

Growth and Development: Misallocation

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Lecture Notes for PhD Growth and Development (EC8510)

Motivation

- ▶ Development and growth accounting suggest that aggregate differences in TFP are an important source of differences in relative living standards.
- ▶ We need to understand the forces that shape TFP.
- ▶ Two distinct channels:
 - 1) Differences in the adoption of best practice methods and technologies
 - 2) Differences in the extent to which resources are allocated efficiently
- ▶ Models that start with an aggregate production functions can't distinguish between the two.

What is Misallocation?

- ▶ If markets are perfect then resource flow to their most productive use:
 - ▶ Land flows to the most productive farmer
 - ▶ Capital flows to the most productive factor
 - ▶ Education flows to the person who will benefit most
 - ▶ Health spending will be put to its most productive use
- ▶ Misallocation arises if factors of production are allocated inefficiently.
- ▶ This means that the marginal product is not equalized.

What is Misallocation?

- ▶ Misallocation could be:
 - ▶ Across firms within (or across) sectors;
 - ▶ Across sectors
 - ▶ Across space
- ▶ The misallocated factor could be:
 - ▶ Human capital;
 - ▶ Physical capital; or
 - ▶ Talent.
- ▶ Usually models of misallocation feature a distribution of productivities:

$$y_i = z_i f(k_i)$$

What is *Not* Misallocation?

- ▶ Measurement error in revenue or inputs
- ▶ Unavoidable adjustment costs or transportation costs
- ▶ Differential riskiness of investments
- ▶ Compensating differentials for labor (amenities and disamenities)
- ▶ Misspecification in the production function

What Can Generation Misallocation?

- ▶ TFRP dispersion due to...
 - ▶ Tax rate differences between firms
 - ▶ Size-dependent regulations
 - ▶ Price markup differences across products
 - ▶ Wage markdown differences across firms
 - ▶ Discrimination
 - ▶ Financial frictions, state-owned banks, cronyism
 - ▶ Licensing, entry restrictions, land-use restrictions
 - ▶ Under- or over-investment in public goods
 - ▶ Externalities

Misallocation Affects TFP (Jones, 2011)

- ▶ An economy produces a single output Y , from two inputs: Steel and Lattes.
- ▶ Production is very simple

$$X_s = AK_s, X_l = AK_l$$

- ▶ Resource constraints in the economy are:

$$K_s + K_l = \bar{K}$$

- ▶ Steel and Lattes are combined by a single firm to form output according to:

$$Y = X_s^{0.5} X_l^{0.5}$$

Lattes and Steel

- ▶ Suppose that the firm must allocate capital to steel and lattes to produce maximum output.
- ▶ Let's suppose that it does so by giving $K_s = x\bar{K}$ and $K_l = (1 - x)\bar{K}$.
- ▶ Substituting back into the production function we have,

$$Y = A\sqrt{x(1-x)\bar{K}}$$

- ▶ TFP has two parts:
 - ▶ A measure of efficiency in production, A ; and
 - ▶ $\sqrt{x(1-x)}$: A geometric average of the allocations.
- ▶ It is straightforward to see that TFP is maximized when $x = 0.5$.

Type of Studies

- ▶ Restuccia and Rogerson (2017) divide studies into two types:
 - ▶ Direct: Specifies a potential source of misallocation, measures it, and uses a model to assess its consequences.
 - ▶ Indirect: tries to quantify the overall amount of misallocation without identifying the underlying source.
- ▶ Studies are also:
 - ▶ Micro
 - ▶ Macro
- ▶ This is probably the most active area on the intersection of micro and macroeconomics

Indirect Approach

- ▶ Seeks to assess the extent of misallocation without identifying the underlying cause
 - ▶ Useful for identifying relevant patterns, but silent about the source
 - ▶ Efficiency dictates equalization of marginal products:
$$\alpha z_i k_i^{\alpha-1} = \alpha z_j k_j^{\alpha-1}$$
- ▶ It follows that violations of this condition imply misallocation.
- ▶ The bigger the violation, the bigger the misallocation.

Identifying Misallocation

- ▶ But how to identify violations?
- ▶ Given our functional form, the previous conditions becomes:

$$\frac{y_i}{k_i} = \frac{y_j}{k_j}$$

- ▶ Given data on y_i and k_i we can identify whether misallocation exists.
- ▶ We can do even more though!

Inferring the Effect of Misallocation on TFP

- ▶ Suppose $y_i = z_i k_i^\alpha$ with α known and you have data on y and k .
- ▶ Define $Y = \sum_i y_i$, $K = \sum_i k_i$, and TFP as Y/K
- ▶ If we know z_i then we can solve for the level of output if capital were allocated efficiently. Denote this as Y^*
- ▶ Can solve for z_i as: $z_i = y_i/k_i^\alpha$ from data.
- ▶ Y/Y^* is the effect of misallocation on aggregate TFP.
- ▶ Implicitly if y_i/k_i is not constant, $Y^* > Y$

Conceptual Issues

- ▶ If we write down a model and it does not fit some part of the data, how do we interpret this?
- ▶ Important issues relating to measurement and specification
 - ▶ Demand structure
 - ▶ Production structure
 - ▶ Inputs and outputs may be measured with error ([Bills, Klenow, and Ruane, 2017](#))
 - ▶ Adjustment costs vs. distortions ([David and Venkateswaran, 2017](#))

Practical Issues

- ▶ Microdata typically reports $p_i y_i$ not y_i
- ▶ Hopenhayn and Lucas model assumes homogenous output so not an issue as $p_i = p$
- ▶ We can identify z_i up to a scaling factor.
- ▶ But if output is not homogenous and prices vary, we can't identify z_i .
- ▶ We need a framework that permits price heterogeneity (Melitz).

Misallocation in a One Factor Melitz Model

- ▶ Single household, preferences $u(C)$, labor H supplied inelastically.
- ▶ N producers, where N is taken as given,
 - ▶ $y_i = z_i k_i$
 - ▶ $C = Y = [\sum_i y_i^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}}$
- ▶ Idiosyncratic taxes on revenue: τ_i
- ▶ Competitive labor market, competitive final goods producer, monopolistic competition among producers of varieties.

Identifying Misallocation in a One Factor Melitz Model

- ▶ If $\tau_i = 0 \rightarrow$ equilibrium allocation is efficient.

- ▶ Producer i solves,

$$\max_{k_i} p_i z_i k_i - w k_i \text{ s.t. } p_i = B(z_i k_i)^{\frac{-1}{\sigma}}$$

- ▶ This implies:

$$z_i^{\frac{\sigma-1}{\sigma}} k_i^{-\frac{1}{\sigma}} = z_j^{\frac{\sigma-1}{\sigma}} k_j^{-\frac{1}{\sigma}} \forall i, j$$

- ▶ This implies,

$$\frac{p_i y_i}{k_i} = \frac{p_j y_j}{k_j}$$

- ▶ efficiency \rightarrow average revenue products are equalized
- ▶ Provides a simple condition for identifying misallocation.

Computing the Effect of Misallocation in a One Factor Melitz Model

- ▶ We need to uncover z_i given data on $p_i y_i$ and k_i
- ▶ Trick: Demand system lets us do this up to a scaling factor.
- ▶ Demand system implies:

$$p_i = B y_i^{\frac{-1}{\sigma}} \rightarrow p_i y_i = B y_i^{\frac{\sigma-1}{\sigma}} = B(z_i k_i)^{\frac{\sigma-1}{\sigma}}$$

- ▶ We can now infer z_i using data on $p_i y_i$ and k_i :

$$z_i = B^{\frac{\sigma}{1-\sigma}} \frac{(p_i y_i)^{\frac{\sigma}{\sigma-1}}}{k_i}$$

Computing the Effect of Misallocation in a One Factor Melitz Model

- ▶ Need to compute Y/Y^*
- ▶ Key point: efficient labor allocation depends on relative z' s:

$$\frac{k_i}{k_j} = \left[\frac{z_i}{z_j} \right]^{1-\sigma}, \sum k_i = K \rightarrow k_i^* = \frac{z_i^{1-\sigma}}{\sum z_j^{1-\sigma}} H$$

- ▶ Let k_i denote observed allocation and h^* denote the efficient allocation.

$$Y = \left[\sum (z_i k_i)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} = \frac{1}{B^{\frac{\sigma}{1-\sigma}}} \left[\sum \left(B^{\frac{\sigma}{1-\sigma}} z_i k_i \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

$$Y^* = \left[\sum (z_i k_i^*)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} = \frac{1}{B^{\frac{\sigma}{1-\sigma}}} \left[\sum \left(B^{\frac{\sigma}{1-\sigma}} z_i k_i^* \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

- ▶ So don't need to know $B^{\frac{\sigma}{1-\sigma}}$

Recovering the Wedges

- ▶ Without taxes:

$$z_i^{\frac{\sigma-1}{\sigma}} k_i^{-\frac{1}{\sigma}} = z_j^{\frac{\sigma-1}{\sigma}} k_j^{-\frac{1}{\sigma}} \rightarrow \frac{p_i y_i}{h_i} = \frac{p_j y_j}{k_j}$$

- ▶ With idiosyncratic taxes on revenue we have:

$$(1 - \tau_i) z_i^{\frac{\sigma-1}{\sigma}} h_i^{-\frac{1}{\sigma}} = (1 - \tau_j) z_j^{\frac{\sigma-1}{\sigma}} k_j^{-\frac{1}{\sigma}} \rightarrow \frac{(1 - \tau_i) p_i y_i}{h_i} = \frac{(1 - \tau_j) p_j y_j}{k_j}$$

- ▶ This implies:

$$\frac{(1 - \tau_i)}{(1 - \tau_j)} = \frac{p_j y_j / k_j}{p_i y_i / h_i}$$

- ▶ We can identify τ_i up to a scaling factor – a uniform tax on all producers does not create misallocation.

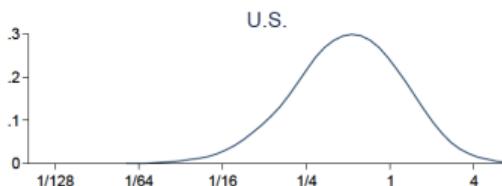
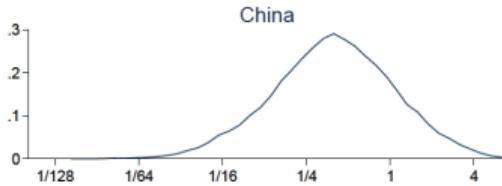
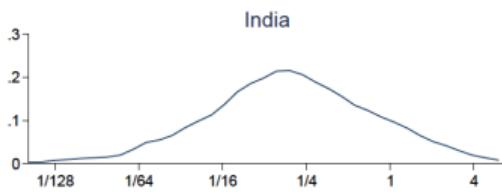
Summary

- ▶ Taking as given the imposed structure (inc. a value for σ) + data on $p_i y_i$ and h_i , we can:
 - 1) infer the TFP loss due to misallocation
 - 2) Uncover the implicit distortions causing misalloction

Hsieh and Klenow (2009)

- ▶ HK generalize previous analysis to multiple factors.
- ▶ Consider distortion to output and distortion to k/h
- ▶ Research question:
 - ▶ Is there more capital misallocation in China and India than the US?
 - ▶ Is this difference quantitatively important?
- ▶ Rough idea:
 - ▶ Firms may differ in productivity
 - ▶ But, they should all make the same revenue from the same input.
 - ▶ Dispersion in revenue productivity measures misallocation.

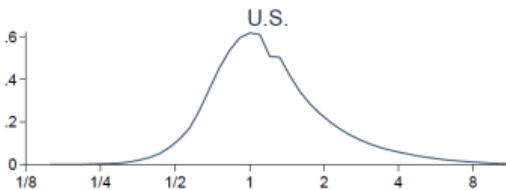
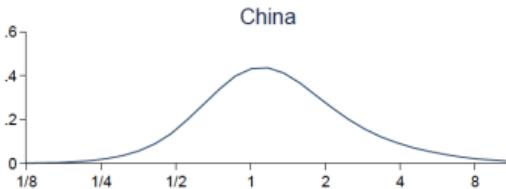
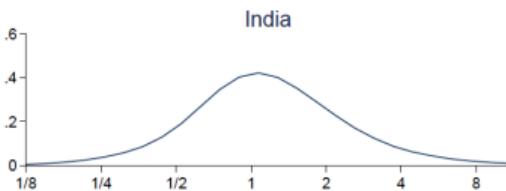
Results: TFPQ



Interpretation: TFPQ

- ▶ All countries have highly productive firms
 - ▶ This is a theme
- ▶ India and China have bigger left tails
 - ▶ This is also a theme
- ▶ But, this could be because of many things:
 - ▶ Different talent distribution
 - ▶ Different tastes
 - ▶ Different qualities
- ▶ But, we know that $TFPR$ should not differ.

Results: TFP



Results

- ▶ With no distortions TFP would increase by:
 - ▶ China: 86-115%
 - ▶ India: 100-120%
 - ▶ US: 30-43%
- ▶ Developing countries are more distorted.

Gains to Becoming US

TABLE VI
TFP GAINS FROM EQUALIZING TFPR RELATIVE TO 1997 U.S. GAINS

	1998	2001	2005
China			
%	50.5	37.0	30.5
India	1987	1991	1994
%	40.2	41.4	59.2

Gains to Becoming US

- ▶ Estimates suggest that reallocation would lead to
 - ▶ 49% of the TFP gap between the US and China
 - ▶ 35% of the TFP gap between the US and India
- ▶ Substantial (but remember the nature of the exercise).
- ▶ Needed: better understanding about sources of misallocation.

Decomposing TFPR with Multiple Inputs

- ▶
$$TFPR_i = \frac{P_i Y_i}{(K_i^\alpha L_i^{1-\alpha})^\gamma X_i^{1-\gamma}}$$
- ▶ PY is gross output, K is physical capital, L is labor, and X are intermediates.
- ▶ $TFPR_i \equiv [VAPK_i^\alpha VAPL_i^{1-\alpha}]^\gamma APX_i^{1-\gamma}$
- ▶ VAPK refers to the "Value of the Average Product of Capital", ...
- ▶ $VAPK \propto VMPK \propto VRPK$ only if Cobb-Douglas and equal markups.

Scale vs. Mix Distortions

- ▶ Scale: common component of VAPK, VAPL, and VAPX
- ▶ Mix: ratios of VAPK/VAPL, VAPK/VAPX, VAPL/VAPX
- ▶ David and Vekateswaran (2019) and Bils, Klenow, Ruane (2020) find mostly *scale* distortions
- ▶ Suggests markups, revenue taxes/subsidies, errors in revenue/(all inputs)
- ▶ Suggests financial frictions, wage markdowns, etc. aren't dominant.

Persistence

- ▶ Most of the variance in TFPR is in the firm or plant fixed effect.
- ▶ Again points to persistent markups, measurement error, and revenue taxes/subsidies.
- ▶ Not consistent with a dominant role for financial frictions or adjustment costs.
 - ▶ More likely to affect firms in a dynamic way.
 - ▶ E.g. financial frictions might affect firms differently over the business cycle or as the firm ages, leading to fluctuations in TFPR over time.

Dynamic Effects of Static Misallocation

- ▶ If barriers are increasing in productivity...
 - ▶ firms may invest less in productivity and quality before they enter (Bento and Restuccia, 2017)
 - ▶ innovate less after they enter (Hsieh and Klenow, 2014; Akcigit et al., 2021)
 - ▶ and enter in greater numbers (Atkeson and Burstein, 2010; Jaef, 2021).
In the U.S. plants grow or die. In India, they stagnate.

Farms

- ▶ Land misallocation and productivity:
 - ▶ Massive variation in farm TFPR (even controlling for land quality)
 - ▶ Better farmers do not use more land because most of it is untitled
 - ▶ May also be “wedges” in hiring non-family workers, financing, intermediate inputs
 - ▶ Restuccia et al. say reallocating land could more than triple aggregate farm TFP.
- ▶ Gollin and Udry (2019) argue that there should be no misallocation across plots within farms that sell homogenous crops at given prices.
 - ▶ Idiosyncratic shocks, measurement error, and heterogeneity explain 2/3 of TFPR dispersion.

Direct Approach

- ▶ Quantifies the role of specific policies/institutions that create misallocation, either through natural experiments or structural models
- ▶ Some examples:
 - ▶ Regulation and discretionary provisions
 - ▶ Selective industrial policy
 - ▶ Financial frictions
 - ▶ Trade restrictions
- ▶ Challenges:
 - ▶ Many specific policies/institutions are not amenable to direct measurement
 - ▶ The bulk of misallocation does not come from a single source

De Mel, McKenzie, and Woodruff (2006)

- ▶ In general, it is hard to measure the returns to capital (i.e., the MPK). Why?
- ▶ If we compare two firms, one that has more capital than another, we have to ask ourselves “Why does that firm have more capital?”
- ▶ DMW circumvent this problem by giving a sample of small firms in Sri Lanka a cash grant of \$100-200.
- ▶ They then measure the returns to capital, using this grant as an instrument for capital holdings.

Results

- ▶ On average the returns to capital are staggering: 55-63% per year.
- ▶ Question: If these are the returns to giving \$100 to small firms in Sri Lanka, why don't we all do that right now?
- ▶ The results, mask a lot of heterogeneity:
 - ▶ Returns for female entrepreneurs are on average zero.
 - ▶ Firms with wealthy families have a much lower return to capital
 - ▶ More well educated individuals had a much higher return to capital
 - ▶ Those with a larger digit span had a much higher return to capital
- ▶ Under what assumptions does this imply an initial misallocation?

Bloom, Genakos, Sadun and Van Reenen (2009)

- ▶ Bloom and Van Reenen produced a survey of management practices, in consultation with consulting companies.
- ▶ They conducted double blind surveys:
 - ▶ The managers did not know they were being scored.
 - ▶ The surveyor did not know which firm they were surveying.
- ▶ Questions focus on a set of key variables such as performance reviews, J-I-T, etc.
- ▶ Turned these answers into a 5-point scale from bad to good.

Key Findings

- 1) Firms with better management practices tend to have better performance on a wide range of indicators ⇒ larger, more productive, grow faster, and have higher survival rates.
- 2) Management practices vary tremendously across firms and countries
- 3) Countries specialize in different styles of management ⇒ e.g., US firms focus on incentives, Swedish firms focus on monitoring.
- 4) Stronger product market competition appears to boost management practices by eliminating the left tail of badly managed firms and by pushing incumbents to improve their practices.

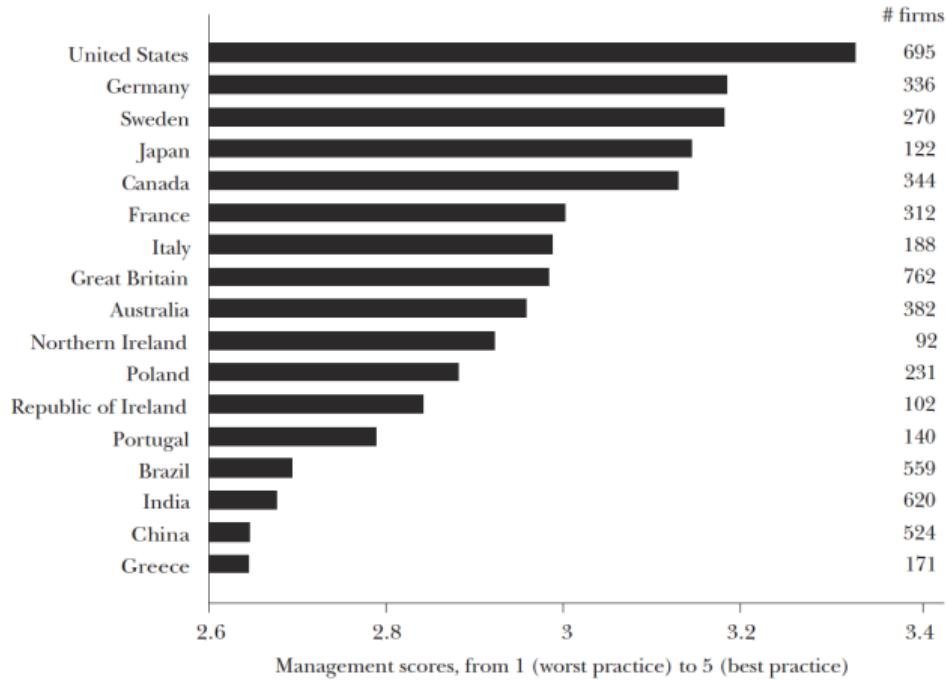
Key Findings

- 5) Multinational firms are generally well managed in every country
- 6) Firms that export (but do not produce) overseas are better managed than domestic non-exporters but are worse managed than multinationals.
- 7) Inherited family-owned firms who appoint a family member as CEO are very badly managed on average.
- 8) Government owned firms are typically managed extremely badly.
- 9) Firms that intensively use human capital, as measured by more educated workers, tend to have much better management practices
- 10) At the country level, a relatively light touch in labor market regulation is associated with better use of incentives by managers.

Three Key Areas

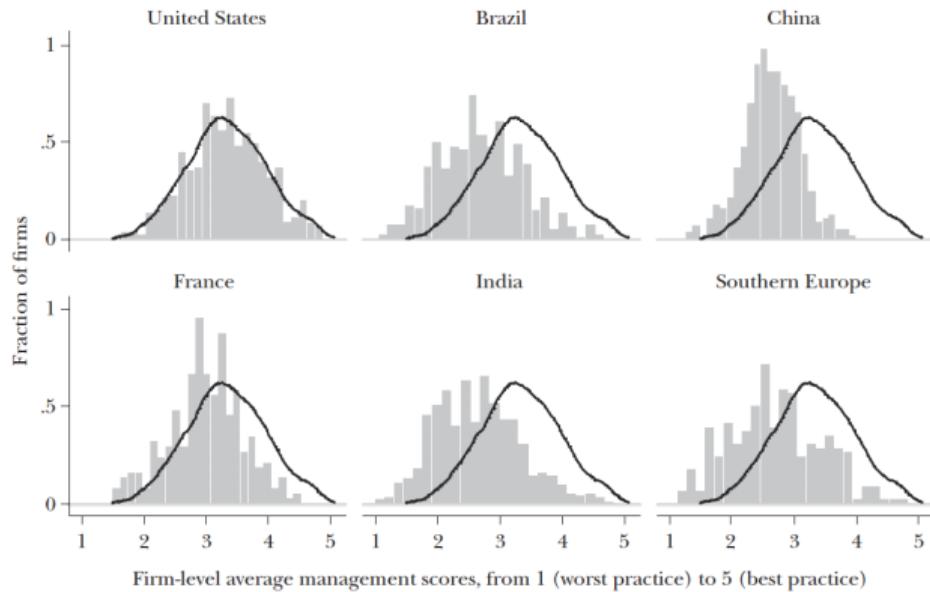
- ▶ Monitoring
 - ▶ Do firms know what is going on
 - ▶ Do they use this information
- ▶ Targets
 - ▶ Set targets, track outcomes, take action
- ▶ Incentives
 - ▶ Rewarding people for performance
 - ▶ Hiring and keeping good people

Management Scores across Countries



Management scores, from 1 (worst practice) to 5 (best practice)

Random sample of firms with 100-5000 employees



Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Ln (Sales)	Ln (Sales)	Ln (Sales)	Ln (Sales)	Ln (Employees)	Profitability (ROCE, %)	5 year Sales growth (%)	Ln (Tobin Q)	Death (%)
Management (z-score)	0.330*** (0.018)	0.150*** (0.016)	0.142*** (0.019)	0.033** (0.013)	0.338*** (0.015)	1.202*** (0.264)	0.039*** (0.013)	0.082** (0.031)	-0.006*** (0.002)
Ln(Employees)	0.905*** (0.018)	0.645*** (0.024)	0.632*** (0.030)	0.374*** (0.096)					
Ln(Capital)		0.307*** (0.019)	0.305*** (0.024)	0.237*** (0.078)					
Competition									
Management × Competition									
General controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Firm fixed effects	No	No	No	Yes	No	No	No	No	No
Firms	4,265	3,493	1,543	1,543	7,519	3,917	3,606	657	7,532
Observations	9,352	8,314	6,364	6,364	15,608	9,163	8,365	1,743	7,532

Three Possible Explanations

- ▶ Developing countries need to get better management
 - ▶ Can we do development accounting?
- ▶ Developing countries need to allocate managers better.
- ▶ Correlation is not causation

Conclusions

- ▶ There is a great deal of dispersion in management practices, even in the US.
- ▶ This is a constant finding in IO: some firms are good and some are not.
- ▶ However, there is much more dispersion in developing countries.
- ▶ And, it seems that dispersion comes in terms of a large left tail – bad firms are not driven out.
- ▶ But, good firms exist in all countries (evidence that the country has the same tech as the US, but that it is not used by all firms).

Causal Estimates

- ▶ We want causal estimates of management practices on outcomes.
- ▶ Can we interpret the above as causal?
- ▶ What is the easiest approach to generate causal estimates?

Does Management Matter: Bloom et al. (2013)

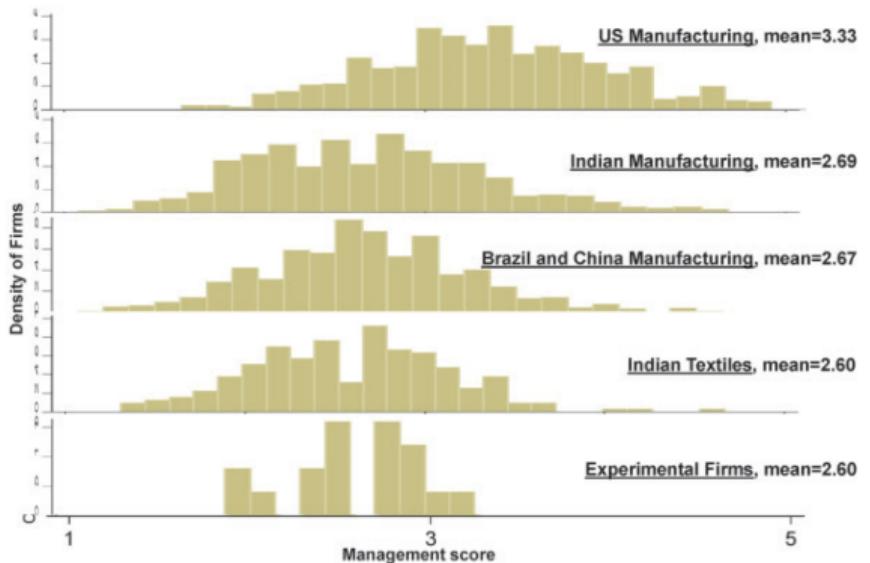
- ▶ Offer high quality consulting to a randomly selected set of Indian textile firms.
- ▶ 100-1000 employees
- ▶ Total 66 in sample
 - ▶ 34 interested
 - ▶ 17 Agreed to commit time
 - ▶ 6 control and 11 treatment ... wow, sample size!

Facts About Firms

	All				Treatment Mean	Control Mean	Diff <i>p</i> -value
	Mean	Median	Min	Max			
Number of plants	28	n/a	n/a	n/a	19	9	n/a
Number of experimental plants	20	n/a	n/a	n/a	14	6	n/a
Number of firms	17	n/a	n/a	n/a	11	6	n/a
Plants per firm	1.65	2	1	4	1.73	1.5	0.393
Employees per firm	273	250	70	500	291	236	0.454
Employees, experimental plants	134	132	60	250	144	114	0.161
Hierarchical levels	4.4	4	3	7	4.4	4.4	0.935
Annual sales (\$m) per firm	7.45	6	1.4	15.6	7.06	8.37	0.598
Current assets (\$m) per firm	8.50	5.21	1.89	29.33	8.83	7.96	0.837
Daily mtrs, experimental plants	5,560	5,130	2,260	13,000	5,757	5,091	0.602
BVR management score	2.60	2.61	1.89	3.28	2.50	2.75	0.203
Management adoption rates	0.262	0.257	0.079	0.553	0.255	0.288	0.575
Age, experimental plant (years)	19.4	16.5	2	46	20.5	16.8	0.662
Quality defects index	5.24	3.89	0.61	16.4	4.47	7.02	0.395
Inventory (1,000 kilograms)	61.1	72.8	7.4	117.0	61.4	60.2	0.945
Output (picks, million)	23.3	25.4	6.9	32.1	22.1	25.8	0.271
Productivity (in logs)	2.90	2.90	2.12	3.59	2.91	2.86	0.869

Top 1% in India by employment and sales

Facts About Firms



Facts About Firms



Garbage outside a factory



Garbage inside a factory



Garbage inside a factory



Shelves overfilled and disorganized

Facts About Firms



An old warp beam, threading equipment, chairs and a desk obstructing the factory floor and blocking the movement of people and materials

Tools left on the floor



Dirty and poorly maintained machines

Facts About Firms



Yarn without labeling, order or damp protection



Yarn piled up so high and deep that access to back sacks is almost impossible



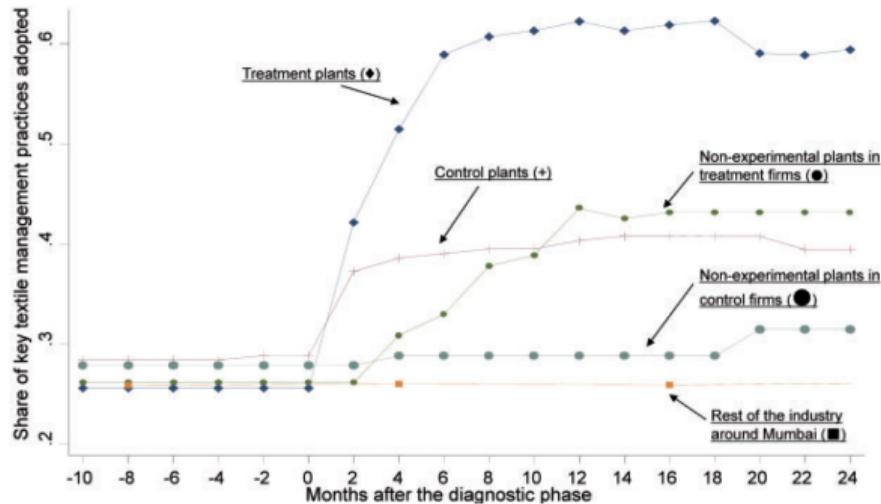
Different types and colors of yarn lying mixed

Crushed yarn cones (which need to be rewound on new cones) from poor storage

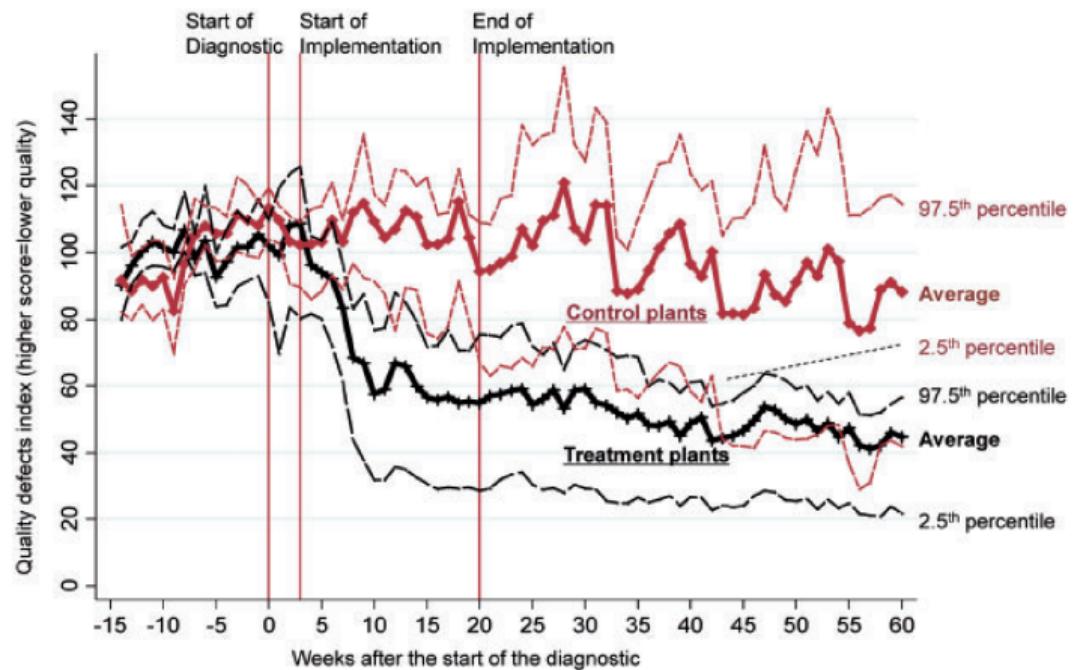
The Intervention

- ▶ Concentrate on:
 - ▶ Factory operations (e.g. maintenance, organization)
 - ▶ Continuous quality control
 - ▶ Inventory management
 - ▶ Human resources management
 - ▶ Sales and order management
- ▶ Market cost: about \$250,000
- ▶ All firms given enough consulting to allow measurement.
- ▶ Treatment firms given 4 months consulting on implementation.

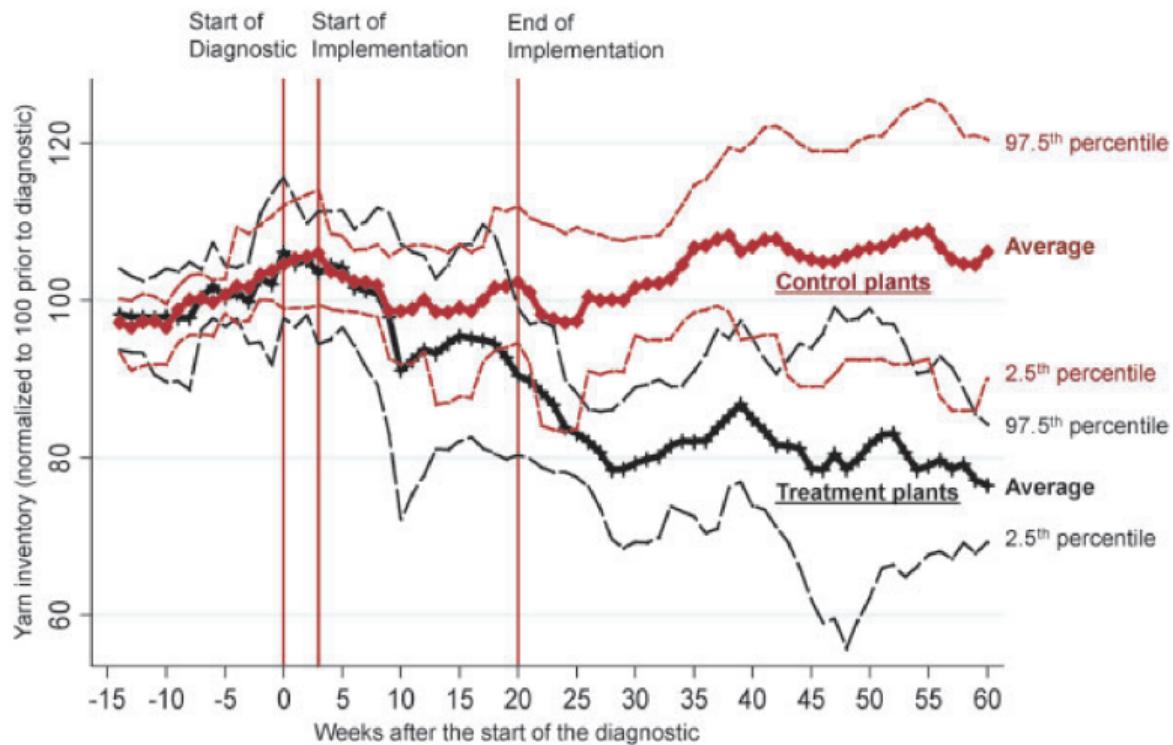
Impacts: Management Practices



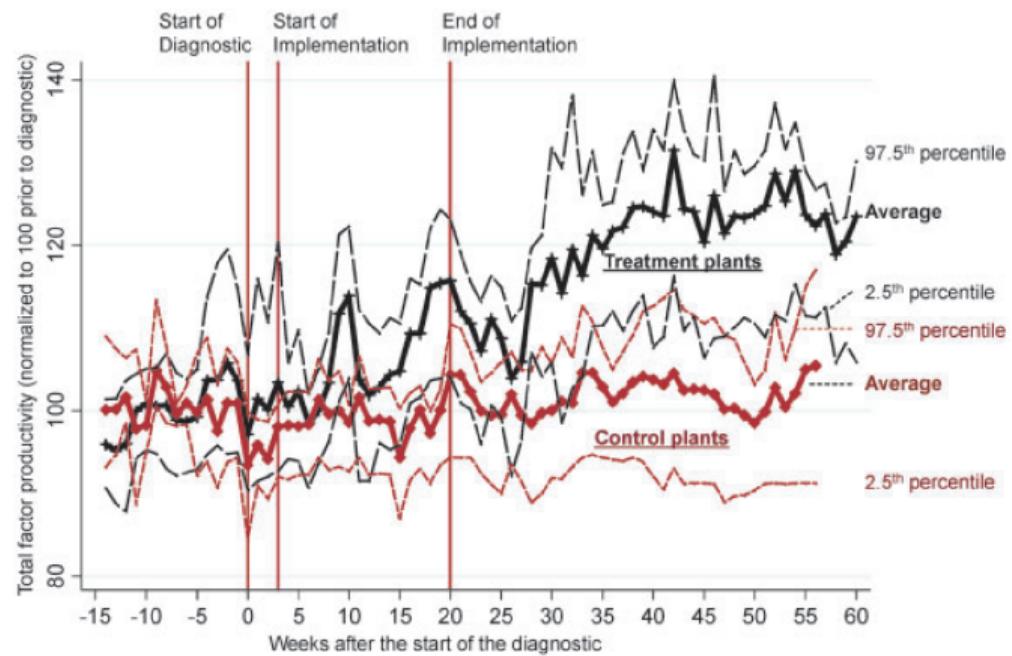
Impacts: Defects



Impacts: Inventory



Impacts: TFPR



Overall

- ▶ At a cost of \$250,000 profits increase by about \$350,000 – could be profitable
- ▶ No evidence of management spillovers.
- ▶ We have our usual questions:
 - ▶ Where did the increase in profit come from?
 - ▶ It seems that we have a real increase in productivity.

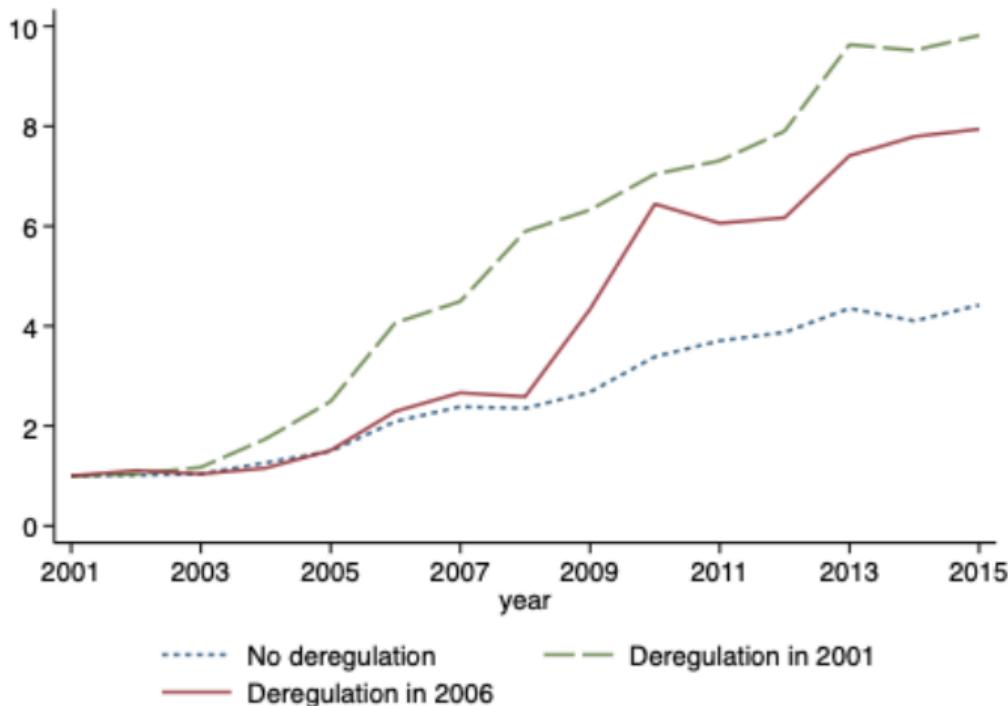
Do Management Interventions Last? – Bloom et al. (2018)

- ▶ Revisiting the plants in 2017 the authors found:
 - ▶ About half the management practices adopted had been dropped, but a significant gap remains
 - ▶ Performance gap still exists, suggesting lasting impact of effective management practices.
 - ▶ Management practices had spread within firms, but not across firms.
 - ▶ Managerial turnover and lack of Director time were two of the most cited reasons for the drop in management practices.

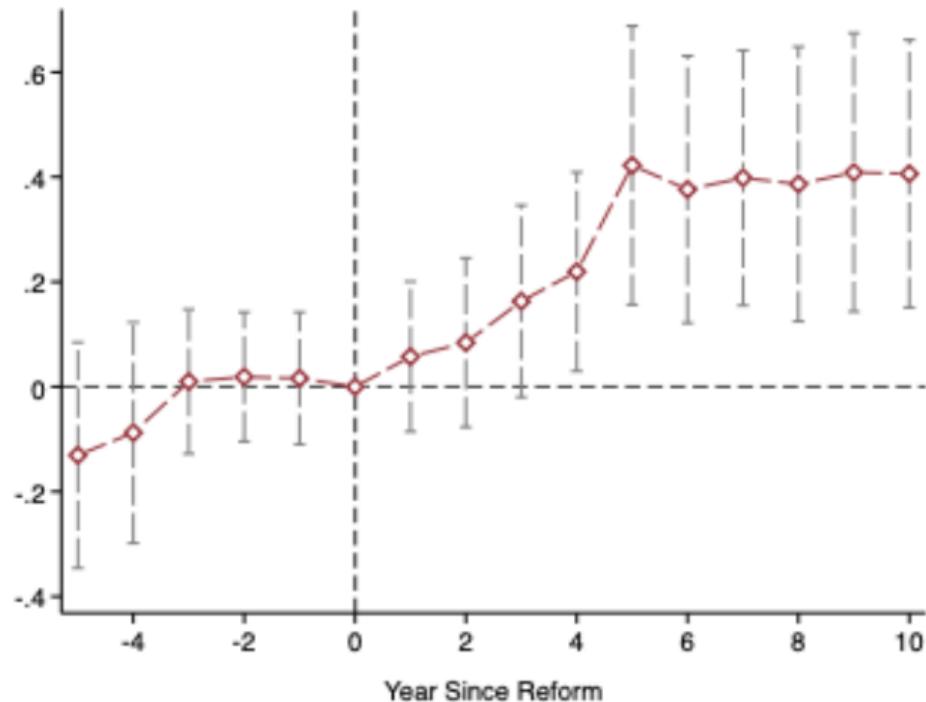
Bau and Matray (2023)

- ▶ An interesting paper that tries to tie together direct and indirect approaches.
- ▶ “Direct Intervention”: India introduced the automatic approval of FDI up to 51% of a domestic firm’s equity, increasing access to capital.
 - ▶ Increases the overall amount of capital, allowing the *average* firm to grow
 - ▶ Can change the *distribution* of capital across firms, affecting capital misallocation
- ▶ Exploiting the staggered introduction of the policy across industries, the authors us a diff-in-diff approach.
- ▶ Natural experiment helps to isolate changes in inputs and MRPK due to the policy (avoiding measurement error and other contaminants).

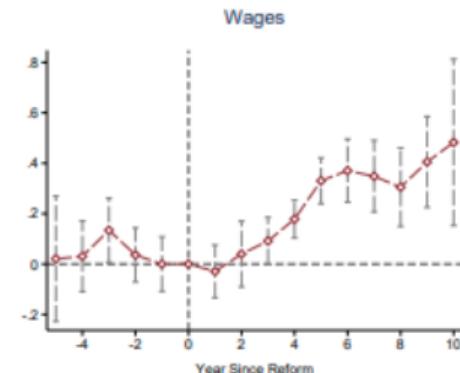
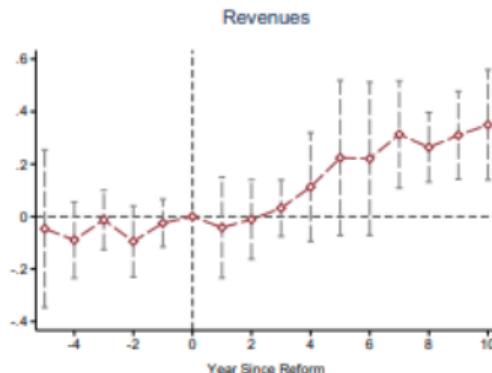
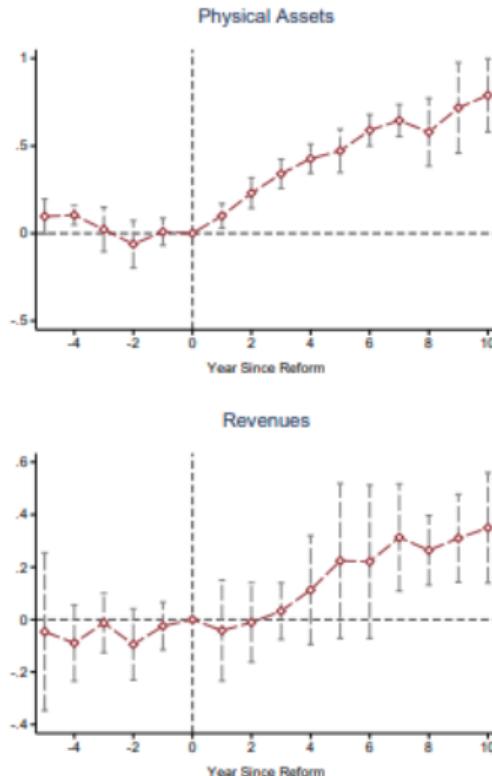
Flow of Foreign Equities



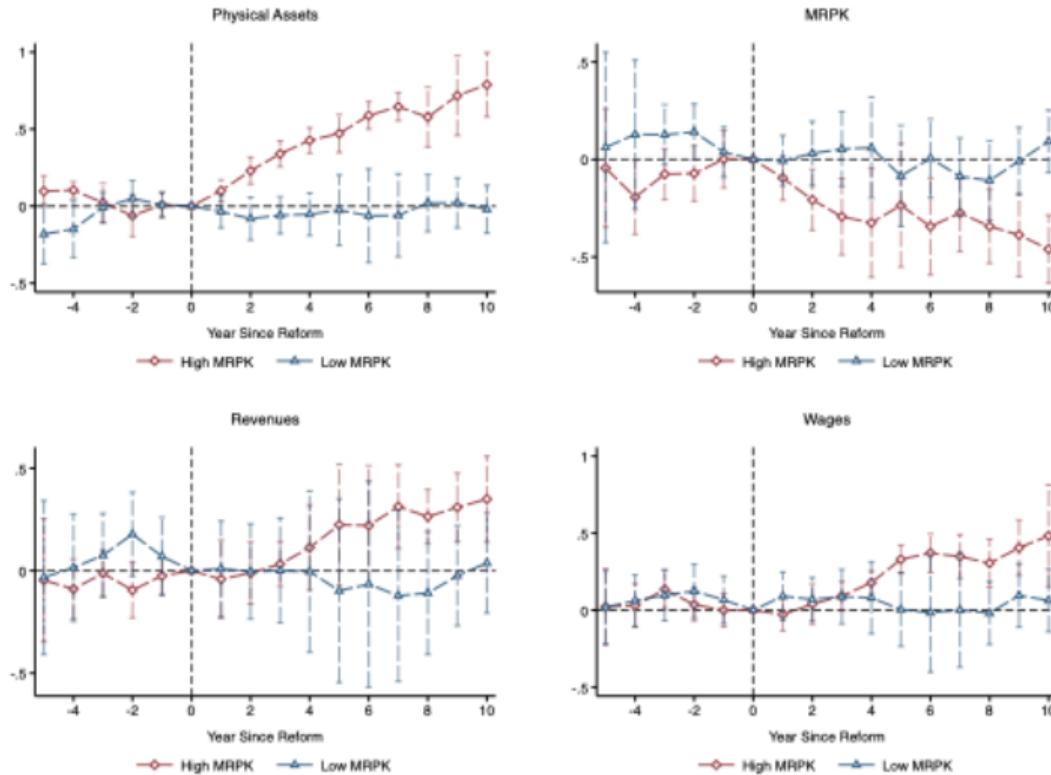
Average Effect of FDI Liberalization on Physical Capital



Effect of FDI Liberalization on High MRPK firms



Effect of FDI Liberalization on High and Low MRPK firms



Aggregate Effects

- ▶ Results suggest that misallocation fell within treated industries but not whether this had economically meaningful effects on output growth.
- ▶ To get at aggregate effects BM use a theoretical framework to estimate the policies effect on the treated industries' Solow residual, a proxy for aggregate productivity,

$$\Delta Solow_{I,t} \approx \sum_{i \in I} \lambda_i \Delta log A_i + \sum_{i \in I} \sum_{x \in \{K, L, M\}} \lambda_i \alpha_i^x \frac{\tau_i^x}{1 + \tau_i^x} \Delta log x_i$$

where λ_i is the ratio of firm i 's sales to treated industry I 's net output, $\Delta log A_i$ is the change in TFPQ, α_i^x is the output elasticity w.r.t x , τ_i^x is the level of the firm-specific wedge prior to the policy change, and $\Delta log x_i$ is the change in the log input x consumed by firm i .

Aggregate Effects

Increase in Solow Residual	
Lower Bound	3.4%
Conventional Approach	16.3%
Lower Bound Allowing for Cumulative Effects	6.2%
Non-Linear Approximation	6.0%