

Misallocation, Growth and Financial Market Imperfections

Microeconomic Evidence

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2 fundamental reasons for income differences

1. different production possibilities

2. different allocations

(1) is about geography; even for agriculture I think it is secondary



So the emphasis is on (2): different allocations

- Across countries
- Within countries, across sectors
- Within sectors, across enterprises

Rustuccia and Rogerson (2008) provided a convenient, compelling framework for understanding how micro-level misallocation can translate to aggregate TFP losses. In Jones' (2011) example of cross-sector misallocation:

$$\begin{array}{ll} \text{Production} & X_{man} = L_{man}, X_{farm} = L_{farm} \\ \text{Resource} & L_{man} + L_{farm} = \bar{L} \\ \text{Aggregation} & Y = X_{man}^{\frac{1}{2}} X_{farm}^{\frac{1}{2}} \end{array}$$

$$\text{If } x \equiv \frac{L_{man}}{\bar{L}}$$

$$Y = A(x)\bar{L}$$

$$\text{where TFP } A(x) = \sqrt{x(1-x)}$$

Hsieh and Klenow (2009) use this to calibrate TFP losses from these sources of misallocation.

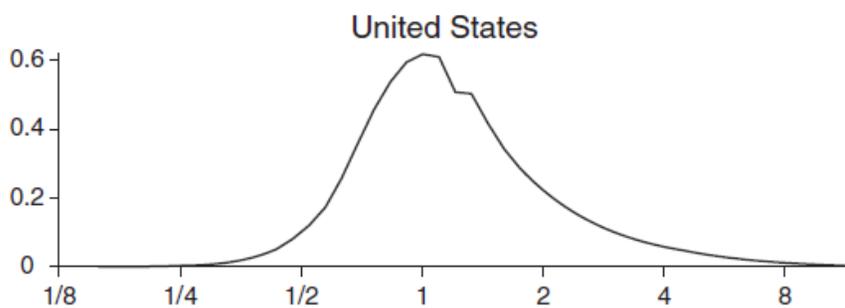
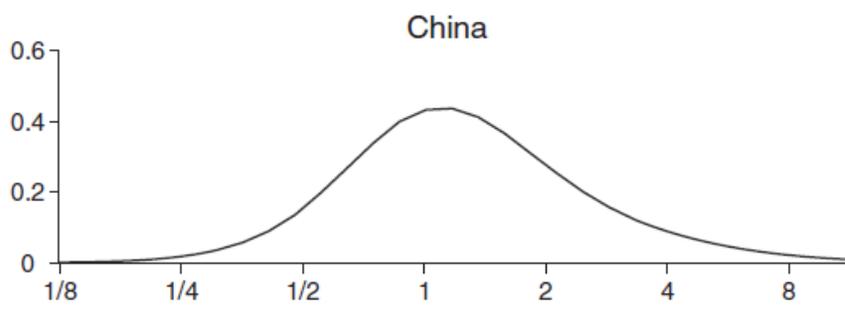
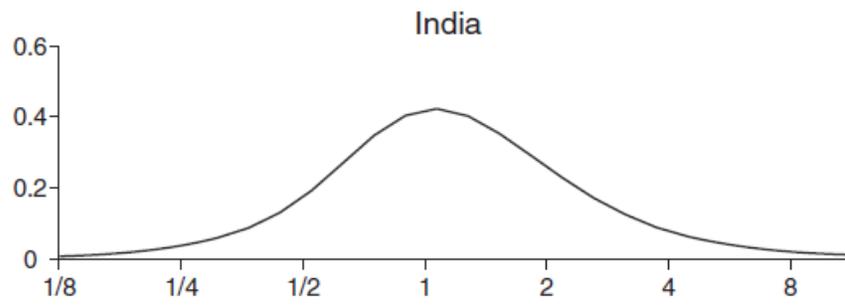


FIGURE II
Distribution of TFPR

Equalizing TFPR dispersion in India to US levels increases Indian TFP by 40-60%

Huge challenges of measurement, and opportunities of rapidly-expanding data availability

- Syverson (2011 JEL) has a tremendous overview
- Trade literature leading the way (current state of the art: De Loecker, Goldberg, Khandelwal and Pavcnik 2012)
- Micro foundations are sometimes quite abstract:

$$\pi(s, \tau) = \max_{n, k \geq 0} \left\{ (1 - \tau_Y) s k^\alpha n^\gamma - (1 + \tau_N) w n - (1 + \tau_K) r k - c_f \right\}$$

- Need to understand what drives dispersion in productivity
 - Growth and equilibrium implications depend on this (Midrigan and Xu 2010; Moll (2011); Collard-Wexler, Asker and De Loecker (2011); Buera, Kaboski and Shin (2011))
 - Micro policy depends on this





Productivity differences are real, measurable.

But the sources are varied and have dramatically different implications

- Transitory, *ex-post* productivity shocks
 - e.g., unexpected, transitory infestation of *striga*
 - the classic: rainfall





- Permanent plot-level fixed effects
 - the dirt
- Slow-moving, management
 - cultivation practices, technological innovation, knowledge of new *striga*-resistant seeds
- Capital market imperfections
 - “I’d love to use fertilizer, but I don’t have the money”

- Land market imperfections

- Why isn't the productive farmer renting or buying the other's land?
(even in households!)

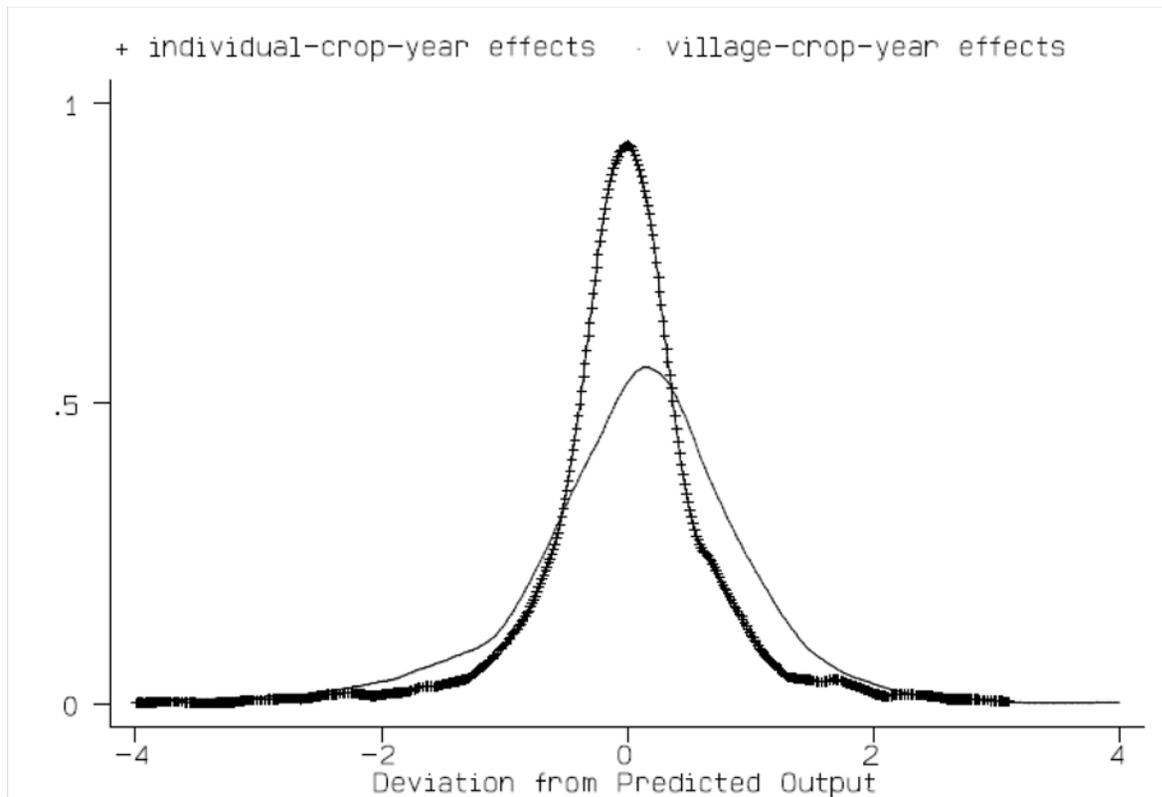
- Labor market imperfections

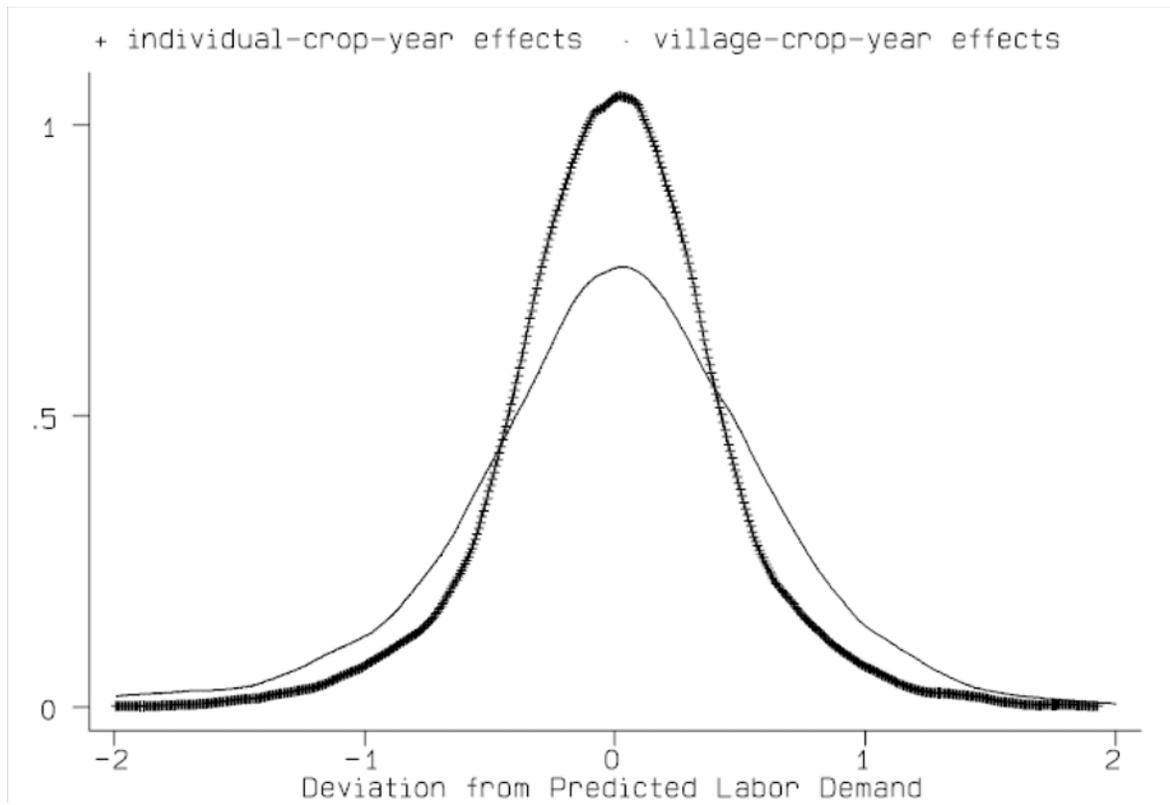
- thin, high transaction cost labor markets
- moral hazard, supervision costs

An aside: we are ignorant of the operation of rural labor markets in most of Africa, don't know to judge the opportunity cost of time

Variable	Mean	Std Dev
Total Cost of Cultivation (cedis)	1289	1380
Cost of Chemical Inputs (cedis)	124	203
Value of Family Labor (cedis)	827	946
Value of Harvest (cedis)	848	893
Profits (cedis)	-441	1281

...back to misallocation; it is very apparent in agriculture





- Uncovering the reasons for this variation is at the heart of empirical microeconomics of development
- All of this is w/in a very small sector; the goal is not to provide an accounting of misallocation overall
- But the underlying mechanisms guiding allocations should be vividly apparent in these settings

- Two simple market failures are at the heart of many of the most well-developed models that connect misallocation with growth
 - Credit
 - Insurance
- These also are what farmers and small-scale entrepreneurs report...

Credit Constraints and Misallocation

A variety of models:

Occupational choice: (Banerjee/Newman (1993); Galor and Zeira (1993); Lloyd-Ellis and Bernhardt (2000); Jeong and Townsend (2008); Buera (2008); Buera, Kaboski and Shin (2011) have something like

$$y^{ei}(a, t) = \max_k \pi(k, t) + r(a - k)$$

subject to $k \leq \Omega(a, t)$

where $\pi(k, t) = f^i(k, t) - h^i(t)$ and Ω describes the financial frictions. Ω typically founded on imperfect enforcement.

High wealth, high ability types become entreps, others choose between working for a wage and subsisting. Good t , low a types constrained out of entrepreneurship.

Productivity shocks interacting with financing constraints: Midrigan and Xu (2010), Moll (2012) have something like

$$y = f(z, k, l)$$

where z bounces around, with entrepreneurial wealth evolving according to

$$\dot{a} = f(z, k, l) - wl - (r + \delta)k + ra - c$$

and

$$k \leq \Omega(a)$$

All of these models have interesting dynamics, provide a framework for understanding a nondegenerate distribution of wealth, variation across firms in MP, and a systematic (and sometimes highly complex) relationship between capital market imperfections, productivity and growth.

Financial frictions, risk and investment

Greenwood-Jovanovic (1990); Angeletos (2007) see Townsend-Ueda (2006). Incomplete insurance and risk aversion lead to inability to capture gain of high risk/high return investments.

Model

Start with standard prefs:

$$U(x_0, \omega_0, x) \equiv E_1 \sum_{t=1}^{\infty} \beta^{t-1} u(c_t(x_{t-1}, \omega_{t-1}, x_t))$$

where $c_t = k_t - s_t - q * I(\text{join financial system}_t)$

safe tech returns δ

risky tech returns $\eta_t = \theta_t + \varepsilon_t$ (where θ_t is aggregate shock, ε_t iid)

- If individual is not in financial sector, invests proportion ϕ_t in the risky tech, so

$$k_{t+1} = s_t(\phi_t\eta_t + (1 - \phi_t)\delta_t)$$

Thus k_{t+1}, c_{t+1} depend on history of shocks through t .

- If individual is in financial sector, saves s_t in bank, which completely smooths all idiosyncratic shocks. Fixed cost of entry into financial sector q , get interest rate $r(\theta_t) = \gamma \max(\delta, \theta_t)$. For these guys, $k_{t+1} = s_t r(\theta_t)$.

Household chooses $x_t = (d_t, s_t, \phi_t)$ (d_t is a dummy for participation in financial system)

- Key micro mechanism is that guys outside the formal financial sector are subject to idiosyncratic shocks ε when investing in risky, high return activity

Current Evidence on financial frictions

Setting	Focus	Paper(s)
Medium-size formal firms in India	Borrowing	Banerjee, Duflo (2008)
Micro- and small firms in Sri Lanka	Borrowing	De Mel et al.
Farmers in rural Morocco	Borrowing	Crépon et al (2011)
Micro- and small firms in Ghana	Borrowing	Fafchamps et al (2011)
Rural Thailand	Borrowing	Kaboski, Townsend
Urban microenterprise in India	Borrowing	Banerjee et al (2010)
Urban microenterprise in Philippines	Borrowing	Karlan, Zinman (2011)
Urban microenterprise in Tanzania	Borrowing	Berge et al (2011)
Rural microenterprise in Pakistan	Borrowing	Giné, Mansuri (2011)
Rural microenterprise in Mongolia	Borrowing	Attanasio et al (2011)
Urban microenterprise in Ghana	Borrowing	Karlan et al. (2012)
Small-scale farmers in China	Insurance	Cai et al (2010)
Small-scale farmers in India	Insurance	Cole et al. (2011)
Small-scale farmers in India	Insurance	Mobarak, Rosenzweig (2012)
Small-scale farmers in Ghana	Borrow/Ins	Karlan et al (2012)

Preferences

$$u(c) + \beta \sum_{s \in S} \pi_s u(c_s)$$

Alternative environments

1. Complete Markets

$$c = y - k - a - \sum_{s \in S} p_s i_s$$
$$c_s = f_s(k) + ra + i_s + y_s$$

and k is independent of y, y_s

2. Capital Constraints

add $a \geq 0$

(need to eliminate i_s as well, but maintain idea of insurance....)

So

$$c_s = \bar{c} = \sum_{s \in S} \pi_s [f_s(k) + ra + y_s]$$

when $a = 0$ binds,

$$\frac{dk}{dy} > 0 > \frac{dk}{dy_s}$$

(but $\frac{dk}{dy_s} = 0$ if priced fairly)

3. Imperfect insurance

$$i_s \equiv 0$$

If $u(\cdot)$ is cara, $\frac{dk}{dy} = 0$. But $\frac{dk}{dy_s} > 0$

4. Binding capital constraints plus imperfect insurance

with $a = 0$,

$$u'(c) = \beta \sum_{s \in \mathcal{S}} \pi_s f'_s(k) u'(c_s)$$

and simple IFT implies

$$\frac{dk}{dy} > 0 > \frac{dk}{dy_s}$$

(because k is the only way to transfer resources across periods).

Evidence on capital constraints and imperfect insurance

- India changed rules on eligibility for directed credit. Bigger firms became eligible, and then some lost eligibility. (Duflo Banerjee 2008)
 - Firms that gained access to loans increased borrowing, increased investment and increased sales
 - Then reversed when the policy switched back

	Depe	
	Log(sales) _t -log(sales) _{t-1}	
	Complete Sample	Sample without substitution
	OLS	OLS
	(1)	(2)
A. t=1997-2000		
1. Sample with Changes in limit		
post*big	0.194	0.168
	(.106)	(.118)
	152	136
2. Sample without Change in limit		
post*big	0.007	0.022
	(.074)	(.081)
	301	285
3. Whole sample		
post*big	0.071	0.071
	(.068)	(.069)
	453	421
B. t=1999-2002		
1 Sample with Changes in limit		
post2*biggest	-0.403	-0.387
	(.207)	(.196)
	168	150
2. Sample without Change in limit		
post2*biggest	-0.092	-0.045
	(.108)	(.128)
	401	380
3. Whole sample		
post2*biggest	-0.143	-0.113
	(.111)	(.134)
	569	530

- De Mel, McKenzie, and Woodruff (2008 QJE; 2009 AEJ: Applied; 2012 Science)

\$100-\$200 grants to a random subset of \approx 700 small enterprises in Sri Lanka

Impact of Treatment Amount on:	Capital Stock (1)	Log Capital Stock (2)	Real Profits (3)
10,000 LKR In-kind	4793* (2714)	0.40*** (0.077)	186 (387)
20,000 LKR In-kind	13167*** (3773)	0.71*** (0.169)	1022* (592)
10,000 LKR Cash	10781** (5139)	0.23** (0.103)	1421*** (493)
20,000 LKR Cash	23431*** (6686)	0.53*** (0.111)	775* (643)
Number of enterprises	385	385	385
Number of observations	3155	3155	3248

rate of return $\approx 50\%$; huge heterogeneity in returns, (none for women), 5 year effects are large for men's enterprises

- Crépon, Devoto, Duflo, Parienté (2011 WP)
 - MFI expansion in rural Morocco, associated with doubling of borrowing
 - Cultivation output increased by 25%, profits by 50%
 - Livestock output increased by 10%, no change in profits
 - No change in non-farm enterprises
 - Again, large heterogeneity by business status before

- But that's it for the simple story...

- Fafchamps, McKenzie, Quinn and Woodruff (2011): Grants of \approx \$120 to small enterprises in Accra

Figure 3: Post-treatment CDFs of Capital Stock for Males by Treatment Group

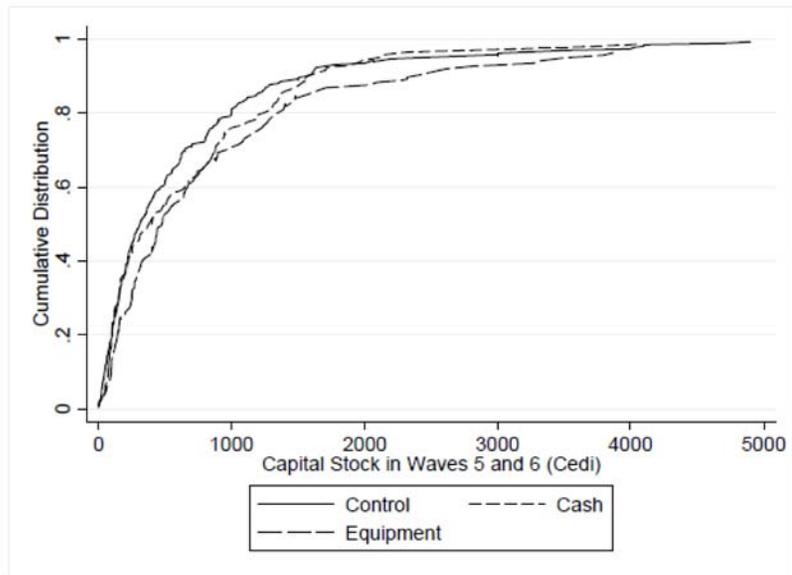


Figure 4: Post-treatment CDFs of Capital Stock for Females by Treatment Group

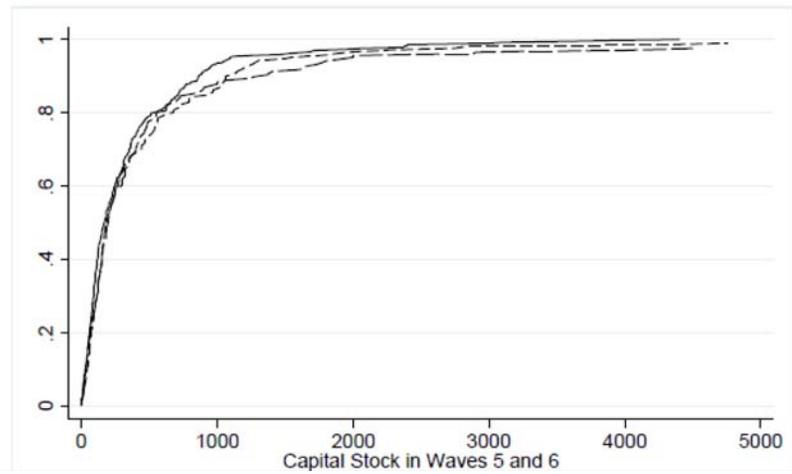


Figure 1: Post-treatment CDFs of Monthly Profits for Males by Treatment Group

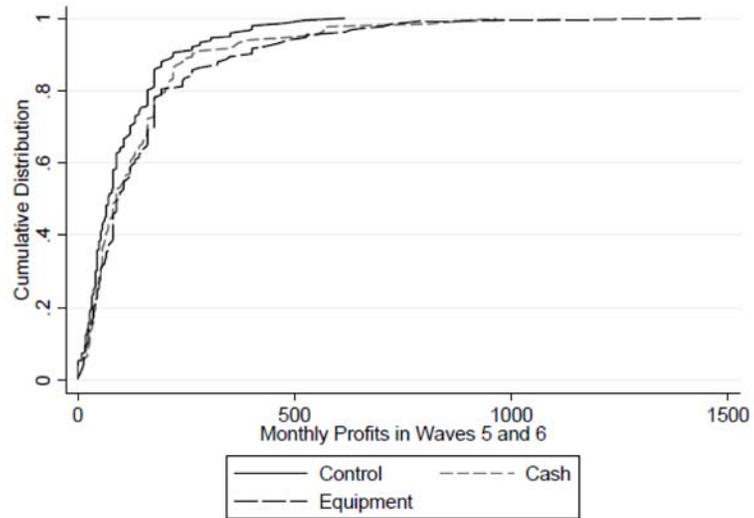
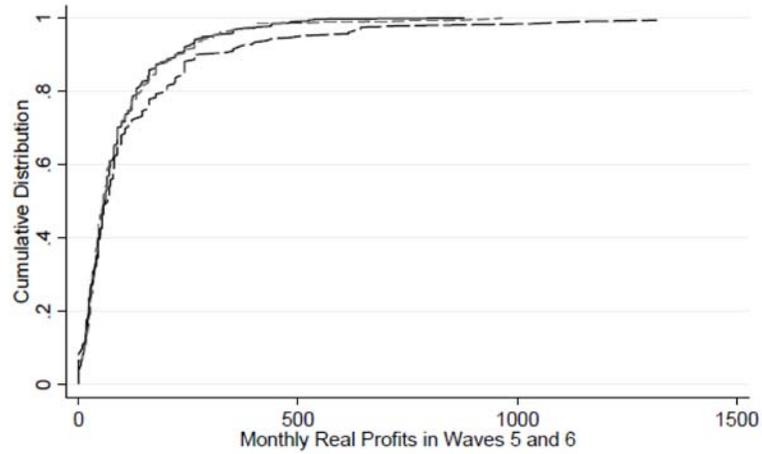
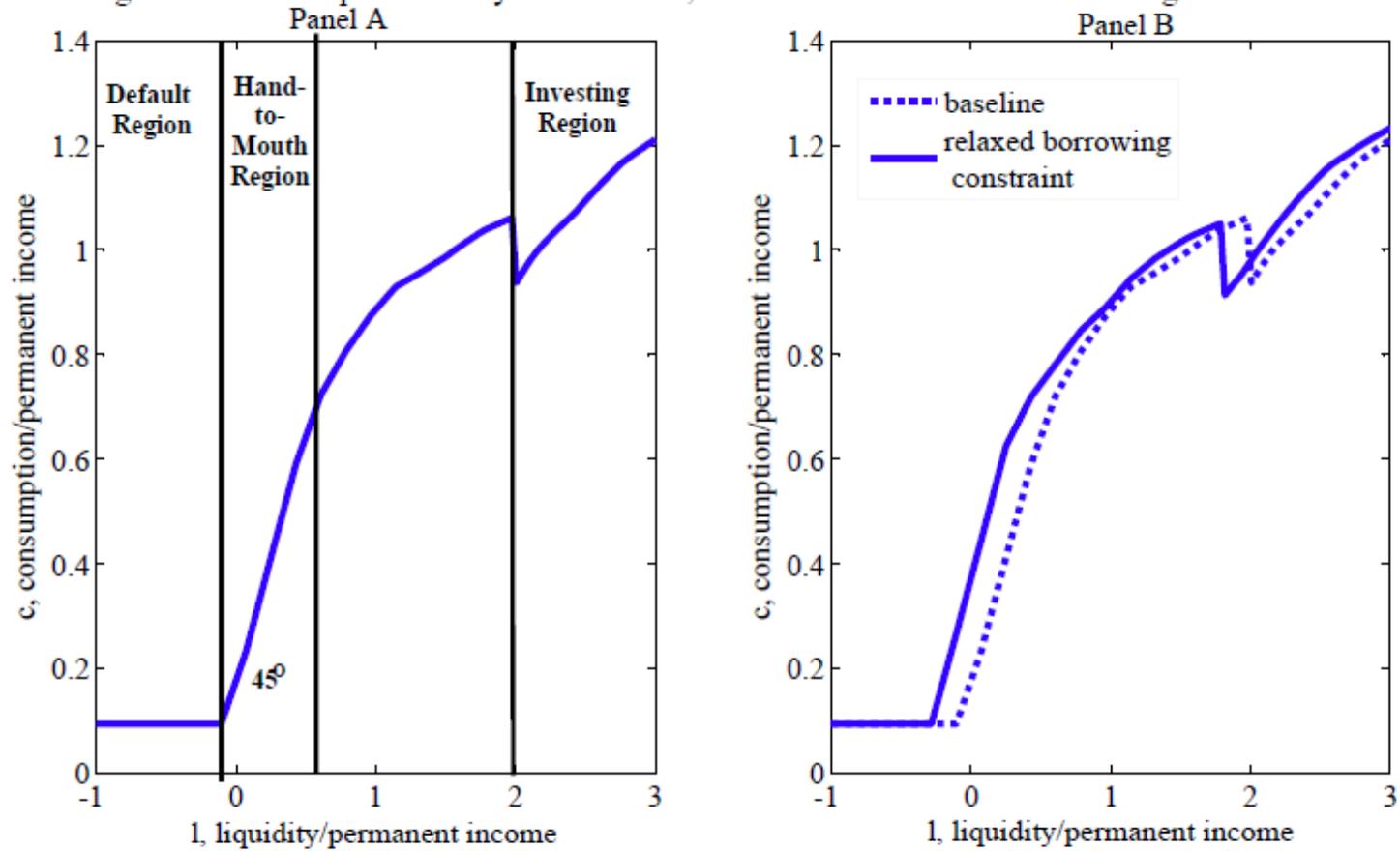


Figure 2: Post-treatment CDFs of Monthly Profits for Females by Treatment Group



- Kaboski, Townsend (forthcoming, *Econometrica*; 2011). Million-Baht Fund program in Thai villages
 - per-capita magnitude varies inversely with village size; borrowing increases 1-1 with program
 - consumption also increases (1-1?), but only in initial years, and loans are repaid
 - no strong effect on business income, investment or entry
 - not so puzzling: heterogeneity is at the core of these models

Figure 3: Consumption Policy for Fixed i^* , Baseline and Reduced Borrowing Constraint



- Banerjee, Duflo, Glennerster and Kinnan (2010 WP)
 - Expansion of urban MFI in Hyderabad
 - increases borrowing
 - New businesses established

	All households		
	(1)	(2)	(3)
	New business	Stopped a business	Profit
Treatment	0.016** [0.008]	-0.003 [0.004]	475.15 [2326.340]
Control Mean	0.054	0.031	550.494
Control Std Dev	0.252	0.173	46604.8
N	6735	6650	2362

no effect on avg consumption, but durable expenditure increases (and non-durable decreases) among hhs likely to start a business

- Karlan and Zinman (2011, Science)
 - expanded credit supply in the Philippines by randomizing credit score cut-off
 - Negative effects on business investment

	Full sample		
	OLS result	SE	Control group mean
Borrowing			
Number of loans from financial institutions in month before survey	0.094**	0.045	0.359
Number of loans from friends, family, or moneylenders in month before survey	-0.011	0.042	0.286
Business size			
Number of businesses in household	-0.102*	0.060	1.378
Number of paid employees (not including in-kind contributions) in all household businesses	-0.273**	0.123	0.878

- Berge, Bjorvatn, Tungodden (2011 WP). Grants of \$80-100 to small businesses in Dar es Salaam, among existing borrowers of an MFI

	(1) Total Savings ITT	(2) Total Loans ITT	(3) Total Investments ITT
Training	218.059*** (82.246)	173.668** (78.592)	-38.395 (177.041)
Grant	6.359 (63.705)	13.988 (47.380)	12.143 (90.523)
Training*Female	-172.751 (107.680)	-174.798* (91.262)	75.188 (196.098)
Female	37.364 (75.420)	52.654 (57.195)	-97.901 (167.152)
Sum Female	45.308 (67.688)	-1.130 (48.473)	36.792 (81.628)
Observations	494	494	494

- and no impact on profits

	(1) Profit Margin ITT
Training	-0.014 (0.028)
Grant	-0.004 (0.016)
Training*Female	0.003 (0.033)
Female	-0.013 (0.024)
Sum Female	-0.010 (0.018)
Observations	494

- Giné, Mansuri (2011) randomized access to \$1700 in loans in rural Pakistan.
 - No effect of access to loans on investment, sales, profit, or income.
 - Another arm provided business training, with mixed results
- Attanasio, Augsburg, De Haas, Fitzsimons and Harmgart (2011) randomized access to individual or group loans in rural Mongolia
 - No effect of access to individual loans on probability of owning a business, profits, income or nondurable consumption.
 - Some evidence that group loans generate more enterprises.

- Karlan, Knight and Udry (2011 WP). Grants of \approx \$150 to tailors in Accra, Ghana

	Investment (in what entrep said in baseline they would buy with extra 200 cedis) FE
Consulting Only	8.734 (101.7)
Capital Only	192.0* (103.5)
Consulting & Capital	86.45 (104.4)
Observations	461
Fixed Effects	Yes
Rounds with Data	1,6,8
Individuals	160
Baseline Mean	400.3673

	<u>Stated Income</u>	<u>Revenue</u>	<u>Expenses</u>	<u>Revenue less Expenses</u>	<u>Hours Worked per Month</u>	<u>Profit per Hour</u>	<u>Total Staff</u>
	FE	FE	FE	FE	FE	FE	FE
Consulting Only	-14.60 (27.38)	-58.74 (63.98)	29.37 (45.10)	-103.7** (46.95)	6.131 (14.25)	-0.0918 (0.117)	-0.154 (0.219)
Capital Only	-36.91* (19.26)	54.84 (55.09)	7.059 (38.97)	-11.99 (40.57)	-2.533 (12.28)	-0.177* (0.101)	-0.196 (0.223)
Consulting & Capital	-23.37 (29.02)	-18.52 (67.50)	32.91 (46.81)	-87.71* (49.53)	-11.61 (14.81)	-0.0694 (0.121)	-0.0471 (0.225)
Observations	889	599	607	598	612	612	462
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rounds with Data	1,3,5,6,7,8	1,5,6,8	1,5,6,8	1,5,6,8	1,3,6,8	1,3,6,8	1,6,8
Individuals	160	160	160	160	160	160	160
Baseline Mean	111.9	235.0	244.9	1.2	243.0		1.26

Where are we?

Setting	Outcomes
Medium-size formal firms in India	$\uparrow I, \uparrow \pi$
Micro- and small firms in Sri Lanka	$\uparrow I, \uparrow \pi$
Farmers in rural Morocco	$\uparrow I, \uparrow \pi$
Micro- and small firms in Ghana	cash v. in-kind
Rural Thailand	\uparrow cons
Urban microenterprise in India	\uparrow businesses
Urban microenterprise in Philippines	\downarrow businesses
Urban microenterprise in Tanzania	nothing
Rural microenterprise in Pakistan	nothing
Rural microenterprise in Mongolia	nothing
Urban microenterprise in Ghana	$\uparrow I, \downarrow \pi$

- – As Kaboski/Townsend emphasize, heterogeneous responses to be expected depending on history of shocks, current wealth
- Heterogeneity also driven by $\Omega(W; t)$; and by productivity shocks and/or fixed characteristics
- Heterogeneity interacts with learning; option value of experimenting in Karlan, Knight, Udry.
- This all speaks to the massively growing literature on business training (which has much *weaker* results)

On to risk....

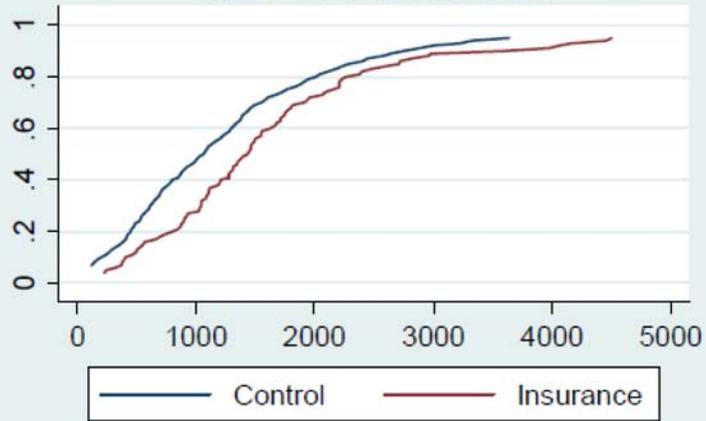
- Cai, Chen, Fang, Zhou (2010). Randomized incentives to microinsurance (for sows) sales agents in China

Variables	Number of Sows in March 2008			Number of Sows in June 2008		
	(1)	(2)	(3)	(4)	(5)	(6)
No. of Insured Sows	.828*** (3.24)	.839*** (2.90)	.760** (2.49)	.886*** (2.89)	.906** (2.60)	.819** (2.22)
No. of Sows in Dec. 2006			.549** (2.38)			.574** (2.14)
Constant	19.84** (2.86)	41.93** (2.67)	2.97 (1.72)	23.03*** (2.94)	54.29*** (2.88)	2.78 (1.33)
Township Dummies	No	Yes	Yes	No	Yes	Yes
Adjusted-R ²	.6000	.7254	.7680	.5839	.7173	.7550

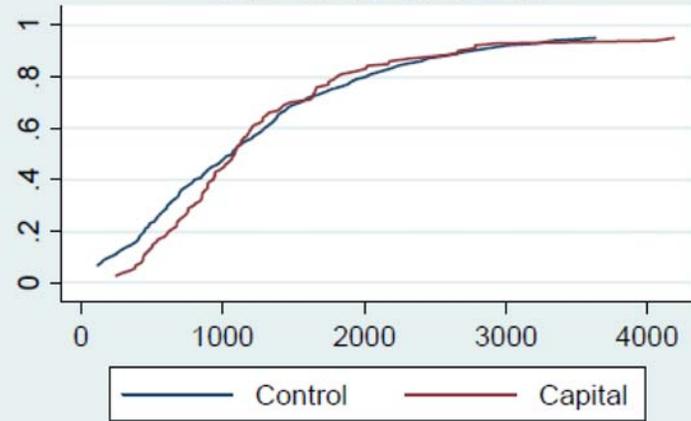
- Free provision of rainfall index insurance to farmers in India (Cole, Giné, Vickery 2011)
 - No effect on overall investment in agriculture
 - But significant shift into riskier cash crops
- Randomized access to rainfall index insurance to farmers in India (Mobarak, Rosenzweig 2012)
 - Significant shift away from drought-tolerant varieties
 - Significant shift into higher yield varieties

- Randomized provision of index insurance, capital to farmers in Ghana (Karlen, Osei, Osei-Akoto, Udry)

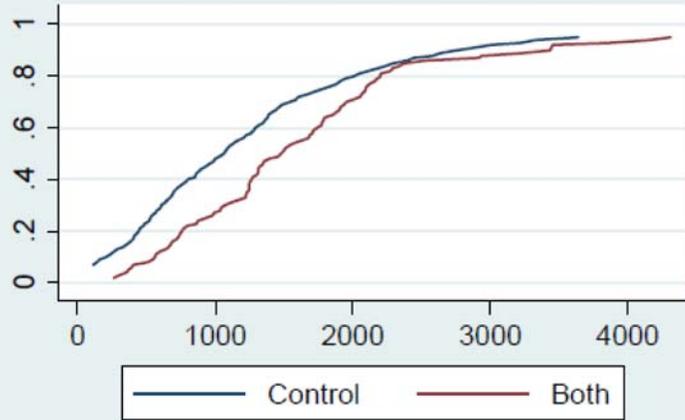
CDF of Total Costs



CDF of Total Costs



CDF of Total Costs



Setting	Effect of Insurance/capital
Small-scale farmers in China	↑ I in risky sows
Small-scale farmers in India (gift)	switch to cash crops
Small-scale farmers in India (sale)	switch to riskier, HYV
Small-scale farmers in Ghana	Ins → ↑ I in ag; Capital → nothing

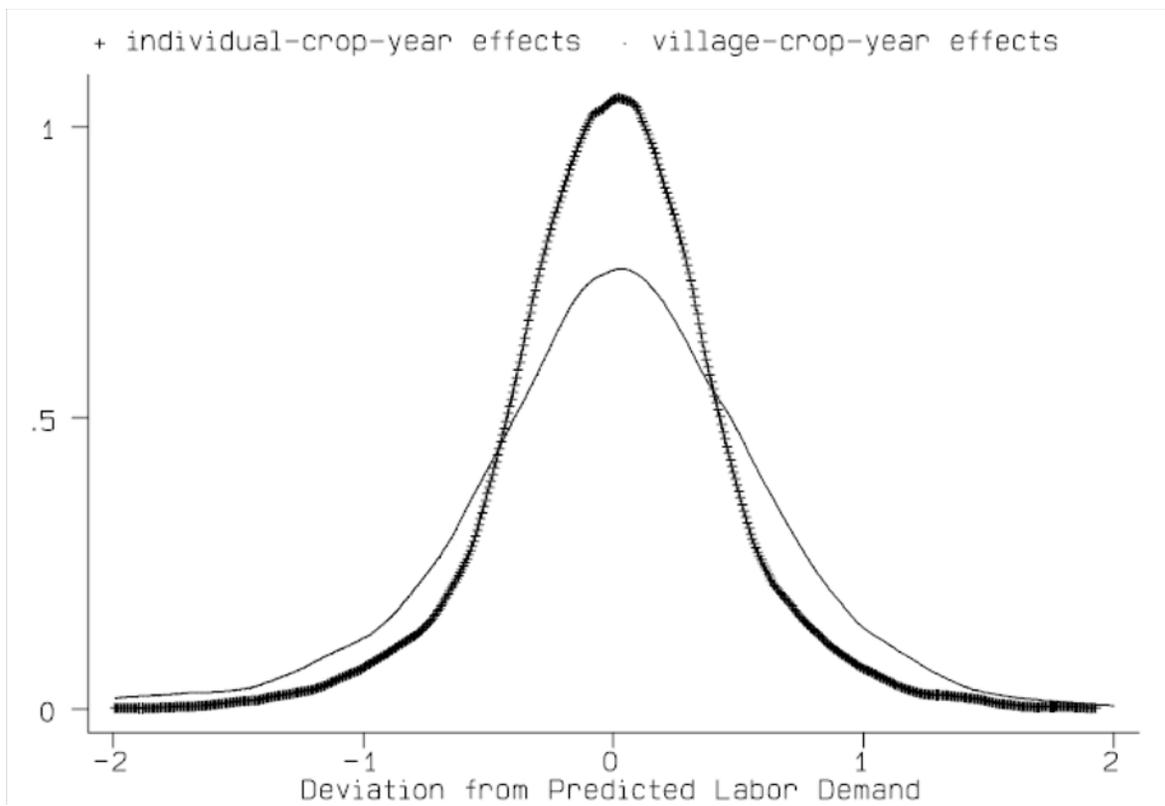
none of these show improvements in profits.

Observations

1. Massive variation across firms even in narrowly-defined sectors in productivities, input intensities

2. Source of this variation is of the essence. What is the evidence on misallocation?
 - (a) Productivity dispersion, shocks; microenterprises as subsistence activities. Are we looking at the wrong businesses?

 - (b) Inefficiency in the allocation of resources



3. Most of the interesting recent literature has concentrated on financial market imperfections, but at best mixed evidence that farmers, small and microenterprise are capital constrained in the classic sense that $k = \Omega(W)$
4. Much stronger evidence of general concerns about risk and inability to insure. Important response of investment to safety.

5. Heterogeneity:

- (a) Certain firms face binding capital constraints and others not; all endogenous
- (b) Multiple imperfections; relaxation of $k = \Omega(W)$ may be irrelevant, particularly with endogenous W .
- (c) Spatial heterogeneity in type of financial imperfection as in Karaivanov and Townsend (2012)
- (d) Idiosyncratic heterogeneity:
 - i. Productivity shocks are not fully known, even to entrepreneur – room for learning about oneself
 - ii. Management, technology, markets: robust evidence of learning from others

6. Little evidence that financial constraints are key

(a) Strong evidence of land and labor market imperfections in rural Africa

(b) Output markets and quality

(c) Variation in technology use, much evidence of learning, but uneven

(d) Management variation, but little support for effectiveness of training

7. Models of misallocation and growth reliant on single constraints are not sufficient; heterogeneity is the rule. Sorry.

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