

Macro from the Micro POV

Financial Markets and Poverty

Chris Udry, Yale University

August 2011

Obsessing on Lucas...

Why *doesn't* capital flow from rich to poor countries?

Evidence on returns to capital:

- Interest rates, particularly microfinance
 - Lots of borrowing at rates between 40% and 100%
- Direct evidence from production function estimates, or similar
 - e.g., Banerjee and Duflo; a set of RPED studies from Africa

- In Ghana,
 - Schündeln (2008 WP). Uses Olley/Pakes and Levinsohn/Petrin approach to estimate production functions for firms in presence of capital constraints; returns on the order of 50 - 150%
 - Anagol and Udry (2006 AER PP). Uses relative prices of short- vs long-lasting durable goods to estimate opportunity cost of capital in informal sector. Estimate is 60% .

- Variation in returns
 - Banerjee and Munshi (2004 REStud)

- Review of recent micro evidence on 2 financial frictions at the heart of equilibrium models of distribution and growth

Financial frictions, poverty and occupational choice

Standard model (Banerjee/Newman (1993); Galor and Zeira (1993); Lloyd-Ellis and Bernhardt (2000); Jeong and Townsend (2008); Buera (2008) has something like

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

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

where $\pi(k, t) = f(k, t) - h(t)$ and Ω describes the financial frictions.

Or,

$$y^w(a, t) = w + ra$$

(and most versions also have a subsistence sector)

BN have a nice simple model of Ω :

Borrow L

Pay back: $v(L) + a(1 + r) - L(1 + r)$

Reneg: keep $v(L) - \pi F$

So, obviously,

$$L \leq a + \frac{\pi}{1 + r} F$$

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.

Financial frictions, risk and investment

Greenwood-Jovanovic (1990 JPE); see Townsend-Ueda implementation. 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)

- Notice how simple the model is. No GE stuff going on in the financial sector
- But returns do depend on wealth (through portfolio choice and entry into financial sector)
- $\Psi(k'; k) \equiv \text{prob}(k_{t+1} \leq k' | k_t = k)$
- k_t determines x_t , so in principle we can calculate Ψ (and TU do...)

- Eventually, of course, (almost) everyone joins the financial system. Steady state distribution only happens then
- Key micro mechanism is that guys outside the formal financial sector are subject to idiosyncratic shocks ε when investing in risky, high return activity

Which financial frictions matter?

Experimental evidence can distinguish between alternative models.

Preferences

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

Alternative environments

1. Complete Markets

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

with y, y_s the variables subject to experimental manipulation.

actuarial fairness implies $rp_s = \pi_s$ (assured by arbitrage between i and a)

$$1 = \sum_{s \in S} p_s f'_s(k)$$

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 $a \geq 0$ binds,

$$u'(c) > \beta r u'(\bar{c})$$
$$u'(c) = \beta u'(\bar{c}) \sum_{s \in S} \pi_s f'_s(k)$$

and

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

3. Imperfect insurance

$$i_s \equiv 0$$

Let $S = \{L, H\}$ with $f'_L(k) = 0$

$$r \left[\pi_L u'(c_L) + \pi_H u'(c_H) \right] = \pi_H f'_H(k) u'(c_H)$$

or

$$r \left[\frac{\pi_L u'(c_L)}{\pi_H u'(c_H)} + 1 \right] = f'_H(k)$$

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

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).

Experimental Evidence on capital constraints and imperfect insurance

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

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

| | Capital Stock | Log Capital Stock | Real Profits |
|--------------------------------|--------------------|----------------------|------------------|
| Impact of Treatment Amount on: | (1) | (2) | (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%, lots of variation.

- 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
 - Reduction in wage labor

- Kaboski, Townsend (forthcoming, *Econometrica*; 2011 WP)
 - Million-Baht Fund program in ≈ 60 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

| Technique \ Response Variable | New Short-Term Credit Level | Consumption Level | Asset Growth Rate | Net Income Growth Rate |
|--|-----------------------------|-------------------|-------------------------|------------------------|
| OLS Regression | 1.28** (0.13) | 0.22 (0.20) | -1.08e-6 (2.77e-6) | 1.16e-5** (3.82e-6) |
| Baseline IV Regression: Only Villages With 50-200 Households | 1.92** (0.67) | 1.71** (0.88) | -7.30e-6 (1.63e-5) | 7.37e-5** (3.30e-6) |
| IV Regression using All Villages | 1.38** (0.37) | 2.40** (0.63) | -2.09e-5** (9.89e-6) | 2.11e-5 (1.32e-5) |
| IV Regression without 1% Outliers | 1.39** (0.46) | 1.47** (0.57) | -1.31e-5 (1.40e-5) | 6.99e-5** (3.04e-5) |

** Significant at 5% level * Significant at 10% level

| Technique \ Response Variable | Components of Income | | | | | Investment and Input Uses | | | | | | |
|--|----------------------|------------------|-----------------|-----------------|----------------|---------------------------|-------------------------------|------------------------------------|-----------------------------|----------------------------------|------------------|---------------------------------|
| | Business Profits | Wage and Salary | Rice Farming | Other Crops | Livestock | Number of New Businesses | Amount of Business Investment | Probability of Business Investment | Amount of Agric. Investment | Probability of Agric. Investment | Total Wages Paid | Fert., Pest., etc. Expenditures |
| OLS Regression | 0.69 (0.46) | 0.18** (0.09) | 0.19* (0.10) | 0.40 (0.39) | 0.16 (0.17) | -1.10e-6* (6.33e-7) | 0.01 (0.10) | -8.94e-8 (5.82e-7) | -0.10 (0.10) | 5.99e-7 (7.34e-7) | 0.04 (0.08) | 0.10 (0.06) |
| Baseline IV Regression: Only Villages With 50-200 Households | 1.07 (1.61) | 1.25* (0.66) | 0.21 (0.56) | 1.03 (1.14) | 1.89 (2.09) | 3.67e-6 (3.06e-6) | -0.33 (0.40) | 6.52e-7 (2.93e-6) | -0.04 (0.38) | 1.94e-6 (3.18e-6) | -0.24 (0.31) | -0.13 (0.31) |
| IV Regression using All Villages | 1.64** (0.70) | 0.66* (0.39) | -0.10 (0.24) | -0.02 (0.63) | 0.67 (0.83) | 8.39e-7 (2.18e-6) | -0.12 (0.19) | -3.18e-8 (2.14e-6) | -0.15 (0.18) | 4.33e-6* (2.70e-6) | -0.22 (0.16) | -0.30 (0.24) |
| IV Regression without 1% Outliers | 0.97 (1.32) | 1.26** (0.65) | 0.36 (0.40) | -0.98 (1.28) | 0.88 (0.60) | 3.67e-6 (3.06e-6) | -0.01 (0.17) | -- | 0.25 (0.25) | -- | 0.11 (0.16) | -0.11 (0.15) |

- – business and labor market income increase; but no entry
- wages increase

- 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 |

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

| | Capital Stock FE | Truncated Capital Stock FE |
|-----------------------------------|------------------------|-------------------------------------|
| Panel A: Males and Females | | |
| Cash Treatment*Female | 82.61 (72.01) | 49.17 (37.27) |
| Equipment Treatment*Female | 135.34** (65.55) | 120.24*** (34.51) |
| Cash Treatment*Male | 31.36 (70.33) | 2.21 (61.10) |
| Equipment Treatment*Male | 157.71 (102.12) | 83.74 (69.85) |
| Number of Observations | 4256 | 4256 |
| Number of Firms | 765 | 765 |

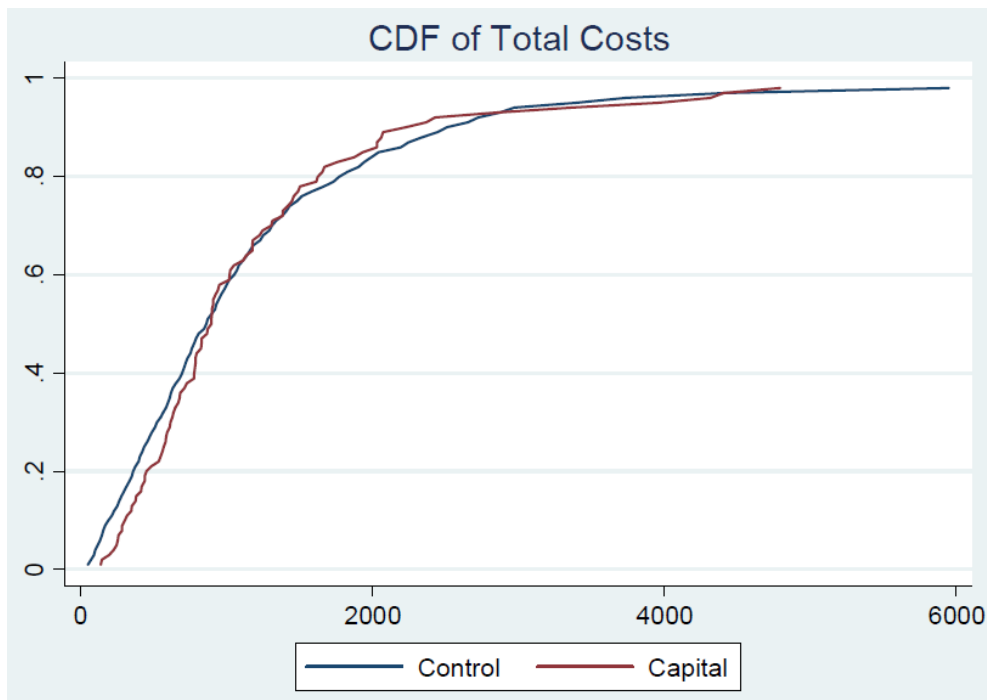
| Dependent Variable: Real Monthly Profits (Cedi) | | | | |
|---|-----------|-----------|-----------|-----------|
| | (1) | (2) | (3) | (4) |
| | OLS | OLS | FE | FE |
| Cash Treatment | 14.50* | 9.59 | 3.96 | 0.48 |
| | (8.68) | (7.32) | (13.89) | (8.23) |
| Equipment Treatment | 38.60*** | 36.75*** | 43.23*** | 30.87*** |
| | (11.21) | (10.67) | (12.31) | (10.73) |
| Cash Treatment*Female | | | | |
| Equipment Treatment*Female | | | | |
| Cash Treatment*Male | | | | |
| Equipment Treatment*Male | | | | |
| Constant | 119.69*** | 102.19*** | 120.34*** | 103.05*** |
| | (8.84) | (4.40) | (7.37) | (3.71) |
| Baseline trimming | No | Yes | No | Yes |
| Waves | All | All | All | All |
| Observations | 4354 | 4203 | 4354 | 4203 |
| Number of sheno | 792 | 764 | 792 | 764 |

- 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 |

- Karlen, Osei, Osei-Akoto, Udry
 - No evidence of capital constraints:



Pattern of investment corresponds to incomplete insurance, but no increase in profit

| VARIABLES | ln(output) | ln(total costs) |
|--------------|---------------------|--------------------|
| insuredAcres | 0.09 (0.069) | 0.15** (0.058) |
| bothAcres | 0.11 (0.075) | 0.07 (0.063) |
| capT | 0.07 (0.082) | 0.06 (0.068) |
| new2009 | -0.15*** (0.048) | -0.09** (0.040) |
| not2009 | 0.04 (0.087) | -0.07 (0.073) |
| year2 | 0.12** (0.050) | 0.09** (0.042) |
| Constant | 6.43*** (0.049) | 7.03*** (0.041) |
| Observations | 2,330 | 2,330 |
| R-squared | 0.018 | 0.019 |

Observations

1. Agriculture looks different

(a) No evidence of binding credit constraints

(b) In Ghana, people find resources to invest when future insurance is provided

(c) No evidence that these investments are highly profitable. Are there other returns?

2. Businesses have very mixed results

- (a) Sri Lanka, Hyderabad, Ghana – business investment responsive to capital grants, eased access to finance
- (b) Morocco, Philippeans, Thailand, Tanzania – business investment, startups unresponsive to finance.
 - i. indeed, in Thailand, looks like asset growth might fall as buffer stocks are drawn down when credit constraints are loosened
- (c) Very, very weak evidence on profitability, except in Sri Lanka and some Ghana businesses

3. Are we looking at the wrong businesses?