Models of Corporate Finance for Development

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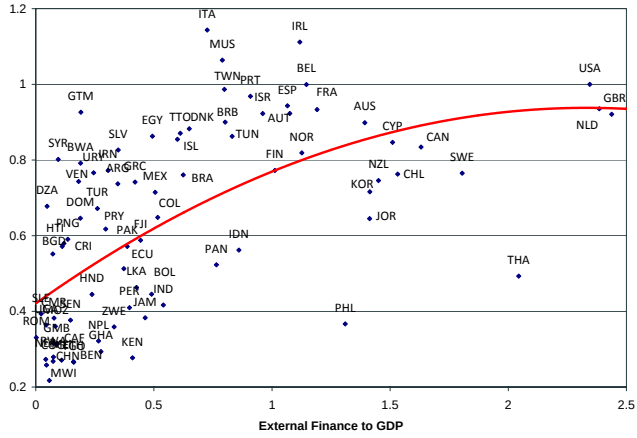
STEG-PEDL Online Course: Private Enterprises, Productivity, and Economic Growth

Lecture Outline

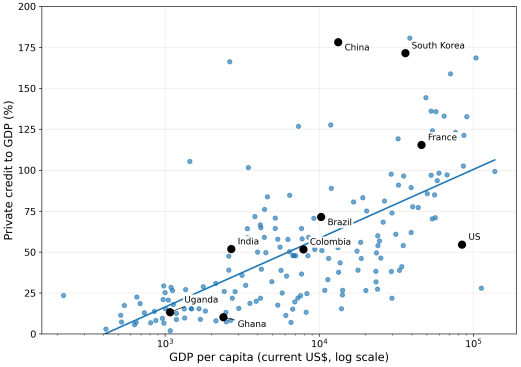
- What is corporate finance?
  - Some facts and debt and equity across the development spectrum
- Model of debt financing & constraints
  - Midrigan & Xu (2014): Finance and Misallocation: Evidence from Plant-level Data
- Model of equity financing & constraints
  - Peter (2025): Equity Frictions and Firm Ownership
- Some empirics of venture capital
  - Colonnelli et al (2026): Startups in Africa

External Finance across countries

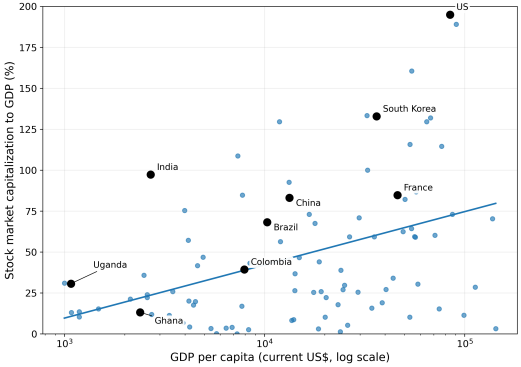


Source: Virgiliu Midrigan's teaching slides.

External Finance ≈ Debt + Equity



Debt (Private Credit)



Equity (Stock Market Capitalization)

External Finance: Debt & Equity

- Why do firms need external finance?
  1. Timing: e.g., capital needs to be paid for before production and sales
  2. Risk-sharing: businesses might succeed or fail
- Debt
  - Borrow \$1, promise to repay $(1 + r)$ next period
  - Typically, r independent of how the firm performs, risk stays with owner
- Outside Equity
  - Sell a fraction ϕ of the firm
  - Buyer receives share ϕ of profits every period (risk-sharing)

Modigliani-Miller

- Does a firm's mic of debt and equity matter?
- Under certain conditions, no!
  - If debt and equity are priced competitively
  - Agents are risk-neutral
  - No "frictions" to issue either form of finance

$\Rightarrow$ debt and equity are essentially the same

- In practice, they are imperfect substitutes $\Rightarrow$ important to consider both!

Next: study debt frictions in isolation

- Assume no access to outside equity
- Debt is the only form of external finance
  - Typical assumption in macro-dev literature; because data is scarce?
- Discuss Midrigan & Xu: Finance and Misallocation
- Other prominent examples
  - Buera, Kaboski & Shin

Debt Frictions and Development

What's a debt friction?

- Overview in Banerjee & Duflo Handbook of Growth (2005)
  - Borrowing rates between 20% and 125%
  - Default risk? Not quite, default rates $< 10\%$
- Yet, typically, we model debt frictions as a constraint
  - Firms are constrained in the level of debt by their (tangible) assets
  - Less stringent data requirements for calibration
- For work on interest rates, see Calvacanti et al (2023): Financing Costs and Development

Midrigan & Xu (2014, *AER*), simplified version

- "Finance and Misallocation: Evidence from Plant Level Data"
- Question: What is the effect of financial frictions on aggregate output / TFP?
- How: Quantitative model of entrepreneurship + data from South Korea
- Key findings:
  - Modest losses from misallocation among *existing* firms (5%)
  - Too little entry into the modern sector (40%)

Midrigan & Xu: simplified model setup

- Analyze decision problem of entrepreneur in “modern sector”
  - In the paper: traditional sector that uses low-TFP technology with only labor
  - We will discuss entry into the modern sector later
- Consider steady-state, i.e. wages W and interest rate r constant

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- Preferences

$$\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\theta}}{1-\theta}$$

  - Agents are risk-averse, θ governs risk aversion

Midrigan & Xu: simplified model setup ctd

- Technology: $y_t = z_t^{1-\eta} \left(k_t^{\alpha} l_t^{1-\alpha}\right)^{\eta}$
  - Decreasing returns to scale in $\{k, l\} \Rightarrow$ firms make profits even when price-takers
- Productivity: $\ln z_t = \rho_z \ln z_{t-1} + \sigma_z \varepsilon_t$
  - ρ_z governs persistence of productivity, σ_z governs dispersion
- Simple "corporate finance": no equity, one-period debt subject to a constraint
  - Budget constraint: $c_t + k_{t+1} - b_{t+1} = y_t - Wl_t + (1-\delta)k_t - (1+r)b_t$
  - Collateral constraint: $b_{t+1} \leqslant \xi k_{t+1}$

A note on debt frictions

- Here: maximum leverage constraint $b_{t+1} \leqslant \xi k_{t+1}$
  - Can borrow at most a fraction ξ of the capital
  - Usually justified as physical collateral
- Alternative "ad hoc" constraints
  - $b_{t+1} \leqslant \xi(z_t) k_{t+1}$: more poductive / bigger firms can borrow more (intangible capital)
  - Cash-flow based: $b_{t+1} \leqslant z_t^{1-\eta} \left(k_t^{\alpha} l_t^{1-\alpha}\right)^{\eta}$
- Interest rate depends on firm characteristics
  - Classic setup: Kehoe & Levine (1993)
  - More debt $\Rightarrow$ higher default probability $\Rightarrow$ higher interest rate

Back to Midrigan & Xu

- Let $a_{t+1} = k_{t+1} - b_{t+1}$ denote entrepreneur's net worth
- Timing assumptions:
  - entrepreneur chooses a_{t+1} before observing z_{t+1}, but can adjust k_{t+1} ex-post
  - equivalent to assuming rental market for capital
- Allows to write budget constraint

$$c_t + a_{t+1} = \underbrace{y_t - Wl_t - Rk_t}_{\pi_t} + (1 + r)a_t$$

  - $R = r + \delta$ user cost (rental rate) of capital

Networth formulation

- Rewrite the collateral constraint ($b_{t+1} \leqslant \xi k_{t+1}$)

$$k_t \leqslant \frac{1}{1-\xi} a_t \equiv \lambda a_t$$

- Given timing assumptions, $\{k_t, l_t\}$ is the solution to

$$\max_{\{k_t, l_t\}} z_t^{1-\eta} \left(k_t^{\alpha} l_t^{1-\alpha}\right)^{\eta} - W l_t - R k_t$$

$$\text{s.t. } k_t \leqslant \lambda a_t$$

  - Amount of capital in the firm (possibly) constrained by the entrepreneur's net worth

Who is constrained?

- Let's solve for the optimal k_t ignoring the borrowing constraint:

$$k_t^* = z_t \, R^{-\frac{1-\eta+\alpha\eta}{1-\eta}} \, W^{-\frac{(1-\alpha)\eta}{1-\eta}} \, \widetilde{\alpha}$$

- The borrowing constraint binds when

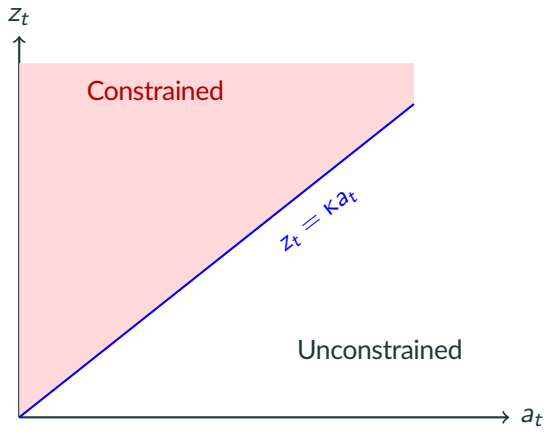
$$k_t^* > \lambda a_t$$

- Equivalently,

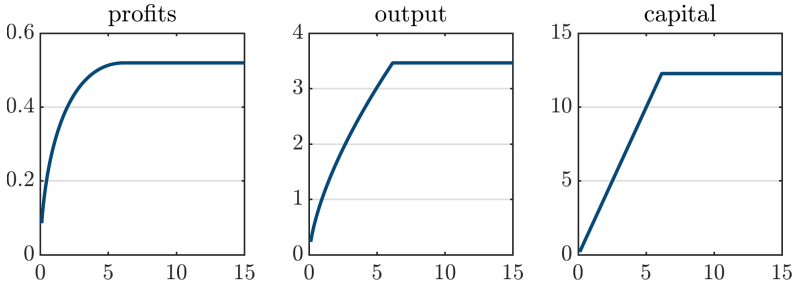
$$z_t > \frac{\lambda a_t}{R^{-\frac{1-\eta+\alpha\eta}{1-\eta}} \, W^{-\frac{(1-\alpha)\eta}{1-\eta}} \, \widetilde{\alpha}} \equiv \kappa a_t$$

- $\Rightarrow$ high productivity & low wealth entrepreneurs are constrained

Who is constrained – graphically



Output, capital, and profits depend on net worth



- Reduction in capital $>>$ reduction in profits
  - Decreasing returns to capital, so last few units of capital make fewer π than the first

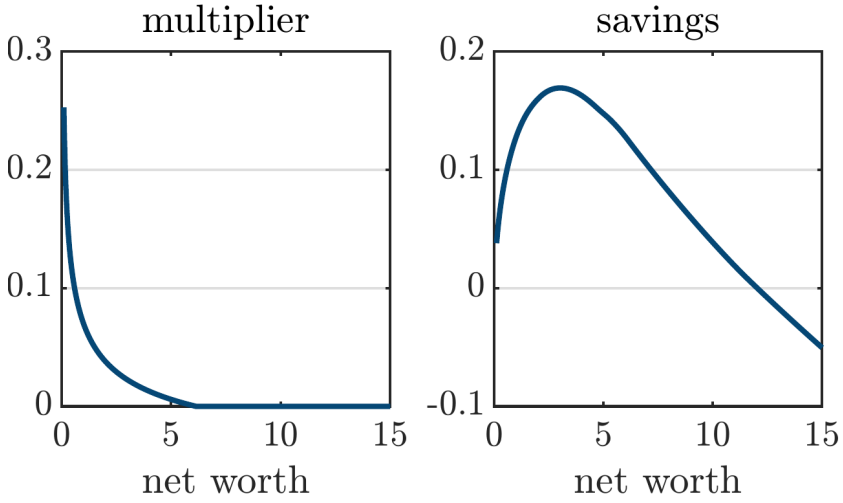
Dynamic problem - how much to save?

- $\pi(a, z) \equiv$ maximum profits of entrepreneur with wealth a, productivity z
  - Full summary of intra-period choices
- Dynamics: Bellman equation

$$V(a, z) = \max_{a'} \frac{c^{1-\theta}}{1-\theta} + \beta \mathbb{E} V(a', z')$$
$$\text{s.t. } c + a' = \pi(a, z) + (1 + r)a$$

- Euler equation $c(a, z)^{-\theta} = \beta \mathbb{E} c(a', z')^{-\theta}(1 + r + \lambda \mu(a', z'))$
  - Where $\mu(a', z')$ is the multiplier on the constraint

Multiplier and savings as a function of networth



Aggregation

- Fixed labor supply, $\int l_{it+1} \mathrm{d}i = L = 1$
- Closed economy, so $\int k_{it+1} \mathrm{d}i = \int a_{it+1} \mathrm{d}i$, i.e. $\int b_{it+1} \mathrm{d}i = 0$
- Let τ_{it} denote wedge in capital FOC: $\tau_{it} \equiv \frac{R+\mu_{it}}{R}$
  - $\mu_{it} \gtrless 0 \rightarrow \tau_{it} \gtrless 1$
- Implies $\frac{k_{it}}{K_t} = \frac{(\tau_{it})^{-\frac{1-(1-\alpha)\eta}{1-\eta}} z_{it}}{\int (\tau_{it})^{-\frac{1-(1-\alpha)\eta}{1-\eta}} z_{it}}$ and $\frac{l_{it}}{L_t} = \frac{(\tau_{it})^{-\frac{\alpha\eta}{1-\eta}} z_{it}}{\int (\tau_{it})^{-\frac{\alpha\eta}{1-\eta}} z_{it}}$

Financial Frictions and Aggregate TFP

$$Y_t = \underbrace{\left(\int z_{it}^{1-\eta} \left(\frac{k_{it}}{K_t} \right)^{\alpha\eta} \left(\frac{l_{it}}{L_t} \right)^{(1-\alpha)\eta} \mathrm{d}i \right)}_{\mathrm{TFP}_t} \left(K_t^{\alpha} L_t^{1-\alpha} \right)^{\eta}$$

$$\mathrm{TFP}_t = \frac{\left(\int z_{it} \left(\tau_{it} \right)^{-\frac{\alpha\eta}{1-\eta}} \mathrm{d}i \right)^{1-(1-\alpha)\eta}}{\left(\int z_{it} \left(\tau_{it} \right)^{-\frac{1-(1-\alpha)\eta}{1-\eta}} \right)^{\alpha\eta}}$$

Without financial frictions: $\mathrm{TFP}_t^* = \left(\int z_{it} \mathrm{d}i \right)^{1-\eta}$

Do financial frictions matter for macro?

- Consider 2 calibrations of the simple model
  - Closed economy (R clears the capital market), small open economy
  - Roughly follow calibration in Midrigan & Xu
- What could lead to larger TFP losses?
  - Insights from Moll (2014)
  - Ingredients that make aggregate effects stronger

Parameters

- Assigned parameters
  - period 1 year, so $\beta = 0.96$, $\theta = 2$
  - $\eta = 0.85$, $\alpha = 1/3$, $\delta = 0.06$
  - ξ = 0.86 as in Midrigan - Xu for South Korea
- Calibrated parameters
  - TFP process persistence and variance: ρ_z and σ_z
  - Calibration targets: corr $(\log y_{it}, \log y_{it-1})$, s.d. $(\Delta \log y_{it})$

$\Rightarrow$ $\rho_z = 0.896$, $\sigma_z = 0.40$

Macro Consequences, Closed Economy

	$\xi = 0.86$	$\xi = 0.5$	$\xi = 0$
TFP loss, %	0.22	2.37	7.26
τ	1.02	1.16	5.00
W	1	0.96	0.88
r	0.017	0.009	-0.043
Y	1	0.96	0.88
K/Y	3.62	3.52	3.36

- Relatively modest losses, primarily due to reduction in TFP
- Welfare losses larger: drop in r makes precautionary savings difficult

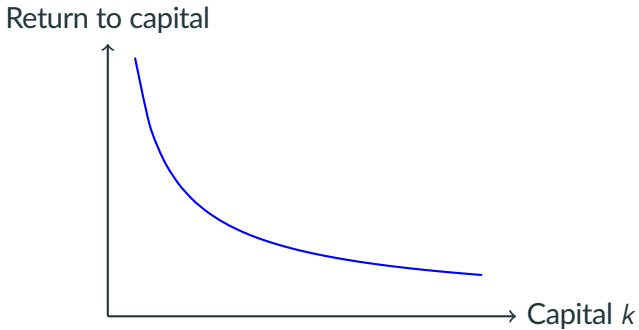
Macro Consequences, Small Open Economy, R=1.017

	$\xi = 0.86$	$\xi = 0.5$	$\xi = 0$
TFP loss, %	0.22	1.71	3.43
τ	1.02	1.11	1.25
W	1	0.95	0.88
r	0.017	0.017	0.017
Y	1	0.95	0.88
K/Y	3.62	3.30	2.95

- Smaller TFP losses due to self-financing (higher r)
- Similar Y losses because K/Y falls more

Self-Financing and Misallocation

- Why are TFP losses modest? Self-financing!
  - DRS $\Rightarrow$ at low levels of k, returns are very high
  - Can quickly save up out of the constrained region



Self-Financing and Misallocation

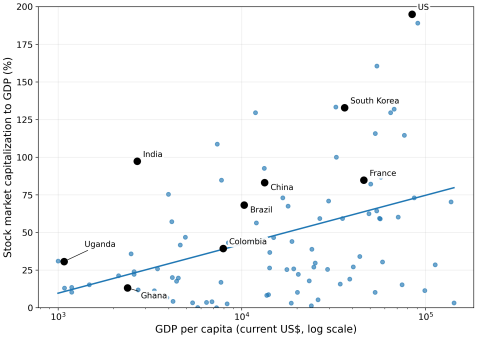
- Why are TFP losses modest? Self-financing!
  - DRS $\Rightarrow$ at low levels of k, returns are very high
  - Can quickly save up out of the constrained region
- What if high productivity very transitory?
  - Less time to save, but also matters less for aggregate (Moll, 2014)
- Why might losses still be large?
  - Non-convexities: entry costs, adoption costs, capital indivisibilities
  - Savings constraints

Equity Part 1: Public Equity

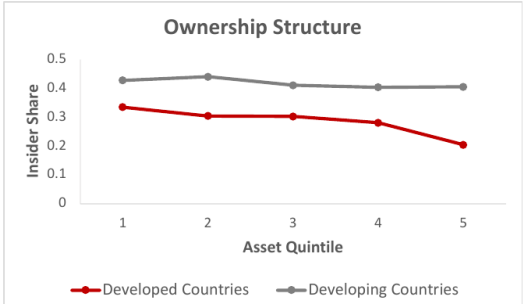
Part 1: Public Equity

- First, let's talk about public equity, i.e. firms that went public and sold stock.
  - At the end: venture vapital & other forms of private equity
- 2 margins of public equity issuance:
  - Extensive margin: does a firm IPO?
    - Measured as stock market capitalization to GDP
  - Intensive margin: how much of the firm is publicly traded?
    - Measured as "insider share": % of firm held by top 3 shareholders (Peter, 2025)

Both margins lower in developing countries



Extensive Margin (Stock Market Cap)



Intensive Margin (Insider Share, Yan, 2024)

A model of (insider-controlled) public firms (Peter, 2025)

- If insiders own $\approx 40\%$ of a public firm, need to use an entrepreneurship model!
- Setup: similar to Midrigan & Xu
  - $y = zk^{\nu}$ (think: labor already optimized out)
  - Timing difference: k' chosen before z' known $\Rightarrow$ more risk for entrepreneur
  - Cash-on-hand x, savings in capital k' or in bonds a'
  - Similar leverage constraint on debt issuance (λ)
  - Key new ingredient: entrepreneur owns a share $1 - \varphi$ of the firm

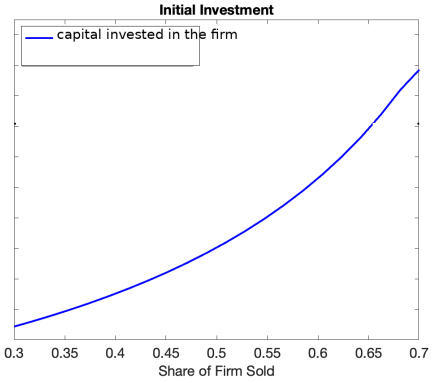
A model of (insider-controlled) public firms (Peter, 2025)

- Problem of an entrepreneur who sold φ of her firm
  - We'll discuss after how much they optimally sell

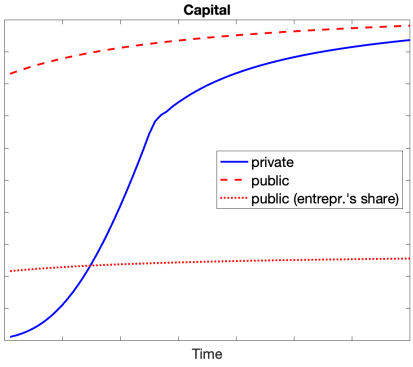
$$
\begin{aligned}
V(x; z, \varphi) = \max_{\{c, a', k', x'\}} \; & u(c) + \beta \mathbb{E} V(x'; z', \varphi) \\
\text{s.t.} \quad & c + a' + (1 - \varphi) k' = x, \\
& x' = (1 - \varphi) \left[z' k'^{\nu} + (1 - \delta) k' \right] + R a', \\
& a' \geqslant -(1 - \varphi) \lambda \frac{(1 - \delta)}{R} k'.
\end{aligned}
$$

- The bigger is φ,
  1. The less of any given capital k' the entrepreneur has to finance herself
  2. The less risk she is exposed to

Bigger share sold ⇒ more investment in the firm



More k in more widely held firms

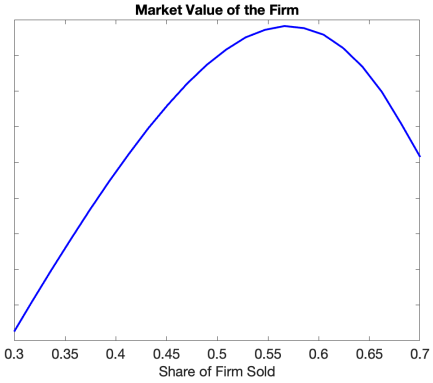


Equity allows faster saving out of constraint

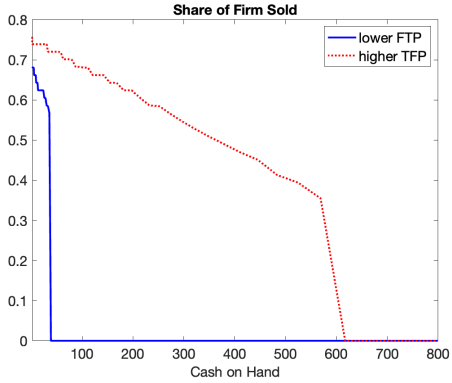
Equity Frictions

- Why don't all firms go public then and sell the entire firm?
  - Seems to solve both debt constraints and risk-sharing
- In practice
  - Underwriting fees and other costs of access public markets
  - Information frictions: moral hazard and adverse selection
- In the model
  - Fixed cost of IPO
  - "Agency cost" that scales with share sold (moral hazard)

Price of Equity and Share sold



Agency cost guarantees internal solution for φ



Low wealth & high TFP entrepreneurs sell

Taking Stock

- Outside equity allows investment (like debt), but also risk-sharing
- Seems particularly relevant in low-income countries
  - Some evidence that business income more volatile in poor countries
  - Fewer opportunities for insurance etc
- Quantitatively, Peter (2025) shows that equity frictions $>>$ debt frictions
- Relevance for development? Promising research area!

Equity Part 2: Startups

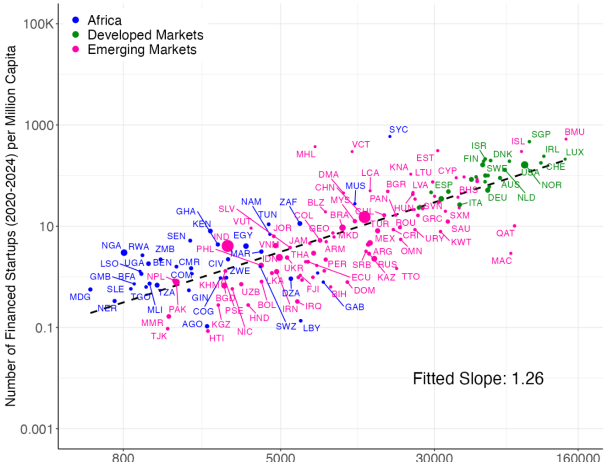
Private Equity and Startups

- Young (high-growth) firms typically can't access public equity markets
- Most funding for start-ups is in the form of private equity
  - FFF investors (friends, family, and fools)
  - Institutionalized private equity (e.g. venture capital funds)
- Very important part of financing ecosystem in the US
  - Especially for innovative firms
- What do we know about startup finance in Africa?

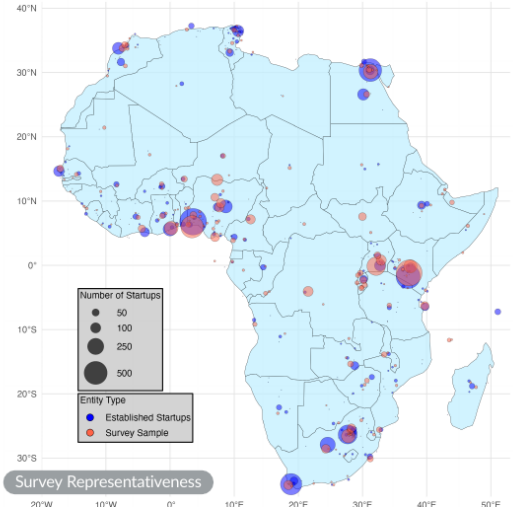
Colonnelli, Cruz, Lopez, Porzio, Zhao (2026)

- First comprehensive data collection on startups in Africa
  - What are their constraints? Who funds them?
- Sample of 4,444 startups all over the continent
  - $<$ 10 years old
- Plus $\approx$ 1,000 established startups (previously received VC funding)

Fewer startups in low-income countries



Startups concentrated in a few hubs



Only larger firms access VCs

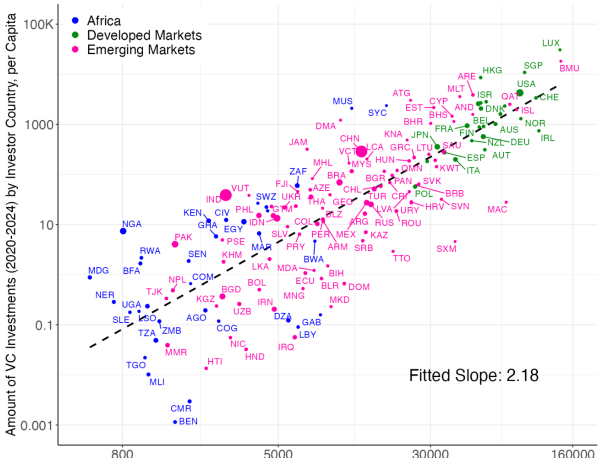
Share (%)	2-5 (Average:4)	6-10 (Average:8)	11-20 (Average:15)	21+ (Average:48)
Personal savings/resources	45.1	33.3	27.8	18.9
Family and friends	19.0	20.7	15.6	12.0
Bank loans	8.6	15.5	15.2	25.2
Angel or VCs	7.2	10.9	18.4	25.5
Government funded or backed loans	7.3	7.7	6.7	5.4
Others (Grants, Crowdfunding, etc.)	12.8	11.9	16.3	12.9

Results of incentivized experiment

- Most startups prefer equity, even over debt with good terms
  - Risk sharing?
- Preference for local investors
  - At least investors with local expertise
  - VC is more than just money
- What venture capital is “available”?

Less VC financing directed towards low-income countries

Less VC financing originating from low-income countries



Conclusion

Conclusion: A Fruitful Research Agenda

- Corporate finance is central to development — but it is not just about credit.
- Debt, outside equity, and venture capital shape
  - who becomes an entrepreneur,
  - which firms scale,
  - how risk is shared,
  - and ultimately aggregate productivity and growth.
- Equity frictions may be especially important in low-income environments
- This leaves many open questions for future research:
  - Which institutions help create local equity markets and what can policy do?
  - How do financing frictions affect innovation, selection, and inequality?