Using a Life Cycle Model to Evaluate Financial Literacy Program Effectiveness

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Goals:

- Evaluate financial literacy programs using a theoretical framework
- Model how financial knowledge shapes wealth
- Provide insights for designing policy and programs

Context: Changes in many markets and more individual responsibility

- Individuals:
  - Wide heterogeneity in behavior
  - Costs of financial illiteracy (Lusardi & Tufano, 2015)

- Financial education programs
  - Mixed evidence but many issues in evaluating effectiveness
  - Meta analyses can tell us little about this topic

Previous work on which this paper is based

- The Economic Importance of Financial Literacy: Theory and Evidence (Lusardi and Mitchell, *JEL 2014*)
- Optimal Financial Knowledge and Wealth Inequality (Lusardi, Michaud, and Mitchell, forthcoming *JPE*)

Understanding and measuring financial literacy

Interest Rate: Let's say you have $100 in a saving account paying 2% interest/year. How much would you have in the account at the end of 5 years?

Inflation: Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account. would you be able to buy*:*

Risk Diversification: True or false? Buying a single company stock usually provides a safer return than a stock mutual fund.

We have found that

- Financial literacy varies over the life cycle
- Low among those with low income and education
- Strikingly similar findings across countries

It can be the result of choice

Optimal Financial Knowledge and Wealth Inequality

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

  Lusardi /Mitchell, 2007
- What generates that relationship?
  - The wealthy enjoy higher asset returns. Why? Yitzhaki 1987

Our Approach:

- Calibrated stochastic LC model: max EU of life cycle consumption (no preference heterogeneity).

- Budget constraint complex:
  - ✓ imperfect markets,
  - ✓ labor income & equity stochastic,
  - ✓ mortality uncertain,
  - ✓ uncertain OOP medical costs,
  - ✓ realistic social insurance system.

- Endogenous Financial Knowledge (FK) accumulation, which generates higher return on investments.

Two technologies available to transfer resources over time:

- Simple technology pays risk-free return

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

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

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

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.*

FK evolves over time:

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

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

Investment in knowledge is the additional choice variable in stochastic LC model

The Household's Problem

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

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

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

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

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

Results: Simulated & Observed at 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

Some important findings

- It is not convenient for everyone to invest in financial knowledge:
  - optimal levels of financial literacy can be low or zero for some people
- Financial knowledge can decrease over time and the life cycle (optimally)
- Financial knowledge matters a lot

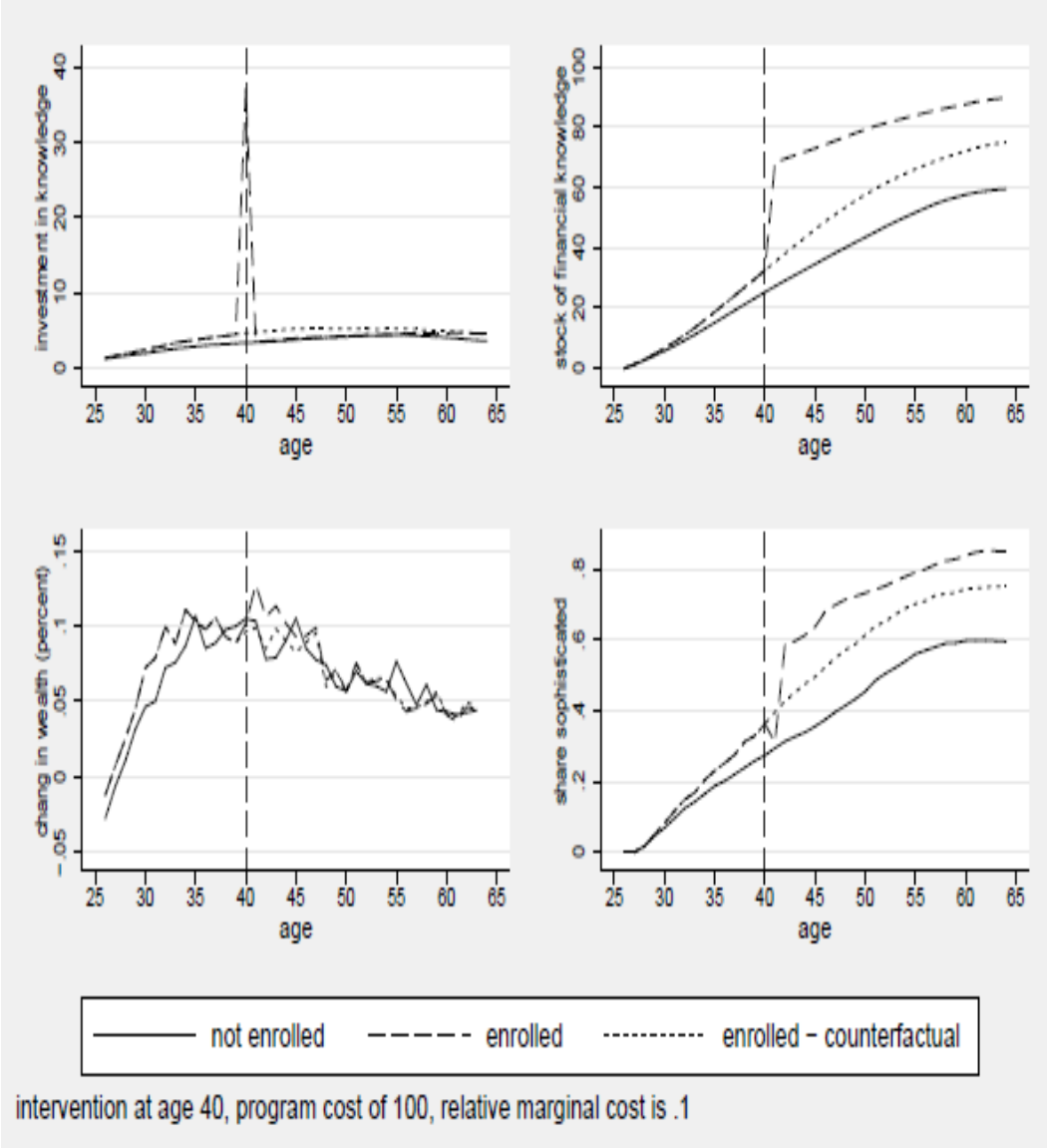
  - From 30 to 40% of wealth inequality is due to financial knowledge

Then Use Model to Evaluate Employer-Provided FK Programs

- Fin program cuts EE cost of investing in knowledge;
- Firm offers program & eligibility assigned randomly to all EEs of a given age;
- We compare each (simulated) EEs outcome *with and without access* to program;
- *Great advantage*: we see actual counterfactuals! So can estimate selection bias.

Program Effects: Offer FK @ages 30, 40, 50

- 1-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):

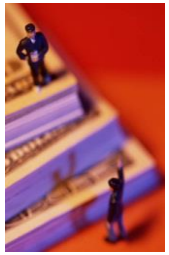
- When people can chose to take FK:
  - At baseline: participants have higher earnings, more initial knowledge, and more wealth;
  - Nonparticipants are poorer, earn less, and have little financial knowledge.

- This implies: Average program effect that assumes program *nonparticipants* benefit as much as *participants* quite upwardly biased.

Illustration:

- If (wrongly) assumed participation independent of retirement wealth & use nonparticipants as counterfactual:
  - Est. program effect suggests retirement wealth ↑ by 75%.
  - But actually, true estimated effect 1%, ns.

- So using wealth of nonparticipants as counterfactual **overestimates** program effect.



Other important insights

- *About financial education programs*
  - Should not expect 100% participation
  - Should expect some groups to be more likely to participate
  - Increase in knowledge may not translate into increase in savings
- *Which programs are more likely to have an impact?*
  - *Longer term programs rather than one shot ones*
  - *Target middle-age or older population*

Conclusions

- Financial knowledge *economically important* for understanding differences in LC wealth accumulation.
- Makes sense for some to remain unsophisticated, and for effects to fade in later life, even with fin educ
- Theoretical models can help us understand the effects of financial education programs

Policy Relevance

- We can learn relatively little about program effectiveness when we have limited information about programs and cannot account of endogenous financial knowledge

- We have new insights on how to make programs effective

Where to get additional information

Papers and other information

- *Global Financial Literacy Excellence Center (GFLEC)*

http://www.gflec.org

Wharton's Pension Research Council:

- http://www.pensionresearchcouncil.org/