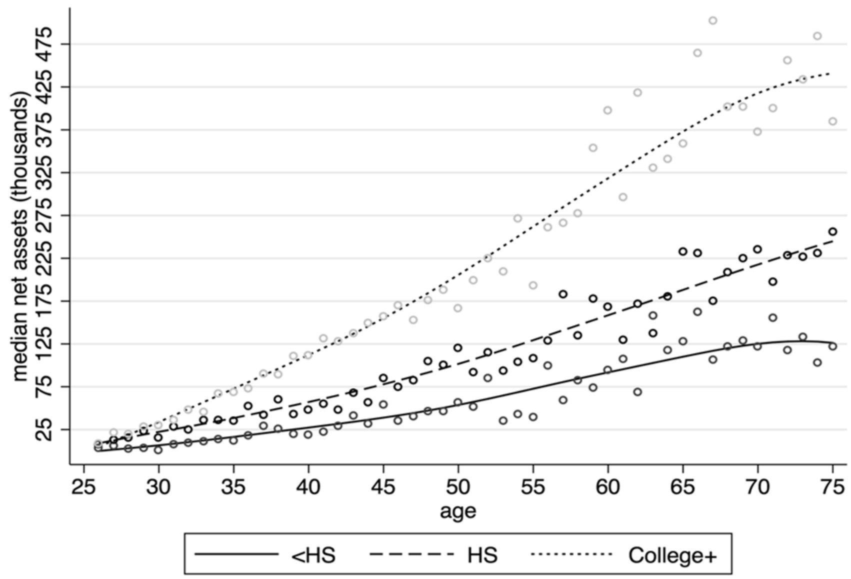
- Our model differs from prior literature:
  - FinKnowl accumulation with imperfect markets, labor income & equity returns & mortality uncertain, uncertain OOP medical costs, and a realistic social insurance system.
  - Endogenous wealth inequality.

Labor Income Varies by Education Over LC

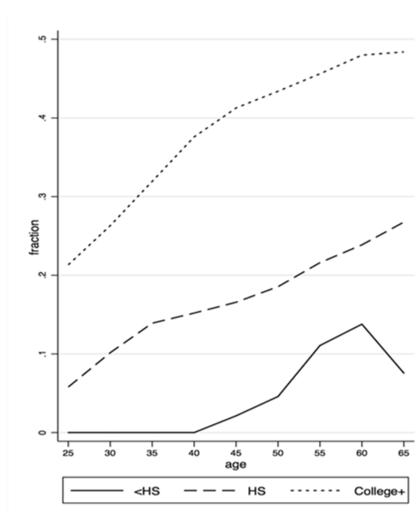
(<HS, HS, College+)

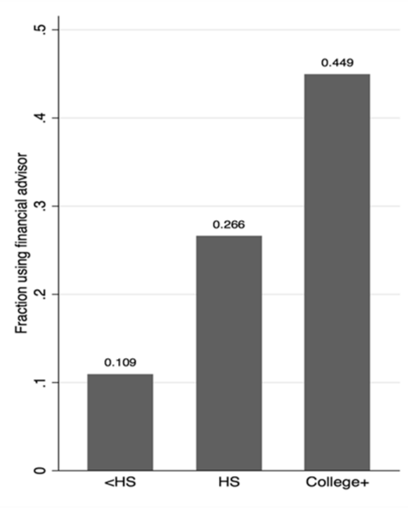


Net Assets Vary by Education over LC



Fin Knowledge & Use of Fin Advice Vary by Education over LC





Our model:

- Consumers max EU of life cycle consumption: function of household composition $n_t * u(c_t/n_t)$ where n_t =HH equiv scale.

- Given budget constraint w/ uncertainty:
  - Net of tax labor income subject to shocks y_t;
  - Stochastic OOP medical expenditures (when retired) oop_t;
  - Mortality tables;
  - Stochastic returns for sophisticated financial products > risk-free rate.

→ No pref heterogeneity.

Two technologies available to transfer resources over time:

- Simple technology pays risk-free return

$$\bar{R} = 1 + \bar{r}$$

- Sophisticated technology pays an expected rate of return which depends on f_t

$$\tilde{R}(f_{t+1}) = \bar{R} + r(f_{t+1}) + \delta_\varepsilon \varepsilon_{t+1}$$

where $\varepsilon_t \sim N(0,1)$ iid shock; middle term is excess returns due to investment; δ is st.dev. of returns on the sophisticated technology.

  - To invest, must pay fixed costs c_d and allocate time $\pi_i(i_t)$
  - κ_t *= 1 if invest, = 0 else.*

10

Fin Knowl evolves over time:

- Last period’s knowledge ↑ by i, and ↓ by δ (due to forgetting &/or obsolescence):

$$f_{t+1} = \delta f_t + i_t$$

- Govt Transfers: tr_t with c_{min}= guaranteed income floor
  - ✓ Cannot buy sophisticated tech if at the govt min income level. Also this lowers EV of consumption for lower-paid.
- Social Security progressive

Labor income and medical expenditures

- Labor income AR(1) with permanent and transitory components η_y

$$y_t = g_e(t) + \overbrace{\mu_t + \nu_t}^{\eta_y}$$
$$\mu_t = \rho_e \mu_{t-1} + \varepsilon_t$$
$$\varepsilon_t \sim N(0, \sigma^2_{\varepsilon}), \nu_t \sim N(0, \sigma^2_{\nu})$$

- OOP expenditures similar: ARI (1)

$$oop_t = h_e(t) + \eta_o$$

Other constraints:

- Cash on hand

$$x_t = a_t + y_t + tr_t - oop_t$$

- End of period assets:

$$a_{t+1} = \widetilde{R}_\kappa(f_{t+1})(x_t + tr_t - c_t - \pi(i_t) - c_d I(\kappa_t > 0))$$

where

$$\widetilde{R}_\kappa(f_{t+1}) = (1-\kappa_t)\overline{R} + \kappa_t \widetilde{R}(f_t)$$

13

The Household's Problem

$$V_d(s_t) = \max_{c_t, i_t, \kappa_t} n_{e,t} u(c_t / n_{e,t}) + \beta p_{e,t} \int_\varepsilon \int_{\eta_y} \int_{\eta_o} V(s_{t+1}) dF_e(\eta_o) dF_e(\eta_y) dF(\varepsilon)$$

$$a_{t+1} = \widetilde{R}_\kappa(f_{t+1})(a_t + y_{e,t} + tr_t - c_t - \pi(i_t) - c_d I(\kappa_t > 0)), \; a_{t+1} \geq 0$$

$$f_{t+1} = \delta f_t + i_t$$

$$\widetilde{R}_\kappa(f_{t+1}) = (1-\kappa_t)\overline{R} + \kappa_t \widetilde{R}(f_{t+1})$$

Value function solved by backward recursion.

- 3 consumer decision variables: 2 continuous (c_t,i_t), 1 discrete (κ)
- 5 state space variables : e, f_t, a_t, η_y η_o

14

Calibration

- Preferences CRRA, risk aversion set to 1.6 and discount factor to 0.96.
- Consumption floor set to \$10,000
- Rate of return $\bar{r} = 0.02$ on safe technology
- With an equity premium of 4%, we use the following function

$$r(f_{t+1}) = 0.04 \times f_t / 100$$

where f_t has a maximum of 100 and min of zero. Standard deviation of returns assumed 0.16

- Income and out-of-pocket processes are AR(1) are from Hubbard, Skinner and Zeldes.
- The participation cost of using the sophisticated technology is fixed to \$750 (median of \$750 in Vissing-Jorgensen ,2002)
- The cost function for investment set to

$$\pi(i_t) = 100 i_t^{1.75}$$

- The depreciation factor is set to 0.94.
- Solve the model for each education group, then simulate a cohort of 2500 consumers.

15

Baseline Parameter Values

Relative risk aversion *(σ)*	1.6	
Discount factor *(β)*	0.96	
Risk-free return $(\bar{r})$	0.02	
Max return for knowledge investment $r(f_{max})$	0.04	
Inv'stmt prod'n f'n	π_0	50
$\pi(i) = 50{*}i^{1.75}$	π_1	1.75
Fixed cost of partic. in soph tech (c_d)	750	
Depr. rate for fin knowledge (δ)	0.06	
Min consumption floor (C_{min})	10,000	

16

Baseline: Av. Sim. LC Fin Knowl Levels

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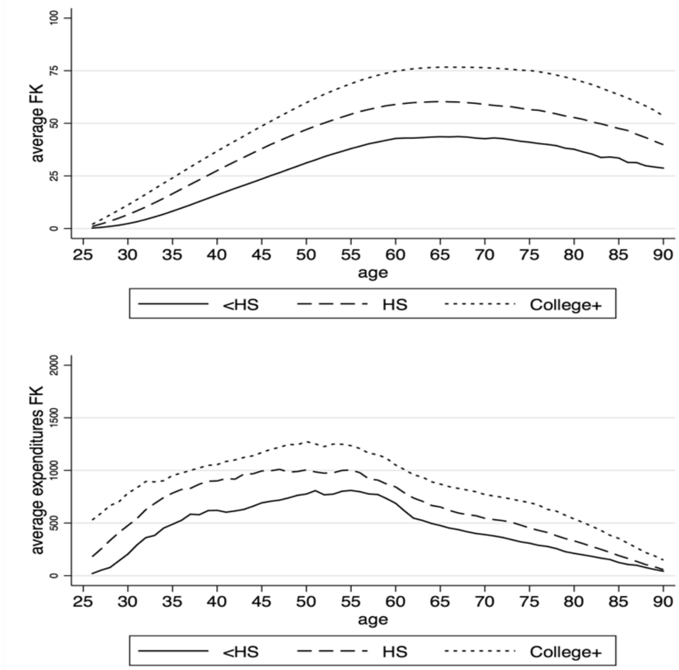
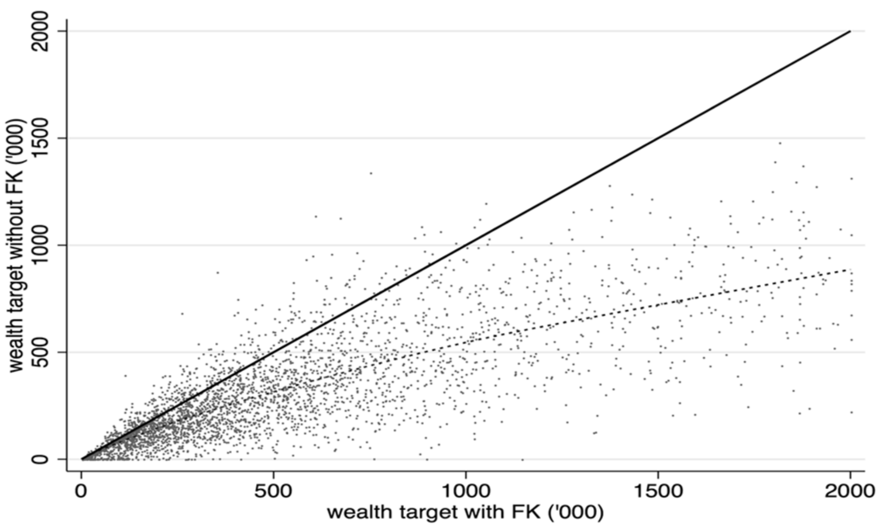
Spending on Fin Knowl



Simulated Predicted Wealth at Retirement: Baseline & w/o Fin Knowl.

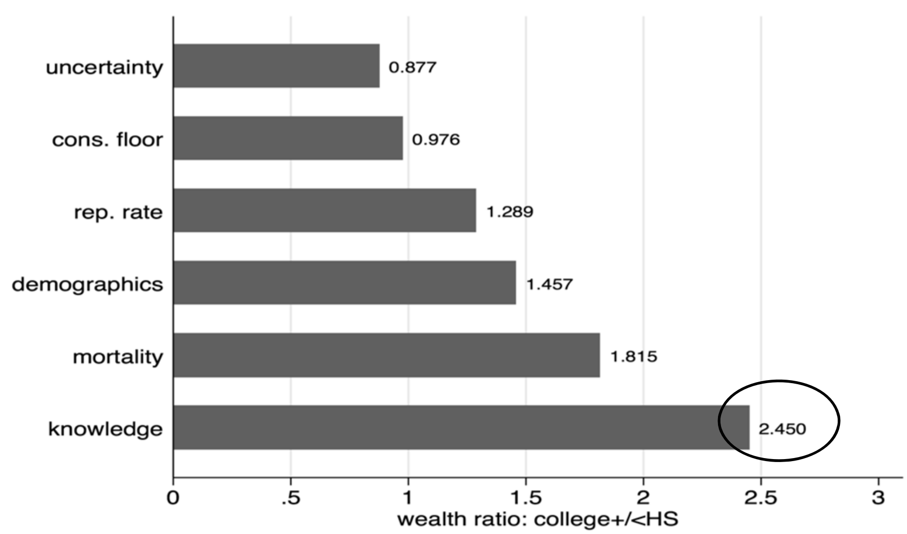


Simulated & Observed Results @ Retirement (65)

Baseline Simulation	<HS	College	Coll/<HS
Med. Wealth ($W)	95K	347K	3.66
Ave. Income ($Y)	32K	48K	1.49
W/Y Ratio	2.98	7.3	2.45
% Poor ($w_t < 2y_t$)	0.39	0.17	0.45
% Part.($\kappa_t > 0$)	0.45	0.78	1.74
Data (PSID)			
Med. Wealth ($W)	102K	365K	3.59
% Poor ($w_t < 2y_t$)	0.35	0.16	0.46
% Part. ($\kappa_t > 0$)	0.28	0.75	2.68

19

Decomposition of W/Y Inequality across Education Groups at Retirement



Decomposing Inequality

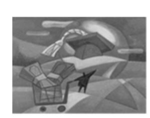
Sensitivity of ratio of median W/Y for college graduates to high school dropouts at retirement:

- With uncertainty alone: 0.88
- With consumption floor: 0.98
- Different replacement rates: 1.3
- Differences in demographics and mortality: 1.8
- Financial knowledge: 2.45

21

Paper Offers Much Sensitivity Analysis for Pref's & Costs

- Different risk aversion *(σ=1.6 vs 1.1 or 3)*
- Diff depreciation for fin knowledge *(δ=.06 vs .03 or .09)*
- Diff investmt prod'n f'n *($\pi(i) = 100*i^{1.75}$ and 4 variants)*
- Diff fixed cost of participation in sophisticated tech (*cd=$750 vs 500 and 1000)*
- Diff. discount factors *(β=.96 vs .94 and .98)*



Two Policy Experiments

- Scenario 1: Lower income floor (c_{min})
  →Both wealth and financial literacy increase.

- Scenario 2: Lower retirement income 20%
  →Wealth and fin literacy increase, large welfare benefits.

25

Baseline Simulation	<HS	College	Coll/<HS
Med. Wealth	95K	347K	3.66
W/Y	2.98	7.3	2.45
% Poor	0.39	0.17	0.45
% Partic.	0.45	0.78	1.74
% Low FK	0.54	0.21	0.39
Lower Cmin Flr			
Med. Wealth	109K	361K	3.32
W/Y	3.42	7.6	2.22
% Poor	0.36	0.16	0.45
% Partic.	0.47	0.7	1.65
Low FK	0.52	0.19	0.37
Lower Ret. Income			
Med. Wealth	125K	412K	3.29
W/Y	4.08	9.01	2.21
% Poor	0.29	0.09	0.31
% Partic.	0.49	0.8	1.65
Low FK	0.49	0.16	0.32

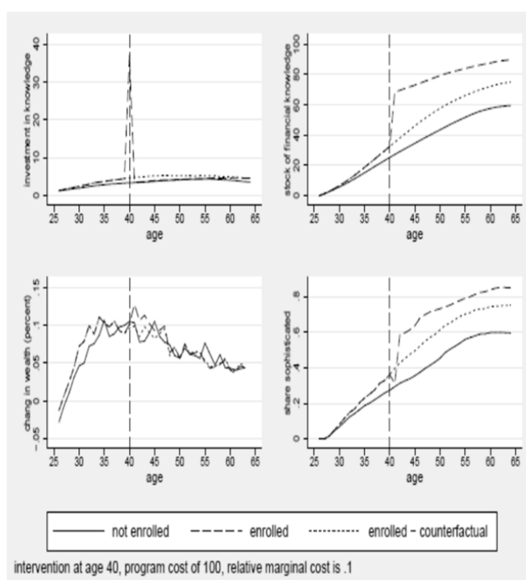
26

Also Use Model For Program Evaluation of Employer-Provided Fin Knowl Programs

- Fin program can cut ee cost of investing in knowledge.
- Firm offers program & eligibility assigned randomly to all ees of a given age.
- Compare each (simulated) ee’s outcome with and without access to program.
- *Great advantage*: we see actual counterfactuals! So can estimate selection bias.

Compare LC Effects of FK @ages 30, 40, 50

- One-shot treatment offered to age 40 does best.
- Slowing depreciation key to higher retirement wealth.
- Lower cost programs more favorable.



Participant vs Nonparticipant Diff's

(conditional on being eligible):

- Participation in FK is endogenous.
  - Participants have higher earnings, more initial knowledge, and more wealth at baseline;
  - Nonparticipants are poorer, earn less, and have little financial knowledge at baseline.

- Selectiveness implies: average program effectiveness measure that assumes program *nonparticipants* could benefit as much as *participants* will be biased.

29

Illustration:

- If program participation assumed to be independent of retirement wealth, nonparticipants can help measure the counterfactual: Estimated program effect suggests retirement wealth up by 75%.

→But actually, effect is 1% and ns!

- Using wealth trend of nonparticipants as counterfactual grossly overestimates program effect.
- DD with eligibility yields smaller biases, compared to using participation.

Conclusions:

- Financial knowledge is *economically important* for understanding differences in LC wealth accumulation.
- Makes sense for some to remain unsophisticated, and for effects to fade in later life.
- Program evaluation needs to acknowledge endogeneity of FK program participation.
- Safety nets raise wealth inequality.

31

What works?

1. *Financial education in school*: Next generations face different economic landscape.
2. *Financial education in the workplace*: Workers face disintermediated reality.
3. But must reaffirm learning so doesn't depreciate.

32

Thank you!

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33

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34