Identifying Constraints to Financial Inclusion and their Impact on GDP and Inequality:

A Structural Framework for Policy

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Roadmap

- ▶ Motivation
- ▶ Model
    - ▶ Links to the literature
    - ▶ Intuition
    - ▶ Model description
- ▶ Data and calibration
- ▶ Evaluation of policy options
    - ▶ Comparative statistics
    - ▶ Welfare analysis
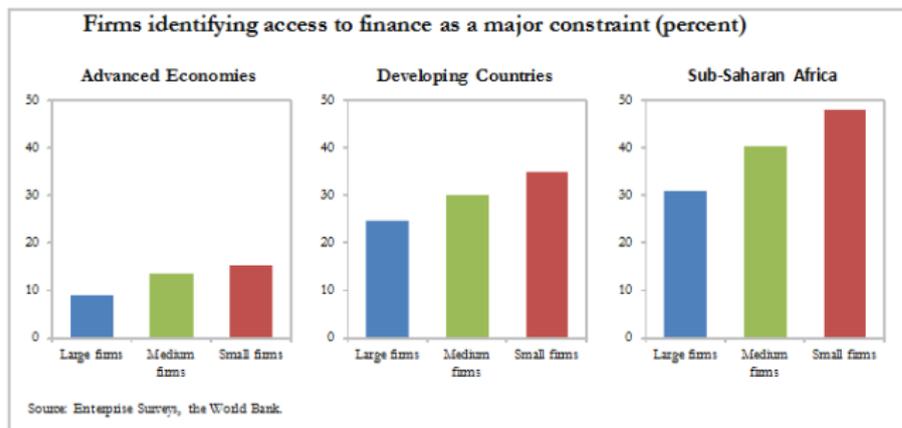- ▶ Summary and next steps

Motivation (1)

- There is a considerable scope for financial deepening in developing countries: deepening not equal to inclusion.
  - Low firms access to finance.
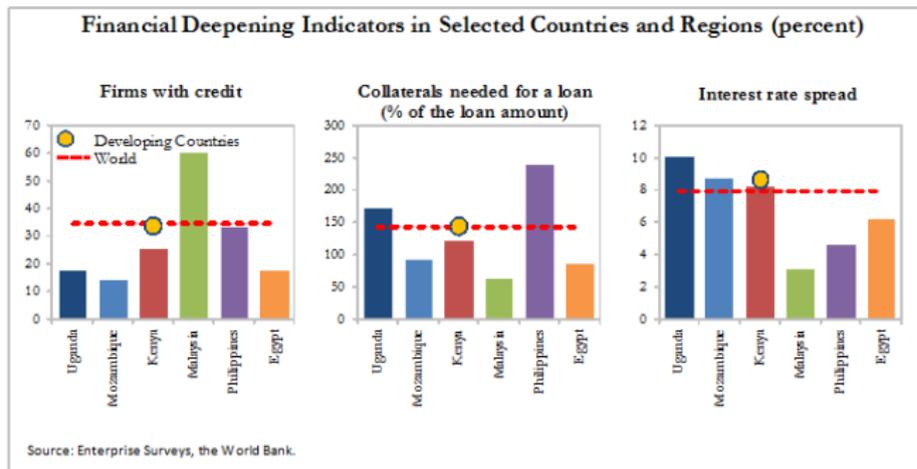 - High collateral requirements and interest rate spreads.

Financial Deepening Indicators in Selected Regions (percent)

Source: Enterprise Surveys, the World Bank.
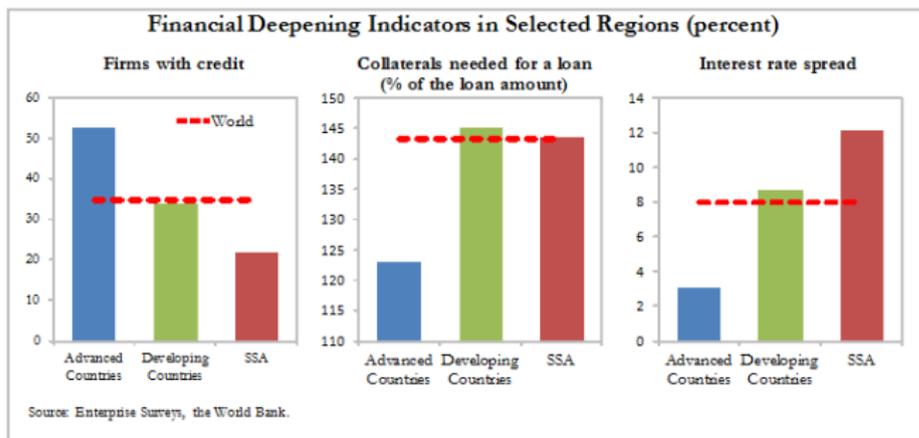
Motivation (2)

- Smaller firms tend to be most credit-constrained, especially in developing countries.

Firms identifying access to finance as a major constraint (percent)

Motivation (3)

▶ Constraints to financial deepening could be country-specific.

Financial Deepening Indicators in Selected Countries and Regions (percent)

Source: Enterprise Surveys, the World Bank.

Motivation (4)

- ▶ Empirical evidence on the link between financial development, growth, and inequality often inconclusive.
  - ▶ Regression analysis:
    - ▶ may not be suitable for developing countries.
    - ▶ channels of transmission and causal mechanisms are hard to pin down.
    - ▶ policy evaluation is challenging.
  - ▶ Different dimensions of financial inclusion (access, depth, efficiency) have differential impacts.
  - ▶ Policy impact could vary across countries.
- ▶ This paper:
  - ▶ sheds light on links between financial inclusion, GDP, inequality, and welfare through the lens of a GE model.
  - ▶ focuses on business start ups and firm access rather than household inclusion.

Model (1)—Links with the literature

- ▶ The model features
  - ▶ Heterogeneous agents with respect to their wealth and talent,
  - ▶ Occupational choice,
  - ▶ Overlapping generations.

- ▶ A growing theoretical literature on the aggregate and distributional impacts of financial intermediation
  - ▶ Occupational choice and financial frictions—Banerjee and Newman (1993), Lloyd-Ellis and Bernhardt (2000), and Cagetti and Nardi (2006).
  - ▶ Relation among financial intermediation, aggregate productivity and income—Gine and Townsend (2004), Jeong and Townsend (2007, 2008), Amaral and Quintin (2010), Buera et al. (2011), Moll (2014).

Model (2)—Links with the literature

- We focus on several dimensions of financial inclusion within a unified framework and analyze how they interact.
    - Limited commitment—Evans and Jovanovic (1989), Holtz-Eakin et al. (1994); Banerjee and Duo (2005), Jeong and Townsend (2007), Buera et al. (2011), Buera and Shin (2013), Caselli and Gennaioli (2013), Midrigan and Xu (2014), Moll (2014).
    - A fixed entry cost—Greenwood and Jovanovic (1990), Townsend and Ueda (2006), D'Erasmo and Moscoso Boedo (2012).
    - Asymmetric information—Townsend (1979), Castro et al.(2009), Greenwood et al. (2010, 2013), Cole et al. (2012).

Model (3)—Links with the literature

▶ Unlike studies in which multiple financial frictions co-exist, we provide normative policy assessments.

  ▶ Moral hazard and limited commitment—Clementi and Hopenhayn (2006), Albuquerque and Hopenhayn (2004).
  ▶ Moral hazard and imperfect information—Abraham and Pavoni (2005), Doepke and Townsend (2006).
  ▶ Adverse selection and limited commitment—Martin and Taddei (2013), Karaivanov and Townsend (2014).
  ▶ Moral hazard, limited commitment and hidden income—Kinnan (2014).

- ▶ Greater financial inclusiveness impacts GDP, inequality, and welfare through 3 channels:
  - ▶ Limits waste of resources due to financial frictions, pushing up GDP.
  - ▶ More efficient allocation of funds increases TFP as talented agents increase the scale of production.
    - ▶ but, untalented agents could become entrepreneurs, decreasing TFP.
    - ▶ in some cases, there could be undesirable impact on inequality and welfare—there are policy trade-offs between GDP and inequality.

Model (5)—Overview

- Agents have different wealth (b) and talent (z), and choose their occupations between workers and entrepreneurs.
    - Workers supply labor to entrepreneur.
    - Entrepreneurs use labor and capital for production.
- In equilibrium:
    - Untalented or talented but wealth constrained→worker.
    - Talented with a certain level of wealth→entrepreneur.
- An economy with two regimes.
    - "Savings only" regime—agents cannot borrow but can make a deposit.
    - "Credit" regime—agents can borrow and make a deposit but are subject to
        - Fixed entry cost (Greenwood and Jovanovic, 1990), ψ
        - Limited commitment (Evans and Jovanovic, 1989), λ
        - Costly state verification (Townsend, 1979), χ.

Model (6)—Individuals

- ▶ Each agent lives for 2 periods.
  - ▶ First period—credit participation, occupational choice, and investment decisions.
  - ▶ Second period—consumption (c) and bequest (b') decisions to maximize utility, $u(c, b') = c^{1-\omega} b'^{\omega}$, such that $c + b' = W$ (second period wealth).
    - ▶ The optimal bequest rate is $\omega \longrightarrow u(c, b')$ is a linear function of $W \longrightarrow$ the agent is risk neutral $\longrightarrow \max E(u) \approx \max E(W)$.
- ▶ Each agent has an offspring, with wealth b' and talent (z) which is either inherited from parents (with prob. γ) or drawn from a stochastic process.

Model (7)—Occupational choice

▶ Occupational choice between being a worker or an entrepreneur

    ▶ Each worker supplies one unit of labor and earns w when production is successful.

    ▶ The entrepreneur invests in capital and labor, and obtains income through business profit.

        ▶ The production technology is $f(k, l) = z(k^\alpha l^{1-\alpha})^{1-\nu}$.

        ▶ Production fails with probability p, in which case the output is zero and only a fraction (η) of installed capital is recovered.

Model (8)—Credit participation decision

- All agents can make a deposit, but need to pay a fixed cost (ψ) to borrow.
    - If the agent doesn't pay the cost and can thereby only save—savings only regime.
    - If the agent pays the cost and can thereby borrow—credit regime.
        - In equilibrium, ψ is more likely to exclude poor entrepreneurs from financial markets as this amounts to a larger fraction of their wealth.
- Two steps:
    - First, the agent chooses occupation conditional on the regime she is living in.
    - Second, the agent chooses the underlying regime by comparing the expected incomes that can be obtained in each regime.

Model (9)—Savings regime

▶ Individuals in savings only regime cannot borrow

▶ In the first period, the agents wants to maximize expected income—given the initial wealth, max expected income $\approx$ max W^S

$$W^S = \begin{cases} (1 + r^d)b + (1 - p)w & \text{for workers} \\ \pi^S(b, z) & \text{for entrepreneurs} \end{cases}$$

$\pi^S(b, z) =$
$\max_{k,l} \{ \underbrace{(1 - p)[z(k^\alpha l^{1-\alpha})^{1-\nu} - wl - \delta k + k]}_{\text{if production succeeds}} + \underbrace{p\eta(1 - \delta)k}_{\text{if production fails}}$

$\quad + \underbrace{(1 + r^d)(b - k)\}}_{\text{wealth not used in production}} \quad$ subject to $k \leq b$.

Model (10)—Credit regime

- Agents in the credit regime have access to external credit by paying a participation cost (ψ).

- $W^C = \begin{cases} (1 + r^d)b + (1-p)w & \text{for workers} \\ \pi^C(b, z) & \text{for entrepreneurs} \end{cases}$. The agent chooses to pay ψ only if $W^C > W^S$.

- In order to borrow, agents need to sign a financial contract $\longrightarrow$ the amount of borrowing (Φ), the value of collateral (Δ), and the face value of the contract (Ω).

    - Implicit lending rate $r^l = \frac{\Omega}{\Phi} - 1$, and leverage ratio $\widetilde{\lambda} = \frac{\Phi}{\Delta}$
    - If production fails and the entrepreneur cannot pay $\Omega \longrightarrow$ default.

Model (11)—Financial frictions

- ▶ Limited commitment
  - ▶ Contract enforcement is imperfect—entrepreneur can abscond with a fraction $(1/\lambda)$ of rented capital.
  - ▶ Entrepreneurs do not abscond only if $\Phi/\lambda < \Delta \longrightarrow$ the bank is only willing to lend $\lambda\Delta$.

- ▶ Asymmetric information
  - ▶ Whether production fails or not is only known to entrepreneur.
  - ▶ Banks have a monitoring technology, with a cost proportional to the scale of production (χ) paid by the lender.
    - ▶ The bank's optimal verification strategy follows Townsend (1979), which occurs if the entrepreneur cannot pay the face value of the loan and default.

Model (12)—Optimal loan contract

▶ Collateral is interest bearing $(r^d) \longrightarrow \Delta = b - \psi$

▶ Entrepreneurs borrow to increase production scale$\longrightarrow \Phi = k(b, z)$

▶ Financial sector is perfectly competitive$\longrightarrow$ zero profit condition pins down $\Omega(b, k)$

$$\overbrace{(1-p)\Omega}^{\text{if production succeeds}} + \overbrace{p \min(\Omega, \eta(1-\delta)k + (1+r^d)(b-\psi))}^{\text{if production fails}}$$

$$= \underbrace{(1+r^d)k}_{\text{loan value}} + \underbrace{p\chi k \cdot [\begin{array}{ll} 1 & \text{if } \eta(1-\delta)k + (1+r^d)(b-\psi) < \Omega \\ 0 & \text{otherwise} \end{array}]}_{\text{expected cost of monitoring}}$$

Model (13)—Optimal loan contract

▶ Entrepreneur of type (b, z) chooses k and l to max profit

$$\pi^C(b, z) = \max_{k,l}\{$$

$$\underbrace{(1-p)[z(k^\alpha l^{1-\alpha})^{1-\nu} - wl + (1-\delta)k - \Omega + (1+r^d)(b-\psi)]}_{\text{if production succeeds}}$$

$$+\underbrace{p\max(0, \eta(1-\delta)k + (1+r^d)(b-\psi) - \Omega)}_{\text{if production fails}}\}$$

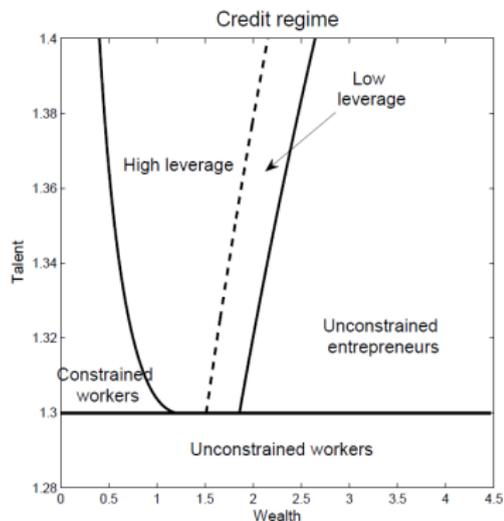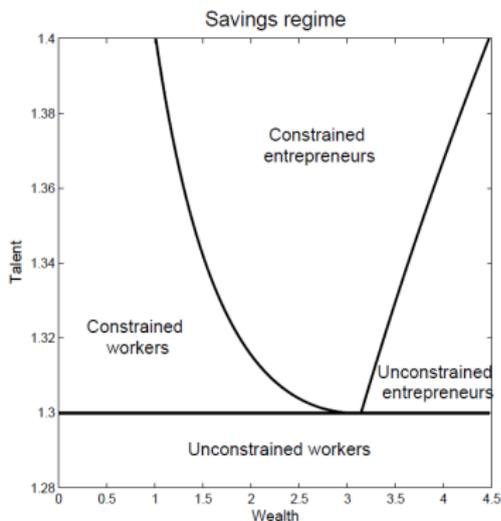subject to

$$k \leq \underbrace{\lambda(b-\psi)}_{\text{credit constraint}}$$

where Ω is the solution to the bank's zero profit condition.

Model (14)—Occupational choice and access to credit

▶ When an agent obtains external credit, the occupation map changes—the area of constrained workers shrinks, and that of unconstrained entrepreneurs increases.

Model (15)—Competitive equilibrium

▶ Given an initial joint probability density distribution $H_0(b, z)$, a competitive equilibrium consists of allocations $\{c_t(b, z), k_t(b, z), l_t(b, z)\}_{t=0}^{\infty}$, sequences of joint distributions $\{H_t(b, z)\}_{t=1}^{\infty}$ and prices $\{r^d(t), w(t)\}_t$, such that

  ▶ Agent of type (b, z) optimally chooses the underlying regime, occupation, $c_t(b, z)$, $k_t(b, z)$, $l_t(b, z)$ to maximize utility at $t \geq 0$,
  ▶ Capital market clears at all $t \geq 0$,
  ▶ Labor market clears at all $t \geq 0$,
  ▶ $\{H_t(b, z)\}_{t=1}^{\infty}$ evolves according to the equilibrium mapping:
    $H_{t+1}(\bar{b}, z) =$
    $\gamma \mu(z) db \int_z 1_{\{b' = \bar{b}\}} H_t(b, z) dz + (1 - \gamma) 1_{\{b' = \bar{b}\}} H_t(b, z) db dz.$

Data and Calibration (1)

- ▶ World Bank enterprise surveys (micro data)
  - ▶ Provide firm-level cross-section data.
  - ▶ Cover a broad range of financial access measures.

- ▶ World Bank development data platform (macro data)
  - ▶ Gross savings rate, non-performing loan, and interest rate spread.

- ▶ Six countries at various stages of economic development
  - ▶ Three LICs—Uganda in 2005, Kenya in 2006, and Mozambique in 2006.
  - ▶ Three EMs—Malaysia in 2007, Philippines in 2008 and Egypt in 2007.

Data and Calibration (2)—Overview of data

▶ Financial deepening in LICs is more constrained across all dimensions, but there is significant heterogeneity within the country groups.

|	Low-income countries			Emerging market economies		
	Uganda	Kenya	Mozambique	Malaysia	Philippines	Egypt
Savings (% of GDP)	8	15.4	7.1	39	25.7	24.5
Collateral (% of loan)	173	120.8	92	64.6	238.4	85.5
Firms with credit (%)	17.2	25.4	14.2	60.4	33.2	17.4
Non-perfor. loan (%)	2.3	10.6	3.1	8.5	4.5	19.3
Interest rate spread	10.9	8.5	8.2	3.3	4.3	6.1
Top 5% emp. share	53.8	54.1	41.3	29.5	52.7	58.4
Top 10% emp. share	64.2	66.9	55.8	46.3	65.7	72.7
Top 20% emp. share	74.6	81	71.9	63.5	79	85.9
Top 40% emp. share	86.4	93.2	87.2	84.1	90.8	95

Data and Calibration (3)—Data, model, and calibrated parameters

Target Moments	Uganda			Kenya			Mozambique		
	Data	Model	Parameter	Data	Model	Parameter	Data	Model	Parameter
Savings (% of GDP)	8	8	$\omega = 0.08$	15.4	15.4	$\omega = 0.15$	7.1	7.1	$\omega = 0.07$
Collateral (% of loan)	173	173	$\lambda = 1.58$	120.8	120.8	$\lambda = 1.83$	92	92	$\lambda = 2.09$
Firms with credit (%)	17.2	17.3	$\psi = 0.03$	25.4	25.6	$\psi = 0.08$	14.2	13.8	$\psi = 0.03$
Non-perfor. loan (%)	2.3	2.9	$p = 0.15$	10.6	11	$p = 0.18$	3.1	2.8	$p = 0.14$
Interest rate spread	10.9	10.1	$\chi = 0.85$	8.5	8.7	$\chi = 0.30$	8.2	8.3	$\chi = 0.70$
Top 5% emp. share	53.8	52.9	$\theta = 4.80$	54.1	57.0	$\theta = 4.40$	41.3	47.0	$\theta = 6.00$
Top 10% emp. share	64.2	64.5		66.9	69.5		55.8	59.1	
Top 20% emp. share	74.6	74.7		81	80.3		71.9	69.2	
Top 40% emp. share	86.4	84.8		93.2	88.7		87.2	80.6	

| Target Moments	Malaysia			Philippines			Egypt		
	Data	Model	Parameter	Data	Model	Parameter	Data	Model	Parameter
Savings (% of GDP)	39	39	$\omega = 0.39$	25.7	25.7	$\omega = 0.26$	24.5	24.5	$\omega = 0.25$
Collateral (% of loan)	64.6	64.6	$\lambda = 2.56$	238.4	238.4	$\lambda = 1.42$	85.5	85.5	$\lambda = 2.17$
Firms with credit (%)	60.4	60.5	$\psi = 0.13$	33.2	33.2	$\psi = 0.07$	17.4	17.5	$\psi = 0.23$
Non-perfor. loan (%)	8.5	7.6	$p = 0.12$	4.5	5.3	$p = 0.11$	19.3	15.7	$p = 0.28$
Interest rate spread	3.3	5.1	$\chi = 0.11$	4.3	4.1	$\chi = 0.35$	6.1	6.8	$\chi = 0.05$
Top 5% emp. share	29.5	34.7	$\theta = 6.80$	52.7	54.7	$\theta = 4.30$	58.4	62.1	$\theta = 4.25$
Top 10% emp. share	46.3	47.1		65.7	66.3		72.7	74.2	
Top 20% emp. share	63.5	61.7		79	77.3		85.9	83.5	
Top 40% emp. share	84.1	78.6		90.8	87.2		95	90.4	

Comparative Statistics (1)—Reducing the participation cost
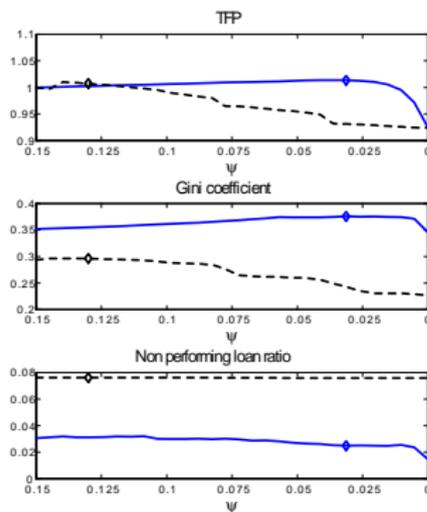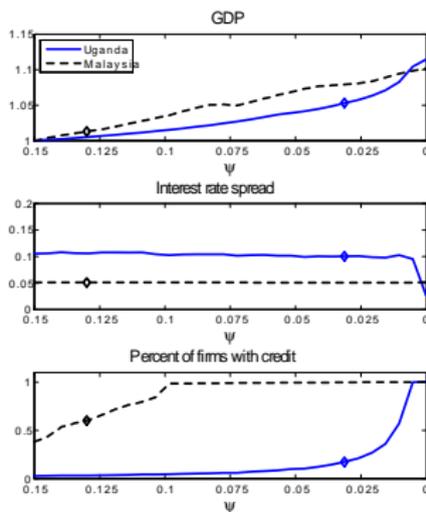
Comparative Statistics (2)—Relaxing collateral constraints
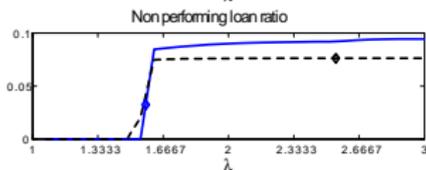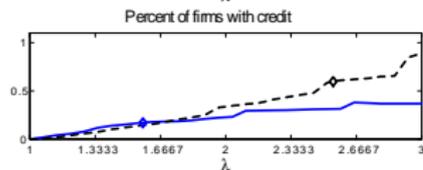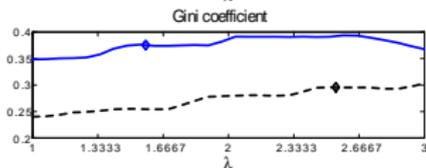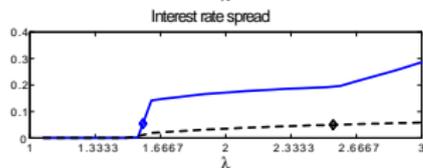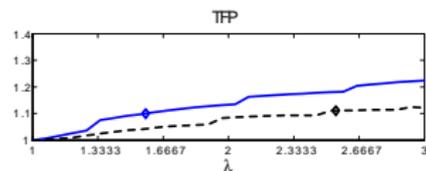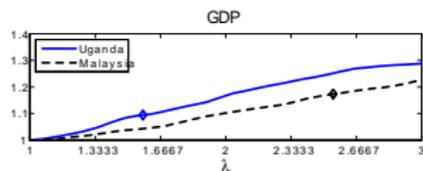
Comparative Statistics (3)—Increasing intermediation efficiency
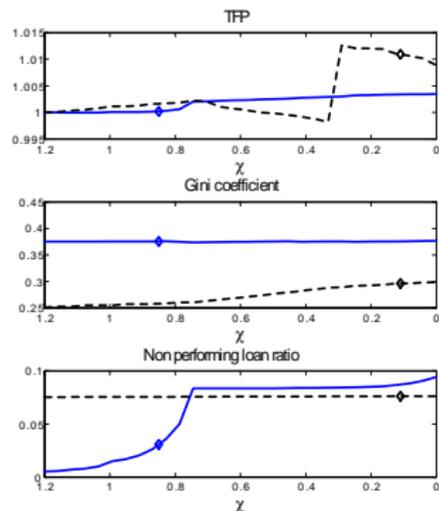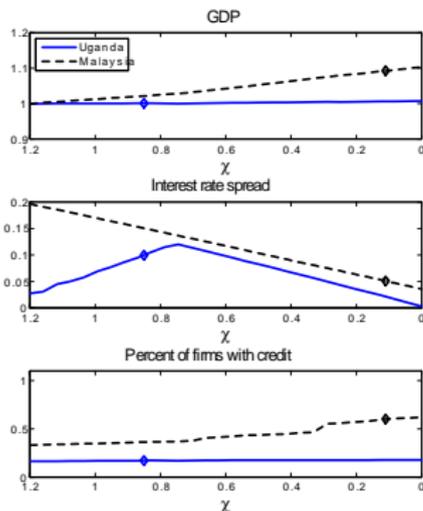
# Comparative Statistics (4)—Impact on GDP and inequality

▶ The impact of financial deepening on GDP and inequality vary with its form and country-specific characteristics.

▶ Relaxing λ generally offers the greatest benefits in terms of GDP, but inequality responds more to lower Ψ.

	Participation cost ψ			Borrowing constraint λ			Intermediation cost χ		
	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini	GDP(%)	TFP(%)	Gini
Uganda	5.83	-8.77	-0.0305	18.71	12.02	-0.0073	0.69	0.33	0.0011
Kenya	5.05	-12.80	-0.0394	12.16	6.37	-0.0192	1.15	0.01	0.0071
Mozambique	13.14	-10.66	-0.0524	9.61	5.76	0.0105	0.55	0.27	0.0011
Malaysia	8.74	-8.25	-0.0694	3.07	0.81	0.0073	1.02	0.18	0.0032
Philippines	2.23	-6.94	-0.0223	21.54	6.71	-0.0329	0.89	0.02	0.0029
Egypt	7.91	-12.42	-0.0231	7.73	4.86	0.0011	0.47	0.08	0.0014

Note: In all cases, we consider financial deepening that moves the country to world financial sector frontier in one of the three financial characteristics.
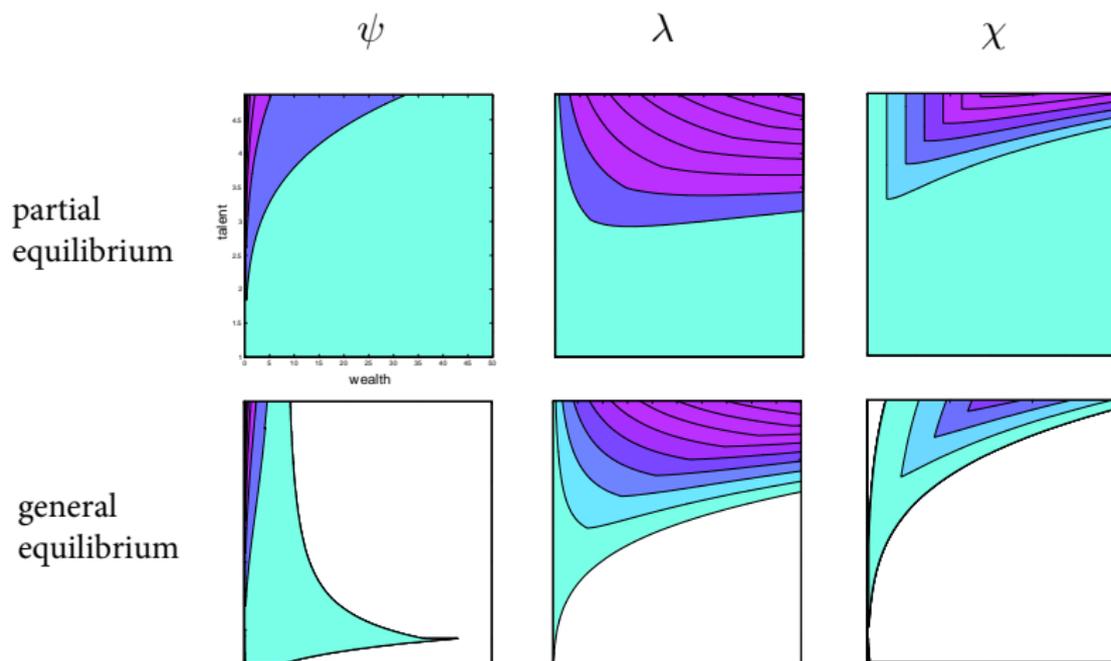
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Comparative Statistics (5)—Interactions among financial constraints

▶ λ is relaxed by 20 percent for different Ψ and χ (Philippines)
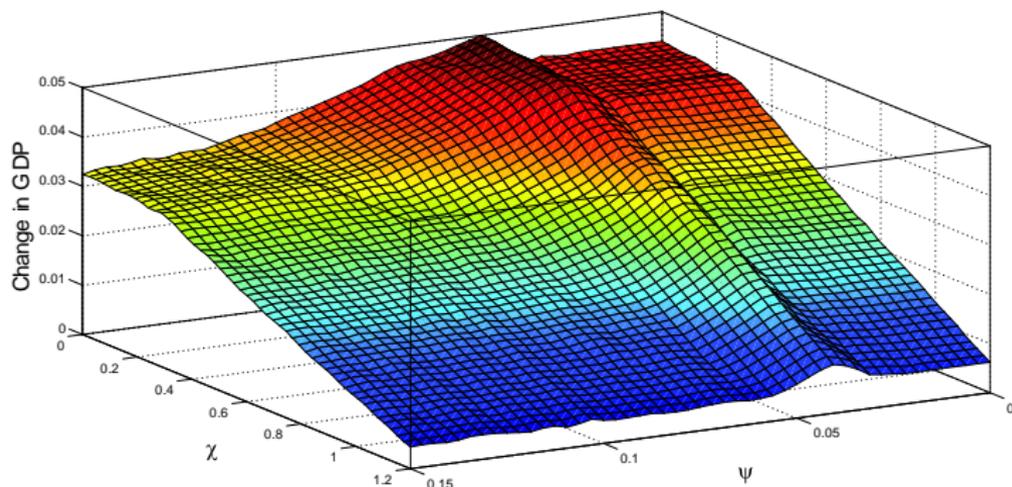
Comparative Statistics (6)—Welfare analysis

▶ The impact of financial deepening on welfare (Philippines).

Summary and next steps (1)

- We develop a tractable micro-founded GE model with features specific to developing countries to evaluate financial deepening policies.

  - Highlight access, depth and efficiency dimensions of financial deepening.
  - Analyze transmission channels and the impact of different forms of inclusion on GDP and inequality.
  - Emphasize how country specific features play a role through the process of financial development.

- A tool for policy analysis

  - Allows identifying the bottleneck factor in the financial system.
  - Provides quantitative policy evaluations.

Summary and next steps (2)

- There are several caveats in applying the framework
  - Does not provide guidance on HOW to promote different forms of financial deepening.
  - Does not directly examine issues of household financial inclusion or mobile banking.
- Next steps will include:
  - Multi-sector model to study formal/informal sector, structural transformation.
  - Monopolistic banking structure.