Economics 270c
Graduate Development Economics

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Graduate Development Economics

Lecture 15 – May 5, 2009

Macroeconomic growth empirics

Lecture 1: Global patterns of economic growth and development (1/20)

Lecture 2: Inequality and growth (1/27)

The political economy of development

Lecture 3: History and institutions (2/3)

Lecture 4: Corruption (2/10)

Lecture 5: Patronage politics (2/17)

Lecture 6: Democracy and development (2/24)

Lecture 7: War and Economic Development (3/3)

Lecture 8: Economic Theories of Conflict (3/10) – Guest lecture by Gerard Padro

Human resources

Lecture 9: Human capital and income growth (3/17)

Lecture 10: Increasing human capital (3/31)

Lecture 11: Labor markets and migration (4/7)

Lecture 12: Health and nutrition (4/14)

Lecture 13: The demand for health (4/21)

Other topics

Lecture 14: Environment and development (4/28)

Lecture 15: Resource allocation and firm productivity (5/5)

Additional topics for the development economics field exam

-- Ethnic and social divisions

-- The Economics of HIV/AIDS

- Grading:
  Four referee reports – 40%

  Two problem sets – 20%
  → Graded problem set 2 passed back soon

  Research proposal – 30%
  → Due today (Tuesday May 5)

  Class participation – 10%

  After lecture today – pizza and beer/soda at LaValls after class (4 pm)

Lecture 15 outline

(1) Credit, firms and economic development

(2) De Mel, McKenzie, Woodruff (2008) on the returns to capital in Sri Lanka micro-enterprises

(3) Hsieh and Klenow (2008) on the misallocation of capital / subsidies in China and India

(1) Credit, firms and economic development

- A stylized concave production function, as a function of capital per capita k:
- Rich country: $Y_1 = A_1(k_1)^{\alpha}$, poor country: $Y_2 = A_2(k_2)^{\alpha}$, where $\alpha<1$
- If technology and institutions diffuse costlessly, $A_1 \approx A_2$. But $k_2 << k_1$ → marginal returns to capital should be much larger in the poor country (Lucas 1990)

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- We know from earlier in the course that $A_1 \neq A_2$. So the relative return to capital in poor countries is ambiguous

  -- Suggestive evidence: real interest rates are high in poor countries (but is just the product of financial regulation?); micro-finance institution claims of large returns for small enterprises, especially to women

(2) De Mel, McKenzie, and Woodruff (2008)

- What are the returns to capital for small firms in less developed countries?

  -- Empirical difficulties include endogenous investment: if higher productivity owners (θ_i) gain access to more capital, the regression of profits on capital will be biased

  -- Highlights the need for exogenous variation in capital, as well as firm fixed effects (to capture unobserved differences across firms)

- Existing non-experimental studies have high estimated returns: Udry and Anagol (2006) at 50-250% per year for Ghanaian farmers, Banerjee and Duflo at 74-100% for Indian firms, McKenzie and Woodruff (2008) at 40-360% per year for small Mexican firms. But how reliable?

(2) De Mel, McKenzie, and Woodruff (2008)

- Main finding: returns to capital in Sri Lanka micro-enterprises are high, at 5% per month, or 60% per year

  -- Firms were randomly chosen to receive 10,000 / 20,000 LKR (US$100 / 200) in either cash or equipment

  -- This is equivalent to roughly 3 / 6 months of median profits, 55 / 110% of initial invested capital

  -- Based on a panel of 385 micro-enterprises across 9 quarterly survey rounds; relatively low attrition (<10%)

- These grants were not used for consumption: most of the cash prizes were used for investment in the business (58%), 18% saved or used to pay off debt, 7% for other non-business investments (i.e., home repairs)

TABLE I

DESCRIPTIVE STATISTICS AND VERIFICATION OF RANDOMIZATION

Baseline characteristic	Total number of observations in R1	Full sample		Means by treatment		t-test p-value
		Mean	SD	Assigned to any treatment	Assigned to control	
Profits March 2005	391	3,851	3,289	3,919	3,757	.63
Revenues March 2005	408	12,193	14,933	11,796	12,739	.53
Total invested capital March 2005	408	146,441	224,512	155,626	133,837	.33
Total invested capital excluding land and buildings March 2005	408	26,530	25,259	25,633	27,761	.40
Own hours worked March 2005	408	52.6	22.3	51.8	53.7	.39
Hours worked, unpaid family, March 2005	405	18.1	28.8	18.2	15.4	.31
Age of entrepreneur	408	41.8	11.4	41.8	41.9	.92
Age of firm in years	403	10.3	10.5	10.8	9.7	.34
Proportion female	387	0.491	0.5	0.459	0.533	.15
Years of schooling of entrepreneur	408	9.0	3.1	8.9	9.2	.40
Proportion whose father was an entrepreneur	408	0.385	0.49	0.373	0.401	.56
Proportion of firms that are registered	408	0.235	0.45	0.254	0.209	.32
Number of household members working in wage jobs	408	0.7	0.83	0.7	0.7	.73
Household asset index	408	0.276	1.610	0.118	0.494	.02
Number of digits recalled in Digit Span Recall Test	370	5.9	1.23	5.9	5.9	.96
Implied coefficient of relative risk aversion from lottery game	403	0.143	1.57	0.206	0.053	.33

III. Data and Measurement of Main Variables

The baseline survey gathered detailed information on the firm and the characteristics of the firm owner. The main outcome variable of interest in this paper is the profits of the firm. Firm profits were elicited directly from the firm by asking,

> What was the total income the business earned during March after paying all expenses including wages of employees, but not including any income you paid yourself. That is, what were the profits of your business during March?

The reported mean and median profits in the baseline are 3,850 and 3,000 LKR, respectively. The survey also asked detailed questions about revenues and expenses. Profits calculated as reported revenues minus reported expenses are lower, awave 2,500 LKR at the mean and 1,350 LKR at the median. Profits calculated in this manner are positively correlated with reported profits, with a correlation coefficient of 0.32. This is about the same level as one finds in other microenterprise surveys. In de Mel, McKenzie, and

(2) De Mel, McKenzie, and Woodruff (2008)

- What drives variation in the returns to capital?
- The firm production function: $Y_i = f(K_i, \theta_i)$, where K_i is capital and θ_i is a characteristic of firm i that makes capital more productive (e.g., owner ability),

$$\frac{\partial^2 f}{\partial K_i \partial \theta_i} > 0$$

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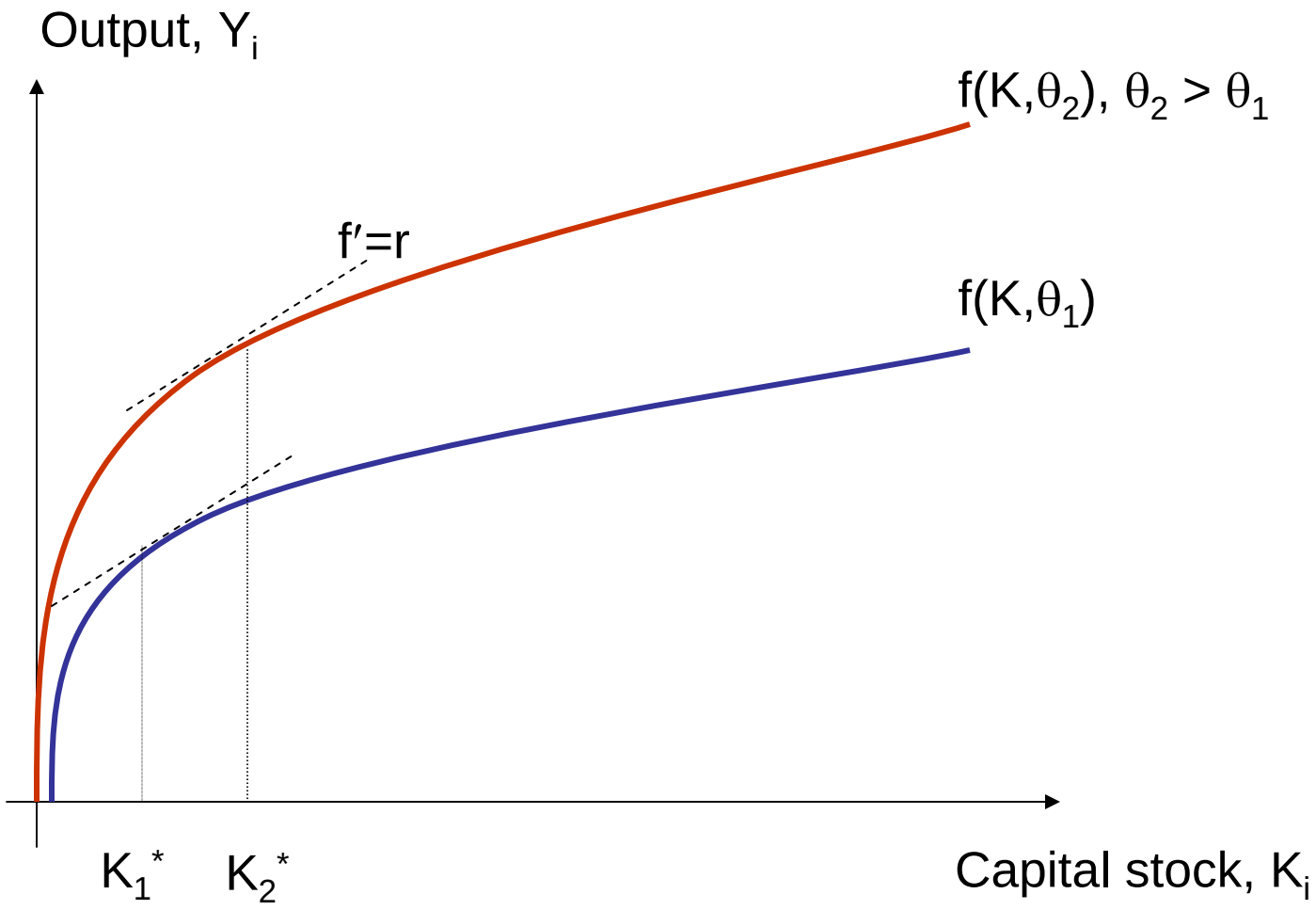
- Benchmark case: perfect credit and insurance markets: $f'(K_i, \theta_i) = r$ for all firms, where r is the market interest rate

  -- The marginal return to capital is the same for all firms, but higher productivity firms are larger in equilibrium:

  $\theta_i > \theta_j \rightarrow K^*_i > K^*_j$

  -- Imperfect credit/insurance markets could lead marginal products to exceed the market interest rate (below)


Output, Y_i
$f(K,\theta_2)$, $\theta_2 > \theta_1$
$f'=r$
$f(K,\theta_1)$
K_1^*
K_2^*
Capital stock, K_i

IV. Estimation of Basic Experimental Treatment Effects

We begin by examining the impact of treatment on the outcomes of interest. The first marker is capital stock, where the treatments were designed to have a direct effect. We are also interested in the effect of the treatments on enterprise profits and the number of hours worked by the owner. We estimate regressions of the following form:

$$(1) \qquad Y_{it} = \alpha + \sum_{g=1}^{4} \beta_g \text{Treatment}_{git} + \sum_{t=2}^{9} \delta_t + \lambda_i + \varepsilon_{it},$$

where Y represents the outcome of interest; $g = 1$ to 4, the four treatment types granted to enterprise i any time before wave t; δ_t are wave fixed effects and λ_i are enterprise fixed effects. We cluster all standard errors at the enterprise level. We estimate (1) in both levels and logs, though as we will discuss, the interpretation of the treatment effect measured in logs is less straightforward. We

Reduced form

TABLE II

EFFECT OF TREATMENTS ON OUTCOMES

Impact of treatment amount on:	Capital stock (1)	Log capital stock (2)	Real profits (3)	Log real profits (4)	Owner hours worked (5)
10,000 LKR in-kind	4,793*	0.40***	186	0.10	6.06**
	(2,714)	(0.077)	(387)	(0.089)	(2.86)
20,000 LKR in-kind	13,167***	0.71***	1,022*	0.21*	−0.57
	(3,773)	(0.169)	(592)	(0.115)	(3.41)
10,000 LKR cash	10,781**	0.23**	1,421***	0.15*	4.52*
	(5,139)	(0.103)	(493)	(0.080)	(2.54)
20,000 LKR cash	23,431***	0.53***	775*	0.21*	2.37
	(6,686)	(0.111)	(643)	(0.109)	(3.26)
Number of enterprises	385	385	385	385	385
Number of observations	3,155	3,155	3,248	3,248	3,378

Reduced form

TABLE III
POOLING OF TREATMENT EFFECTS (DEPENDENT VARIABLE: REAL PROFITS)

	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Treatment amount	5.68***	5.41***				
	(2.18)	(2.09)				
Treatment amount × being 1–4 quarters posttreatment			5.47**			
			(2.08)			
Treatment amount × being 5–8 quarters posttreatment			4.88*			
			(2.85)			
In-kind treatment amount				4.17		
				(2.58)		
Cash treatment amount				6.70**		
				(2.81)		
Treated amount 10,000 LKR					7.65**	
					(3.31)	
Treated amount 20,000 LKR					8.95*	
					(4.53)	
Treatment amount × coastal zone (tsunami affected)						9.08**
						(4.36)
Treatment amount × near-coastal zone						5.10**
						(2.38)
Treatment amount × inland zone						5.34
						(3.33)
Constant	3,841***	3,824***	3,824***	3,823***	3,823***	3,665***
	(185)	(174)	(174)	(174)	(174)	(152)
Trimming top 0.5% of changes in profits	No	Yes	Yes	Yes	Yes	Yes
F-test of equality of treatment effects p-value			0.76	0.45	0.80	0.44
F-test p-value: 2 × 10,000 treatment = 20,000 treatment					0.39	
Firm-period observations	3,274	3,248	3,248	3,248	3,248	4,913
Number of enterprises	385	385	385	385	385	585

Structural / IV

TABLE IV

INSTRUMENTAL VARIABLE REGRESSIONS MEASURING RETURN TO CAPITAL FROM EXPERIMENT

	Real profits IV-FE (1)	Log real profits IV-FE (2)	Real profits 4 instruments (3)	Real profits adjusted (1) IV-FE (4)	Real profits adjusted (2) IV-FE (5)
Capital stock/log capital stock (excluding land & buildings)	5.85** (2.34)	0.379*** (0.121)	5.16** (2.26)	5.29** (2.28)	4.59** (2.29)
First-stage					
Coefficient on treatment amount	0.91***	0.33***		0.91***	0.91***
F statistic	27.81	49.26	6.79	27.81	27.81
Observations	3,101	3,101	3,101	3,101	3,101
Number of enterprises	384	384	384	384	384

(2) De Mel, McKenzie, and Woodruff (2008)

- Perfect insurance market, missing credit market case
- Two issues:

  (1) Access to capital differs across groups of firms. E.g., female and male owned firms face different interest rates. If females have less access, $r_{female} > r_{male}$ and thus (conditional on θ) $f'(K_{female},\theta) > f'(K_{male},\theta) \rightarrow K_{female} < K_{male}$

  (2) Ability θ is (only partially) unobserved by lenders. At a given capital stock $\underline{K}$, $\theta_2 > \theta_1 \rightarrow f'(\underline{K},\theta_2) > f'(\underline{K},\theta_1)$

- Implications of missing credit markets: firms with (1) worse access to credit or (2) better unobserved ability have higher marginal returns to capital

(2) De Mel, McKenzie, and Woodruff (2008)

- Perfect credit market, missing insurance market case
- Now let production be risky: $Y_i = \varepsilon_i f(K_i,\theta_i)$, where the productivity or demand shock $\varepsilon_i \in (0,+\infty)$, $E(\varepsilon_i)=1$

  -- Imagine risk averse micro-enterprise owners producing for household consumption

- Risk averse households will choose to set the capital stock such that $f'(K_i,\theta_i) > r$, so $K_i < K^*$

- Implications of missing insurance markets: firms with (1) more risk averse owners or (2) more variable productivity shocks ε have higher marginal returns to capital

TABLE V

TREATMENT EFFECT HETEROGENEITY (DEPENDENT VARIABLE: REAL PROFITS)

					Females	Males
	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) FE
Treatment amount	5.41***	7.35**	5.29***	4.96**	2.83	6.74**
	(2.09)	(2.86)	(2.15)	(2.19)	(2.39)	(3.09)
Interaction of treatment amount with:						
Female owner		−7.51*				
		(4.02)				
Number of wage workers			−3.69			
			(2.38)			
Household asset index			−2.43**		−2.88**	−3.05
			(1.14)		(1.35)	(2.06)
Years of education			1.56***		0.24	2.03**
			(0.59)		(0.78)	(0.82)
Digit Span Recall			3.80**		7.34***	1.84
			(1.88)		(2.32)	(2.80)
Risk aversion				0.54		
				(1.25)		
Uncertainty				−7.82		
				(7.31)		
Constant	3,824***	3,777***	3,823***	3,840***	2,860***	4,700
	(174)	(179)	(175)	(174)	(211)	(283)
Firm-period observations	3,248	3,084	3,149	3,218	1,484	1,510
Number of enterprises	385	365	369	381	174	176

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We then estimate the treatment effect regression as

$$\begin{aligned} \text{profits}_{i,t} &= \alpha + \beta \text{Amount}_{i,t} + \gamma N_{i,t}^{d} \\ &\quad + \sum_{t=2}^{5} \delta_t + \lambda_i + \varepsilon_{i,t}, \end{aligned} \tag{13}$$

where $N_{i,t}^{d}$ is the number of treated firms in the same industry within radius d of firm i at time t. The average overall treatment effect on profits for treated firms is then $\beta + \gamma \bar{N}^{d}$, where $\bar{N}^{d}$ is the average number of treated firms in the neighborhood of distance d of a treated firm. We likewise augment the returns to capital regression in equation (2) to include this spillover effect. The estimated returns to capital will be just the coefficient β on capital, which gives the marginal impact on profits of a change in capital, controlling for any firms getting treated nearby. Importantly, the mean number of treated firms within 500 meters is identical in the sample of treated and untreated firms (1.82 for treated firms vs. 1.77 for untreated firms). Thus, each treatment negatively affects

TABLE VI

TESTING FOR TREATMENT SPILLOVERS (DEPENDENT VARIABLE: REAL PROFITS)

	(1) FE	(2) FE	(3) IV-FE	(4) IV-FE	(5) FE
Treatment amount	5.50***	5.51***			7.50***
	(2.09)	(2.10)			(2.82)
Capital stock (excluding land & buildings)			5.39**	5.41**	
			(2.28)	(2.28)	
Number of firms in industry treated					
Within 500 m	−1.41**		−1.23*		−2.66***
	(0.61)		(0.62)		(0.85)
Within 1 km		−0.53		−0.49	
		(0.45)		(0.45)	
Amount * female owner					−7.77*
					(3.98)
Within 500m * female owner					3.52***
					(1.17)
Constant	3,829***	3,827***	1,697***	1,619***	3,775***
	(172)	(173)	(520)	(529)	(177)
Observations	3,248	3,248	3,101	3,101	3,084
Number of enterprises	385	385	385	385	365

TABLE VII

COMPARING EXPERIMENTAL TO NONEXPERIMENTAL ESTIMATES (DEPENDENT VARIABLE: REAL PROFITS ADJUSTED FOR VALUE OF OWNER'S HOURS WORKED)

	Nonexperimental results			Experimental results
	(1) OLS	(2) Random effects	(3) Firm FE	(4) Firm FE
Invested capital (excluding land and buildings)	2.58***	1.71*	0.07	5.29**
	(0.70)	(1.02)	(1.07)	(2.28)
Age of owner	−45.7***	−38.3*		
	(15.5)	(20.3)		
Education of owner	−215.3***	−105.8		
	(59.7)	(72.9)		
Owner is female	−1,359***	−2,430***		
	(339)	(491)		
Constant	6,485***	5,800***	2,299***	1,487***
	(985)	(1,163)	(300)	(498)
Observations	349	698	698	3,101
Number of enterprises	349	151	151	384

(2) De Mel, McKenzie, and Woodruff (2008)

- What are the returns to capital for small firms in less developed countries?

  -- They appear to be very high! 60% per year

  -- Much higher for male-run than female-run firms. Is this due to the prior expansion of micro-credit for women? Or due to gender differences in θ in this population?

  -- External validity: the authors have experimental evidence from Mexico of high returns to capital there

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- This raises new puzzles: Why don't more firms self-finance investment from retained earnings? Why can't financial institutions get capital in the hands of these enterprises and share the surplus? Why aren't all of us investing in Sri Lankan micro-enterprises?

Although the variance in returns may limit the willingness of banks to lend to these firms, we still view the high level of returns as something of a puzzle. The majority of the treatments were invested in working capital. If returns to these investments are so high, what prevents firms from growing incrementally by reinvesting profits? Is it a lack of savings institutions—or a lack of knowledge about how the savings institutions operate—recurrent shocks to households, or time-inconsistent preferences? Because working capital investments are unlikely to involve indivisibilities, a lack of savings institutions by itself is unlikely to provide a full answer to this puzzle. What the results point to is the need for a better understanding of how these microentrepreneurs make investment decisions. We see this as a fertile area for future research.

(3) Hsieh and Klenow (2008)

- Another take on the question of whether returns to capital are high for firms in less developed countries
- The answer is yes – and no. In China and India, there is tremendous *dispersion* in firm marginal revenue products (revenue products account for prices and production)

  -- If credit, insurance and other markets were well-functioning, MRPs would be equalized across firms

- This paper models how firm-specific distortions in the allocation of capital (τ_K) and subsidies/taxes (τ_Y) leads to dispersion in MRPs, and quantifies how this misallocation of resources affects aggregate TFP

  -- Compare China and India to U.S. firms

(3) Hsieh and Klenow (2008)

- Model of monopolistic competition with heterogeneous firms. Production for firm i in sector s: $Y_{si} = A_{si}K_{si}^{\alpha}L_{si}^{1-\alpha}$, where the firm specific productivity parameter is A_{si}

  -- With Cobb-Douglas marginal products are proportional to average products

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  -- With Cobb-Douglas marginal products are proportional to average products

- Industry *s* output is the CES aggregate of M_s differentiated products, where $\sigma/(\sigma-1)$ is the mark-up (and $\sigma = 3$ is a conservative assumption)

$$Y_s = \left(\sum_{i=1}^{M_s} Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

- Firm profits: $\pi_{si} = (1-\tau_{Ysi})P_{si}Y_{si} - wL_{si} - (1+\tau_{Ksi})RK_{si}$

(3) Hsieh and Klenow (2008)

- Marginal revenue product is proportion to the revenue to capital ratio, equivalent to: $MRPK_{si} \propto R(1+\tau_{Ksi})/(1-\tau_{Ysi})$

- Marginal revenue product of capital is increasing in the distortions faced in the credit market (τ_{Ksi}, essentially higher interest rates) and increasing in the tax rate τ_{Ysi}

  -- Same intuition as Sri Lankan firms: marginal revenue products are high for constrained or disadvantaged firms

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- If firm productivities and TFPR (the geometric mean of MRPK and MPRL) are jointly log-normally distributed, aggregate sectoral TFP is:

$$\log TFP_s = \frac{1}{\sigma - 1} \log \left(\sum_{i=1}^{M_s} A_{si}^{\sigma-1} \right) - \frac{\sigma}{2} \operatorname{var} \left(\log TFPR_{si} \right). \quad (2.16)$$

(3) Hsieh and Klenow (2008)

- Massive data efforts for all three countries: firm census data, months/years of work processing the data

  -- India: 40,000 plants per year, 1987-88 to 1994-95

  -- China: 100,000 to 200,000 plants per year, 1998-2005

  -- US: 160,000 plants, 1977, 1982, 1987, 1992, 1997

- Consider the same narrowly-defined 4-digit industries across all three countries (sector capital shares from US data, as the most "undistorted" benchmark case)

  -- Some TFPR dispersion within sectors is inevitable due to measurements error or adjustment costs. Again the U.S. serves as a benchmark

Table 2

Dispersion of TFPR

China

	1998	2001	2005
S.D.	0.74	0.68	0.63
75-25	0.97	0.88	0.82
90-10	1.87	1.71	1.59

India

	1987	1991	1994
S.D.	0.69	0.67	0.67
75-25	0.79	0.81	0.81
90-10	1.73	1.64	1.60

United States

	1977	1987	1997
S.D.	0.45	0.41	0.49
75-25	0.46	0.41	0.53
90-10	1.04	1.01	1.19

Figure 2: Distribution of TFPR

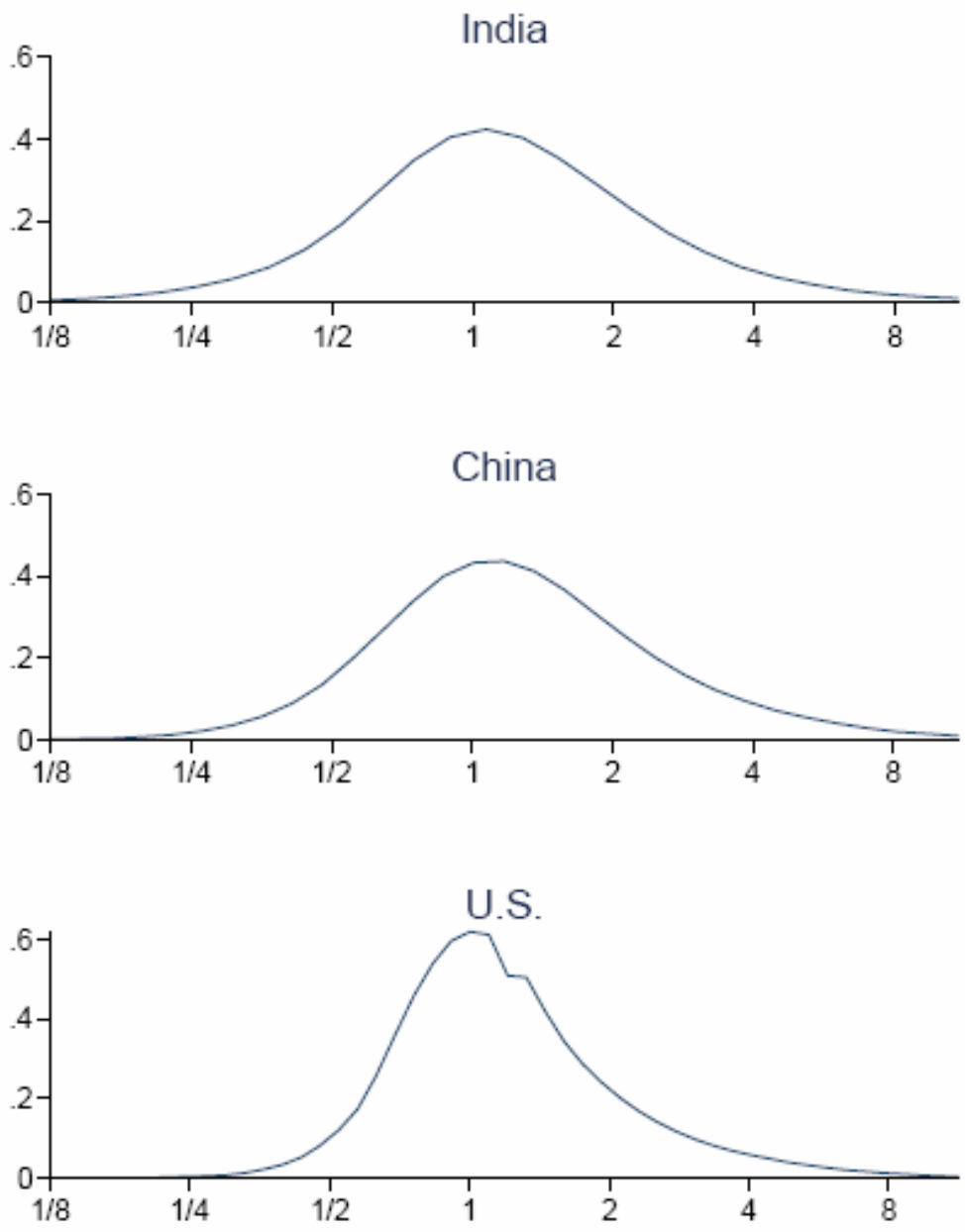


Table 3

TFP Gains from Equalizing TFPR Within Industries

China			
	1998	**2001**	**2005**
%	115.1	95.8	86.6
India			
	1987	**1991**	**1994**
%	100.4	102.1	127.5
U.S.			
	1977	**1987**	**1997**
%	36.1	30.7	42.9

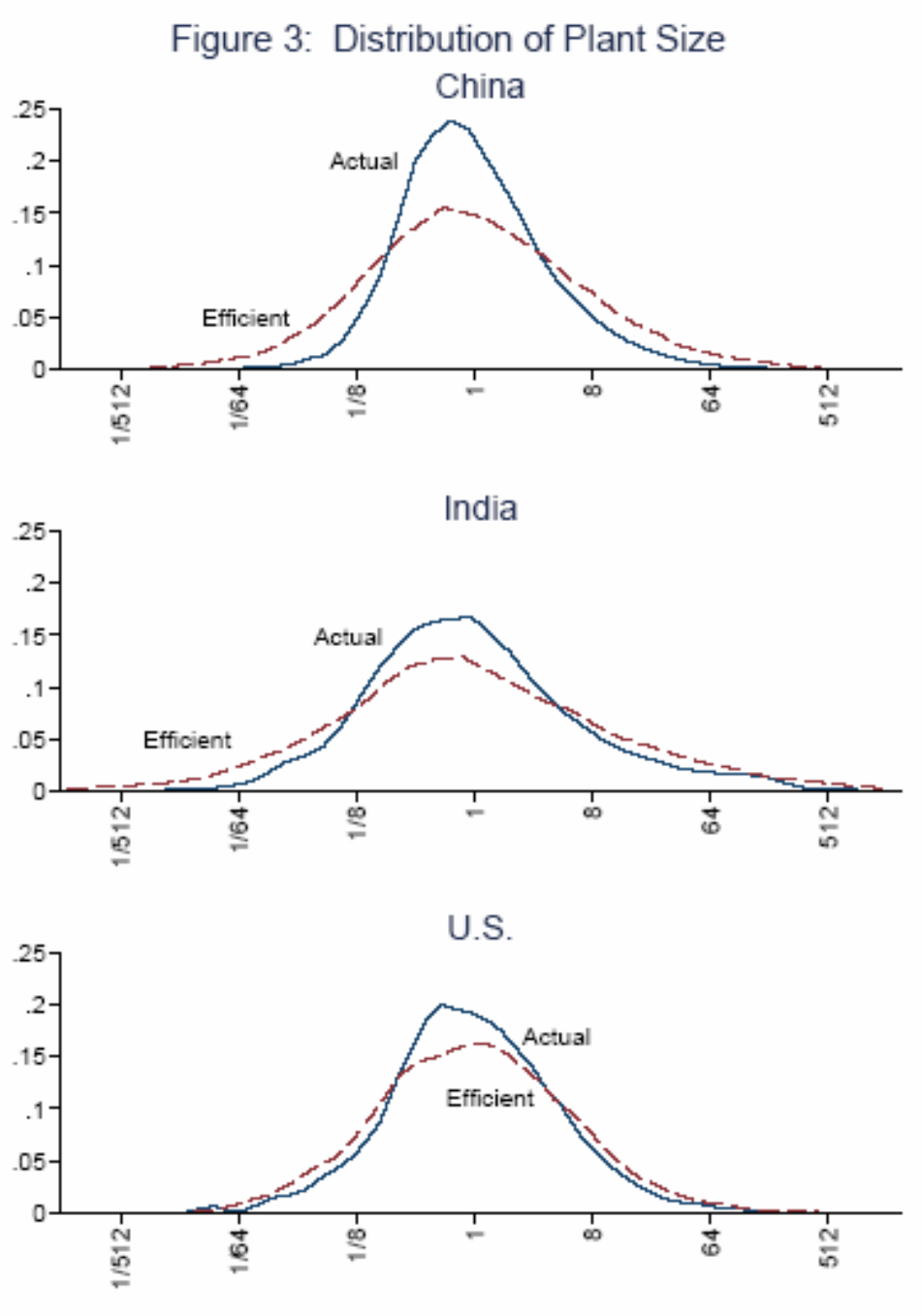


Figure 3: Distribution of Plant Size
China
.25
.2
.15
.1
.05
0
Actual
Efficient
1/512
1/64
1/8
1
8
64
512
India
.25
.2
.15
.1
.05
0
Actual
Efficient
1/512
1/64
1/8
1
8
64
512
U.S.
.25
.2
.15
.1
.05
0
Actual
Efficient
1/512
1/64
1/8
1
8
64
512

Table 5

TFP Gains from Equalizing TFPR *relative to 1997 U.S. Gains*

China

	1998	2001	2005
%	50.5	37.0	30.5

India

	1987	1991	1994
%	40.2	41.4	59.2

Notes: For each country-year, we calculated $Y_{efficient}/Y$ using

$$\frac{Y}{Y_{efficient}} = \prod_{s=1}^{S}\left[\sum_{i=1}^{M_s}\left\{\frac{A_{si}}{\overline{A_s}}\frac{\overline{TFPR_s}}{TFPR_{si}}\right\}^{\sigma-1}\right]^{\theta_s/(\sigma-1)} \quad \text{and} \quad TFPR_{si} \equiv \frac{P_{si}Y_{si}}{K_{si}^{\alpha_s}(w_{si}L_{si})^{1-\alpha_s}}.$$

We then took the ratio of $Y_{efficient}/Y$ to the U.S. ratio in 1997, subtracted 1, and multiplied by 100 to yield the entries above.

Table 10

Ownership of Indian and Chinese Plants

China

	1998	2001	2005
Private Domestic	15.9	37.4	62.5
Private Foreign	20.0	21.7	21.9
State	29.0	18.5	8.1
Collective	35.1	22.4	7.5

India

	1987	1991	2004
Private	87.7	88.4	92.4
State (Central Gov.)	3.3	3.3	2.4
State (Local Gov.)	3.9	3.0	2.8
Joint Public/Private	5.1	5.4	2.4

Table 6

TFP by ownership

China	TFPR	TFPQ
State	-0.415 (0.023)	-0.144 (0.090)
Collective	0.114 (0.010)	0.047 (0.013)
Foreign	-0.129 (0.024)	0.228 (0.040)

India	TFPR	TFPQ
State (Central)	-0.285 (0.082)	0.717 (0.295)
State (Local)	-0.081 (0.063)	0.425 (0.103)
Joint Public/Private	-0.162 (0.037)	0.671 (0.085)

Figure 9: Distribution of Number of Workers

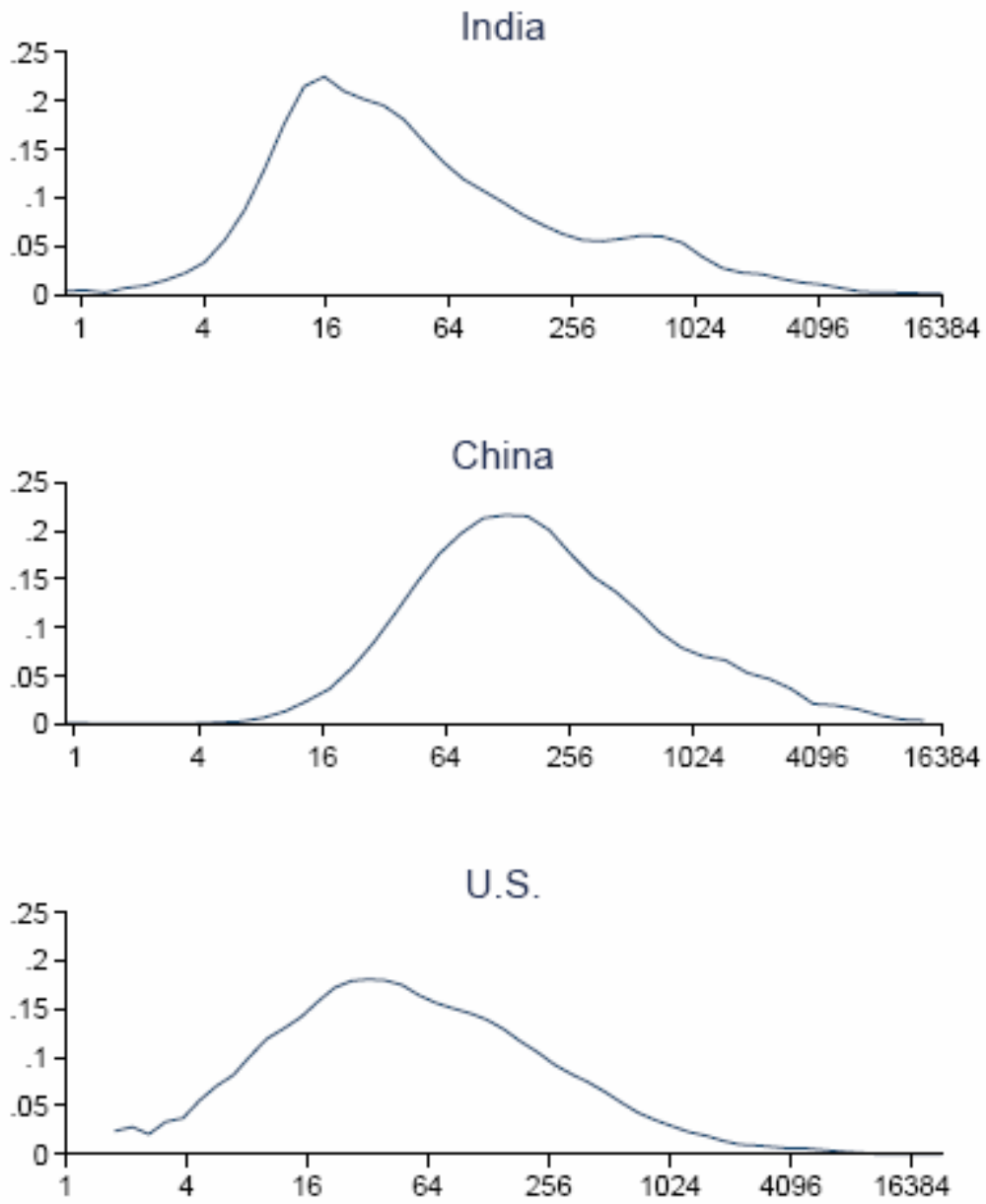
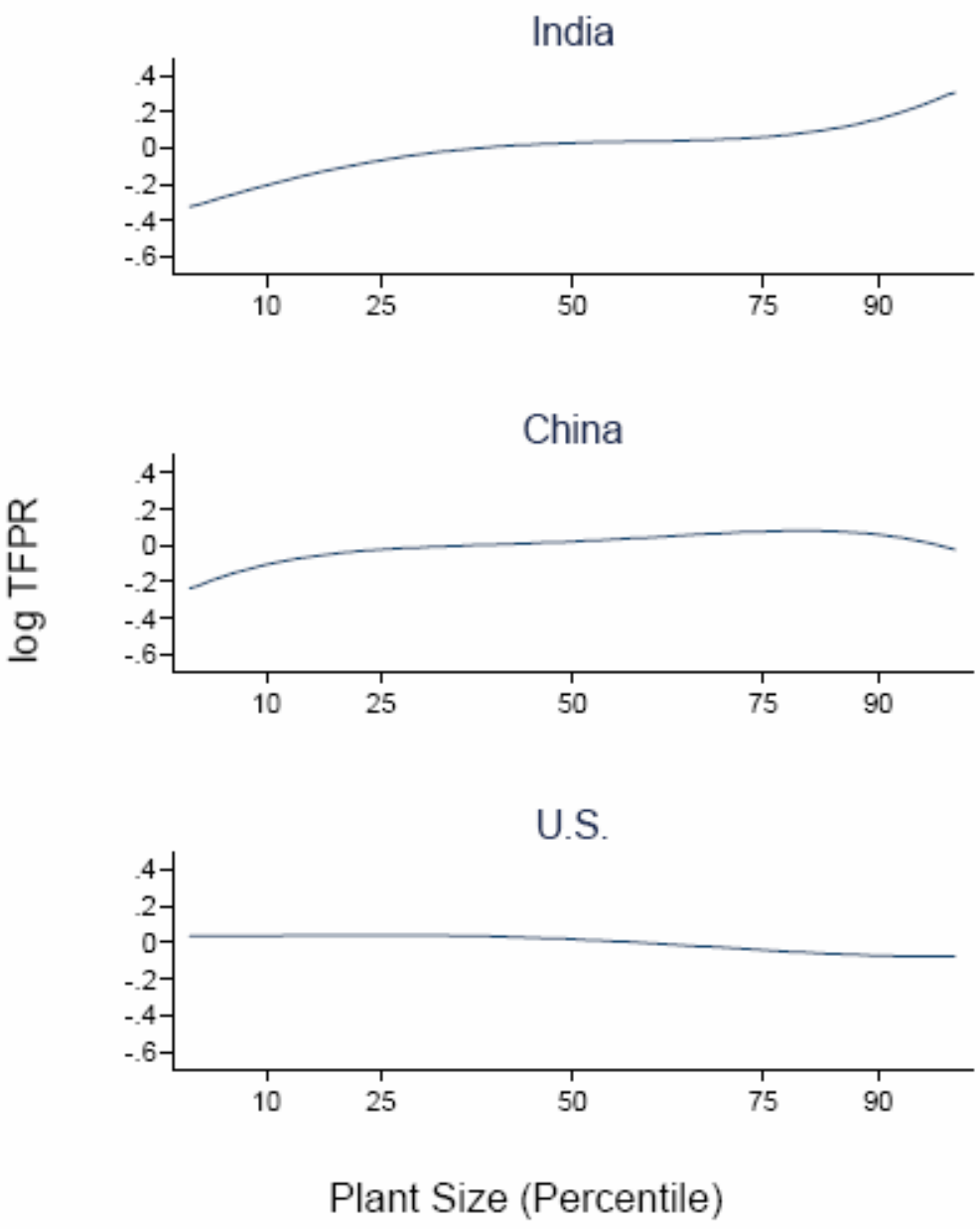


Figure 6: TFPR and Size



(3) Hsieh and Klenow (2008)

- The misallocation of capital and subsidies across firms in China and India appears to lead large drops in aggregate manufacturing TFP in those economies, relative to the U.S. benchmark

  -- Chinese state firms appear to benefit from distortions, but market reforms, especially since the mid-1990s, led to rapid improvement in allocative efficiency

  -- As of 1994-1995, large Indian firms seem particularly constrained, i.e., have high marginal revenue products. Data limitations mean we cannot test whether Indian manufacturing has undergone similar changes.

- One view of development: the emergence of institutions to match capital to high return activities, free of political interference, ethnic/regional favoritism, or cronyism

Whiteboard #1

Whiteboard #2

Whiteboard #3

Whiteboard #4

Whiteboard #5


ARCTIC OCEAN
GREENLAND
BEAUFORT SEA
BAFFIN SEA
GREENLAND SEA
NORWEGIAN SEA
BARENTS SEA
KARA SEA
EAST SIBERIAN SEA
RUSSIA
CANADA
UNITED STATES OF AMERICA
KAZAKHSTAN
MONGOLIA
CHINA
ATLANTIC OCEAN
PACIFIC OCEAN
BRAZIL
INDIAN OCEAN
AUSTRALIA
International Date Line
Midnight
The direction of the earth's rotation
West
East