

MANAGEMENT AS A TECHNOLOGY?

**Nick Bloom (Stanford), Raffaella Sadun (HBS) &
John Van Reenen (LSE)**

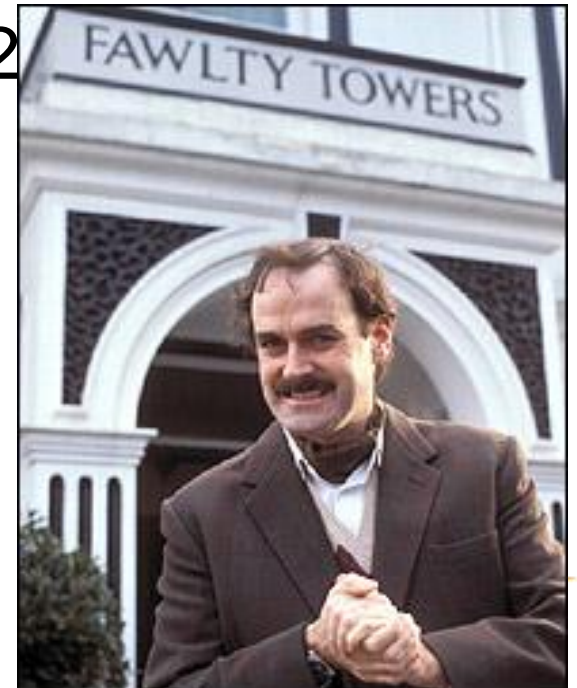
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INTRODUCTION

- Explosion of empirical work on firms & plant performance in last 1-2 decades (IT & opening of National Statistical Agencies)
 - Heterogeneity of productivity 1st order economic fact
 - Related to management practices (new data)
 - **This paper**: Management is partly a transferable “technology”
- Empirical evidence
 - Positive effect of management on performance;
 - More reallocation to better managed firms (especially in US)
 - Competition improves management
 - Informational frictions impede management

PRODUCTIVITY DISPERSION WITHIN COUNTRIES

- **Large cross sectional dispersion *within* countries**
 - Within US SIC4, plant labor productivity 90th-10th \approx 4x (TFP \approx 2x). Syverson (2004). Other countries bigger
 - These plant productivity differences are persistent
- **Is it all measurement problems? NO**
 - Robust to different methods of production function estimation (Olley-Pakes, 1996; Blundell-Bond, 2000; Akerberg et al, 2007, Solow residual)
 - Using plant-specific prices (Foster et al, 2009)
 - Other measures of firm performance (e.g. profitability, size, management quality, etc.) show wide variation

FIRM HETEROGENEITY HAS LONG BEEN RECOGNIZED

“...we have the phenomenon in every community and in every trade, in whatever state of the market, of some employers realizing no profits at all, while others are making fair profits; others, again, large profits; others, still, colossal profits.”

Francis Walker (*Quarterly Journal of Economics*, '87)

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Economic Theories

Measuring Management

Data Description

Empirics

REASONS FOR PERFORMANCE HETEROGENEITY

- **TFP Heterogeneity due to “hard technologies”**
 - R&D, patents, diffusion of ICT (information and communication technologies), etc.
- **These hard technologies matter a lot, but:**
 - After controlling for technology, still a big TFP residual
 - Productivity effects of ICT depend on firm organization (e.g. Bloom, Sadun & Van Reenen, 2012; Bresnahan, Brynjolfsson and Hitt, 2002)
- **Heterogeneity of management practices & organization?**
 - Econometric tradition that fixed effects in production function = managerial ability (Mundlak, 1961)
 - Case studies & recent advances in measurement

SOME ECONOMIC PERSPECTIVES ON MANAGEMENT

- **Fads and fashions?**
- **Standard Factor of Production (FoP)**
- **“Design Approach” of Organizational Economics**
 - Example: Personnel Economics (Lazear & Oyer, 2009) application of economics to Human Resources
 - “Contingent management” school of Woodward
- **“Management as a technology”**
 - Incorporates firm heterogeneity in productivity
 - *Non transferable* management capabilities (IO models & talent models)
 - *Transferable* capabilities “diffusion” models

NOTIONS OF MANAGERIAL “BEST PRACTICE”

- Management styles that have always been better
 - e.g. promotion on ability/effort (rather than family)
- **Complementarity:** Practices that have become desirable because the environment has changed
 - Technological advances makes monitoring output better (e.g. SAP) and enables more performance related pay (Lemieux et al, 2009)
- **Innovation:** Discoveries of how to manage better
 - E.g. Toyota system of Lean Manufacturing
 - **Transferable:** dynamic diffusion

SOME IMPLICATIONS OF “MANAGEMENT AS A TECHNOLOGY” VIEW

- **Effect of Management on Performance**
 - Positive effect on productivity across industries (unlike design) & similar coefficient (unlike FoP)
 - Positive effect on profitability (unlike Design or FoP)
- **Management and Reallocation**
 - Better managed firms should be larger, more likely to survive and grow faster
 - These effects should be greater when environment favours reallocation (e.g. US vs. India)
- **Management and competition**
 - Competition likely to have a positive effect on average management quality (selection and incentives)
- **Management and information**
 - Info a key reason for differences in management

Economic Theories

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BLOOM - VAN REENEN (2007) SURVEY METHODOLOGY

1) Developing management questions

- Scorecard for 18 monitoring (e.g. lean), targets & people (e.g. pay, promotions, retention and hiring). ≈45 minute phone interview of manufacturing plant managers

2) Obtaining unbiased comparable responses (“Double-blind”)

- Interviewers do not know the company’s performance
- Managers are not informed (in advance) they are scored
- Run from LSE, with same training and country rotation

3) Getting firms to participate in the interview

- Introduced as “Lean-manufacturing” interview, no financials
- Official Endorsement: Bundesbank, Bank of England, RBI, etc.
- Run by 55 MBA types (loud, assertive & business experience)

MONITORING – e.g. “HOW IS PERFORMANCE TRACKED?”

Score

(1): Measures tracked do not indicate directly if overall business objectives are being met. Certain processes aren't tracked at all

(3): Most key performance indicators are tracked formally. Tracking is overseen by senior management

(5): Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools

Note: All 18 dimensions and over 50 examples in Bloom & Van Reenen (2006)

MANAGEMENT SURVEY SAMPLE

- Interviewed over 8,000 firms across 22 countries in Americas, Asia & Europe
- Obtained 45% response rate from sampling frame (with responses uncorrelated with performance measures)
- 3 major waves in 2004, 2006 & 2009 with panel element

Medium sized manufacturing firms:

- Medium sized (100 - 5,000 employees, median \approx 250) because firm practices more homogeneous
- Manufacturing as easier to measure productivity
 - Now extended to Hospitals, Retail, Schools, Charities, Nursing homes, Law Firms, Government agencies, etc.

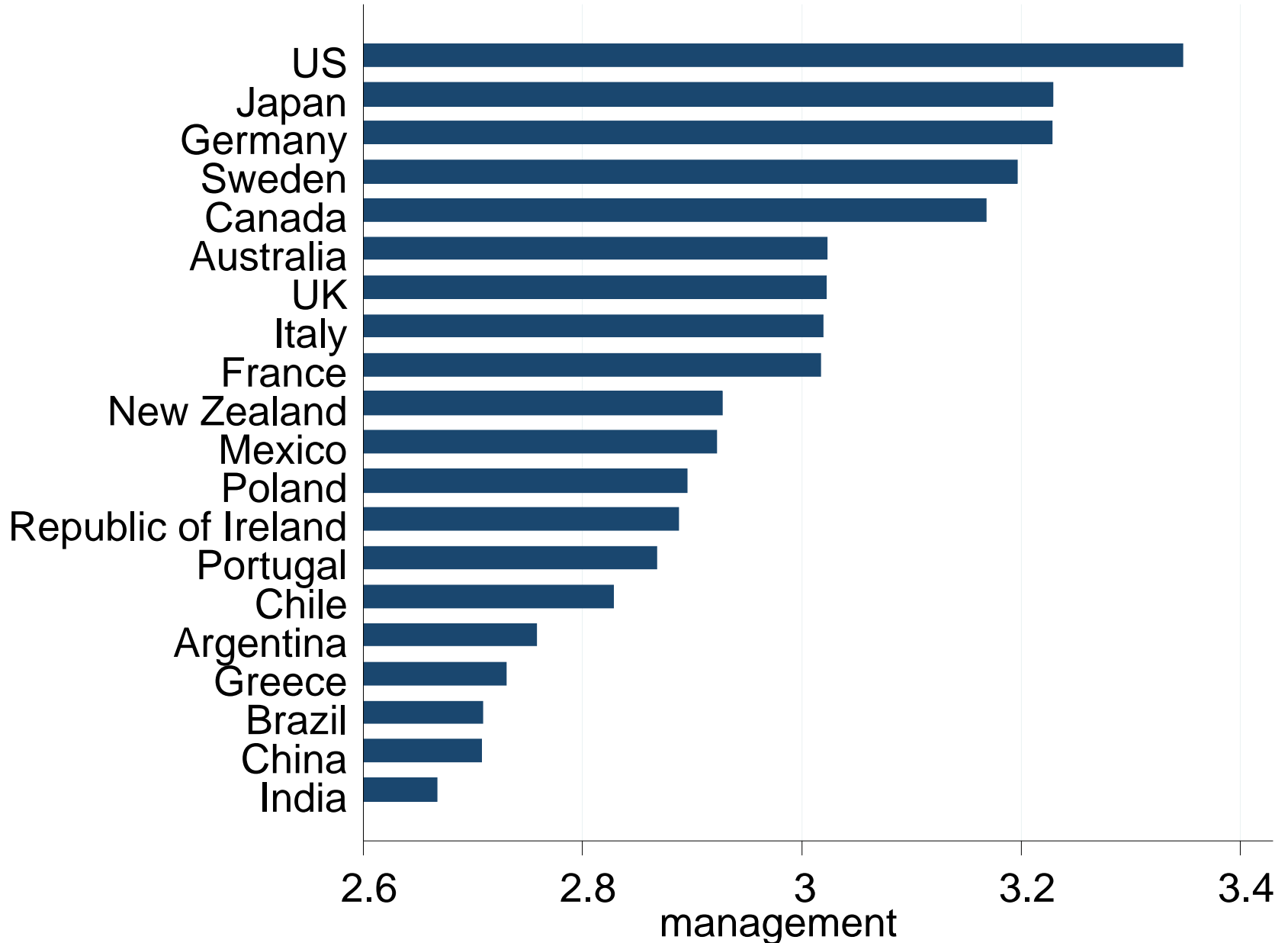
Economic Theories

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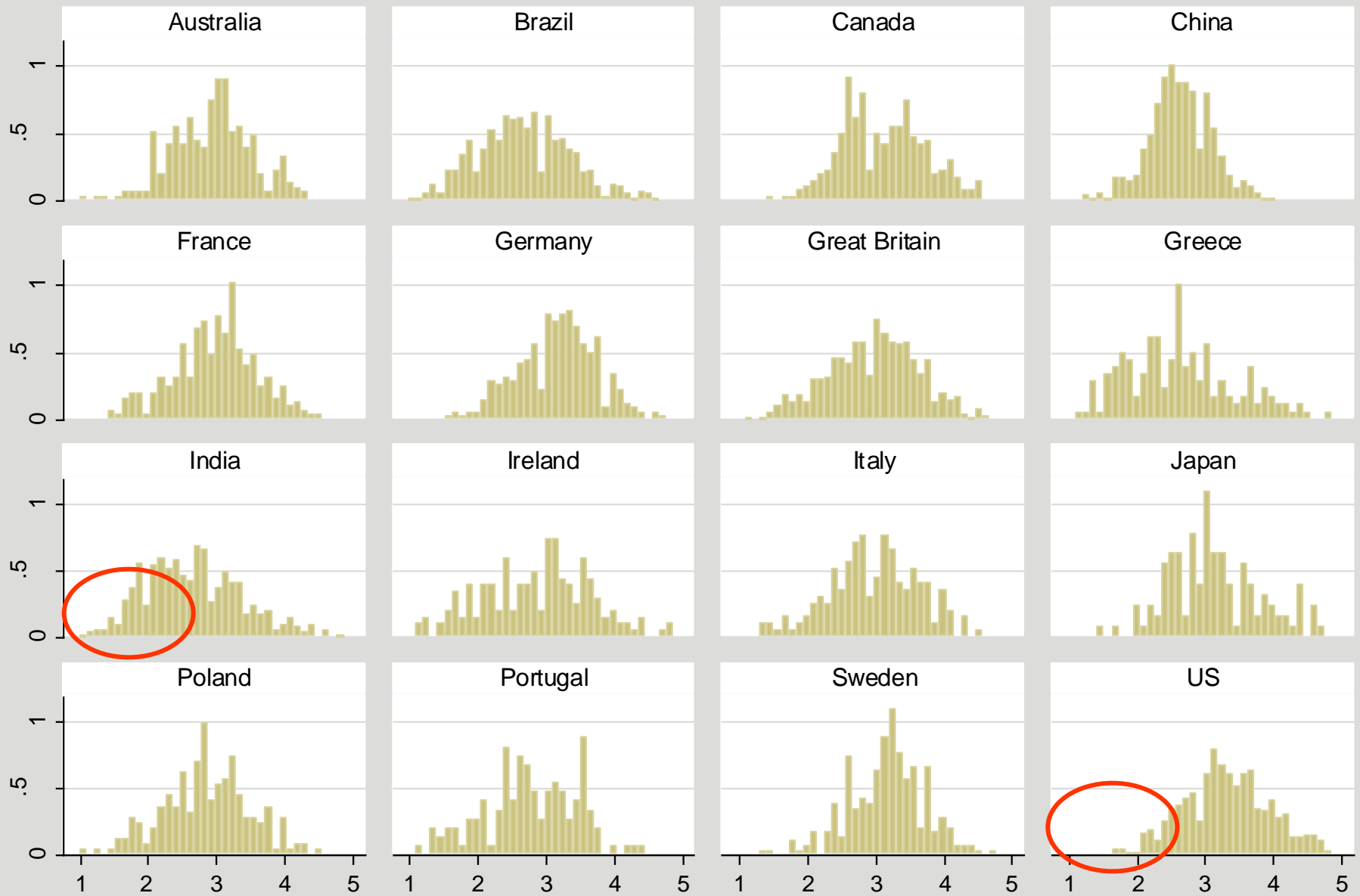
Empirics

MANAGEMENT PRACTICE SCORES ACROSS COUNTRIES



Note: Averages taken across all firms within each country. 9079 observations in total.

VARIATION IN MANAGEMENT SCORES GREATER ACROSS FIRMS THAN ACROSS COUNTRIES



FACTORS INCREASING RISK OF FIRM BEING IN THE “LOWER TAIL” OF BAD MANAGEMENT

- Low Competition (later
- Family-run firm
- Low skills
- State ownership
- Heavy labor regulation

Economic Theories

Measuring Management

Data Description

Empirics

Empirics

- **Management effect on Performance**
- Management and Reallocation
- Management and Competition
- Management and Information

PERFORMANCE REGRESSIONS

Performance
measure

country c

$$y_i^c = \beta MNG_i^c + \alpha_l l_i^c + \alpha_k k_i^c + \alpha_m h_i^c + \gamma' x_i^c + u_i^c$$

management
(average z-scores)

ln(labor)

ln(capital)

ln(materials)

other controls

- Note – not a causal estimation, only an association

BETTER PERFORMANCE IS CORRELATED WITH BETTER MANAGEMENT

Dependent variable	Ln(sales)	Ln(sales)	Profits (ROCE)	5yr Sales growth	Exit
Estimation	OLS	Fixed Effects	OLS	OLS	Probit
Firm sample	All	2+ surveys	All	Quoted	All
Management	0.143*** (0.015)	0.028** (0.014)	1.207*** (0.274)	0.042*** (0.012)	-1.338** (0.498)
Ln(employees)	0.659*** (0.289)	0.363*** (0.108)			
Ln(capital)	0.289*** (0.010)	0.245*** (0.087)			
Firms	2,927	1,345	2,927	2,927	2,927
Observations	7,094	5,512	7,094	7,094	2,927

Notes: Regressions includes controls for country, SIC3 & year, dummies. Firm-size, firm-age, skills, noise controls etc. SE clustered by firm. 2002-2010

MANAGEMENT COEFFICIENTS SIMILAR ACROSS INDUSTRIES (BUT COEFFICIENTS ON LABOR & CAPITAL VARY)

Dependent variable	Ln(Sales)	TFP	Ln(Sales)
Management	0.140*** (0.014)	0.133*** (0.014)	0.011** (0.042)
ln(labor)	0.642*** (0.025)		0.258*** (0.110)
ln(capital)	0.319*** (0.020)		0.442*** (0.077)
Fixed Effects	No	No	Yes
Joint Significance of Industry interactions (<i>p-value</i>)			
Management*SIC2	0.69	0.78	0.20
Ln(labour)*SIC2	0.00		0.00
Ln(capital)*SIC2	0.09		0.01
Observations	7,094	7,094	5,512

Notes: OLS Regressions includes controls for country, industry, year, skills. S.E.s are clustered by firm. Management is z-scored. Industry 20 is baseline.

RANDOMIZED CONTROL TRIALS: BLOOM ET AL (2011)

- Experiment on plants in Indian textile firms outside Mumbai
- Randomized treatment plants get heavy management consulting, control plants get very light consulting (just enough to get data)
- Collect weekly performance data on all plants from 2008 to 2010
 - Improved management practices led to large and significant improvements in productivity and profitability (around \$200,000 so consultancy re-paid itself within a year)

Productivity improvements in a randomized field experiment on the adoption of modern management practices



Notes: Weekly average total factor productivity for the 14 treatment plants which adopted modern management practices for quality, inventory and production efficiency and the 6 control plants. All plants make cotton fabric near Mumbai, India, with between 100 and 1000 employees. Values normalized so both series have an average of 100 prior to the start of the intervention. Confidence intervals we bootstrapped over firms. Source: Bloom, Eifert Mahajan, McKenzie, Roberts (2011).

Empirics

- Management effect on Performance
- **Management and Reallocation**
- Management and Competition
- Management and Information

EXAMINING THE ROLE OF REALLOCATION

$$SIZE_{ij} = \alpha M_{ij} + \beta(M * REALLOCATION)_{ij} + \gamma M_{ij} + u_{ij}$$

$$GROWTH_{ij} = \alpha M_{ij} + \beta(M * REALLOCATION)_{ij} + \gamma M_{ij} + u_{ij}$$

One measure of strength of reallocation is a set of country dummies, with US as base

RELATIONSHIP BETWEEN MANAGEMENT & SIZE IS MUCH WEAKER IN COUNTRIES WITH LESS COMPETITION

- “Selection” effect – market reallocates jobs to more efficient firms
- An additional sd of management score associated with of employment increase:
 - US ~295 more workers
 - UK ~204 more workers
 - India ~97 more workers
- Competitive forces of reallocation much weaker in India compared to US
- Same story with sales growth (dynamic reallocation)

Empirics

- Management effect on Performance
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COMPETITION & MODELS OF MANAGEMENT

- Various ways that competition may influence management
 - Selection – badly run firms more likely to exit
 - Effort – forces badly run firms to try harder to survive (although Schumpeterian effects may counterbalance)
- No obvious relationship in Design and Factor of Production perspectives
- Using panel we can find a role for both mechanisms

COMPETITION AND MANAGEMENT PRACTICES

3 competition proxies from Nickell (1996) & Aghion et al. (2005)

Competition proxies	Dependent variable: Management			
Import penetration (lagged industry-country level)	0.066** (0.033)			
1- Lerner Index¹ (lagged industry-country level)		1.964*** (0.721)		
# of competitors (Firm level)			0.115*** (0.023)	0.120** (0.052)
Observations	2,499	2,980	3,589	864
Firm fixed effects?	No	No	No	Yes
Full controls²	Yes	Yes	Yes	Yes

Notes: “Full controls” includes 108 SIC-3 industry, country, firm-size, public and interview noise (interviewer, time, date & manager characteristic) controls, 2004-2006, UK, US, France and Germany only

Empirics

- Management effect on Performance
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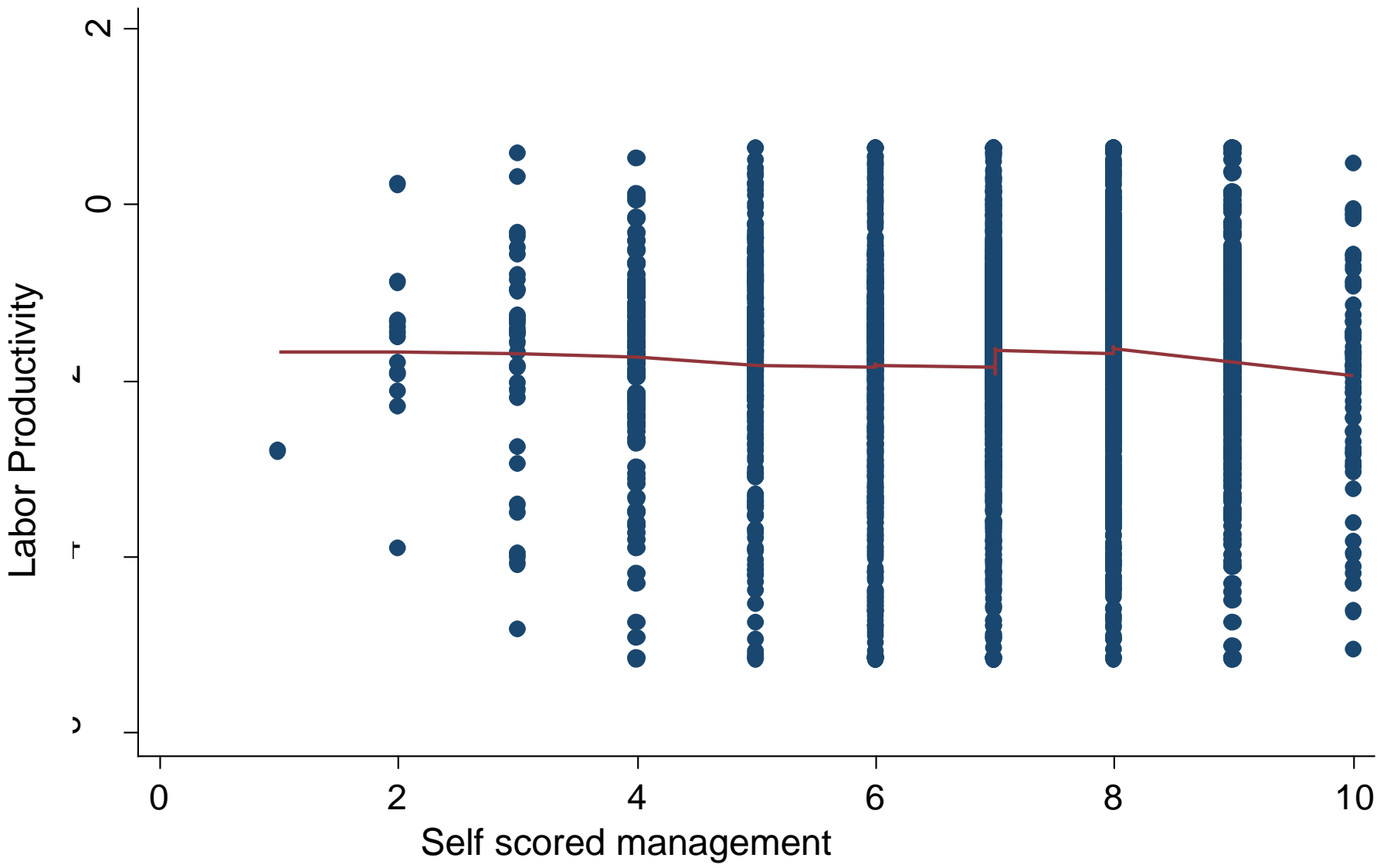
ARE FIRMS AWARE OF THEIR MANAGEMENT PRACTICES BEING GOOD/BAD?

We asked:

“Excluding yourself, how well managed would you say your firm is on a scale of 1 to 10, where 1 is worst practice, 5 is average and 10 is best practice”

We also asked them to give themselves scores on operations and people management separately

SELF-SCORES UNCORRELATED WITH PRODUCTIVITY



* Insignificant 0.03 correlation with labor productivity, cf. management score has a 0.295

COMPETITION AFFECTS FIRM'S SELF-PERCEPTIONS OF MANAGEMENT QUALITY

Dep. Var.	Management			Self-score Management		
	FEs	SIC3	Firm	SIC3	SIC3	Firm
Sample	All	2+ obs	2+ obs	All	2+ obs	2+ obs
Competition	0.064*** (0.018)	0.082*** (0.031)	0.119** (0.051)	-0.038* (0.023)	-0.041 (0.039)	-0.046 (0.073)
%college	0.115*** (0.008)	0.109*** (0.014)		0.040*** (0.011)	0.069*** (0.020)	
Ln(emp)	0.175*** (0.009)	0.157*** (0.017)		0.069*** (0.012)	0.060*** (0.022)	
Obs	8,776	3,276	3,349	7,960	2,934	3,007

Notes: Controls include country & year dummies, public & interview noise (interviewer, time, date & manager characteristic). SEs clustered by firm.

CONCLUSIONS

- Heterogeneity in firm productivity a first order fact
- Linked to management and organization of firms.
- Management a “technology”
 - Better Management stimulated higher productivity & profitability
 - More output allocated to better managed firms
 - This is a reason for “thin tail” in US
 - Competition drives better management through selection & incentives
- Management technologies not just static non-transferable way (e.g. Lucas & Melitz). Partially transferrable (as in diffusion models)

MY FAVOURITE QUOTES:

The traditional British Chat-Up

[Male manager speaking to an Australian female interviewer]

Production Manager: “Your accent is really cute and I love the way you talk. Do you fancy meeting up near the factory?”

Interviewer “Sorry, but I’m washing my hair every night for the next month....”

MY FAVOURITE QUOTES:

The traditional Indian Chat-Up

Production Manager: “Are you a Brahmin?”

Interviewer “Yes, why do you ask?”

Production manager “And are you married?”

Interviewer “No?”

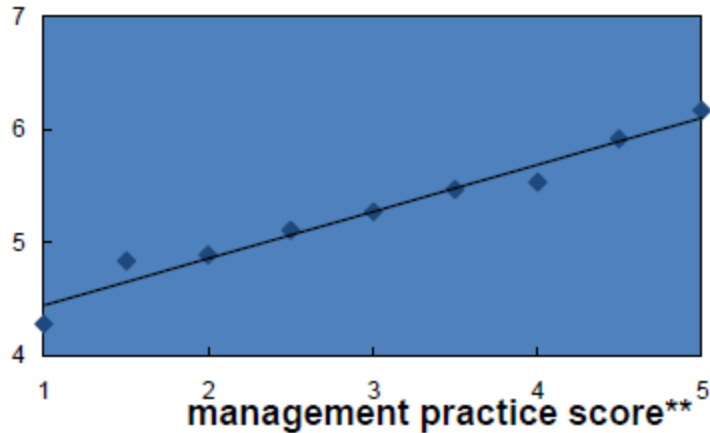
Production manager “Excellent, excellent, my son is looking for a bride and I think you could be perfect. I must contact your parents to discuss this”

NEXT STEPS: OTHER IMPLICATIONS OF THE TECHNOLOGICAL VIEW OF MANAGEMENT

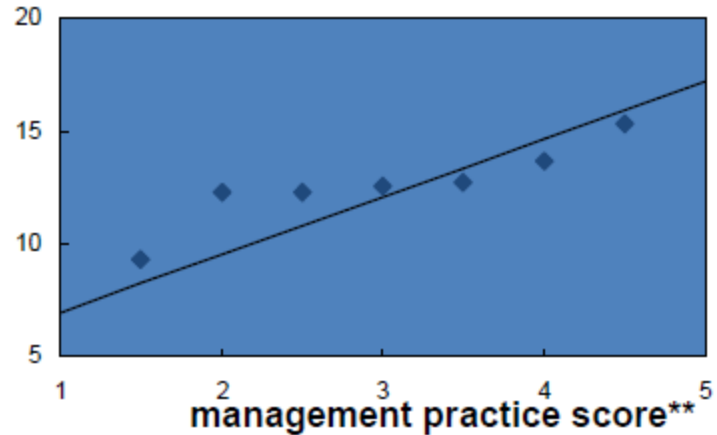
- **Management Practices or just managers?**
 - Better management practices just better human capital (observed and unobserved)
 - Well managed firms get more out of ex ante identical people
- **Management as resilience**
 - Better managed firms more resilient to shocks (e.g. Great Recession)
 - Similar to organizational capital view
- **Management and labour markets**
 - Supply of highly skilled workers
 - Supply of business skills (e.g. B-Schools)

EXTERNAL VALIDATION: MANAGEMENT SCORE CORRELATES WELL WITH PERFORMANCE INDICATORS

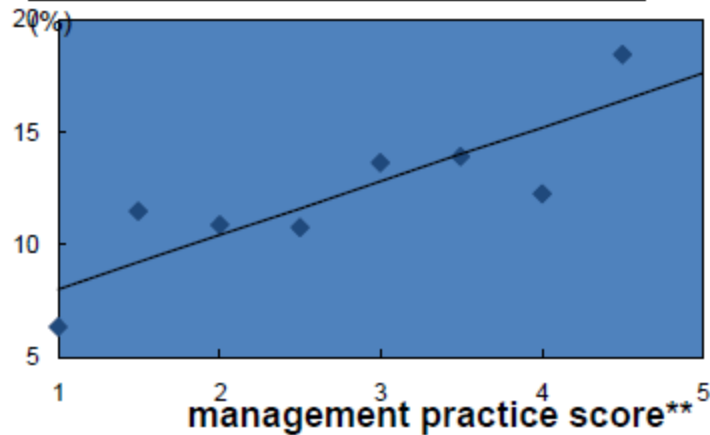
Labour productivity*



Sales growth (%)



Return On Capital Employed, ROCE



* Log scale

** Firms are grouped in 0.5 increments of assessed management score

ADDITIONAL CONTROLS FOR BIAS & NOISE

8 INTERVIEWEE CONTROLS

- Gender, seniority, tenure in post, tenure in firm, countries worked in, foreign, worked in US, plant location, reliability score

3 INTERVIEWER CONTROLS

- Set of analyst dummies, cumulative interviews run, prior firm contacts

5 TIME CONTROLS

- Day of the week, time of day (interviewer), time of the day (interviewee), duration of interview, days from project start