Financial Development Beyond the Formal Financial Market

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The views expressed do not necessarily reflect the position of the Bank of Canada.

Motivation

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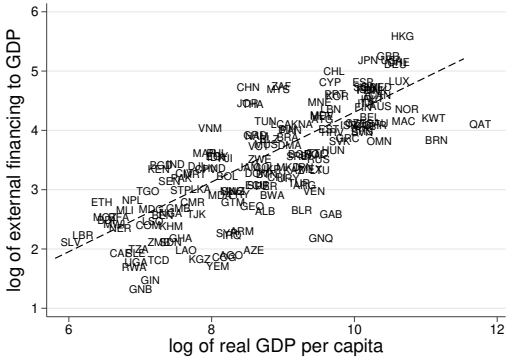
- Studies of financial development focus on formal financing
  - Measurement: external financing, interest rate spread
  - Quantitative analysis: aggregate loss from frictions of formal finance
- Informal financing is missing in these studies
  - Loans from family, friends, suppliers etc.
  - Relationship- or reputation-based, difficult to measure
- Financial development might not be that important if firms in poor countries can rely on informal financing.

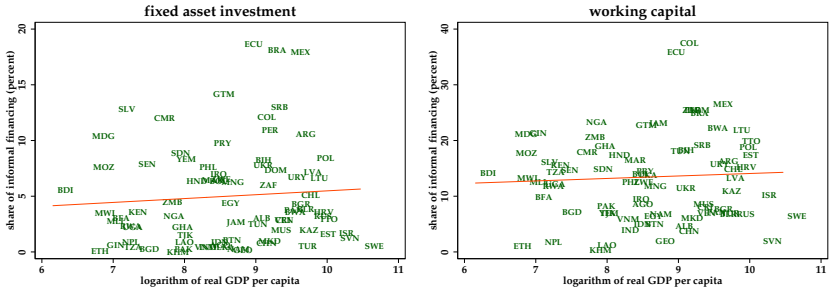
Figure: **Ratio of external financing to GDP and income**



- Rich countries use more formal financing

Source: PWT 8.0 and Global Financial Development Datasbase

Figure: $\frac{\textit{informal financing}}{\textit{total financing}}$ **and income**



- Richer countries also use more informal financing.

Source: PWT 8.0 and World Bank Enterprise Survey

Preview

Empirical patterns

- Fewer entrepreneurs use informal finance in rich countries, but the average size is much larger than poor countries
- Informal financing can substitute for formal financing at the firm-level
- Higher substitution between the two in richer countries

Preview

A model of heterogeneous entrepreneurs with financial frictions

- Formal lenders are faced with financial frictions in the formal financial market
- Informal lenders have comparative advantage in lending, but are constrained themselves

Quantitative analysis

- The incidence of informal finance is hump-shaped over the development process
- Gain from informal finance is higher in the group of middle-income countries

Literature review

- Empirical studies of informal financing.
  Allen et al. (2005), Ayyagari et al. (2010), Degryse et al. (2013)

- Models of informal financing.
  Biais and Gollier (1997), Burkart and Ellingsen (2004), Madestam (2014)

- Quantify the aggregate loss from financial frictions.
  Buera et al. (2011), Greenwood et al. (2010), Jones (2013), Midrigan and Xu (2014), Moll (2014)

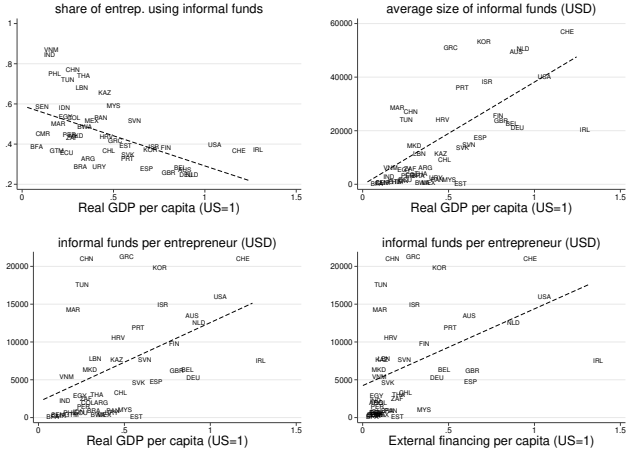
Empirics

Informal financing across countries

- Data: Global Entrepreneurship Monitor (2015)
- 45 countries, each country has $\sim$ 3000 observations
- Variables created from the individual sample

1. Share of entrep. who use money from family, friends and coworkers to start up firms
2. Average size of the inform funds in USD

Cross-country evidence



Source: Global Entrepreneurship Monitor (2015), PWT 9.1

Substitution of informal for formal financing

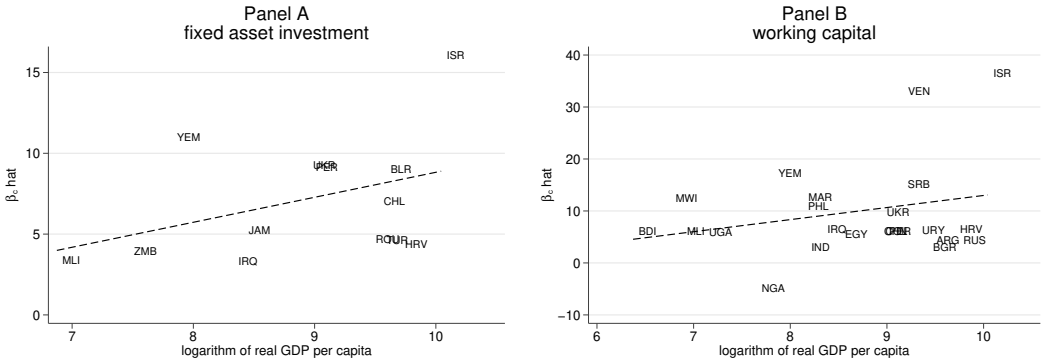
- Data: World Bank Enterprise Survey
- 109 countries, mostly low and middle-income countries
- Empirical specification

$$inf_{ist} = \alpha + \beta_c I\_constrained_i + \chi_{st} + \gamma_i + \varepsilon_{ist}.$$

  - inf_{ist} is the percent of investment or working capital financed with informal funds
  - *I_constrained* is an indicator of whether the firm *i* is financially constrained.

Result

Figure: $\hat{\beta}_c$ **and income**



- The substitution of informal for formal financing increases with income. ▸ cross-country

Source: PWT 8.0 and World Bank Enterprise Survey

Model

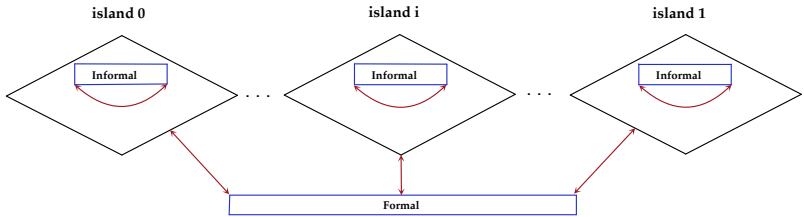
Economic environment

- A continuum of islands $i \in [0, 1]$
- Each island has two households
- A worker household with N workers, hand-to-mouth
- An entrepreneur household with 2 entrepreneurs
- Decreasing return to scale production technology

$$y = Azk^{\alpha}l^{\chi}$$

where A is aggregate TFP and z idiosyncratic productivity

Financial markets and frictions



- Formal financing
  - Limited enforcement over loan repayment $\rightarrow$ collateral constraint $k \leq \gamma a$
- Informal financing
  - Relationship-based within-island lending, perfect enforcement
  - Search friction, lenders have limited funding

Heterogeneity and timing

Entrepreneur household characterized by (a, z_i, z_{-i}, ω)

- Entrepreneur household distributes wealth a to its members
- Productivity shock z_i and z_{-i} realized
- Workers and entrepreneurs leave households to work/produce
- Entrepreneurs seek formal and informal financing
- Production stage, workers (entrepreneurs) earn wage (profit)
- Workers and entrepreneurs return to their households
- Households consume and save into the next period a'

Production and financing

- Entrepreneur household profit function $\pi(a, z_i, z_{-i}, \omega)$

- w/o informal financing, $\omega = 0$

$$\begin{aligned}
\pi(a, z_i, z_{-i}, 0) &= \max_{k_i, l_i} A z_i k_i^{\alpha} l_i^{\chi} - (r+\delta)k_i - w l_i \\
&+ \max_{k_{-i}, l_{-i}} A z_{-i} k_{-i}^{\alpha} l_{-i}^{\chi} - (r+\delta)k_{-i} - w l_{-i} \\
s.t. \quad & k_i \leq \gamma \frac{a}{2},\ k_{-i} \leq \gamma \frac{a}{2},
\end{aligned}$$

- w/ informal financing, $\omega = 1$

$$\begin{aligned}
\pi(a, z_i, z_{-i}, 1) &= \max_{k_i, l_i, \hat{k}, k_{-i}, l_{-i}} A z_i k_i^{\alpha} l_i^{\chi} + A z_{-i} (k_{-i} + \hat{k})^{\alpha} l_{-i}^{\chi} \\
&\quad -(r+\delta)(k_i + k_{-i} + \hat{k}) - w(l_i + l_{-i}), \\
s.t. \quad & k_i + \hat{k} \leq \gamma \frac{a}{2},\ k_{-i} \leq \gamma \frac{a}{2},
\end{aligned}$$

Informal financing

- Determinants of informal financing
  - Access to formal financing $\hat{k} \leq \gamma a_{-i}$
  - "Cost" of informal financing $\hat{r}_i = MPK_{-i} - \delta$
- $\gamma \uparrow$ leads to
  - Formal constraint relaxed $k_i \leq \gamma a_i$
  - Informal constraint relaxed $\hat{k} \leq \gamma a_{-i}$
  - On average entrepreneurs are less constrained, $\hat{r}_i \downarrow$

Recursive competitive equilibrium

Definition

The recursive competitive equilibrium consists of prices (r, w), value function of the entrepreneur household $V^e(a, z_i, z_{-i}, \omega)$, policy functions of the entrepreneur household: consumption $c^e(a, z_i, z_{-i}, \omega)$, inputs $k_i(a, z_i, z_{-i}, \omega)$, $k_{-i}(a, z_i, z_{-i}, \omega)$, $\hat{k}(a, z_i, z_{-i}, \omega))$, $l_i(a, z_i, z_{-i}, \omega)$, $l_{-i}(a, z_i, z_{-i}, \omega)$, and next period wealth $a'(a, z_i, z_{-i}, \omega)$, the consumption of workers c^w, and the stationary distribution of the entrepreneur households $\Omega(a, z_i, z_{-i}, \omega)$, such that,

1. Given the prices, the value function and policy functions of the entrepreneur household solves the following problem,

$$\begin{aligned} V^e(a, z_i, z_{-i}, \omega) \quad &= \quad \max_{c_i, c_{-i}, a'} u(c_i) + u(c_{-i}) \\ & \quad\quad + \beta \mathbb{E} V^e(a', z_i', z_{-i}', \omega'), \\ s.t. \quad & \quad\quad c_i + c_{-i} + a' = \pi(a, z_i, z_{-i}, \omega) + (1 + r)a \\ & \quad\quad a' \geq 0, \end{aligned}$$

2. The workers' consumption satisfies their budget constraint, that is, $c^w = w$.
3. Interest rate r clears the formal financial market. Wage w clears the labor market.
4. The distribution Ω is stationary.

Quantitative Analysis

Summary of calibration

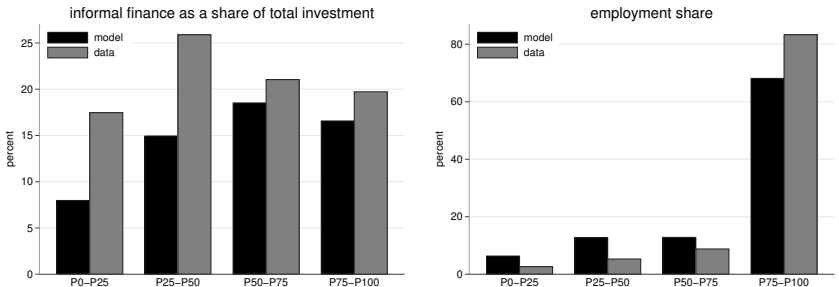
- Normalize $A = 1$, calibrate the model to match the aggregate and distributional moments of Mexico.

Table: **Summary of calibration**

Parameter		Value	Target/Source	Data	Model
A	TFP	1	normalized to be 1	–	–
α	capital share in the production function	0.26	capital share of 1/3	–	–
π	Poisson death rate	0.1	Buera, Kaboski and Shin, 2011 AER	–	
$\alpha + \chi$	scale parameter in production function	0.78	top 5th pct. earning share	0.30	0.35
N	measure of workers	18	share of entrepreneur	10%	10%
δ	capital depreciation rate	0.06	annual depreciation rate	6%	6%
β	discount rate	0.83	annual risk-free interest rate	4%	4%
μ	Pareto tail	3.4	top 10th pct. employment share	69%	67%
γ	collateral value	1.60	ratio of external financing to GDP	0.42	0.42
ϵ	probability of informal financing	0.39	percent of investment financed by informal finance	9.1%	9.1%

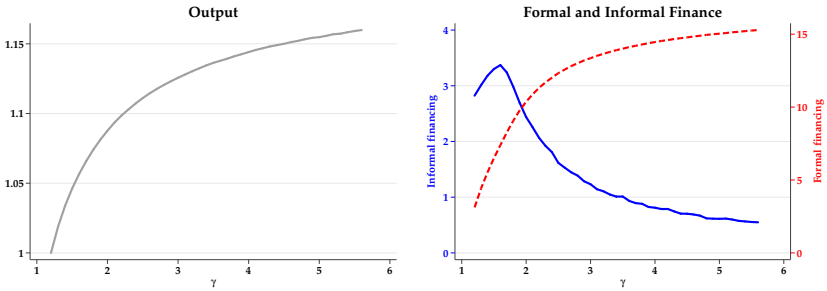
Untargeted distributional moments

Figure: Distributional moments



Dynamics of financial development

Figure: Aggregate dynamics of financial development



- As γ increases, the size of informal financing first increases then declines.

Gain from informal financing

Overview

- Which countries gain the most from informal financing?
  - Divide the countries into five groups by income level
  - Calibrate the benchmark model to match five groups
  - Take the calibrated model and shut down informal financing
  - Compare aggregate output w/ and w/o informal financing

Calibration

Targets:

1. A: real GDP per capita as a share of the 5th (richest) quintile
2. γ: ratio of external financing to GDP
3. ϵ: share of informal financing

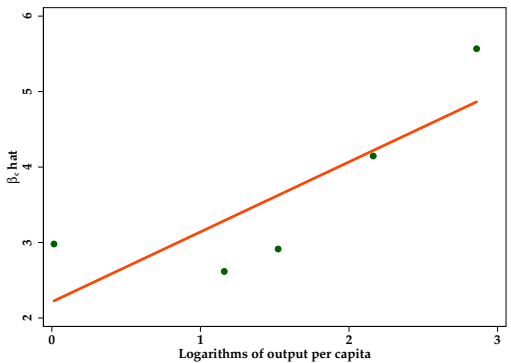
Table: **Calibration of the five quintiles**

Quintile	A	Data	Model	γ	Data	Model	ϵ	Data	Model
5	1	N/A	N/A	1.60	0.42	0.42	0.39	9.1%	9.1%
4	0.60	0.50	0.50	1.68	0.45	0.45	0.28	6.5%	6.5%
3	0.39	0.26	0.26	1.37	0.30	0.30	0.21	5.2%	5.2%
2	0.30	0.18	0.18	1.35	0.29	0.29	0.19	4.8%	4.8%
1	0.14	0.06	0.06	1.13	0.14	0.14	0.23	5.5%	5.5%

Substitution of informal to formal financing

- Estimation using the model-generated sample of entrepreneurs

$$inf_{ist} = \alpha + \beta_c I\_constrained_i + \chi_{st} + \gamma_i + \varepsilon_{ist}.$$



Gain from informal financing by income

Table: **Aggregate output by income**

Quintile	Benchmark	Counterfactual	Percent difference
5	1	0.968	3.21
4	0.499	0.487	2.41
3	0.263	0.257	2.12
2	0.183	0.179	2.05
1	0.058	0.057	2.75

- The richest quintile of countries gains the most from informal financing.

Conclusion

Conclusion

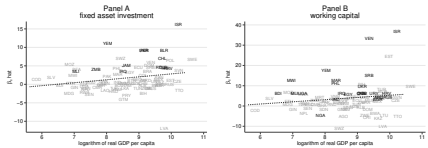
- This paper studies financial development by examining jointly formal and informal financing
- It explores how the demand and supply of informal financing are affected by aggregate economic conditions
- Contrary to conventional wisdom, the gain from informal financing is relatively low for the poorest countries

Appendix

	(1)	(2)	(3)	(4)
financially constrained	-5.126***	-7.982	-4.139***	-3.527
	(1.662)	(5.529)	(1.256)	(3.422)
financial constraint X log GDP pc	0.796***	1.293**		
	(0.223)	(0.614)		
log GDP pc	0.556	-0.239		
	(0.354)	(0.848)		
financial constraint X log ext. fin to GDP			1.764***	1.966**
			(0.414)	(0.937)
log ext. fin to GDP			-0.159	-1.272
			(0.279)	(1.065)
Dependent variable	fixed assets inv.	working capital	fixed assets inv.	working capital
sectorXyear FE	Y	Y	Y	Y
firm-type FE	Y	Y	Y	Y
firm-size&age FE	Y	Y	Y	Y
N	30204	30204	29532	29532
AR2	0.0274	0.0559	0.0265	0.0563

back

Figure: $\hat{\beta}_c$ and income



The substitutability of informal for formal financing increases with income.

Source: PWT 8.0 and World Bank Enterprise Survey

Table: **Substitution of informal to formal financing (all countries)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
financially constrained	-6.244**	-7.528	-5.126***	-7.982	-5.892***	-7.009	-4.139***	-3.527
	(2.703)	(7.269)	(1.662)	(5.529)	(1.881)	(4.816)	(1.256)	(3.422)
financial constrained X log GDP pc	0.970***	1.300	0.796***	1.293**				
	(0.362)	(0.801)	(0.223)	(0.614)				
log GDP pc	0.891*	0.244	0.556	-0.239				
	(0.535)	(1.141)	(0.354)	(0.848)				
financial constrained X log ext. fin to GDP					2.386***	3.122**	1.764***	1.966**
					(0.695)	(1.409)	(0.414)	(0.937)
log ext. fin to GDP					-0.258	-2.226	-0.159	-1.272
					(0.669)	(1.728)	(0.279)	(1.065)
Dependent variable	fixed assets inv.	working capital	fixed assets inv.	working capital	fixed assets inv.	working capital	fixed assets inv.	working capital
sectorXyear FE	N	N	Y	Y	N	N	Y	Y
firm-type FE	N	N	Y	Y	N	N	Y	Y
firm-size&age FE	N	N	Y	Y	N	N	Y	Y
N	30350	30350	30204	30204	29678	29678	29532	29532
AR2	0.00585	0.00423	0.0274	0.0559	0.00324	0.00633	0.0265	0.0563

Notes: The dependent variables for the regressions are the percent of fixed assets investment that is financed through informal channels (columns 1, 3, 5, 7) and the percent of working capital investment that is financed through informal channels (columns 2, 4, 6, 8). Standard errors are clustered at the country- and sector-level.