

Equity Market Participation, Corporate Leverage Choice, and Constrained Intermediaries

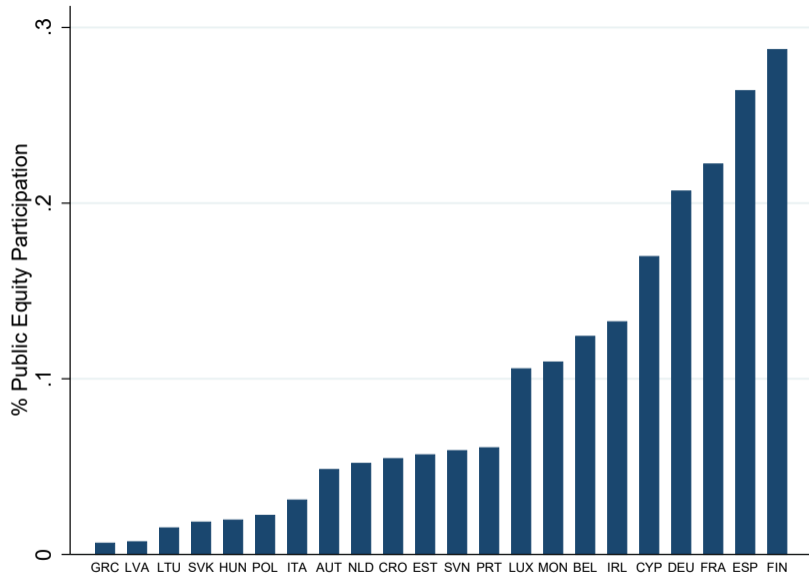
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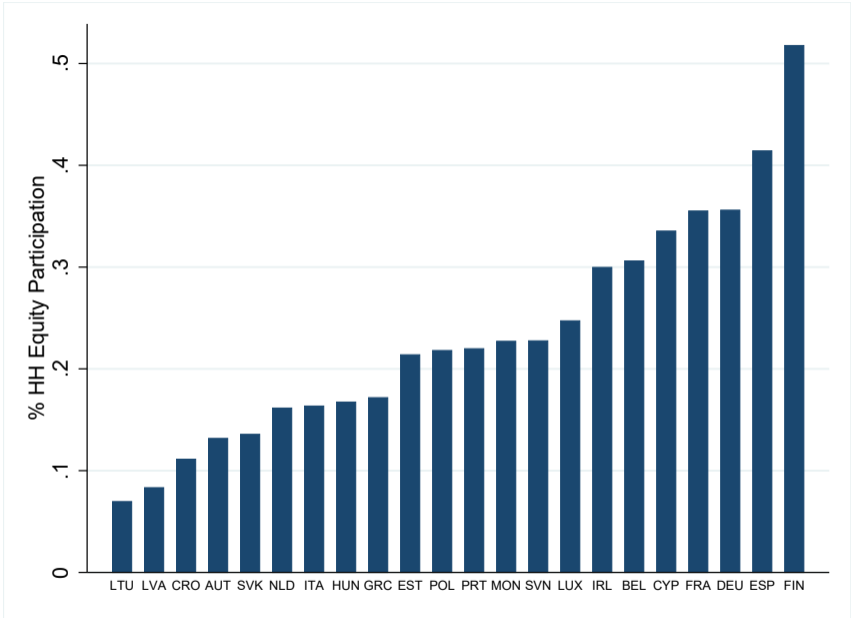
August 29, 2023

Cross-country Equity Market Participation

- ▶ In Europe, equity investment by households is low:
 - ▶ ~ 50 % of US households hold stocks.
 - ▶ In Germany, 21% hold stocks, and 35% hold any equity (active/passive business, equity mutual funds, stocks).
 - ▶ In many Eurozone countries public equity owner share <10%.
- ▶ Investment through regulated intermediaries is very common: Deposits
 - ▶ Banks and insurances: subject to capital regulation, hold little equity as assets.
 - ▶ Large cross-country heterogeneity in equity participation and deposit holdings.



Data: HCFS



Data: HCFS [Back](#)

This Paper

- ▶ **Idea:** With home bias, HH hold domestic equity. Low HH equity investment means little equity financing for domestic firms.
- ▶ Little "aggregate" equity \implies high corporate and financial sector leverage.
- ▶ Why don't we want regulated intermediaries to invest into corporate equity?
 - ▶ Basel rationale: banks should not hold "risky assets".
 - ▶ GE model of intermediation and leverage choice: we might want them to.

This Paper

- ▶ Analyze GE model with heterogeneous HH equity investment, risky financial intermediaries, optimal leverage choice of firms.
 - ▶ Little HH investment \implies scarce equity/high leverage.
 - ▶ lower: investment, output, wages.
 - ▶ higher: bank & firm defaults, return inequality.
 - ▶ Results
 - ▶ First best: equity-based retirement savings system.
 - ▶ Second-best: Intermediaries hold equity and debt, firm vs. bank risk.
 - ▶ Market: intermediaries hold more debt than optimal.
 - ▶ Anti-equity regulation has detrimental effects on financial stability.

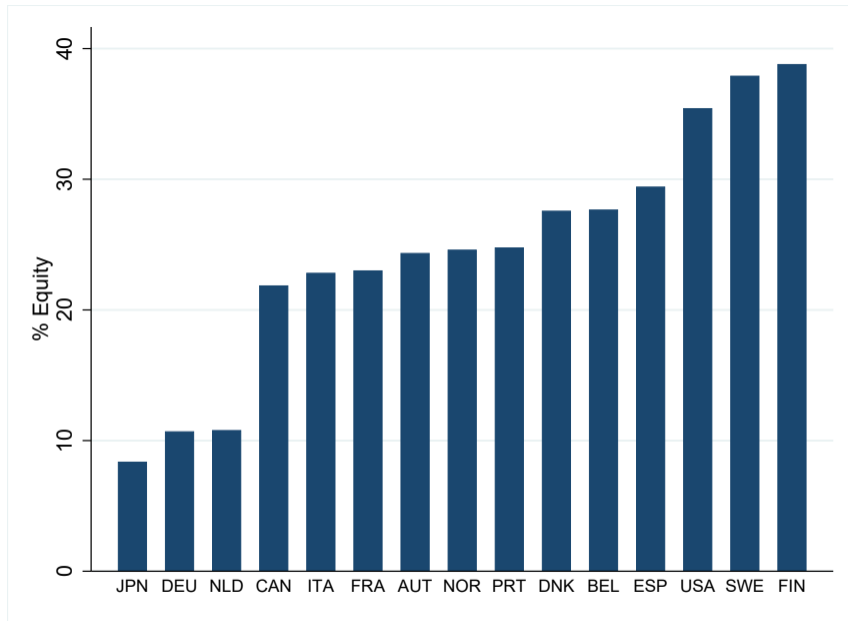
Literature

- ▶ Large literature in household finance on stock market participation and inequality:
 - ▶ Why do so many HH leave equity premium on the table?
 - ▶ Potential drivers: fin. literacy, experiences, entry cost, income risk, institutions (accounting standards, shareholder rights).
 - ▶ Return inequality: Benhabib et al. (2011), Gabaix et al. (2016), Xavier (2021).
- ▶ Small literature on explaining low participation and equity premium conjointly: Ebrahim and Mathur (2001), Favilukis (2013), Breuer et al. (2019).
- ▶ Macrofinance literature: Scharfstein (2018), Diamond (2020), Melcangi and Sterk (2021), Doerr, Drechsel, and Lee (2021).

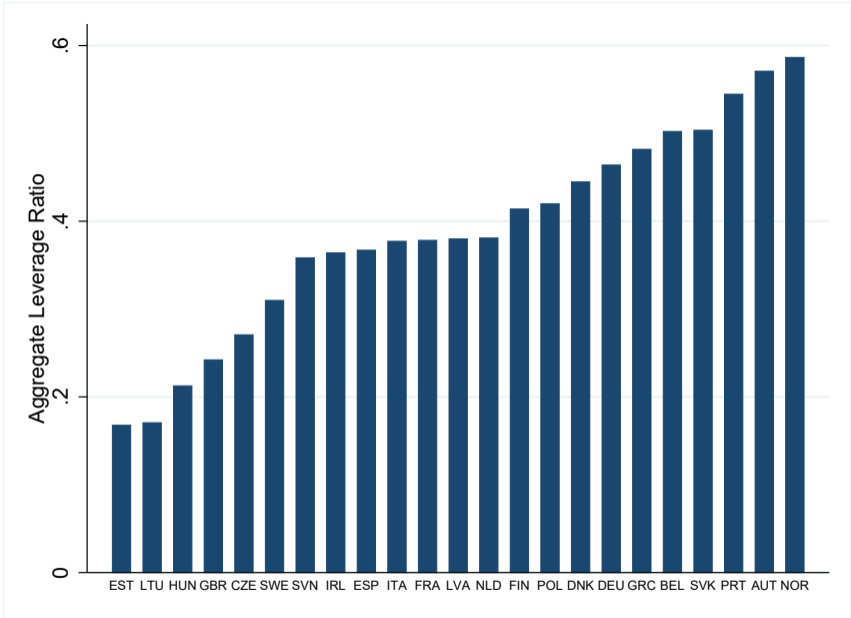
Empirics

Data

- ▶ Financial Accounts Data (ESA, US Financial Accounts): Household and Corporate Balance Sheets.
- ▶ HCFS: Equity Participation.
- ▶ Peter (2021): Inside Equity Share.
- ▶ La Porta et al. (1998): Index of accounting standards.
- ▶ Dimson et al. (2021): Global Equity Premium Estimation

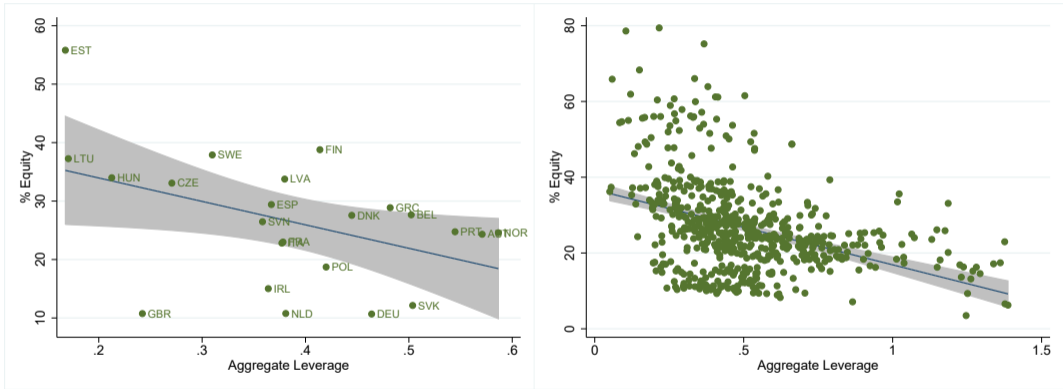


Data: National Financial Accounts.



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More Equity \implies Lower Leverage



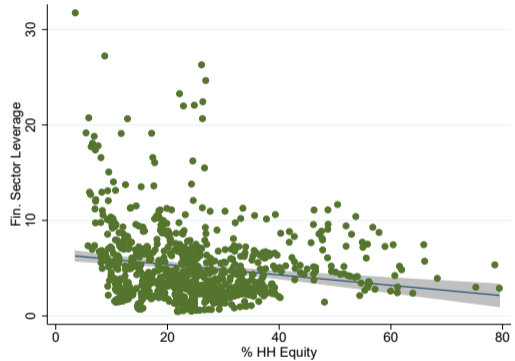
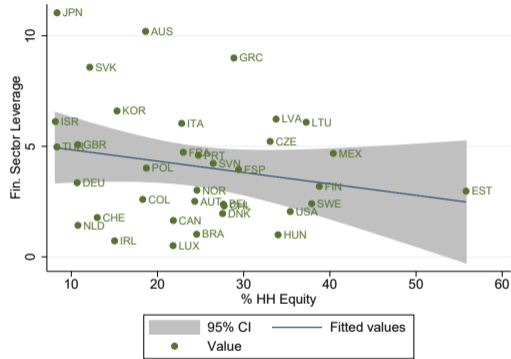
Data: National Financial Accounts. Left: 2019. Right: 1970-2021.

VARIABLES	(1)	(2)	(3)	(4)
		Corporate Leverage		.
% HH Equity	-0.758*** (0.220)	-0.672*** (0.220)	-1.385*** (0.399)	-1.088*** (0.335)
Observations	613	613	613	613
R-squared	0.150	0.293	0.552	0.681
Time FE	No	Yes	No	Yes
Country FE	No	No	Yes	Yes

Standard errors are double-clustered at the time and country level.

*** p<0.01, ** p<0.05, * p<0.1

More Equity \implies Lower Fin. Sector Leverage



Data: National Financial Accounts. Left: 2019. Right: 1970-2021.

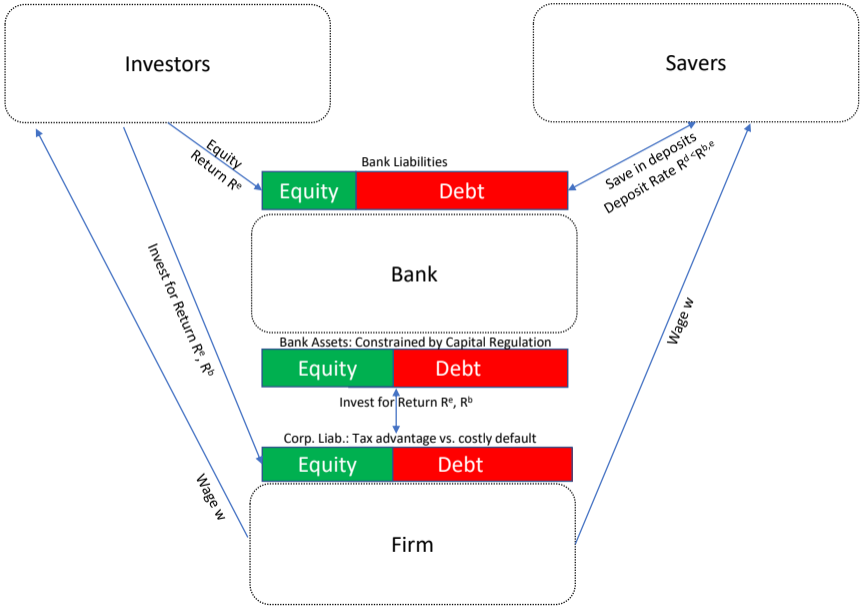
Equity Premium

Accounting Standards

Listed Shares

Inside Capital

Model



Households

- ▶ 2-prd. OLG setting: wage w when young, consumption when old.
- ▶ Two types:
 - ▶ *Investors* have access to all assets.
 - ▶ *Savers* use storage and bank deposits.
- ▶ Risk-neutral: invest into asset with highest return.
- ▶ Available assets: corporate equity, corporate debt, bank equity, bank deposits, storage (returns 1).

Firms

- ▶ Cobb-Douglas Production using capital=equity+debt and labor. Linear Corporate Tax, redistributed lump-sum to old.
- ▶ Optimal Leverage Choice: given prices R^e and R^b , trade-off between costly default ($z < \bar{z}$) and interest deduction.
- ▶ No recovery in default.

$$\max_{e,b,l} [1 - F(\bar{z})] (1-\tau) [z(e + b)^\alpha l^{1-\alpha} - wl] - (1-\tau)R^b b - [1 - F(\bar{z})] \tau b - R^e e.$$

FOC: Firm

$$[1 - F(\bar{z})] (1 - \tau) \alpha^2 E[z|z > \bar{z}] (e + b)^{\alpha - 1} = R^e + f(\bar{z}) \frac{d\bar{z}}{de} \left[(1 - \tau) \frac{R^b b}{1 - F(\bar{z})} + \tau \right] b$$

$$[1 - F(\bar{z})] \left[(1 - \tau) \alpha^2 E[z|z > \bar{z}] (e + b)^{\alpha - 1} - \tau \right] = (1 - \tau) R^b \left[1 + f(\bar{z}) \frac{\frac{d\bar{z}}{db}}{1 - F(\bar{z})} b \right]$$

$$\bar{z} = \frac{(1 - \tau) \frac{R^b}{1 - F(\bar{z})} + \tau}{(1 - \tau) \alpha (e + b)^\alpha} b$$

Bank

- ▶ Intermediates deposits and bank equity to corporate debt and equity.
- ▶ Deposit interest: Nash-bargaining problem: storage is outside option.
- ▶ Cost of intermediation, linear in bank size.
- ▶ Bank defaults if profit < 0 .

$$\max_{e^y, b^y} P(\text{Profit} \geq 0) \times [R^e e^y + R^b b^y - R^d q - R^e e^i - \Gamma(e^i + q)]$$

subject to

$$e^y + b^y \leq q + e^i$$

Crucial modeling choices:

- ▶ Are banks competitive?
- ▶ Deposit insurance?

Equilibrium Dynamics

- ▶ Dynamics are standard OLG:

$$w_t = [1 - F(\bar{z})](1 - \alpha)(e_t + b_t)^\alpha = e_{t+1} + b_{t+1}$$

- ▶ $e + b$ "fixed", leverage b , e , e^i found from firm and bank FOC.
- ▶ Cases:
 - ▶ $R^e = R^b$: Internal solution
 - ▶ $R^b > R^e$: Debt is scarce and expensive.
 - ▶ $R^e > R^b$: Equity is scarce and expensive.
 - ▶ Investment/Output/Wage lower, corporate default probability higher higher.
 - ▶ Return inequality higher, as bank return lower, premium for *investors*.

Planner's problem

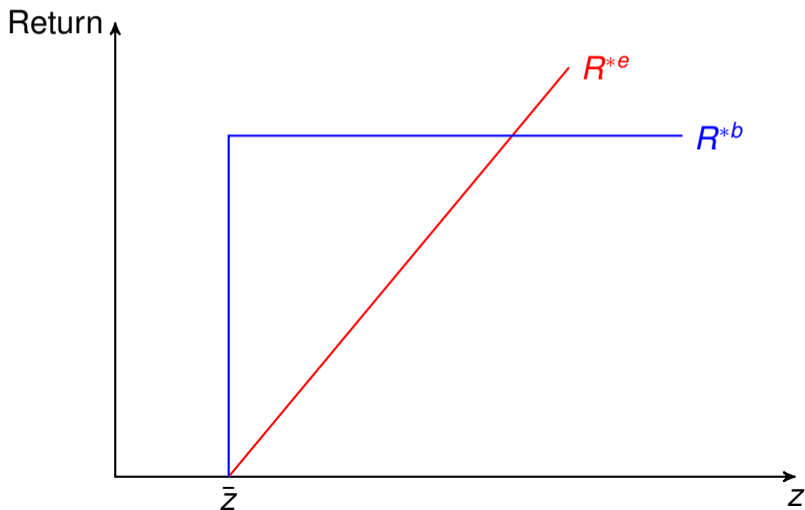
- ▶ Planner maximizes **aggregate expected consumption**, subject to systemic risk: $z = i + a$, with i idiosyncratic, a aggregate.
- ▶ First-best solution: Planner invests saver-hh savings into equity: no default risk.
- ▶ Second-best: Planner can only choose bank asset allocation.
 - ▶ Trades-off bank default risk (less equity) and firm default risk (more equity).
 - ▶ Planner ignores tax advantage: return to capital R .

$$\max_{e,b} P(\text{Profit} \geq 0) \times [R - \Gamma] w$$

$$\text{Profit} = (R^{*e} - \lambda R^e)e + (R^{*b} - \lambda R^b)b - [1 - \lambda + \Gamma] w$$

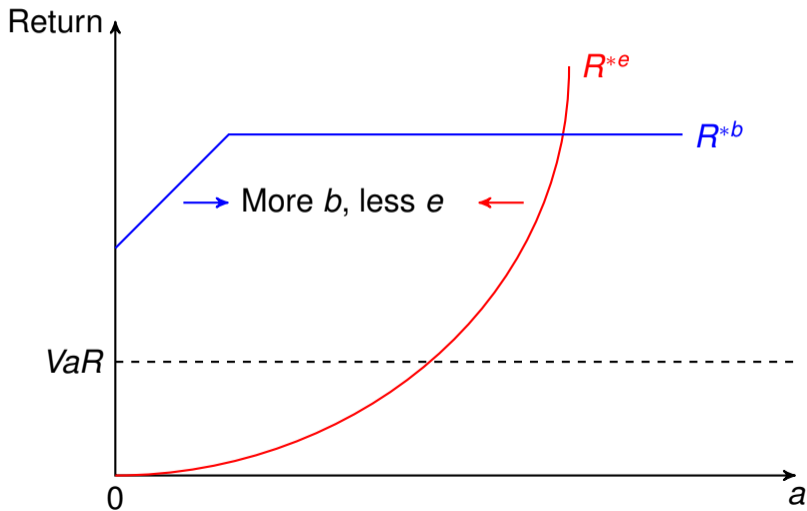
Second best

- ▶ This is a *Value at risk* optimization. Planner chooses debt and equity to minimize bank default risk.



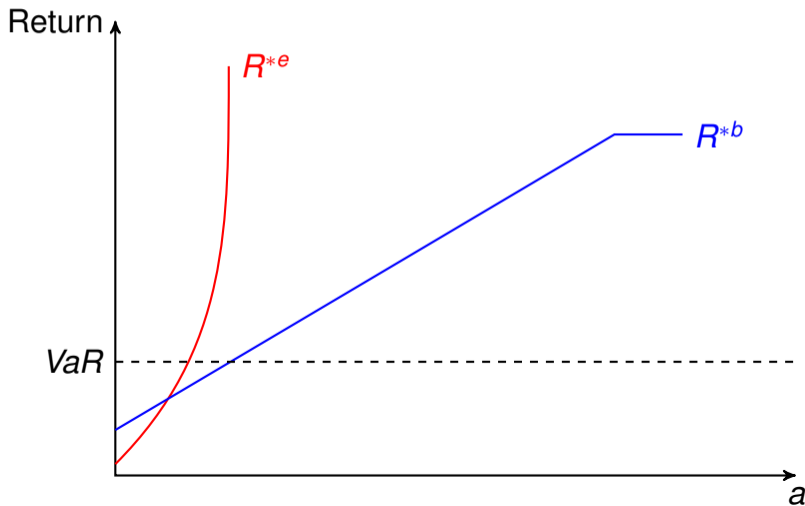
Second best

- ▶ The bank holds a portfolio of all firms.



Second best

- ▶ Optimal weighting to minimize bank default risk. Does not internalize tax advantage: $R^b > R^e$



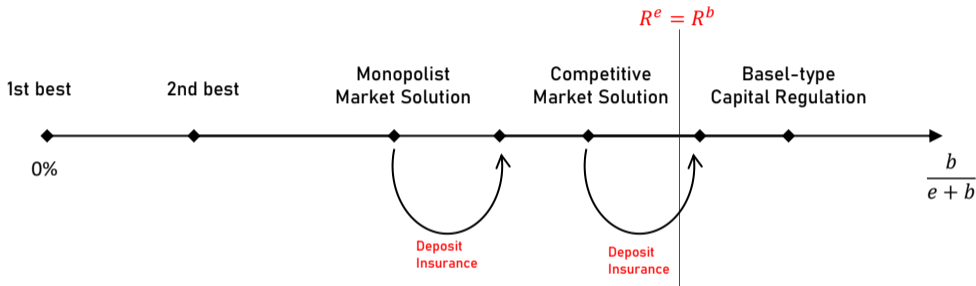
Market Solution

If the banker maximizes profit:

$$\max_{e^y, b^y} P(\text{Profit} \geq 0) \times \text{Profit}$$

$$\text{Profit} = (R^{*e} - \lambda R^e)e^y + (R^{*b} - \lambda R^b)b^y - [1 - \lambda + \Gamma]q$$

- ▶ As debt privately scarce: more debt.
- ▶ With competitive banks: even more debt.
- ▶ With deposit insurance: even more debt.



Stronger tax distortion shifts the red horizontal line to the right.

Bank Regulation

- ▶ The second-best can be implemented via capital regulation: planner chooses risk weights.
- ▶ Constraint:

$$e^i > \chi^e e^y + \chi^b b^y$$

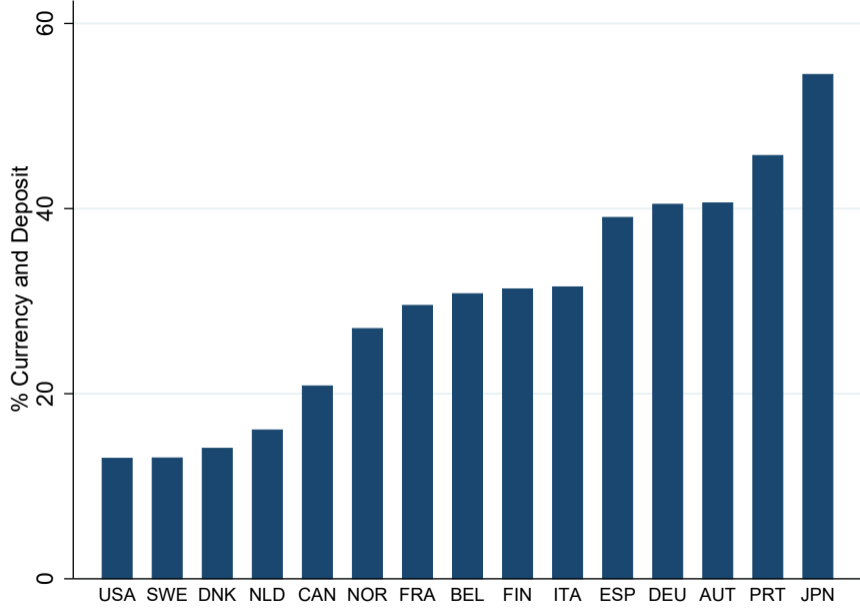
- ▶ Basel-type capital regulation constraint, nests Volcker-rule US regulation with $\chi^e \rightarrow \infty$.
- ▶ If binding (i.i.d case):

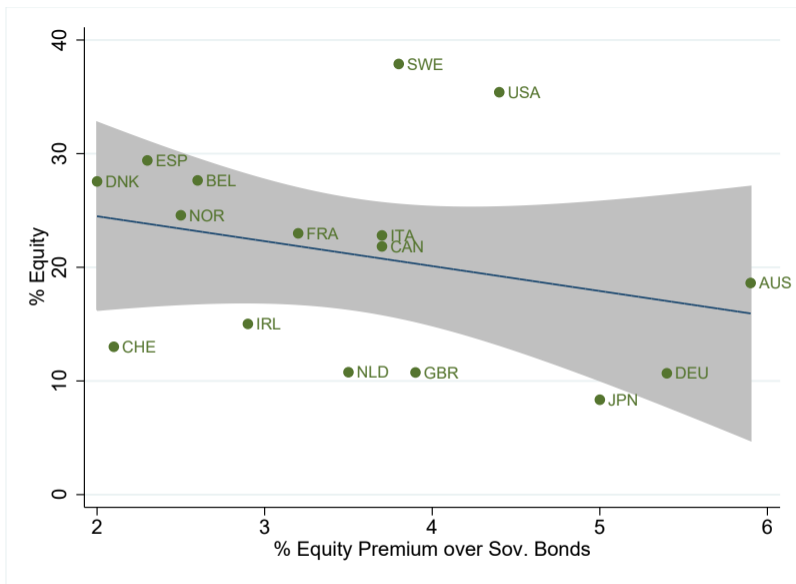
$$R^e - R^b = \frac{\chi^e - \chi^b}{1 - \chi^e} \Gamma > 0.$$

Conclusion

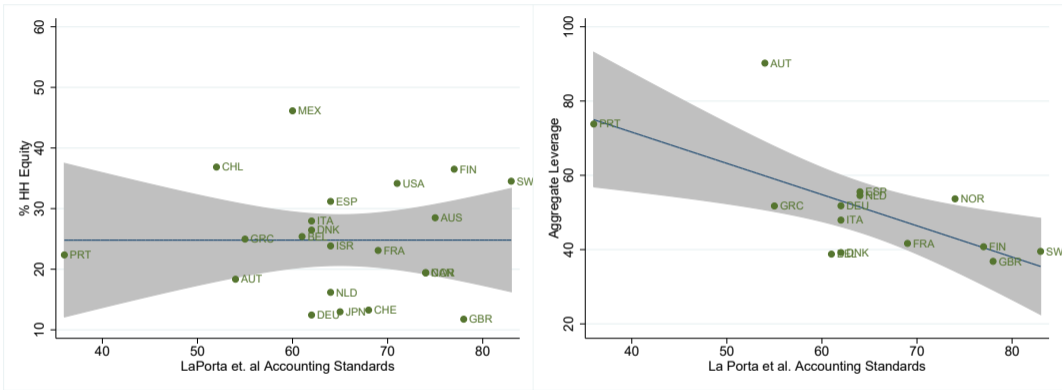
- ▶ Equity investment by domestic households is a crucial determinant of corporate and financial sector leverage.
- ▶ I show in a GE model of financial intermediation that scarce equity can
 - ▶ reduce investment and output, increase firm and bank defaults;
 - ▶ increase wealth inequality through return inequality.
- ▶ I derive socially optimal leverage and show that with low HH equity investment:
 - ▶ capital-based retirement systems increase financial stability;
 - ▶ intermediary investment into corporate equity might be desirable;
 - ▶ anti-equity regulation could make banks **more** risky.

Appendix

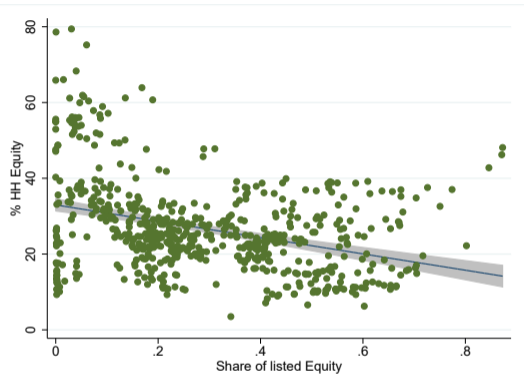
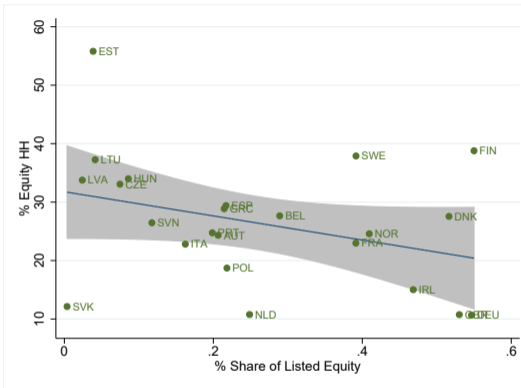




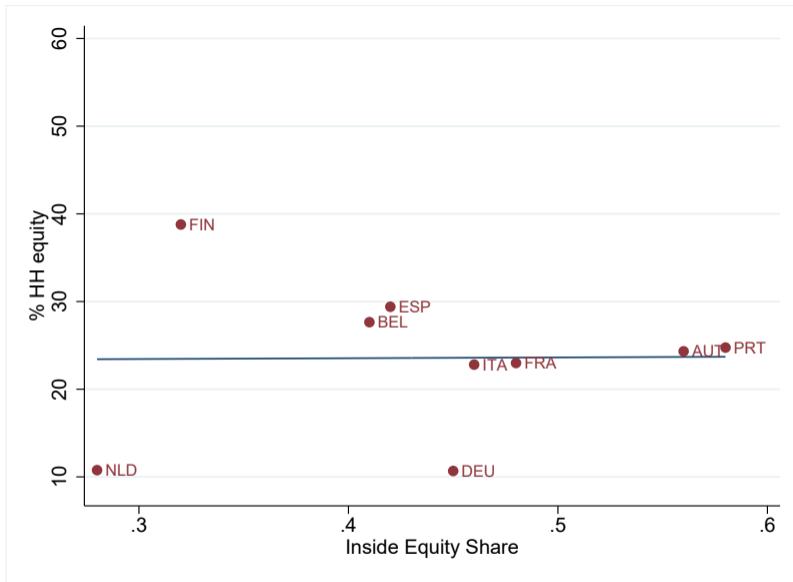
Equity Premium vs. gov. bonds. Data: National Financial Accounts and Dimson et al. (2021) [Back](#)



Institutions? Data: La Porta et al. (1998), Equity and Leverage 2000-2005. [Back](#)



Data: National Financial Accounts. Left: 2019. Right: 1970-2021. [Back](#)



Data: National Financial Accounts and Peter (2021). [Back](#)

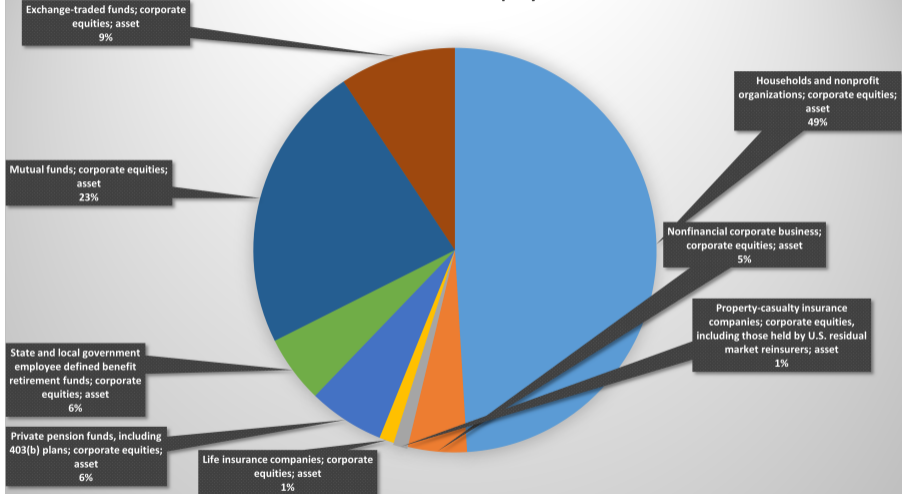
Literature on Leverage Choice

- ▶ Models of optimal leverage choice have long tradition in Finance:
 - ▶ *Myers (1984) Leland (1994), Hennessy and Whited (2005), DeMarzo and He (2021), Bolton et al. (2021).*
 - ▶ In GE models as well: *Covas and Den Haan (2011), Jermann and Quadrini (2012), Begeau and Salomao (2019).*
 - ▶ BUT: households are perfect arbitrageurs.
 - ▶ No role for financial intermediaries.

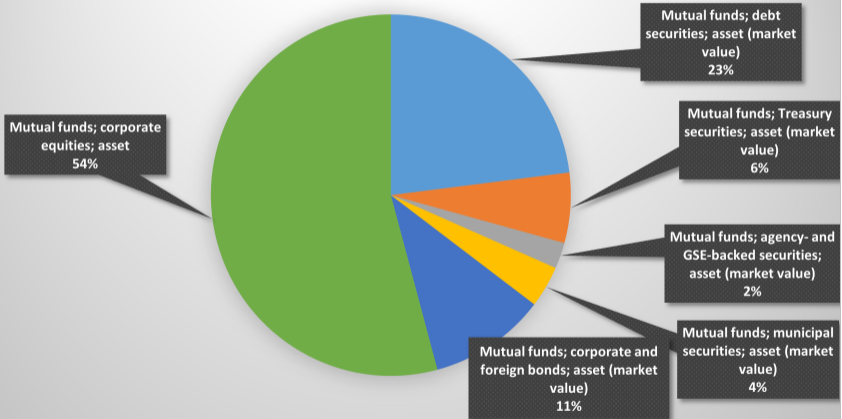
- ▶ Intermediary Asset Pricing: He and Krishnamurthy (2018)
 - ▶ (Leverage) Constraints on financial intermediaries influence asset prices.

- ▶ Optimal Capital Regulation: Admati and Hellwig (2013), Elenev, Landvoigt, and Van Nieuwerburgh (2021)
 - ▶ Optimal Capital Requirement constrains risk-taking by banks.

Who holds US equity?



Mutual Fund Investments



Pension Funds Assets

