The Macroeconomics of Microfinance

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Macro of Micro-Development Policies

- Microfinance: Small loans, targeted to the poor (This paper)
  - High growth rates, desire to scale up... many recent micro studies

- Asset Grants: Small asset transfers, targeted to the poor (Buera, Kaboski & Shin, 2014)
  - Experimental trials in Afghanistan, Bangladesh, Ethiopia, Ghana, Honduras, India, Pakistan, Peru and Yemen

Microfinance Revolution

- Small loans, targeted to the poor ▸ data
- Low default rates: 2.06–3.54 percent (median)
- High growth rates, desire to scale up even more... ▸ data
- Many recent micro studies ... but no evaluation of macroeconomic considerations

Aggregate Importance of Microfinance

Country	Borrowers per-capita	Loans /GDP	Average Loan Balance	Per-capita Income	Total Credit / GDP
Bangladesh	0.13	0.028	112	547	0.37
Mongolia	0.13	0.129	1393	1410	0.62
Peru	0.11	0.041	1590	4658	0.21
Bolivia	0.09	0.107	1926	1776	0.31
Vietnam	0.09	0.044	510	1024	1.06
Kenya	0.04	0.036	744	803	0.20
India	0.02	0.003	146	1154	0.53
Mean	0.02	0.004	655	3192	0.50
Std. Dev.	0.03	0.020	3192	3071	0.30

Source: Microfinance Information Exchange, 2009.

Common Rationale

- Limited access to credit in developing countries
- The productive but poor can’t choose best occupations
- Microfinance, asset grants can unlock poverty traps
- ... transforming the overall economy, e.g., Banerjee & Newman (1993)?

Flurry of Recent Microevaluations

Microfinance: Banerjee et al. (2011), Attanasio et al (2011), Crepon et al. (2011), Field et al. (2011), Greaney et al. (2012), Karlan and Zinman (2011), Kaboski and Townsend (2011, 2012)

- Mixed evidence on narratives, Impacts vary by household type, by program details and environment

Asset Grants: Banerjee et al. (2011), Bandiera et al. (2013), Morduch et al. (2012)... Bleakley and Ferrie (2013)

- Positive effects on occupational choice, income, persisting after 4 years ... persistent effect of large random transfers

Challenges

- What are the macroeconomic effects of development policies?
  - General equilibrium effects, e.g., factor prices
  - Effects on per-capita income, TFP, capital accumulation
- Can't run long-run, macroeconomic experiments
- Cross-country identification is difficult

Alternative: Quantitative Macro Modeling

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2. Map model to key features of macro data, size distribution and dynamic of establishments in developed and developing countries
3. Are key mechanisms quantitatively reasonable? Compare to experimental microevidence
4. Evaluate quantitative macroeconomic importance and macroeconomic mechanisms

Preview of Results for Microfinance

- Question: What are the macroeconomic effects of microfinance on development?
- Answer:
  1. TFP $\uparrow$
  2. capital $\downarrow$
  3. per-capita income ≈ 0
  4. wage rises, redistributing from “rich” to “poor” (marginal entrepreneurs and workers)
- Important GE effects: more redistribution but smaller aggregate impact

Benchmark Model

- Heterogeneous agents: entrepreneurial ability and wealth
- Occupational choice: Work for wage or operate their own technology
- Financial friction: limited enforcement
- Extensions: labor frictions, consumption loans, small open economy, two sectors, additional non-convexities

Model: Plant Technology

$$f\left(z,k,l\right)=zk^{\alpha}l^{\theta}$$

- z: entrepreneurial productivity
- 1 unit of entrepreneur’s time
- k: capital input
- l: labor input (workers)
- $\alpha+\theta<1$

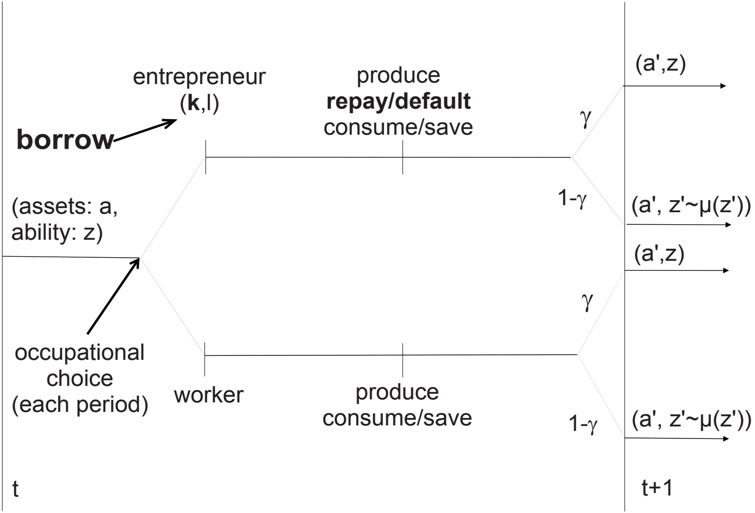
Model: Process of Entrepreneurial Talent

$$z_s = \begin{cases} z_{s-1} & \text{w/ prob. } \gamma \\ \zeta_s & \text{w/ prob. } 1-\gamma \end{cases}$$

$$\zeta_s \overset{iid}{\sim} \eta\zeta^{-\eta-1},\ \zeta \geq 1$$

- γ controls persistence
- $-\eta$ controls the thickness of the right tail

Model Timeline



entrepreneur
(**k**,l)

borrow

produce
repay/default
consume/save

γ (a',z)

$1-\gamma$ (a', z'~μ(z'))

(assets: a,
ability: z)

occupational
choice
(each period)

worker

produce
consume/save

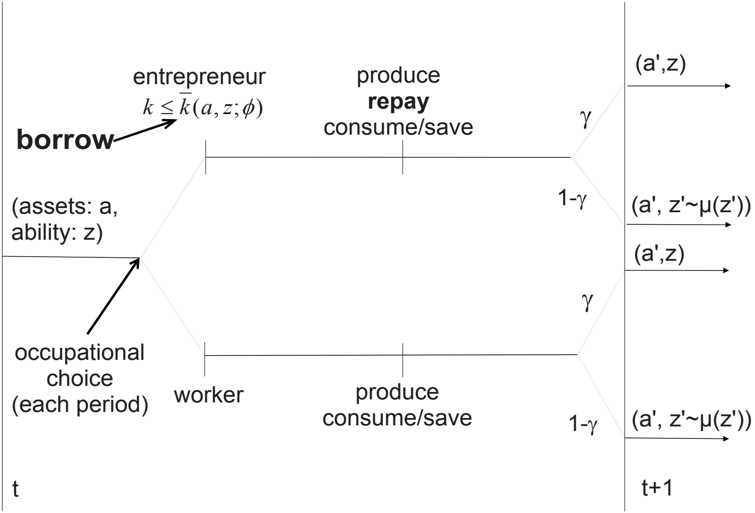
γ (a',z)

$1-\gamma$ (a', z'~μ(z'))

t

t+1

Model Timeline


entrepreneur
$k \leq \bar{k}(a, z; \phi)$
borrow
produce
repay
consume/save
γ
(a',z)
$1-\gamma$
(a', z'~μ(z'))
(assets: a, ability: z)
(a',z)
γ
occupational choice (each period)
worker
produce
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$1-\gamma$
(a', z'~μ(z'))
t
t+1

Model: Individual Problem

Workers' Bellman Equation

Workers supply 1 unit of labor at w

$$v^w(a,z) = \max_{c,a' \geq 0} u(c) + \beta \mathbb{E}_z \max\left\{v^w\left(a',z'\right), v^e\left(a',z'\right)\right\}$$

$$c + a' \leq w + (1+r)a$$

Model: Individual Problem

Entrepreneurs' Bellman Equation

$$v^e\left(a,z\right)=\max_{c,a',k,l}u\left(c\right)+\beta\mathbb{E}_z\max\left\{v^w\left(a',z'\right),v^e\left(a',z'\right)\right\}$$

$$c+a'\leq zk^\alpha l^\theta-\left(r+\delta\right)k-wl+\left(1+r\right)a$$

$$zk^\alpha l^\theta-(r+\delta)k-wl+(1+r)a$$

$$\geq\left(1-\phi\right)\left[zk^\alpha l^\theta-wl+(1-\delta)k\right]$$

(enforcement constraint)

Model: Individual Problem

Entrepreneurs' Bellman Equation

$$v^e\left(a, z\right) = \max_{c, a', k, l} u\left(c\right) + \beta \mathbb{E}_z \max\left\{v^w\left(a', z'\right), v^e\left(a', z'\right)\right\}$$

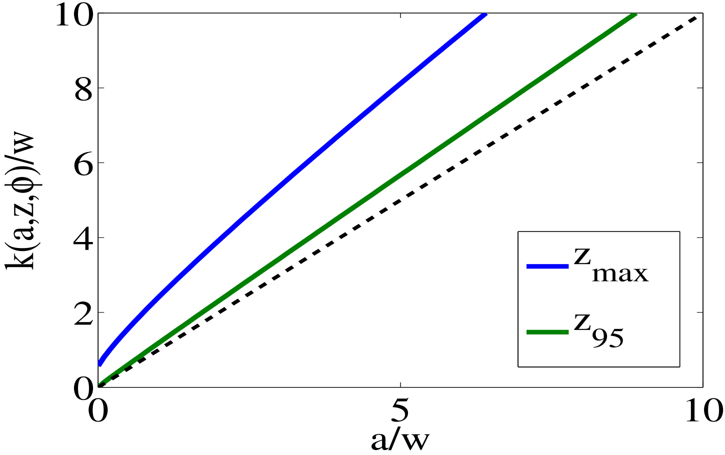
$$c + a' \leq z k^\alpha l^\theta - \left(r + \delta\right) k - wl + \left(1 + r\right) a$$

$$k \leq \bar{k}(a, z; \phi)$$

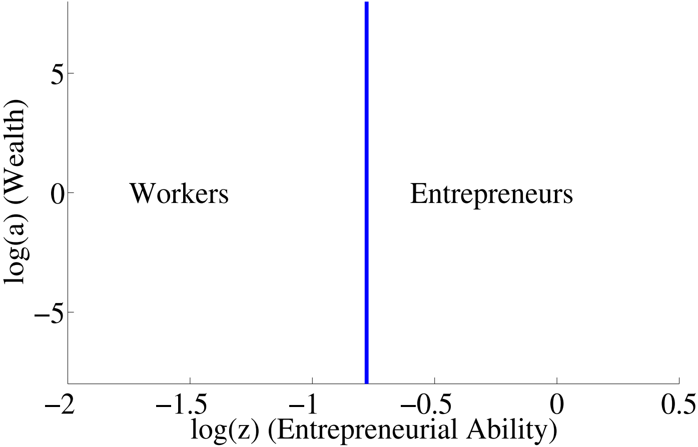
(rental limit)

▸ details

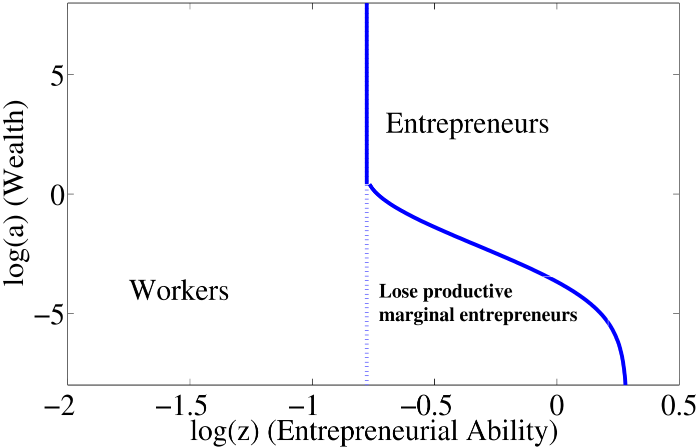
Rental Limit



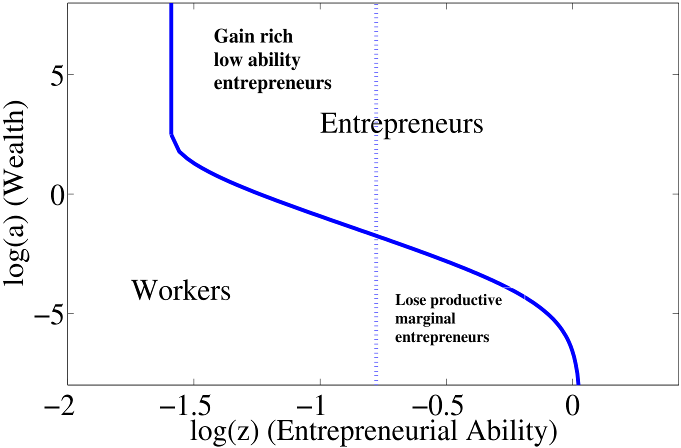
Occupational Choice: Perfect Credit Markets



Financial Friction: Partial Equilibrium



Financial Friction: General Equilibrium



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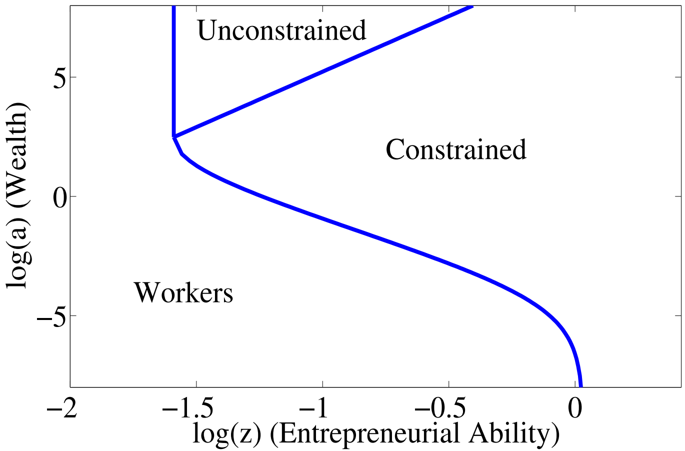
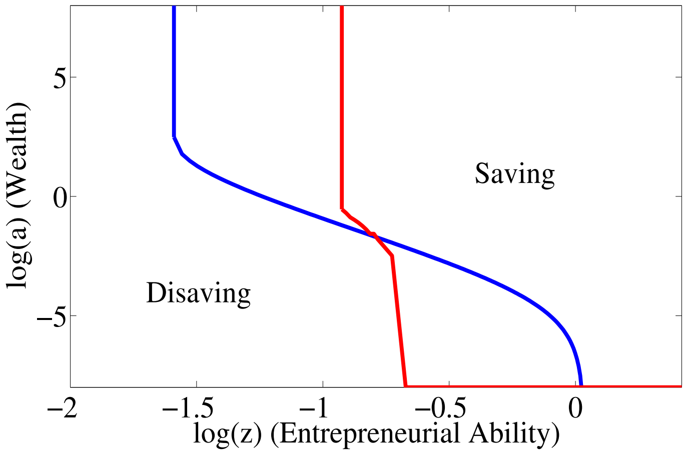
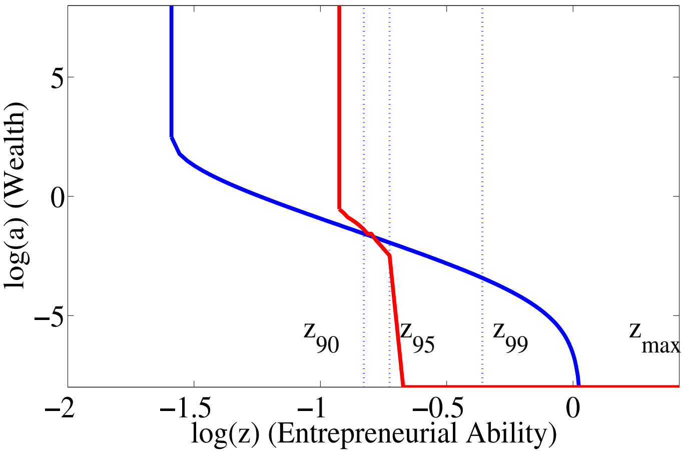


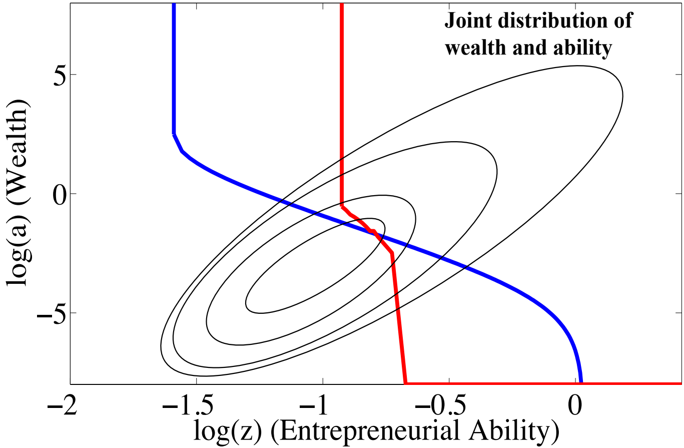
Financial Friction: Poverty Trap



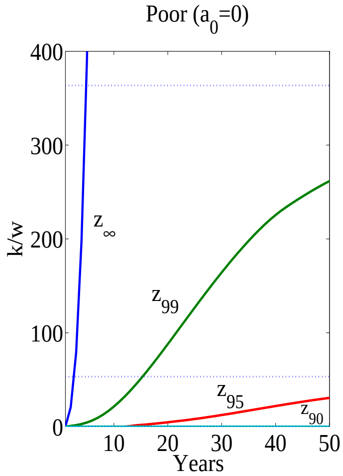
Quantitative Importance

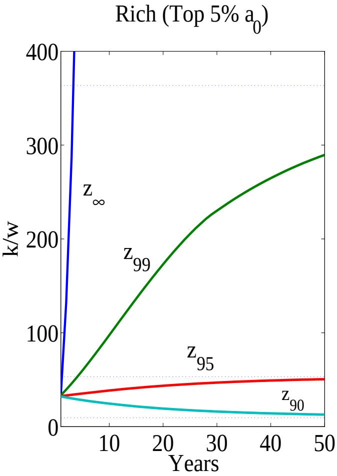


Quantitative Importance (cont'd)



Dynamic of Capital Input



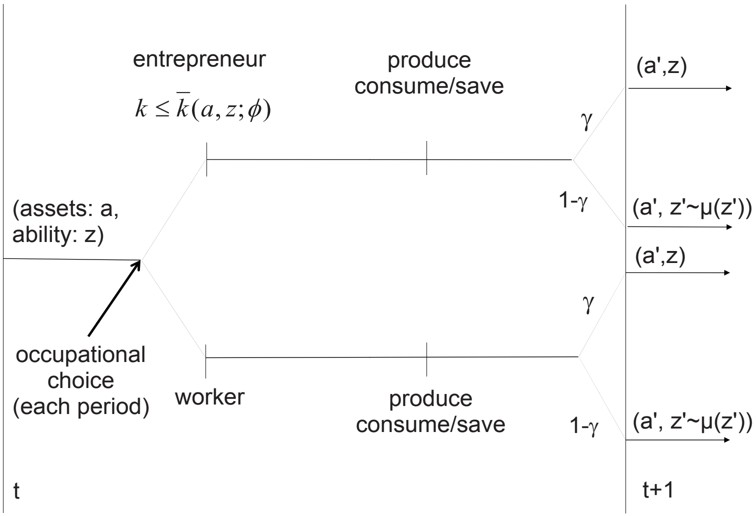


Modeling Microfinance Revolution

Introduce new technology that:

1. guarantees a minimum uncollateralized loan for production
2. has no risk of default
3. and no intermediation costs

Model Timeline



entrepreneur

$k \le \bar{k}(a, z; \phi)$

produce
consume/save

(a',z)

γ

$1-\gamma$

(assets: a,
ability: z)

(a', z'~μ(z'))

(a',z)

γ

occupational
choice
(each period)

worker

produce
consume/save

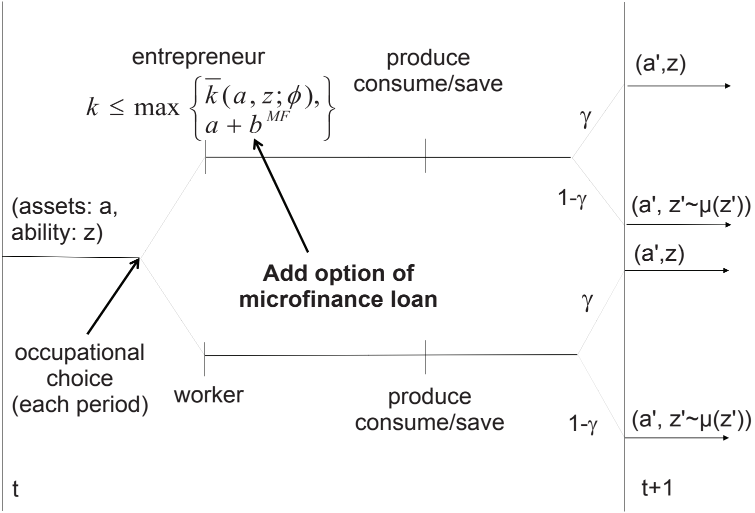
$1-\gamma$

(a', z'~μ(z'))

t

t+1

Can Microfinance Undo These Frictions?



entrepreneur

$k \leq \max \begin{Bmatrix} \overline{k}(a,z;\phi), \\ a + b^{MF} \end{Bmatrix}$

produce
consume/save

(a',z)

γ

$1-\gamma$

(a', z'~μ(z'))

(assets: a,
ability: z)

Add option of
microfinance loan

(a',z)

γ

occupational
choice
(each period)

worker

produce
consume/save

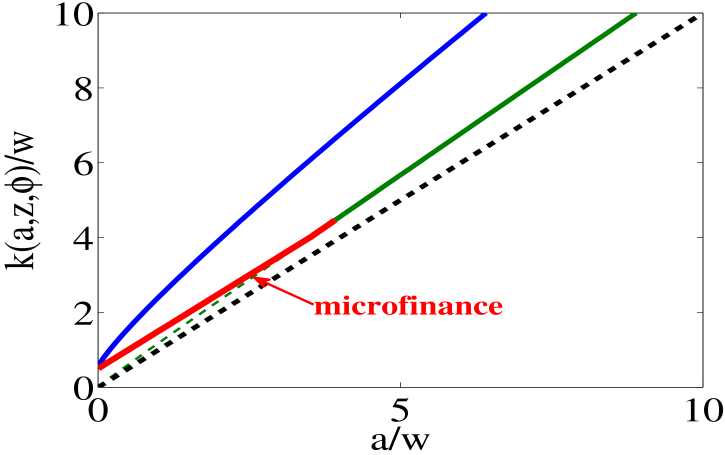
$1-\gamma$

(a', z'~μ(z'))

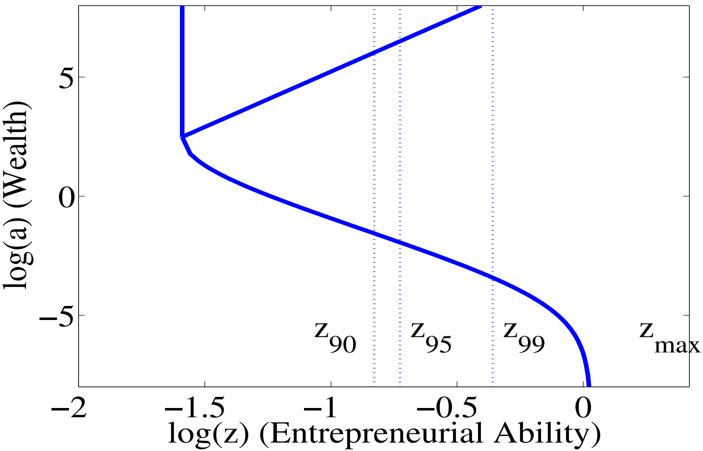
t

t+1

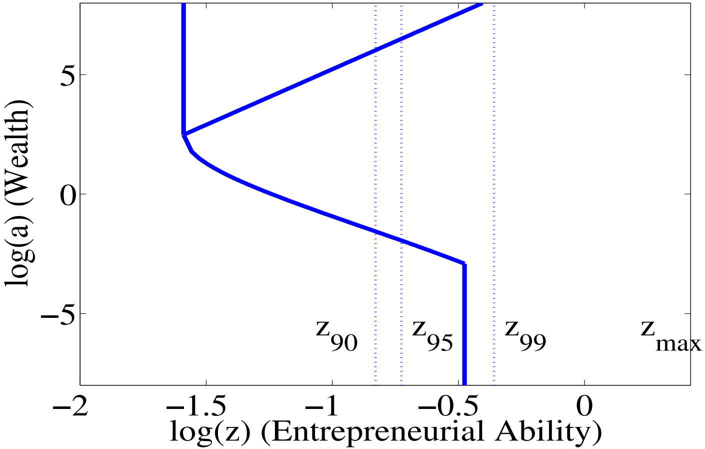
Rental Limit, $b^{MF} = 0.5w$



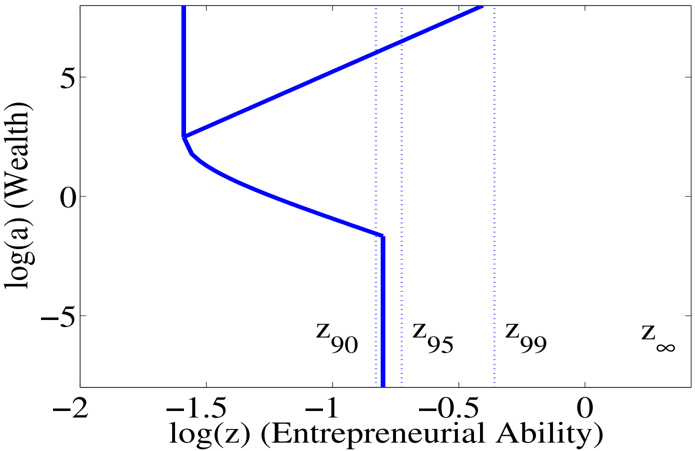
Occupational Choice



Impact on Occupational Choice, $b^{MF} = 0.5w$



Impact on Occupational Choice, $b^{MF} = 1.5w$



Useful Notation

- $o\left(a,z\right)$: occupational choice
- $G\left(a,z\right)$: joint distribution of a, z
- $\mu(z)=1-z^{-\eta}$: stationary distribution of z

Definition: Stationary Competitive Equilibria

$G(a,z)$, policies $o(a,z)$, $c(a,z)$, $a'(a,z)$, $k(a,z)$, $l(a,z)$, rental limit $\bar{k}(a,z;\phi)$, and prices w and r such that:

- Allocations solve individuals' problems given prices and rental limit;
- $\bar{k}(a,z;\phi)$ satisfies EC;
- Labor and credit markets clear;
- $G(a,z)$ satisfies

$$\begin{aligned} G(a,z) = \gamma \int_{\tilde{z}<z, a'(\tilde{a},\tilde{z})\leq a} G(d\tilde{a}, d\tilde{z}) \\ +(1-\gamma)\mu(z)\int_{a'(\tilde{a},\tilde{z})\leq a} G(d\tilde{a}, d\tilde{z}). \end{aligned}$$

Quantitative Strategy

- Choose technology (α, θ) and productivity process (η^{US}, γ) to match US data on size distribution and dynamics of establishments and income concentration, given $\phi^{US} = 1$

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Quantitative Strategy

- Choose technology (α, θ) and productivity process (η^{US}, γ) to match US data on size distribution and dynamics of establishments and income concentration, given $\phi^{US} = 1$
- Choose contract enforcement and distribution of productivity (η^{IND}, ϕ^{IND}) to match Indian data on the size distribution and external finance to GDP
- Evaluate impact of b^{MF}

Relation to Microevaluations

- Two recent studies evaluate interventions impact on entrepreneurial households
  1. Urban: India Hyderabad study
     (Banerjee et al, 2011)
  2. Rural: Thai village funds study
     (Kaboski and Townsend, 2011)

Relation to Microevaluations

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- We simulate similar-sized intervention and compare short-run, partial equilibrium impacts

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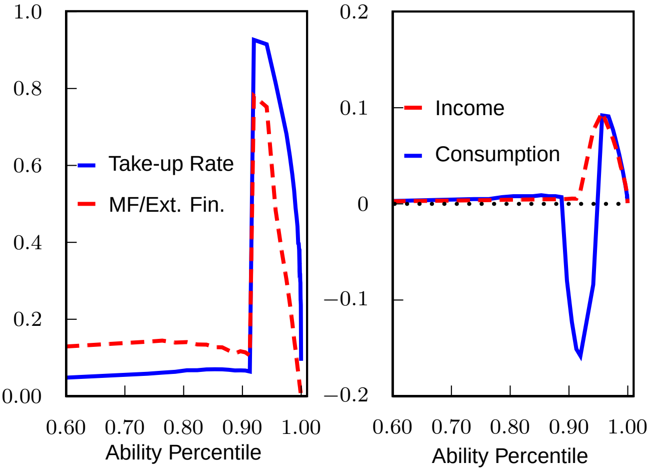
- We simulate similar-sized intervention and compare short-run, partial equilibrium impacts
- Model capture key features (heterogeneity, orders of magnitude) reasonably well

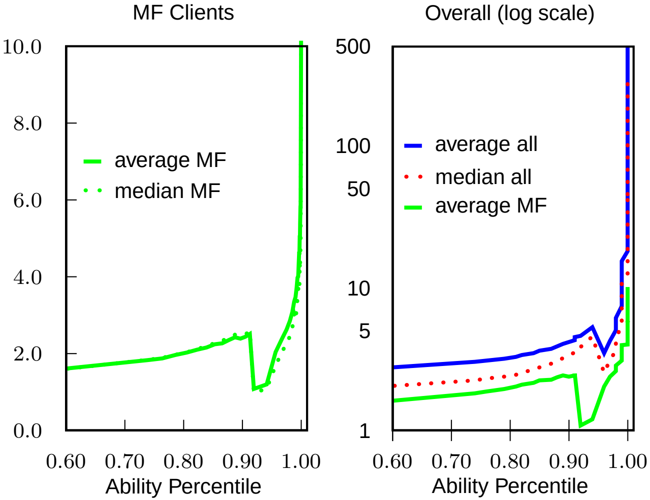
Table : Comparison Summary

	Bmk model	+ Labor shock	+ Cons. loans	India	Thailand
Max Loan/Exp per Cap	1	1	1	1-2	1
Microcredit/Exp	0.1	0.24	0.24	0.1	0.1
Microfinance/Total Credit	0.29	0.54	0.55	0.44	0.33
Entrepreneurship	+4 pp	+1	+1	+2 pp	+1 pp
Investment	+46%	+46%	+36%	+16/128%	+35% (prob).
Consumption	+1%	+20%	+22%	+0/16%	+15%

Impacts on Marginal Ability Entrepreneurs



Size (Employment) of Businesses



Aggregate Implications (Long-Run GE)

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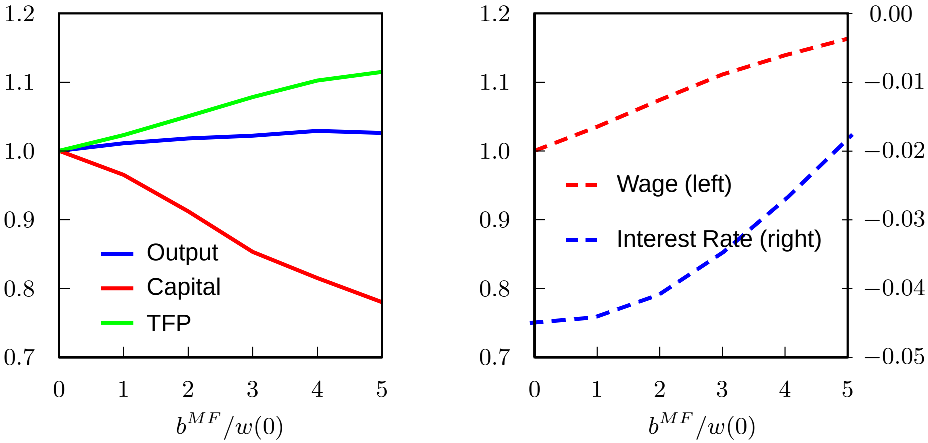
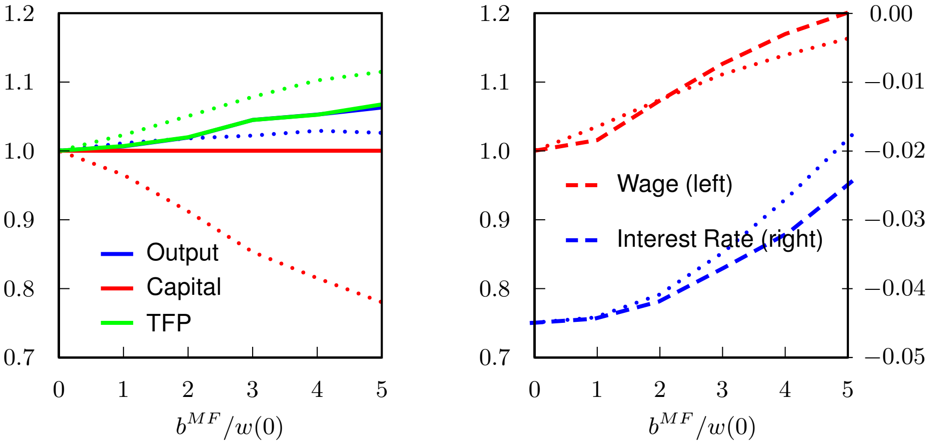
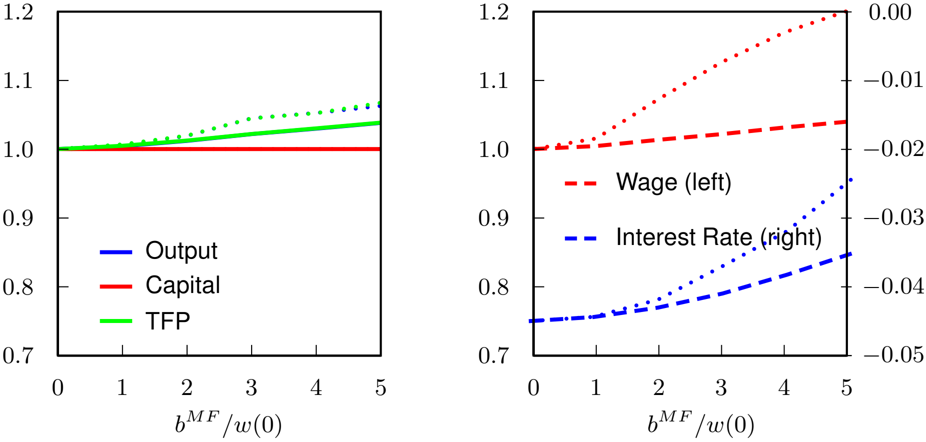


Short-Run GE vs. Long-Run GE



Role of Occupational Choice (Short-Run GE)



Explaining Aggregate Effects in GE

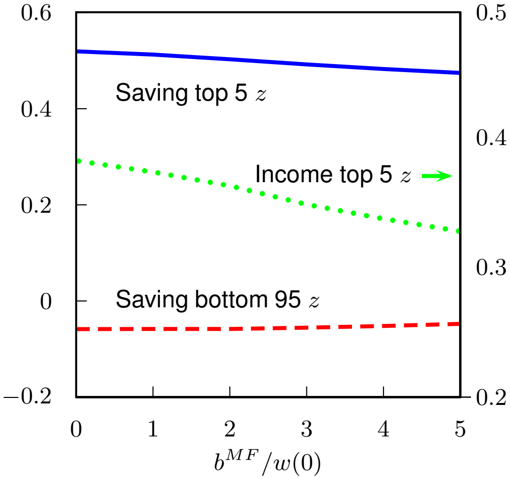
- Why does TFP increase?
  - Microfinance allows entrepreneurs with high marginal product of capital to invest more
- Why does capital fall?
  - Microfinance redistributes income from talented (high saving) to untalented (low saving) individuals

Understanding Capital Accumulation

Aggregate savings rate, S/Y, is an income-weighted average of individual savings:

$$\frac{S}{Y} = \frac{Y(z_{low})}{Y}\frac{S(z_{low})}{Y(z_{low})} + \frac{Y(z_{high})}{Y}\frac{S(z_{high})}{Y(z_{high})}$$

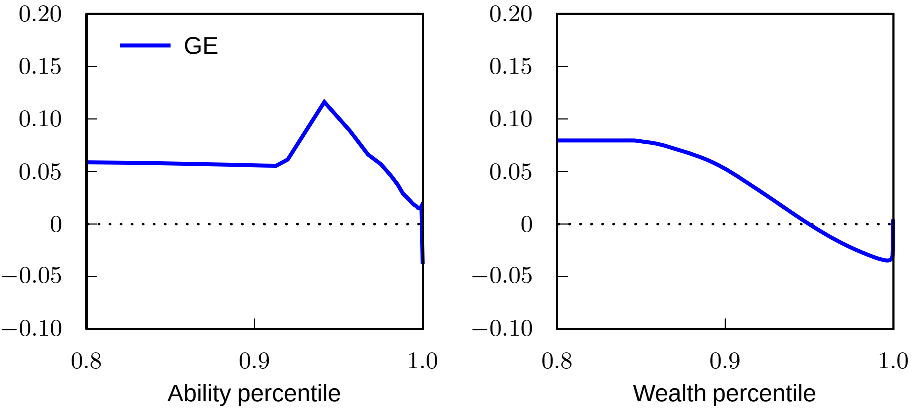
Understanding Capital Accumulation



Distribution of Welfare Gains

Distribution of Welfare Gains

Fraction of permanent consumption



How does GE affect results?

1. More redistribution
    - bigger welfare gains for low ability, low wealth

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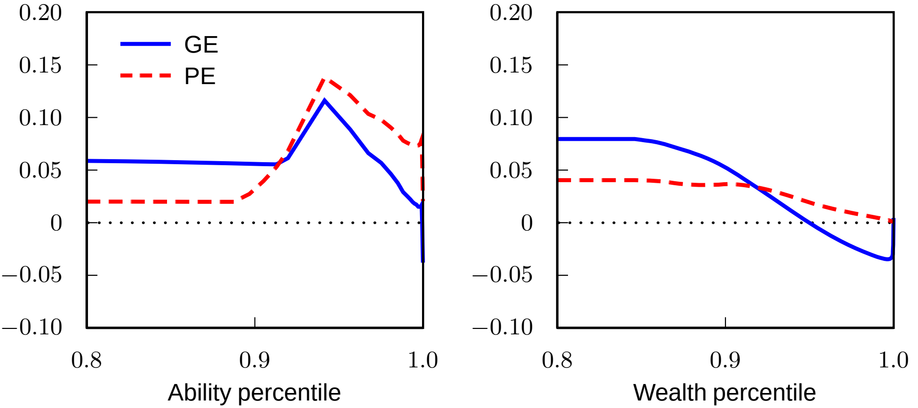
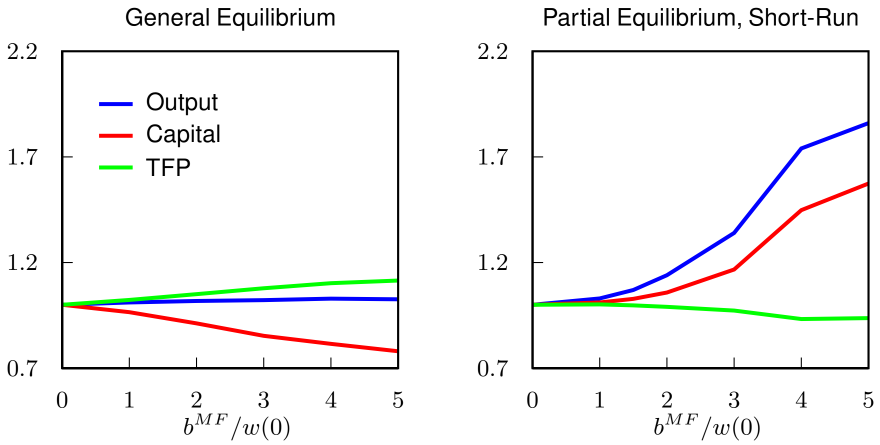
1. More redistribution
    - bigger welfare gains for low ability, low wealth
2. Smaller positive aggregate impacts
    - less capital (income redistributed to low savers through higher wage)
    - less labor than in PE (labor market clearing)

More Redistribution in GE

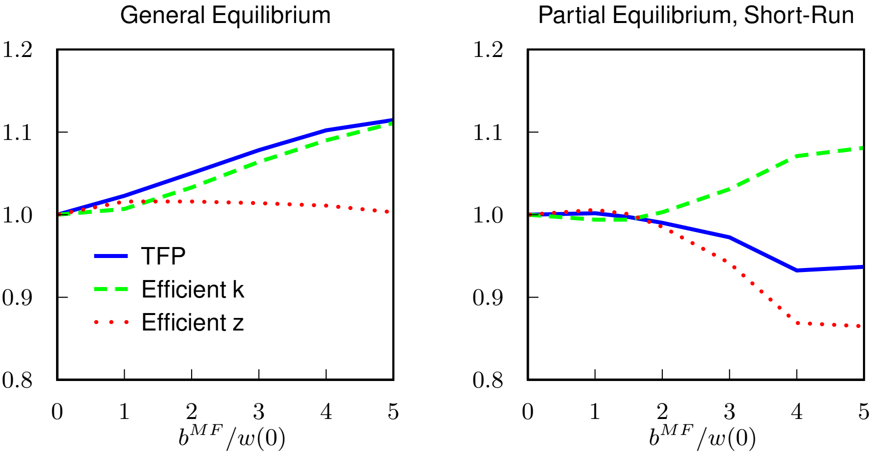
Welfare Gains, cf. ▸ quote



Smaller Aggregate Impacts in GE



Short-Run PE TFP Decomposition



Extensions

- Small open economy ▸ Ext1
  (capturing capital supplied by foreign donors)
  - Capital demand still falls: lower wealth accumulation
  - Smaller TFP gains with r constant
- Negative labor shock ▸ Ext2
  (capturing poor, low ability entrepreneurs)
  - Lower capital accumulation $\Rightarrow$ wage falls
  - Self-employed benefit relative to workers
- Two-sector model with fixed costs ▸ Ext3
  (capturing additional GE effect on relative price)
  - Negative effect on price of good produced with small scale technology
  - Large impact of large loans

Conclusions

- In GE, microfinance is primarily a redistributive policy.
- Potential impact on consumption, productivity and *welfare*, but not aggregate output, as it discourages capital accumulation.
- More broadly, large gains from trade between empirical development and macro quantitative development.

Conclusions (cont'd)

Related quantitative framework can be used to answer other important questions:

- What is the aggregate and distributional impact of asset grants, Buera et al. (2014)
- What is the effect of contract enforcement in development, Buera et al. (2011), Midrigan & Xu (2013), Moll (forthcoming)
- Quantify the effect of relaxing saving and credit constraints in development, Kaboski et al. (2014)
- ...