



The Innovation Paradox

Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up

Xavier Cirera

William F. Maloney

World Bank

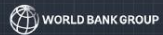
Harvard KSG, October 2018

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Productivity Revisited

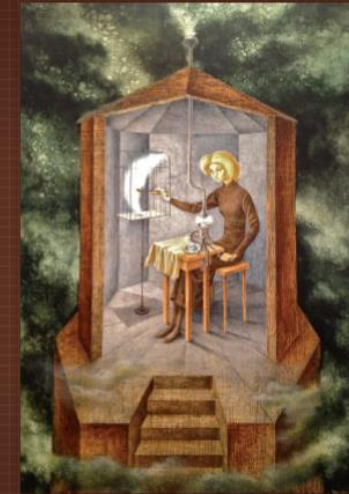


Shifting Paradigms in Analysis and Policy

Ana Paula Cusolito and William F. Maloney

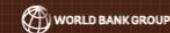


CONFERENCE EDITION High-Growth Firms



Facts, Fiction, and Policy Options for Emerging Economies

Arti Grover Goswami, Denis Medvedev, and Elen Olafsen



World Bank Productivity Project

The Productivity Project: www.worldbank.org/productivity

Productivity Growth: the Ultimate Driver of Jobs, Wages, Poverty Reduction

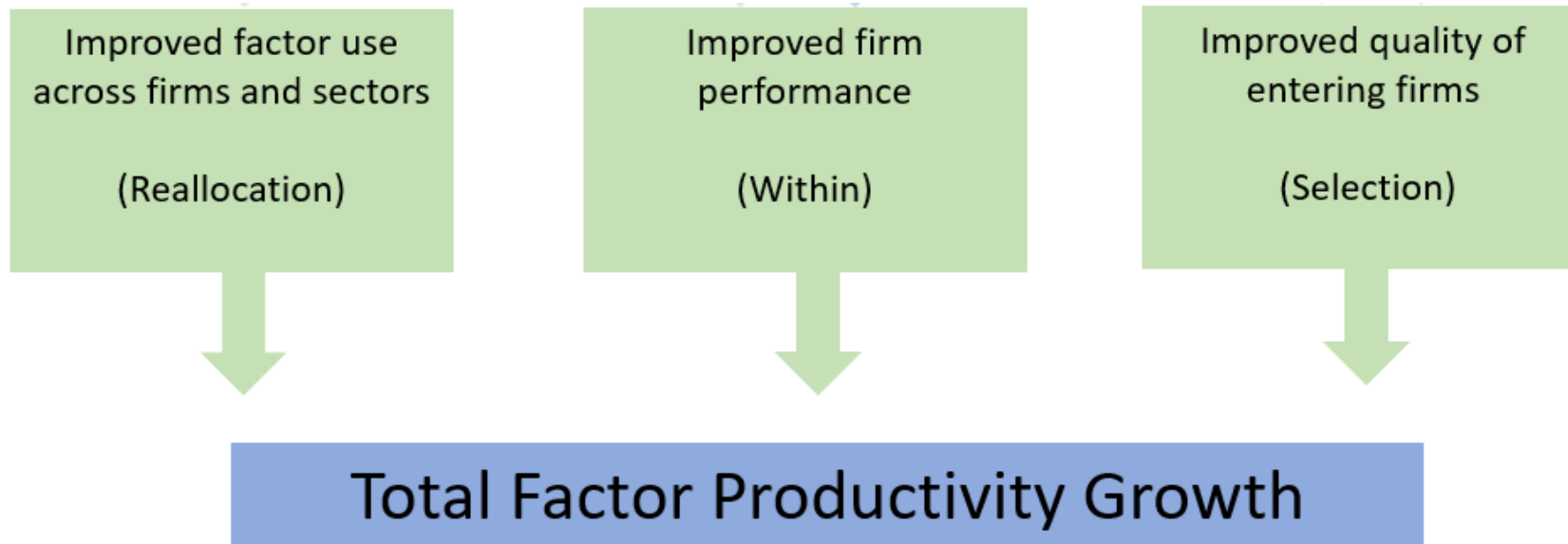
“Civilization and its well-being as well as business prosperity, depend on productivity...”

--Ibn Kaldun (1377)

Productivity isn't everything, but in the long run, it is almost everything”

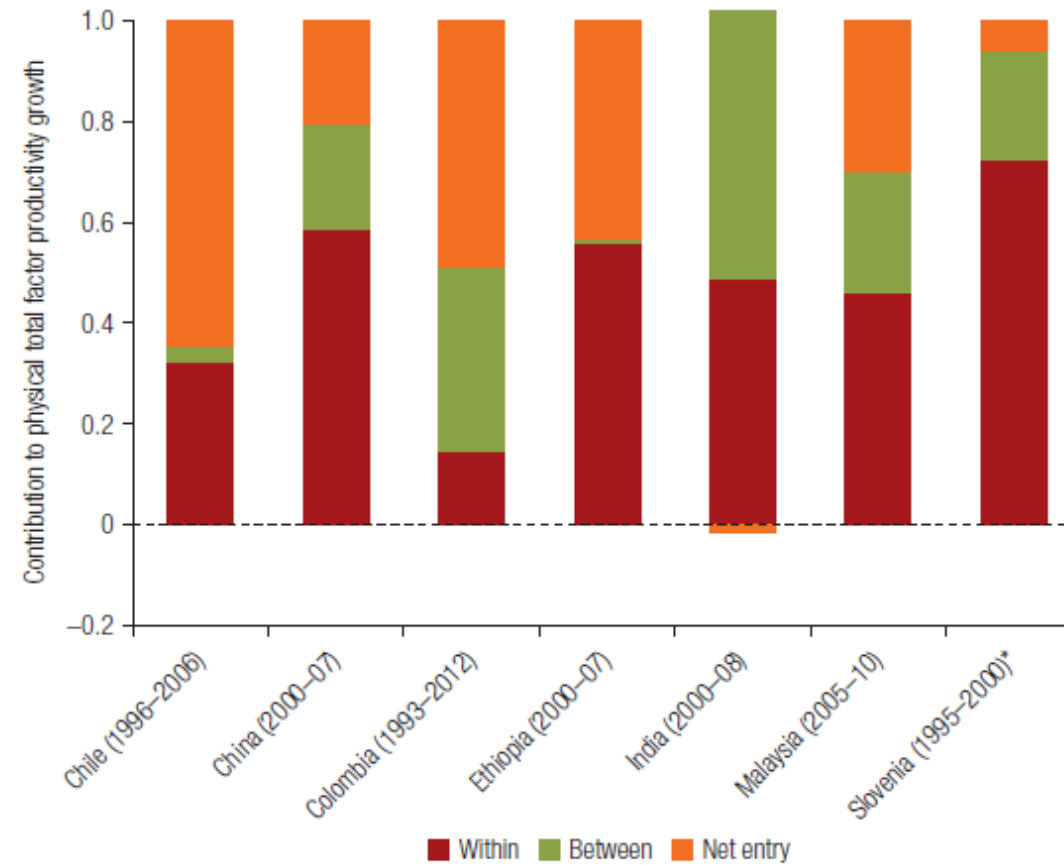
--Paul Krugman (1994)

Technology Adoption a Critical Driver of Productivity Growth



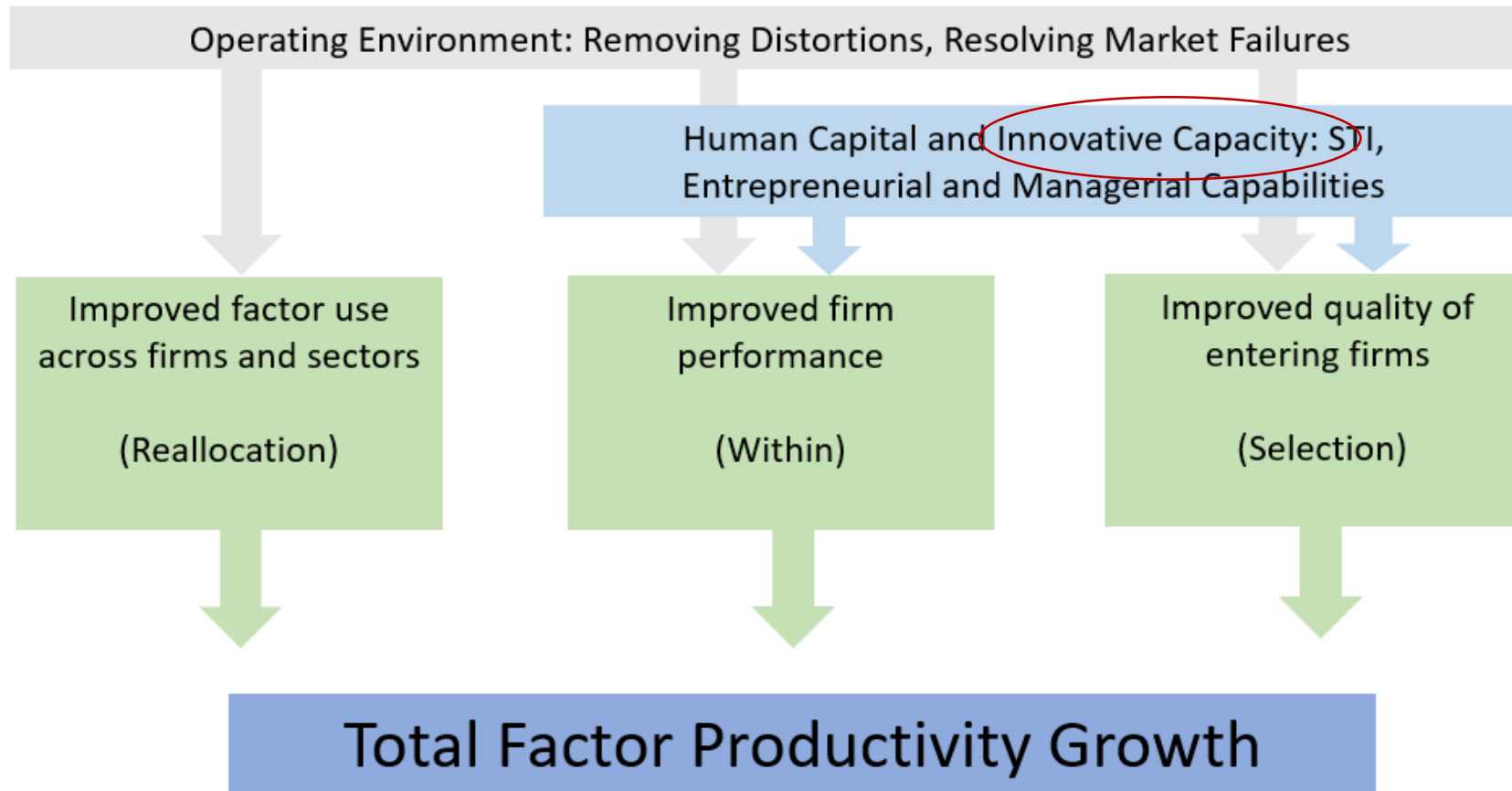
How much is attributable to each?

FIGURE 1.11 Which Dimension Contributes Most to Productivity Growth?



Source: Elaborations using Melitz and Polanec (2015) methodology.

Technology Adoption a Critical Driver of Productivity Growth

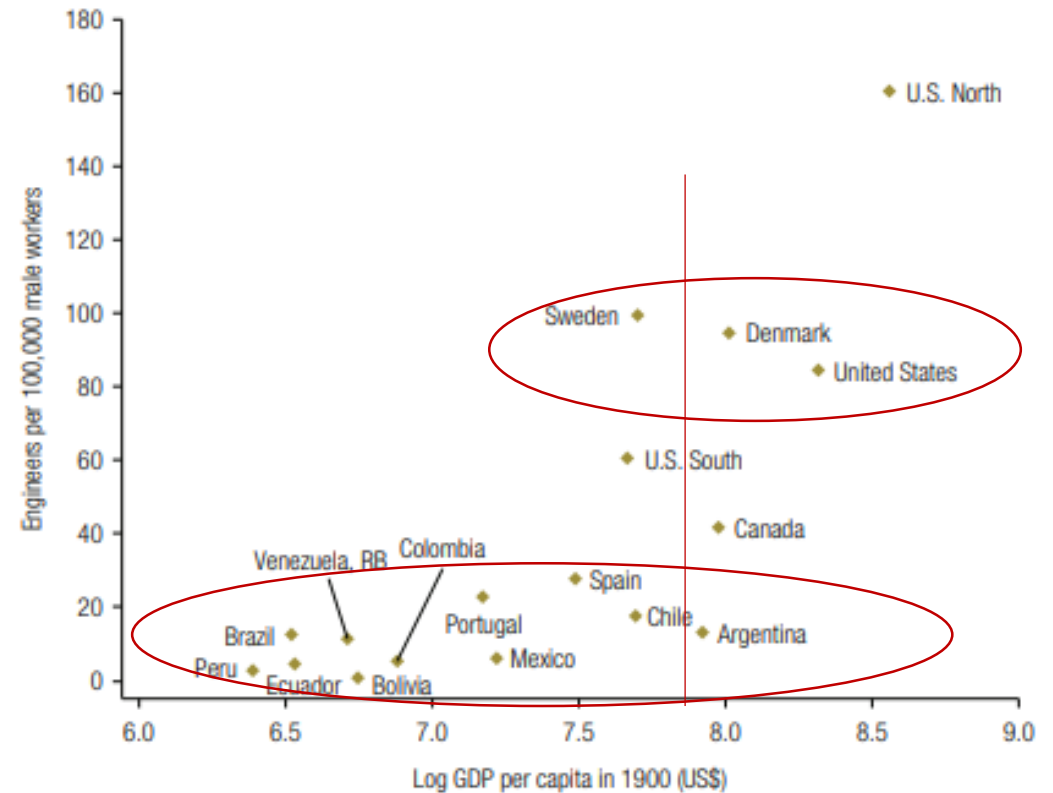


Capacity to both adopt existing technologies and, eventually, invent

History Tells Us That Firm Innovation Capabilities are Critical for Adoption and Growth...

- Latin America lacked the capability to adopt advances in metallurgy and chemistry to mining
 - Chile: #1 copper exporter in 1860
 - Sold mines to foreigners in 1900
 - Delayed industrialization
- US and Japan: developed innovation capability
 - US: generated a national knowledge network UC Berkeley, Columbia U.
 - Japan: #2 copper exporter 1860. Copper companies became Sumitomo (Banking), Fujitsu (computing)
- Both in US and Meiji Japan, growth based on application of new technologies across sectors.

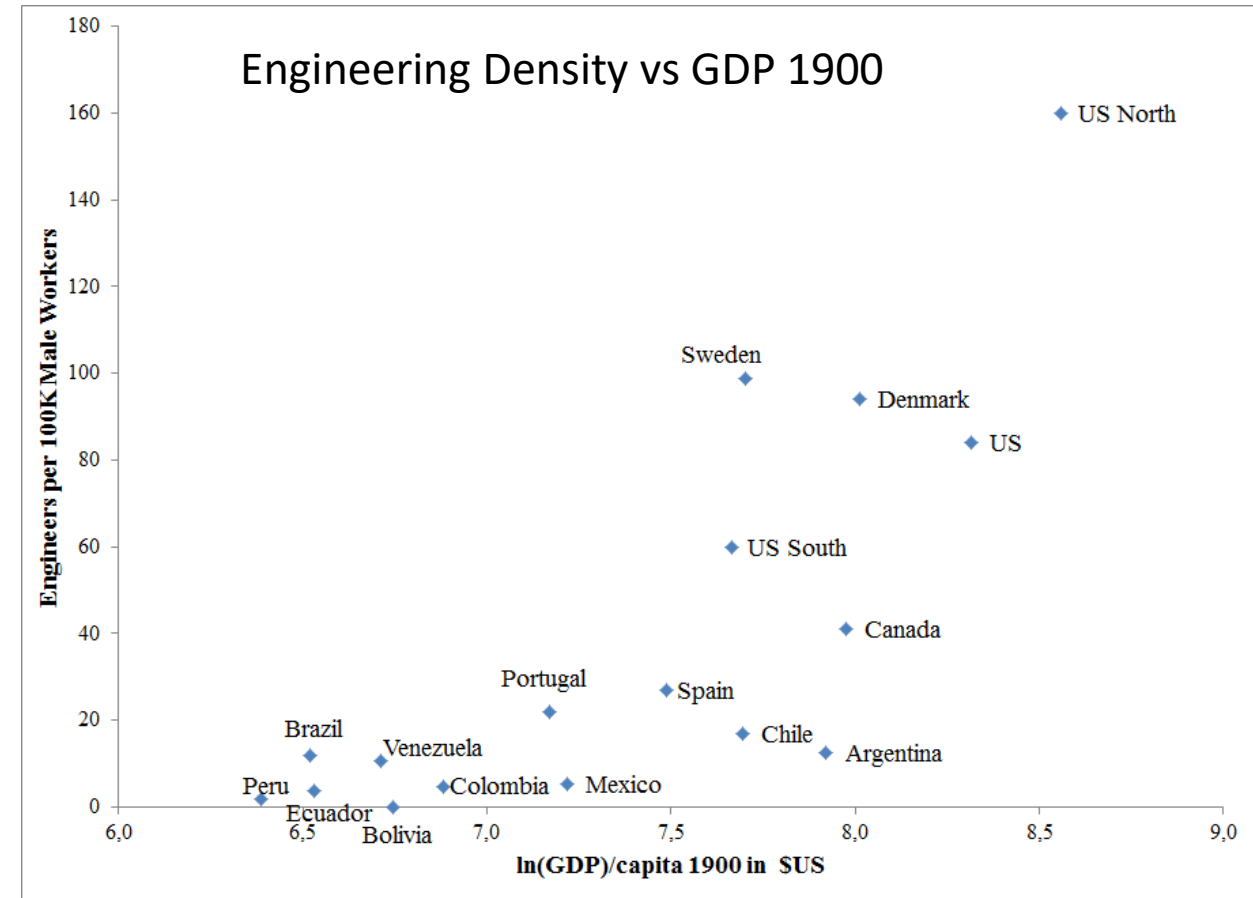
Innovation Capability in 1900 Explains Development Today



Source: Maloney and Valencia Caicedo 2017.

Innovation capabilities are key for growth

- History offers many cases of success and failure **within same products**
 - US (and Japan) vs. Chile with copper
 - Korea vs. Mexico with electronics
- Difference: not **WHAT** they were producing, but how prepared they were to identify and adapt new technologies.



Returns to such investments rise with distance from the frontier

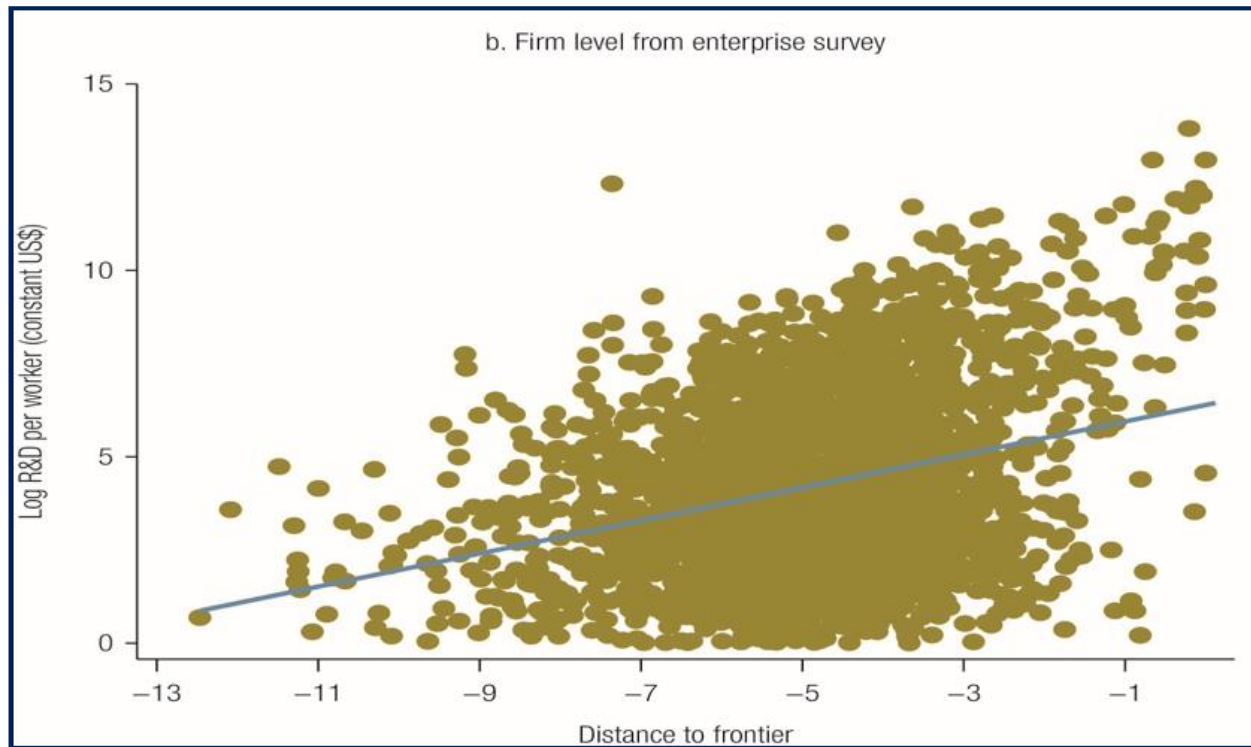
	Dist. to Frontier	Rate of Return to R&D	
▶ USA	-.18	57%	
▶ UK	-.53	77%	
▶ Italy	-.73	88%	
Korea	-1.33	?	} 200-300%?
Slovenia	-1.50	?	
Malaysia	-2.28	?	
Argentina	~-2.50	?	

Griffith, Redding, Van Reenen (2004)

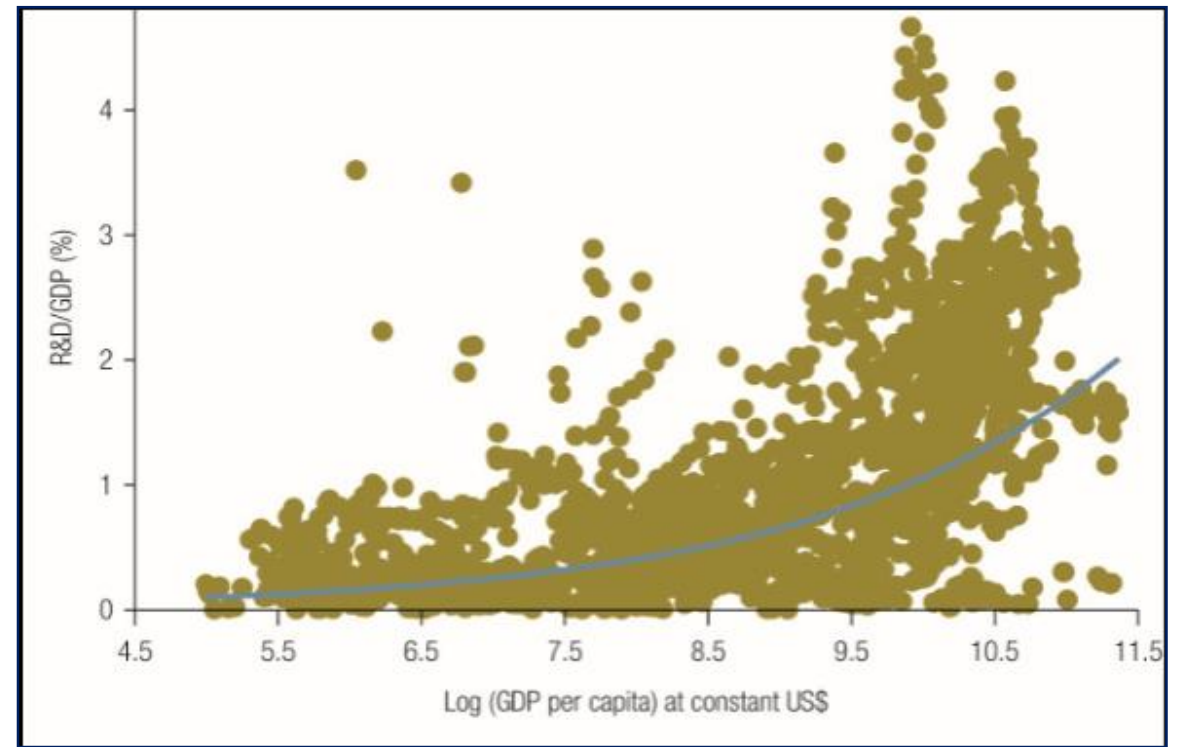
To paraphrase Lucas: How could policy makers think of anything else? **Why don't firms and gov't invest more?**

Low income countries do little innovation: R&D...

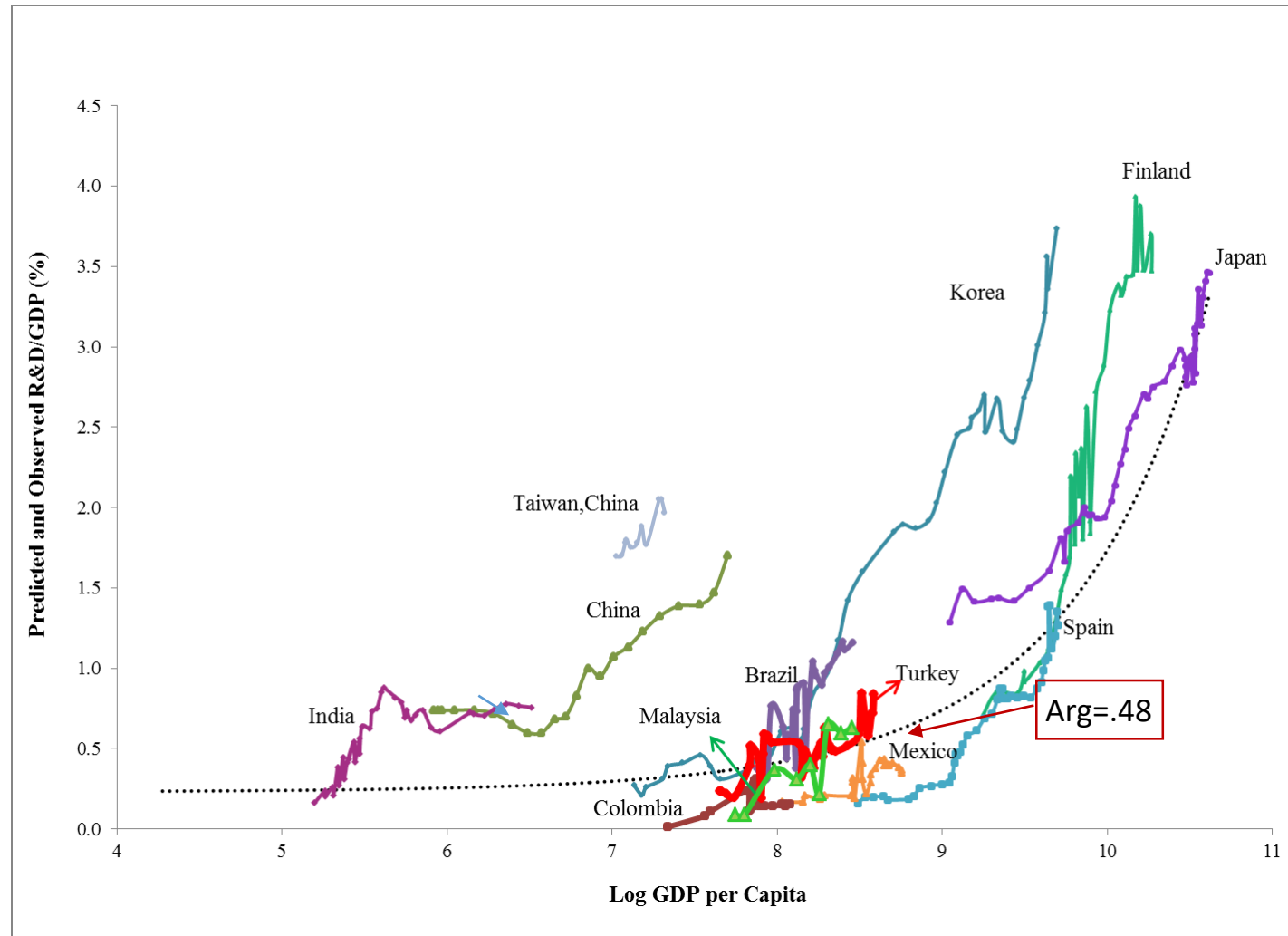
Firm Level Data



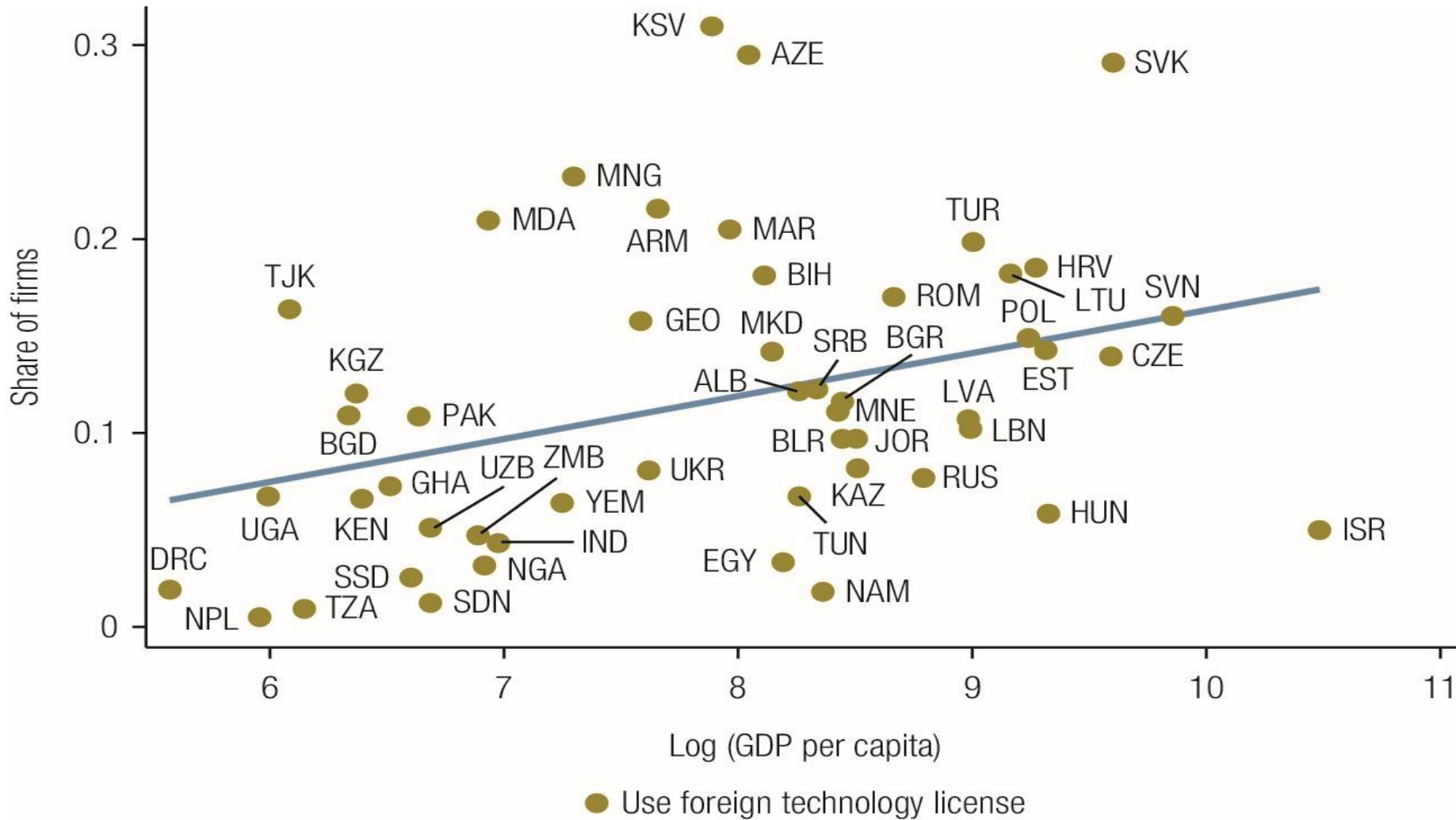
National Data



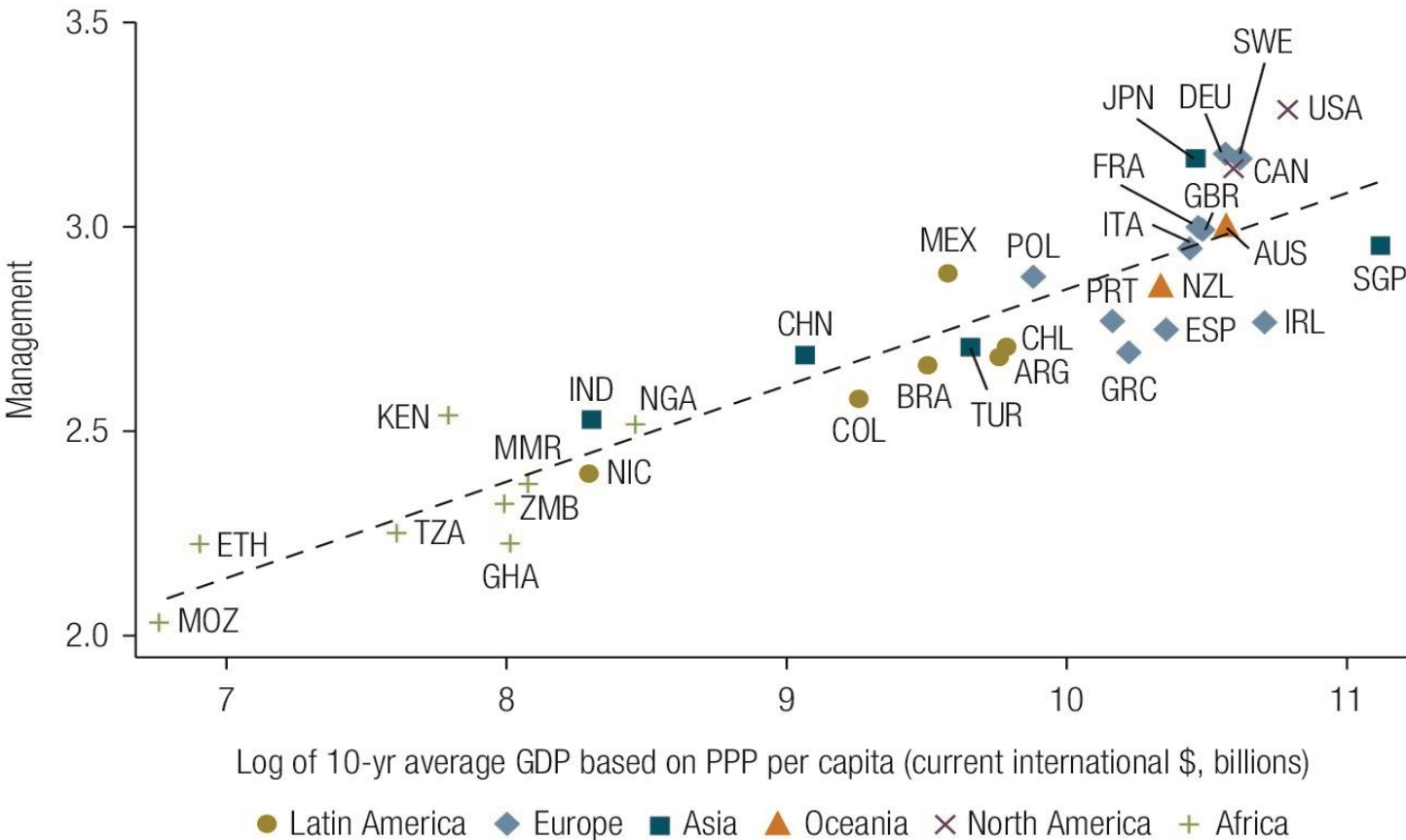
R&D: Detail



...Licensing of foreign technologies...



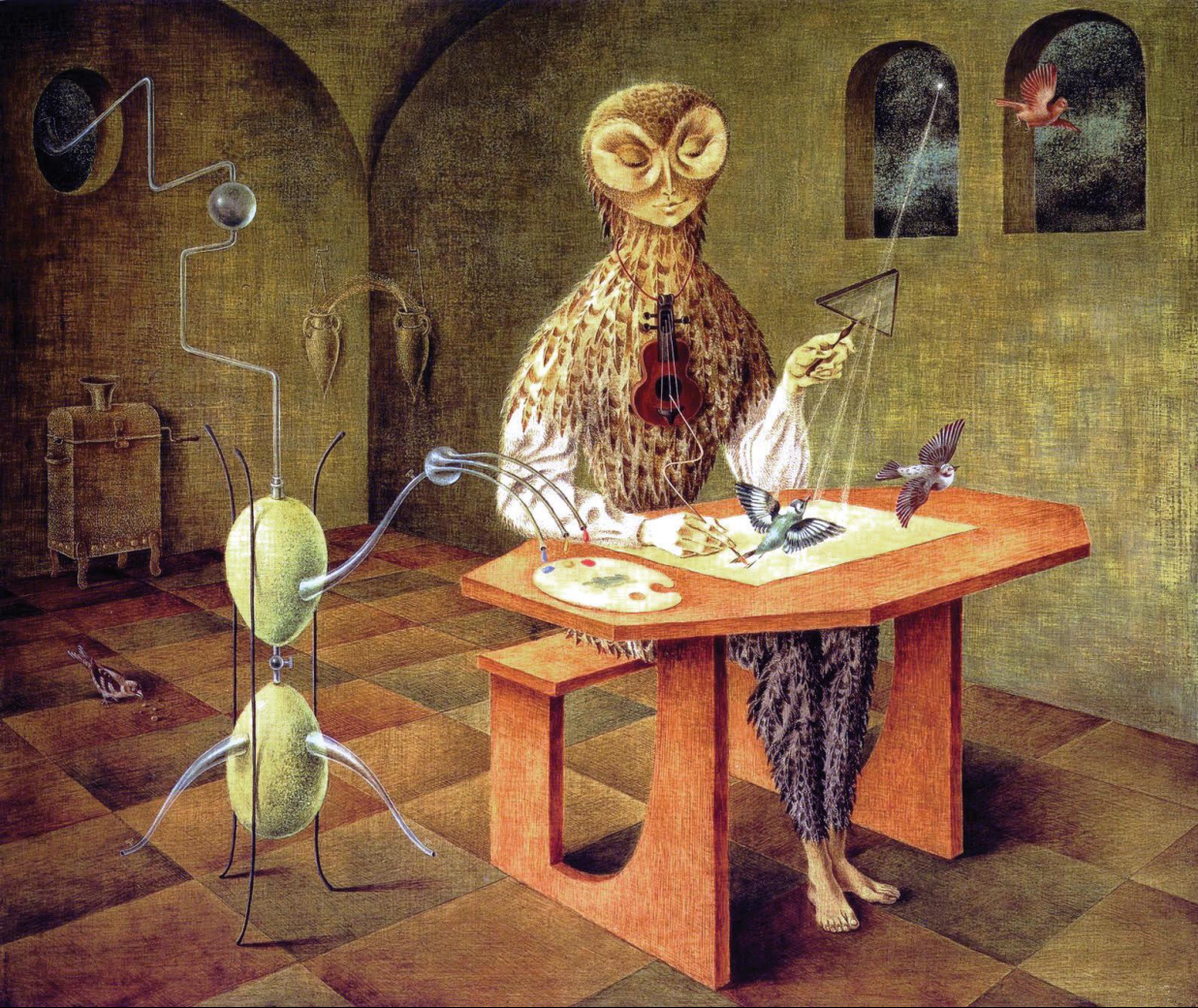
...Managerial Technologies (quality)



Dimensions of managerial practices measured:

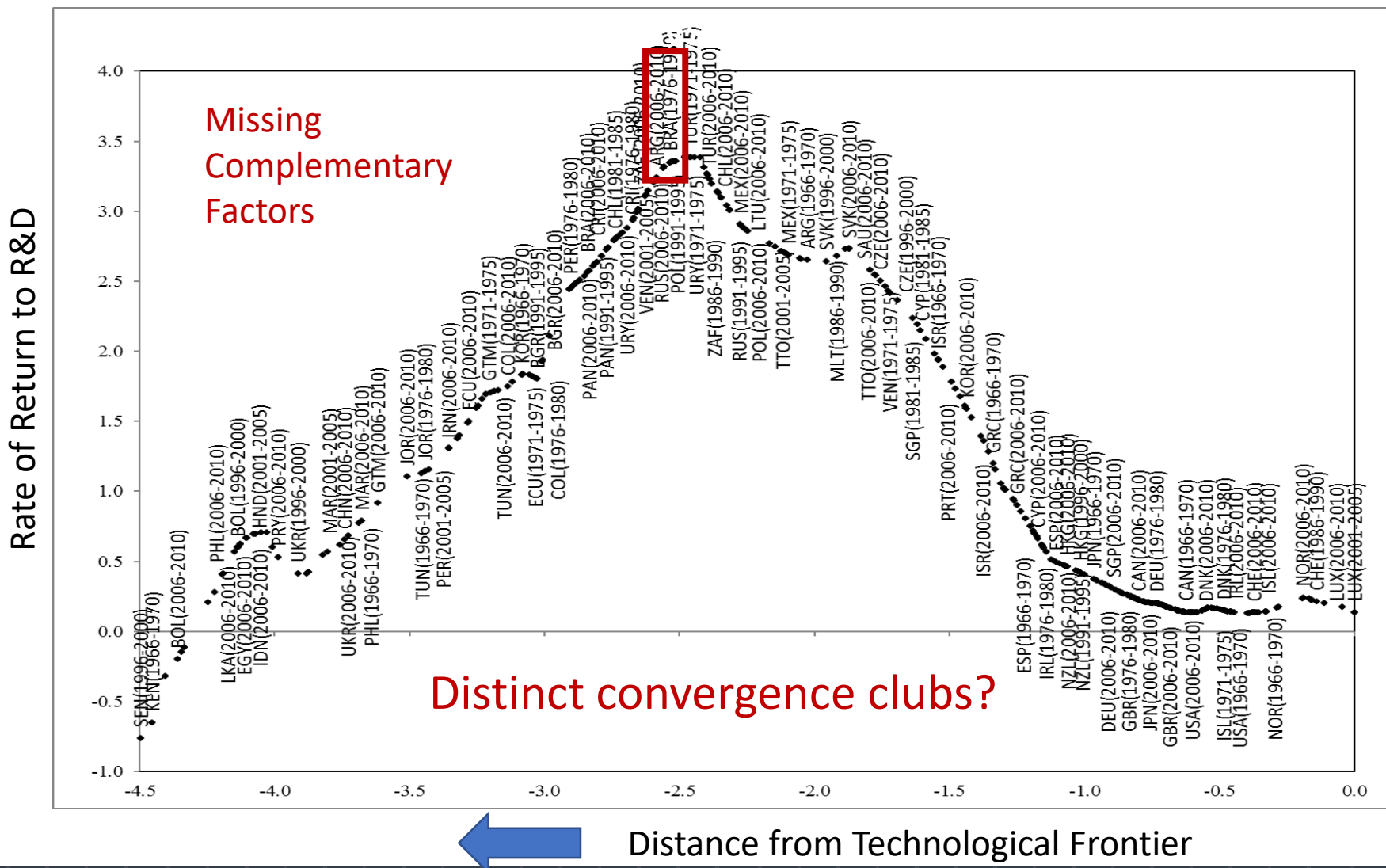
- Production
- Logistics
- Human resources
- Finance
- Marketing & sales

All essential for effective response to gov't incentives



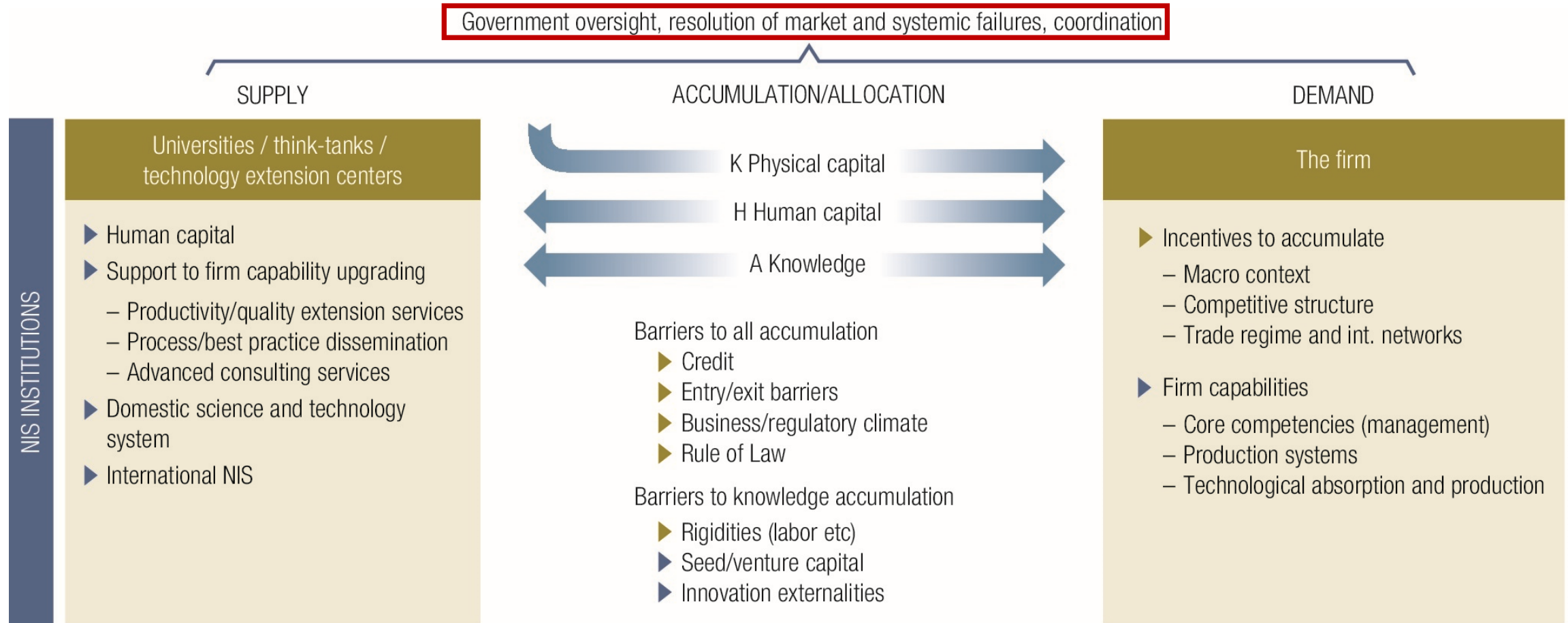
Paradox: Given returns,
why don't firms and
governments invest more
in innovation?

Maybe they don't expect high rates of return



The Expanded National Innovation System

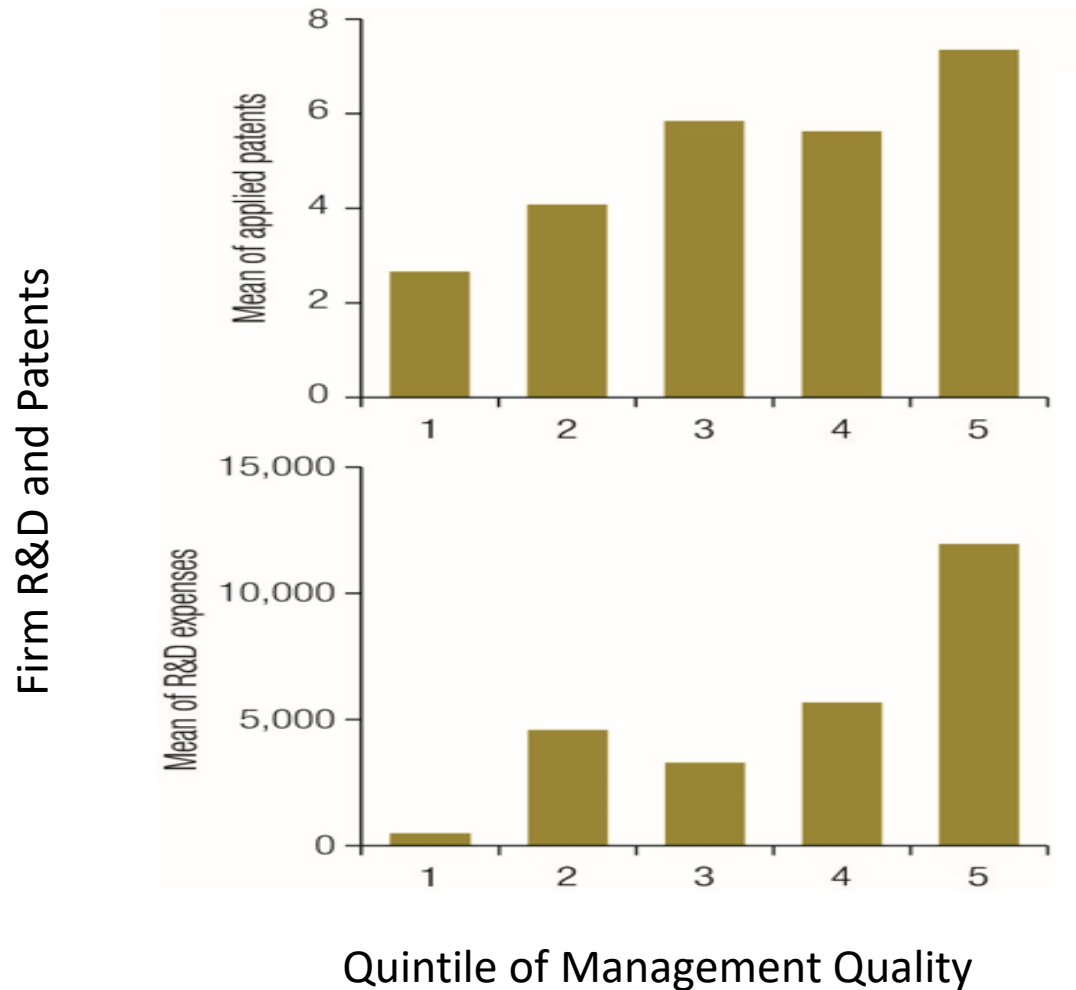
Integrated approach to innovation



Implications

- Concept of NIS must be expanded: The range of missing complements and failed markets is much larger in developing countries
- Need to reconsider how we benchmark innovation
 - R&D/GDP should be relative to other complementary factors
 - More is not better
- Firm capabilities are critical complementary factors and we focus on them

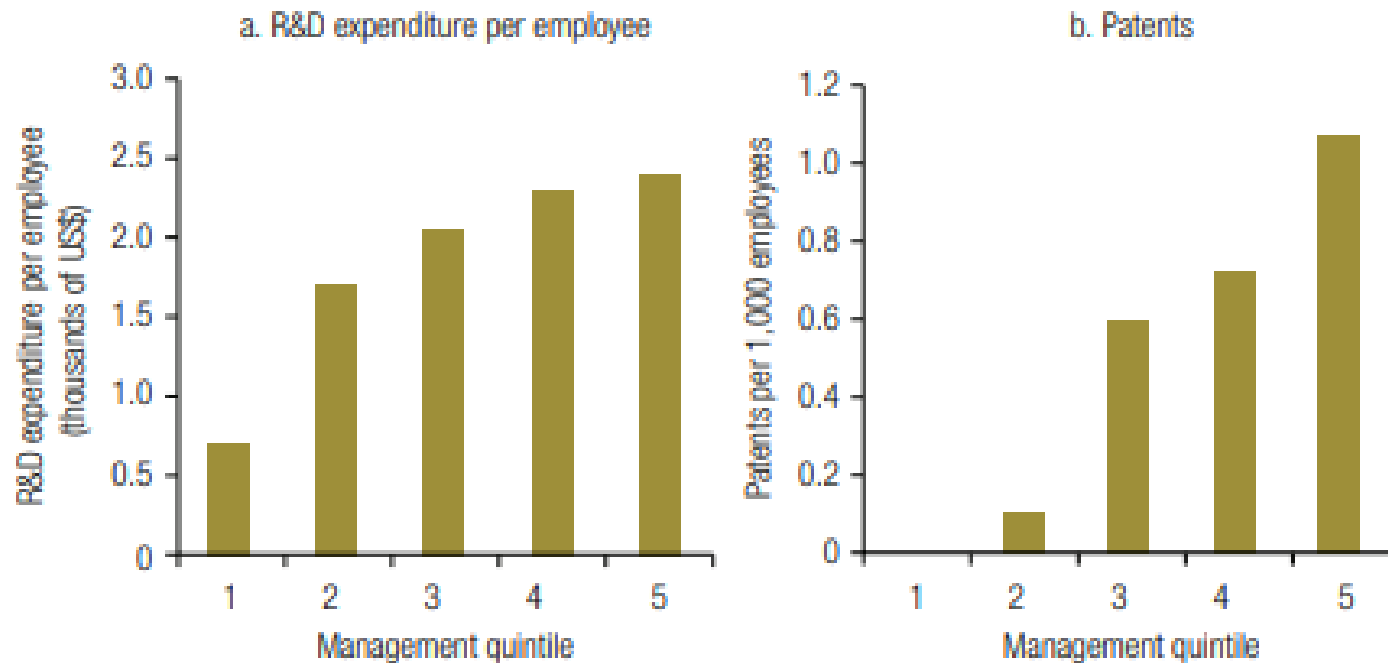
New analytics on management quality and innovation



- MQ shown to:
 - Increase productivity
 - Increase patents after controlling for R&D.
 - Increase R&D
 - Increase impact of R&D on productivity

R&D subsidies, tax write-offs without capabilities is like pushing on a string!

Firms need sound management practices as foundation for strong technological capabilities



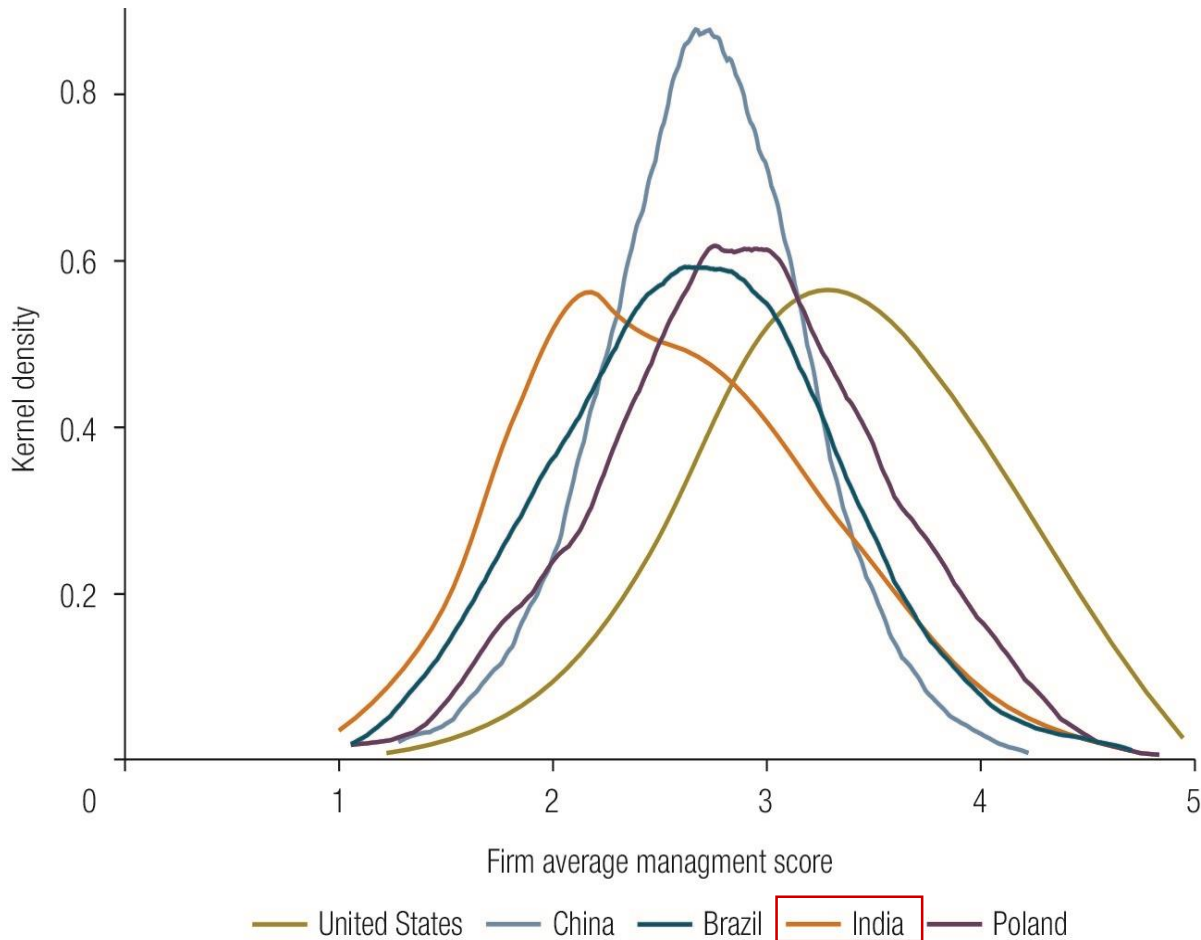
R&D subsidies, tax write-offs without capabilities is like pushing on a string!

Source: Bloom et al. 2017.

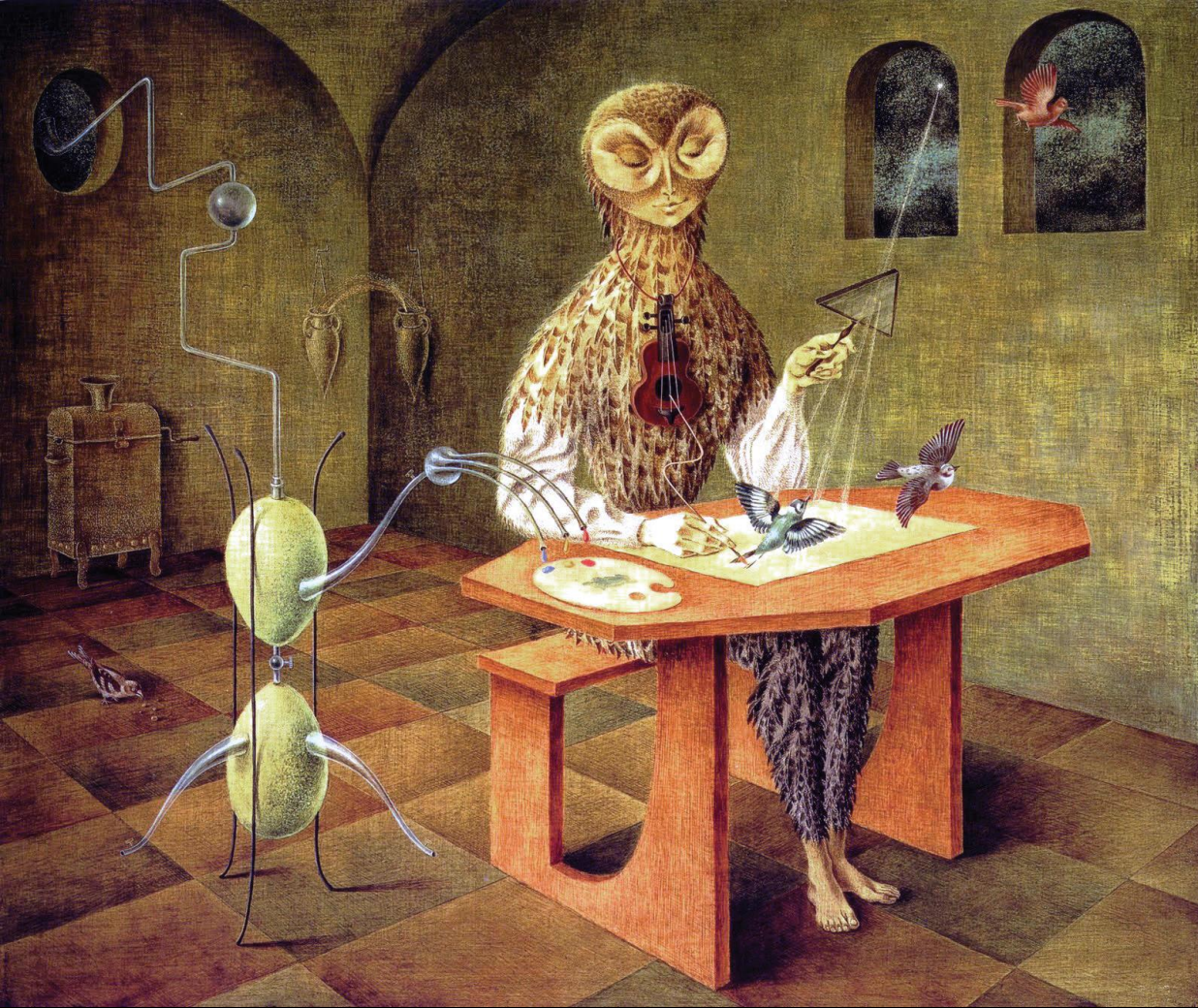
Note: R&D = research and development. Based on MOPS survey for the United States and ordered by quintile of calculated management quality.

What drives management quality?

Distribution of WMS Management Scores



- Must move whole distribution
 - Not just trimming tails
 - Best firms often lag most
- Determinants
 - Competition
 - Human capital
 - Ownership structure
 - Rule of law
 - Trade and participation in GVCs



Government Capabilities and Policy

The innovation policy dilemma

For developing countries:

- Multiplicity of market failures, missing complementary factors and institutions increase policy complexity....
-However government capabilities to design, implement, and coordinate an effective *policy mix* to manage these failures and gaps are weaker.

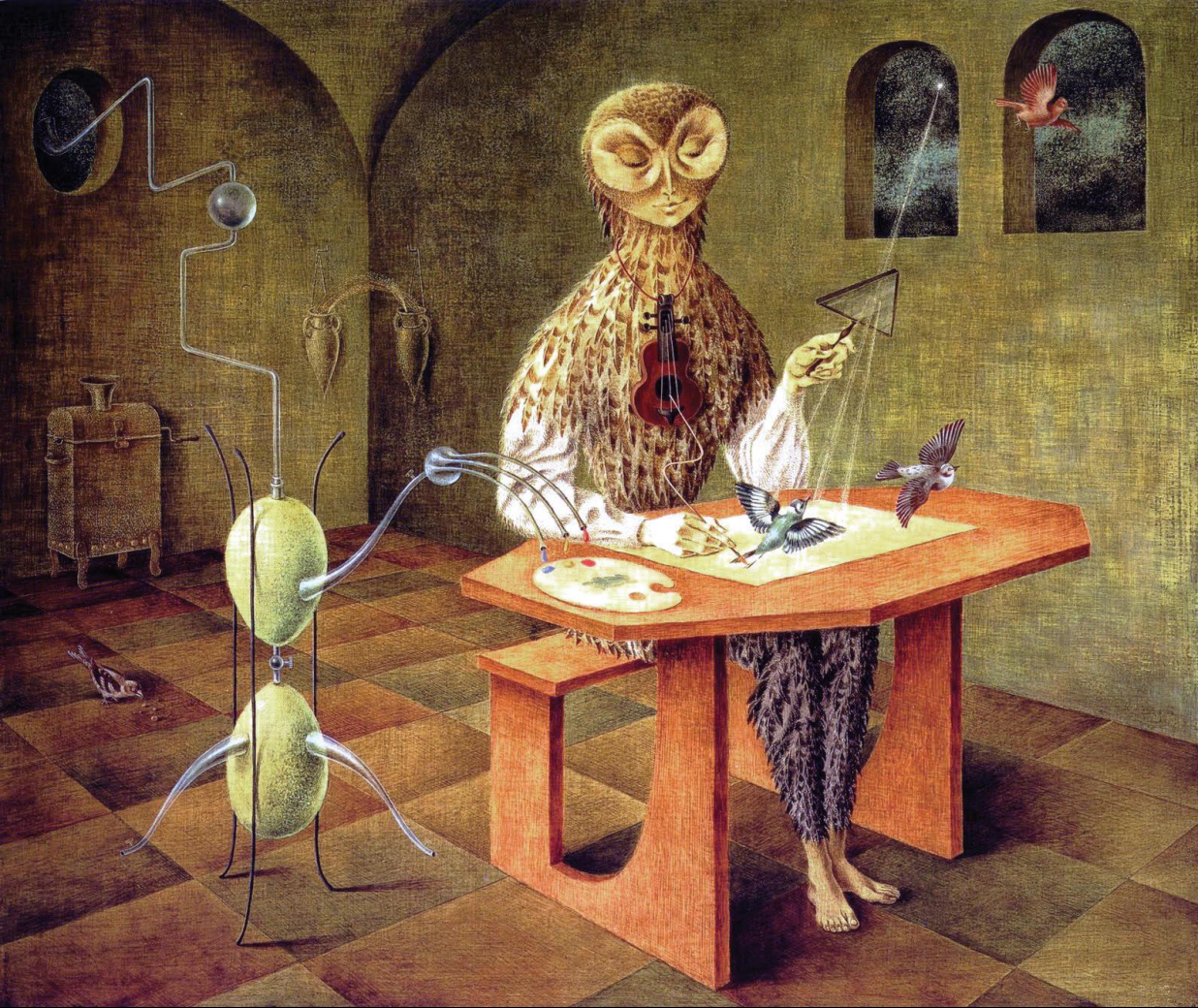
Approaching this dilemma:

- **Good practices and principles** in design and implementation
- The **capabilities escalator** - selecting of an appropriate mix of instruments for stage of technological development

Core Practices and Principles of Good Innovation Policy Making

Governments require capabilities for policy making across 4 key dimensions:

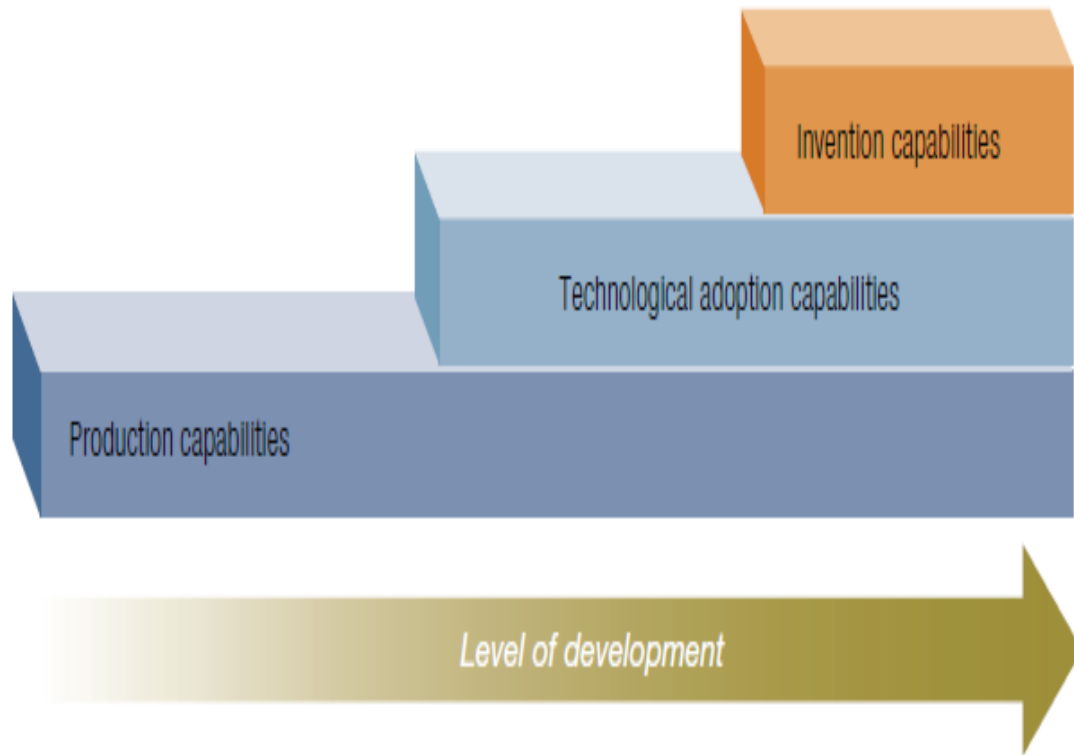
1. Rationale and design of policy
2. Efficacy of implementation
3. Coherence of policies across the NIS (iPER)
4. Policy consistency and predictability over time



Supporting Capabilities
Accumulation

Policies to lift innovation capabilities.. Teaching birds to fly

Capabilities Escalator



Public Policies

Capability Specific Interventions

Technology/ R&D centers/Universities

Science/Technology Parks

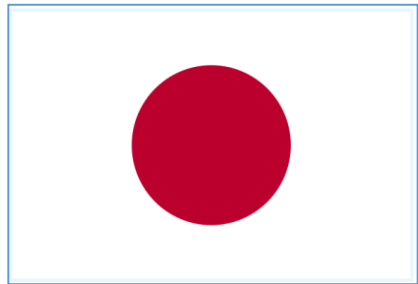
Technologic Extension Services

Business/Export Advisory Services

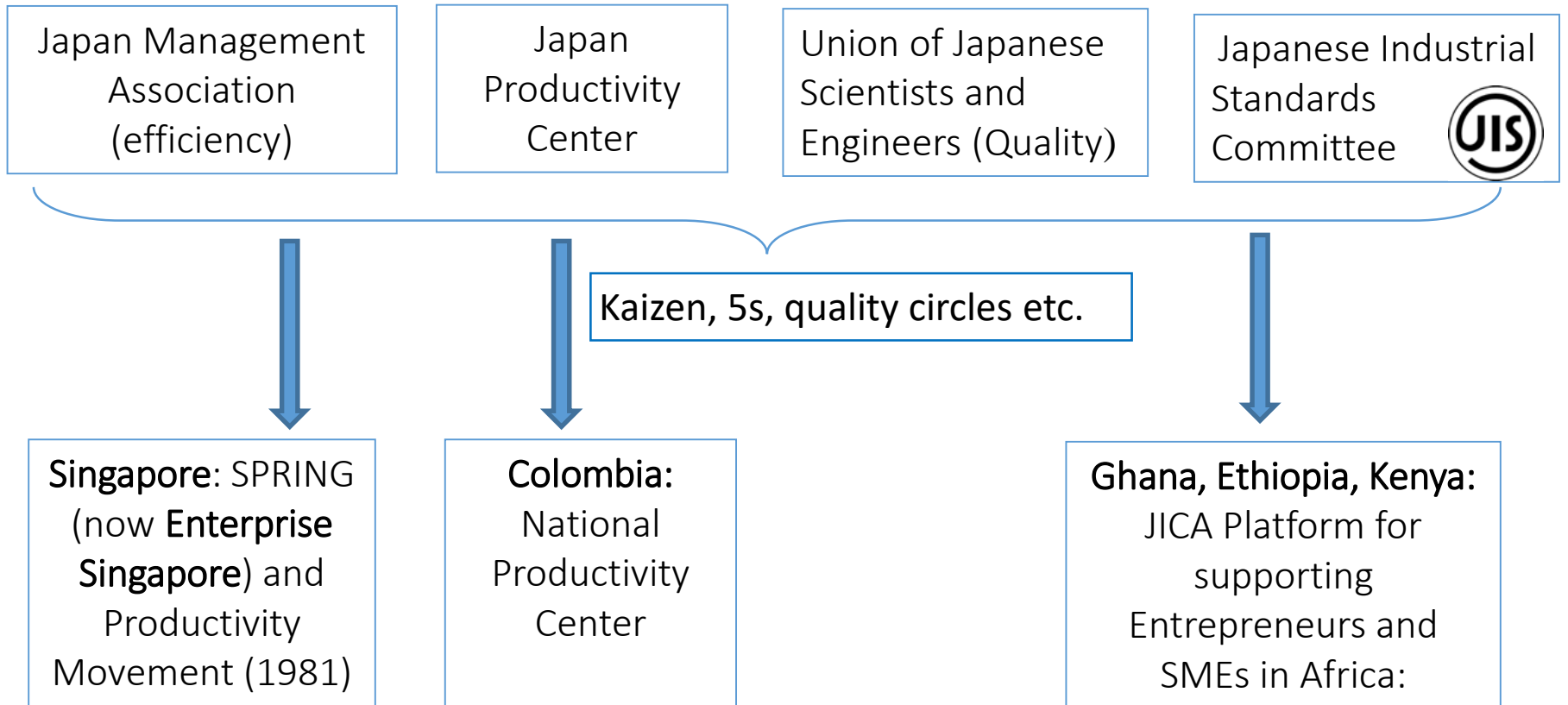
Supporting Market Reforms

Finance, Trade, Competitiveness,
Education, Training

Japanese Productivity Movement: Inspired Singapore and elsewhere.

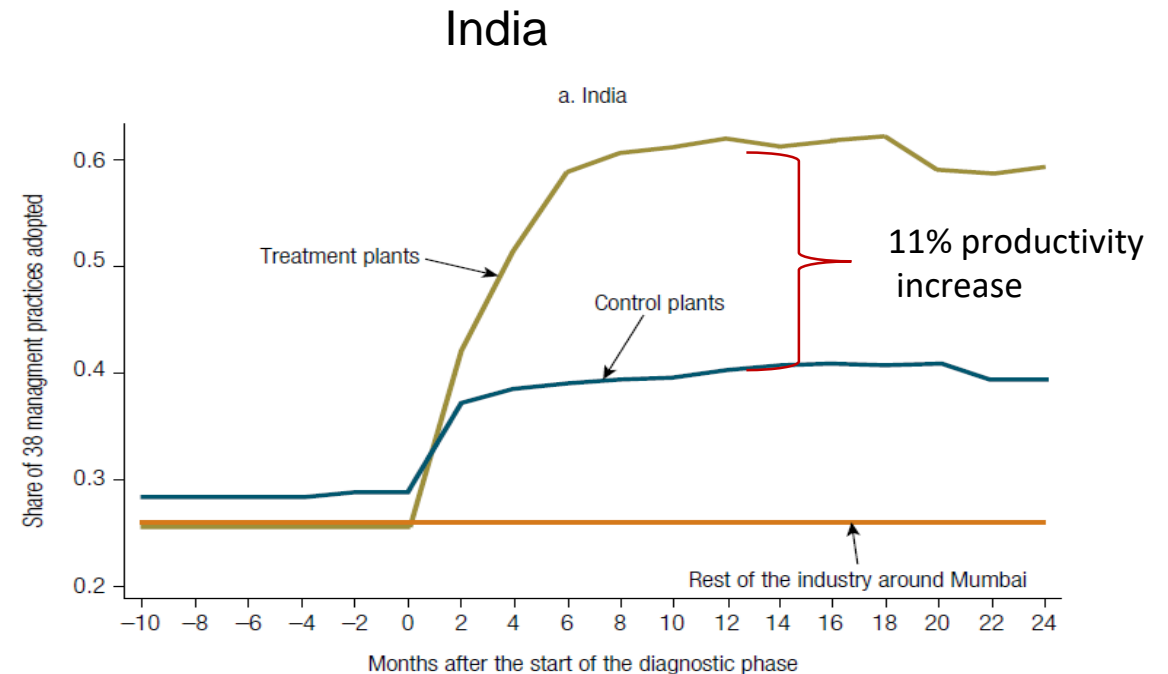


Japanese Productivity Movement (1945)



Do These Programs Work?

- **India textile sector** (Bloom et al 2013)
 - 11% increase in productivity with Accenture consulting.
- **Italy Post War** (Giorcelli 2016)
 - Sustained increase in sales, productivity and longevity for at least 15 years. Better investment decisions (machines, technology)
- In theory, can pay for themselves with higher tax revenues



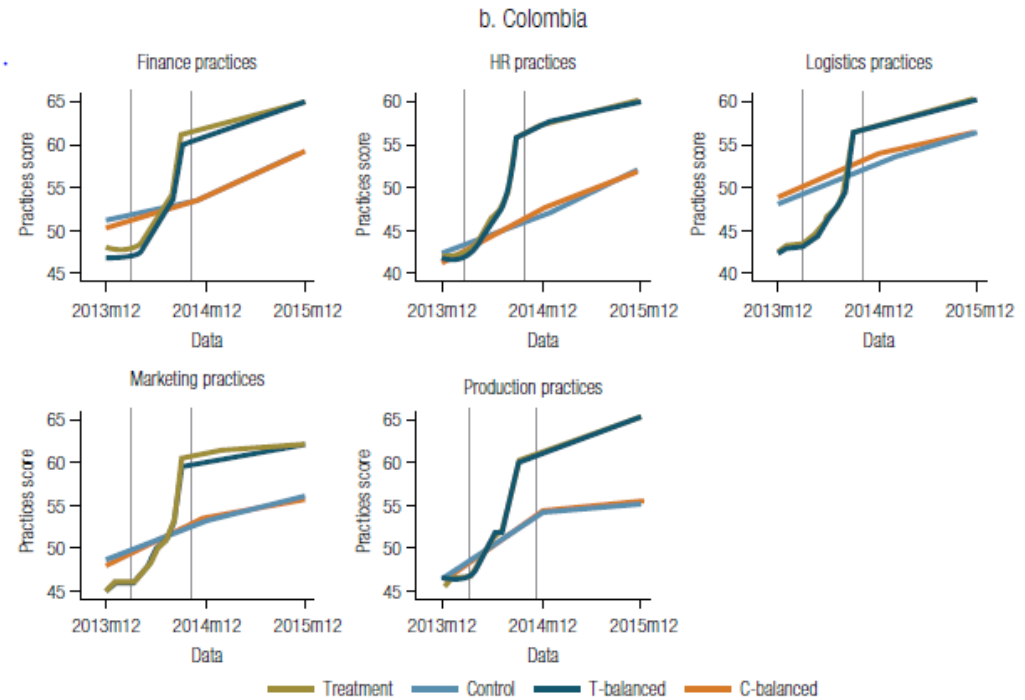
Source: Bloom et al 2013

Do These Programs Work?

- Colombia (WB: Iacovone et al 2018)
 - Increase in management practices adopted..more in group with group interventions.
 - However, design is critical
 - Group more economical
 - Private sector provision

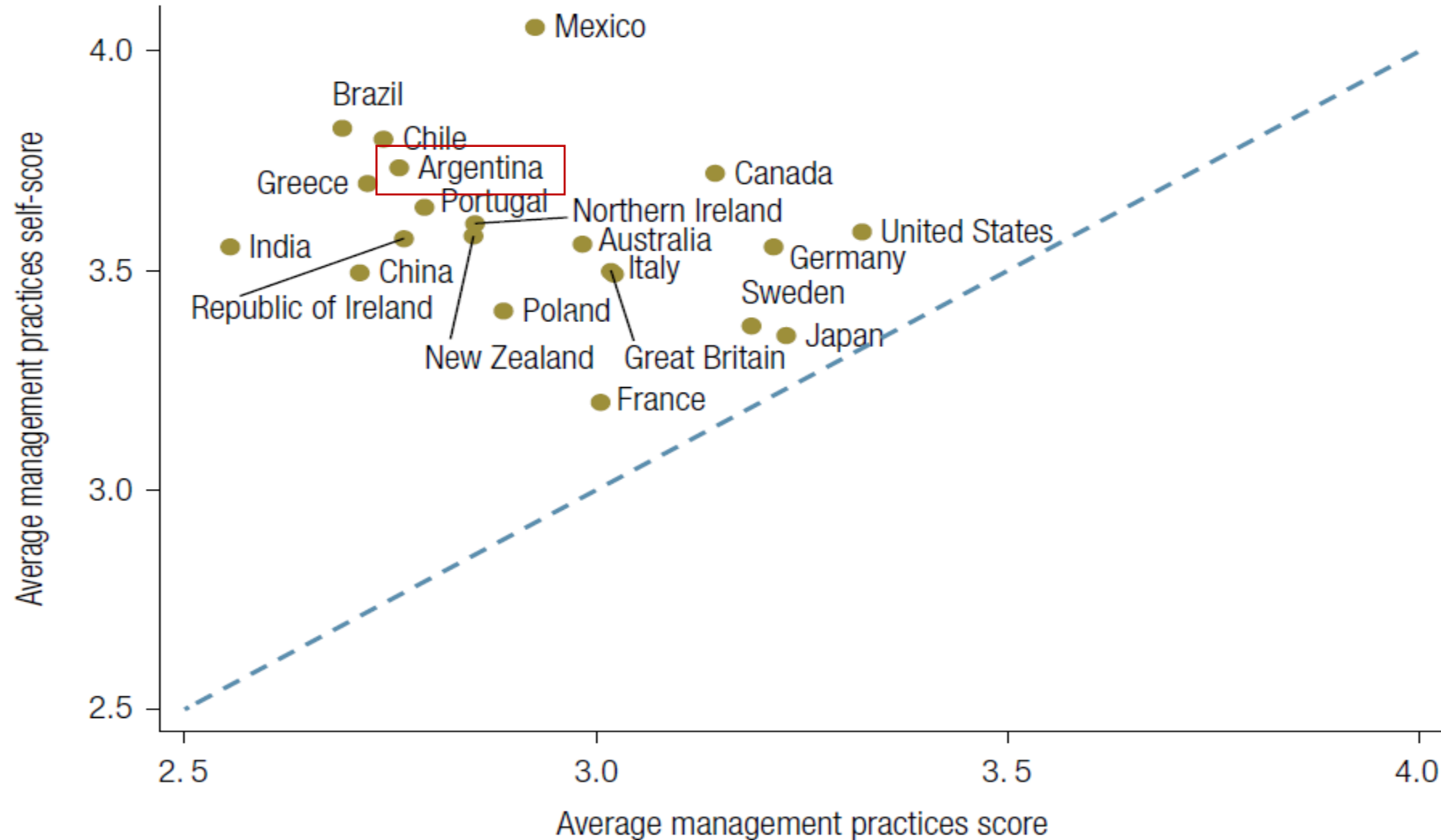
Puzzle: If returns so high, why don't firms do it by themselves?

Consulting Services Led to Better Management Practices in Colombia



Source: McKenzie et al (2018)

Firms don't know what they don't know.....

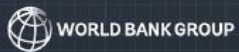


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“Fortune favors the prepared mind”
Pasteur (1854)

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