

Innovation Complementarities, Management Quality and Export Composition

W. F. Maloney

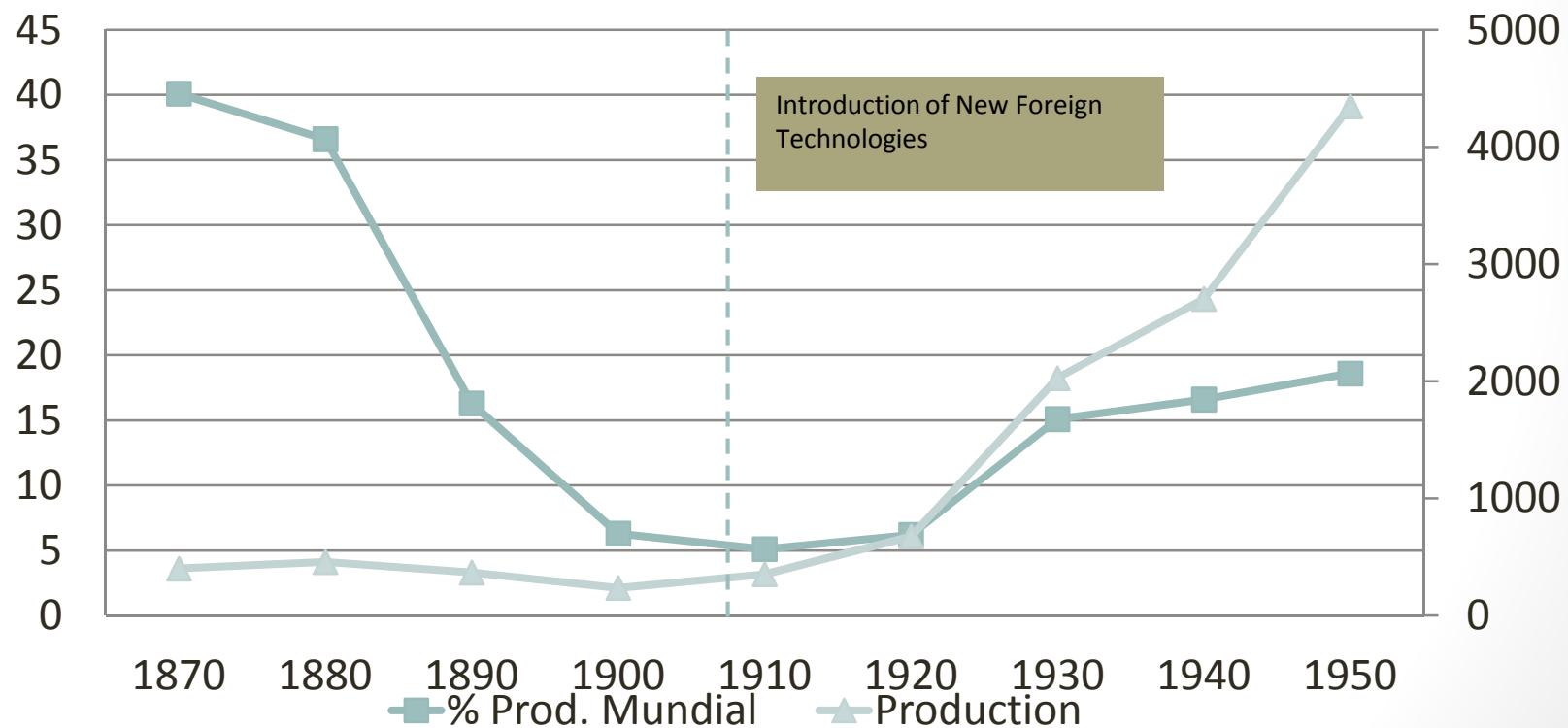
Research Department, World Bank

Ankara, December 2013

<https://openknowledge.worldbank.org/handle/10986/9371>

Ancient Latin American Growth Mystery I: Same Good, Different Outcomes

**Copper in Chile, 1870-1950:
Production and % of World Production**



Ancient LA Growth Mystery II: Same Business Climate, Different Outcomes

Percentage of Firms Managed by Immigrants

Country	Year	% Immigrant Directors/Owners
Argentina	1900	80
Chile	1880	70
Colombia (Baranquilla)	1888	60
Mexico	1935	50

Source: Maloney 2013

Structure of the Presentation

- Part I: Export Composition: is this the missing ingredient?
- Part II: Innovation: the critical agenda
- Part III: Management quality as a missing complement

Export Composition-is this the
critical ingredient?

Why might standard price signals be deceptive in choosing goods

- Marshallian externalities related to goods
 - local industry-level knowledge spillovers, input-output linkages, and labor pooling.
- Volatility externalities: Export diversification?
- Intervention warranted to shift to good with externalities against price signals.

Empirical concerns of policy makers about export composition

1. Yes, Externalities dictate that market will not generate optimal basket
2. How do we measure these externalities?
3. Doesn't the whole world see the same benefit and drive the price down? (GE)
 - Interindustry spillovers, asymmetries
 - Should we look for safe rents, too? Natural Resources
 - More generally, must think of demand side as well
4. Do externalities necessarily come with a good, or does it matter how we produce it?
 - Heterogeneity, Heterogeneity, Heterogeneity

In practice, measurement of MEs is difficult, so we take shortcuts

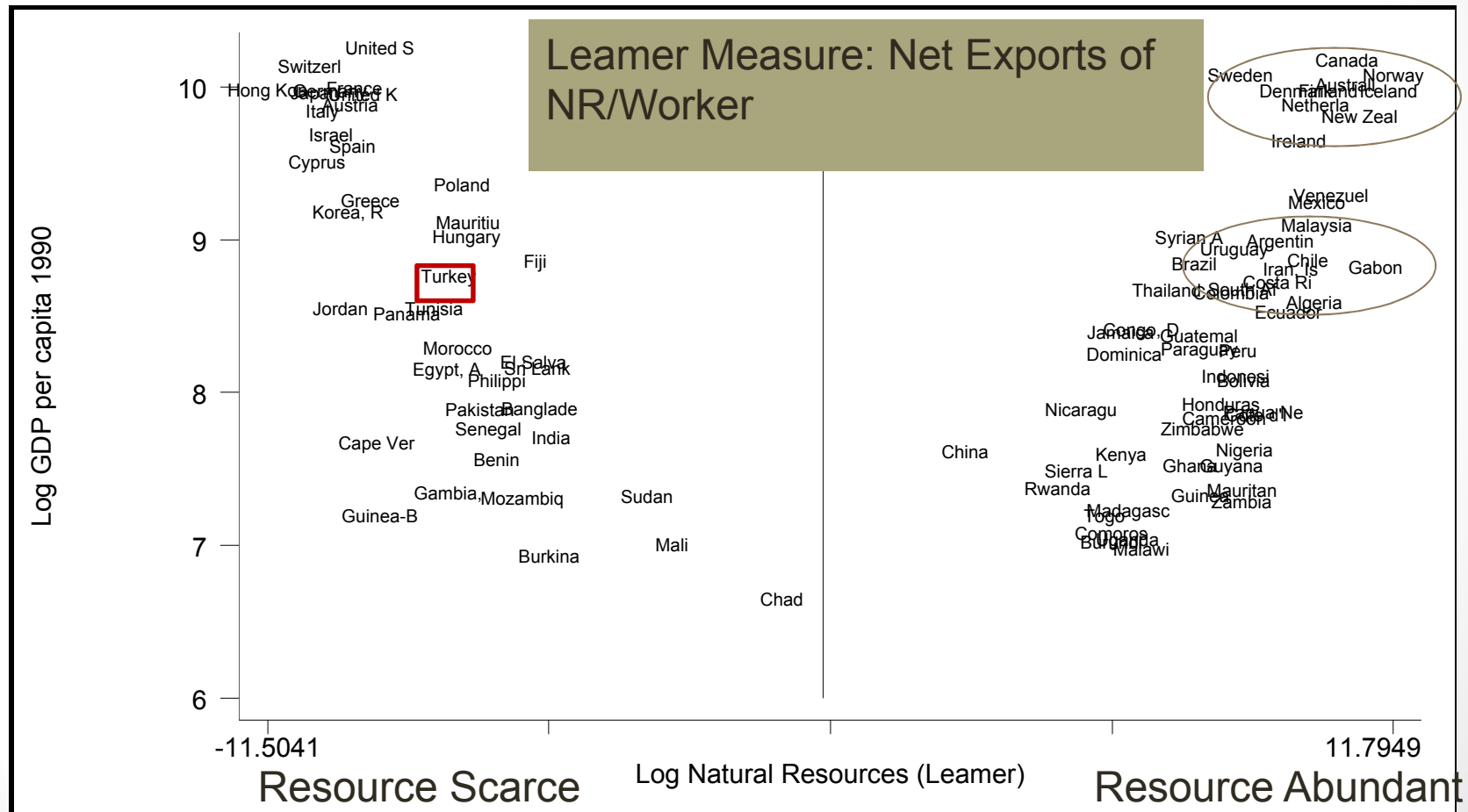
- Natural resources
 - Low productivity (Smith, Matsuyama, Sachs), few Externalities
 - Rent seeking
- High productivity goods
 - Rich Country Goods (Rodrik, Hausmann)
 - High tech (Lall) high inter-industry MEs

CURSED GOODS: NATURAL RESOURCES

Empirically, there is no resource curse

- In growth regressions
 - Minerals are good: Davis (1995), Sala-i-Martin et al. (2004), Stijns (2005), Brunnschweiler (2008, 2009)
 - Conditional on education (above 2 years of schooling): Bravo-Ortega & De Gregorio (2007)
 - Existing resource curse findings fragile: Lederman & Maloney (2007, 2008)
 - [Also, Jacob Viner and Douglass North years ago...]

There is lots of heterogeneity in experiences with NR

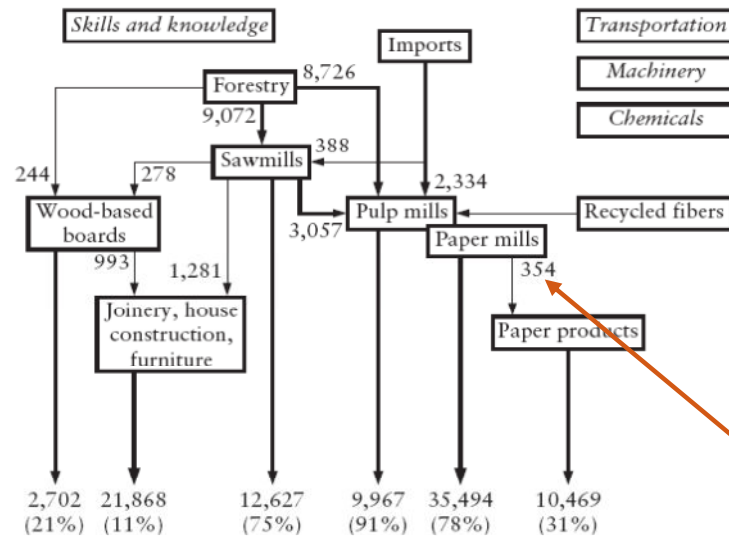


Maloney 2007

Trees can be very high tech!

Innovation policy is key

Figure 8.1 The Swedish Forest Industry Cluster



Source: Authors' calculations.

Note: Resource flows in million SEK. Figures in parentheses denote export shares.

Table 8.4 Participants in the Knowledge and Skill Cluster in the Paper and Pulp Industry (1990)

	Generation	Dissemination
Skills (Education)	Royal Technical University Chalmers Technical University University of Karlstad Swedish Pulp and Paper Research Institute	Swedish Pulp and Paper Research Institute
Knowledge (Research)	Royal Technical University Chalmers Technical University University of Karlstad Swedish Pulp and Paper Research Institute Institute of Surface Chemistry Graphical Research Laboratory Swedish Packaging Research Institute Swedish Newspaper Mills' Research Laboratory	Swedish Pulp and Paper Research Institute Institute of Surface Chemistry Graphical Research Laboratory Swedish Packaging Research Institute Swedish Newspaper Mills' Research Laboratory

Sources: Ds 1991:62, Statistical Yearbook of Forestry 1993, Handbook of the Northern Wood Industries 1991/92.

Nokia: Site of an early pulp mill in Finland

Learn how to learn

HIGH PRODUCTIVITY GOODS

Does It Matter What We Export?

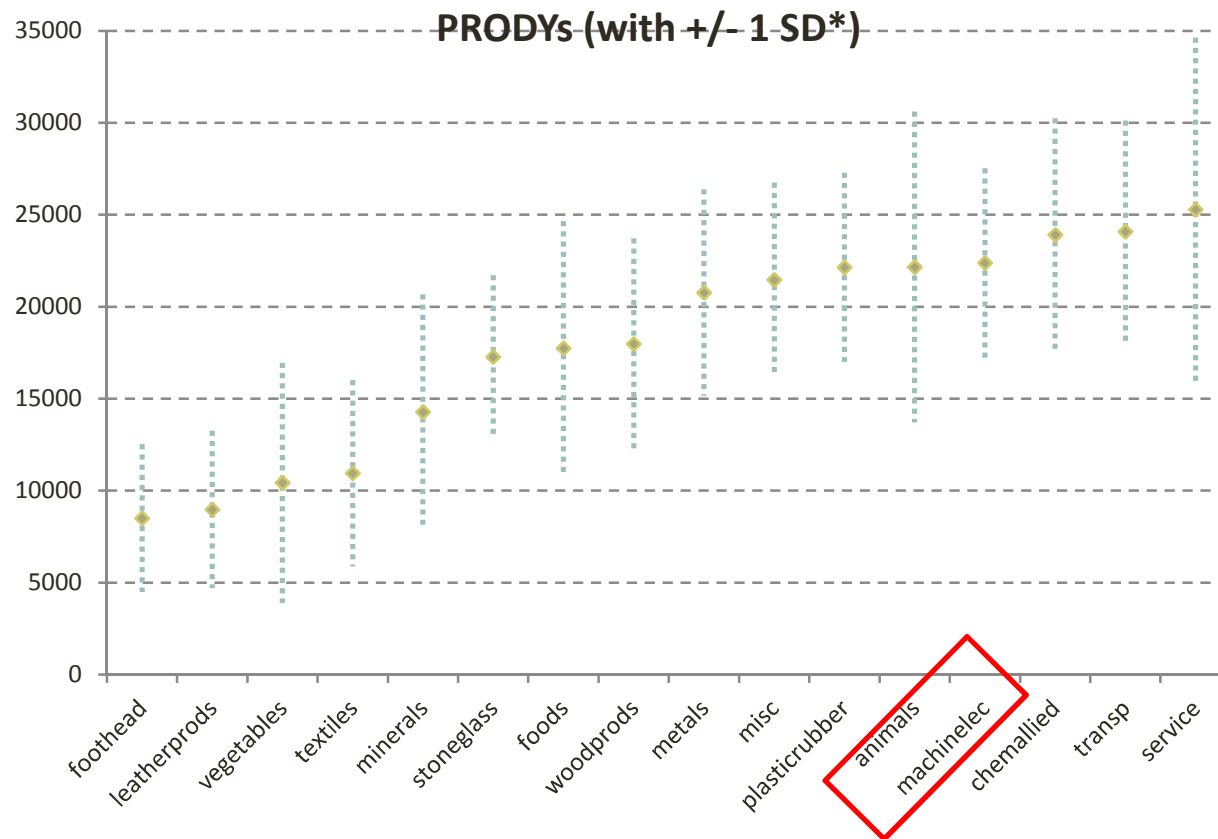
Hausmann, Hwang, Rodrik (2007)

- Model- broadly inter-industry spillover
 - Country should produce the highest productivity good *within its CA*
- Empirics:
 - PRODY= avg. income of countries producing good
 - EXPY= income value of our export basket
 - Similar to Lall (2000)
 - Find higher EXPY correlated with higher growth.

Caveats

- GE critique again?
- Rents- higher where rich countries already are?
 - Not generally the case- Nokia and TVs
 - If easy to move into these goods, then barriers to entry/rents low
- Empirical findings muddy
 - Animals, electrical machinery same PRODY

Again, high degree of heterogeneity



Caveats

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 - Not generally the case- Nokia and TVs
 - If easy to move into these goods, then barriers to entry/rents low
- Empirical findings muddy
 - Animals, electrical machinery same PRODY
 - Finding of an impact on growth fragile

Empirically, some support for MODEL

Growth Regressions								
	Base: HHR Regressions		Including the Export Herfindahl and the Investment Share		With Income Average Value		Including the Export Herfindahl and the Investment Share	
	IV	GMM	IV	GMM	IV	GMM	IV	GMM
Log (initial gdp)	-0.0382*** (0.01)	-0.0203** (0.01)	-0.0414* (0.02)	-0.0177 (0.01)	-0.0166* (0.01)	-0.0177 (0.04)	-0.028 (0.02)	0.0215 (0.03)
Log (expy)	0.0925*** (0.02)	0.0532** (0.02)	0.107 (0.07)	-0.00687 (0.03)	0.102*** (0.02)	0.0504** (0.02)	0.124 (0.08)	0.00275 (0.03)
Category Log (expy)					-0.0577*** (0.02)	-0.00566 (0.10)	-0.0431 (0.03)	-0.119 (0.08)
Log (primary schooling)	0.00468* (0.00)	0.00565 (0.01)	0.00271 (0.00)	0.0101 (0.01)	0.00394 (0.00)	0.00582 (0.01)	0.00207 (0.00)	0.00958 (0.01)
Log (Investment Share)			0.0111* (0.01)	0.0360** (0.02)			0.00935 (0.01)	0.0566*** (0.02)
Root Herfindal Index			0.0551 (0.06)	-0.0381 (0.04)			0.0615 (0.06)	-0.0283 (0.04)
Constant	-0.426*** (0.10)	-0.250* (0.13)	-0.572 (0.44)	0.14 (0.18)	-0.186* (0.10)	-0.199 (0.47)	-0.449 (0.40)	0.699 (0.46)
Observations	285	285	285	285	285	285	285	285
Number of wbgroup		75		75		75		75

Regressions include decade dummies

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1b. A digression on Monkeys

- Being a tree in a dense area is like a ME with same GE concerns
- If easy to jump from one tree to others, then easy to jump to, i.e, no barriers to entry and rents
- Is past a good predictor?
 - iPhone didn't exist, Saab already does
 - Would Chilean forestry produce Saab?

IS IT WHAT WE PRODUCE, OR HOW?
BEYOND GOODS

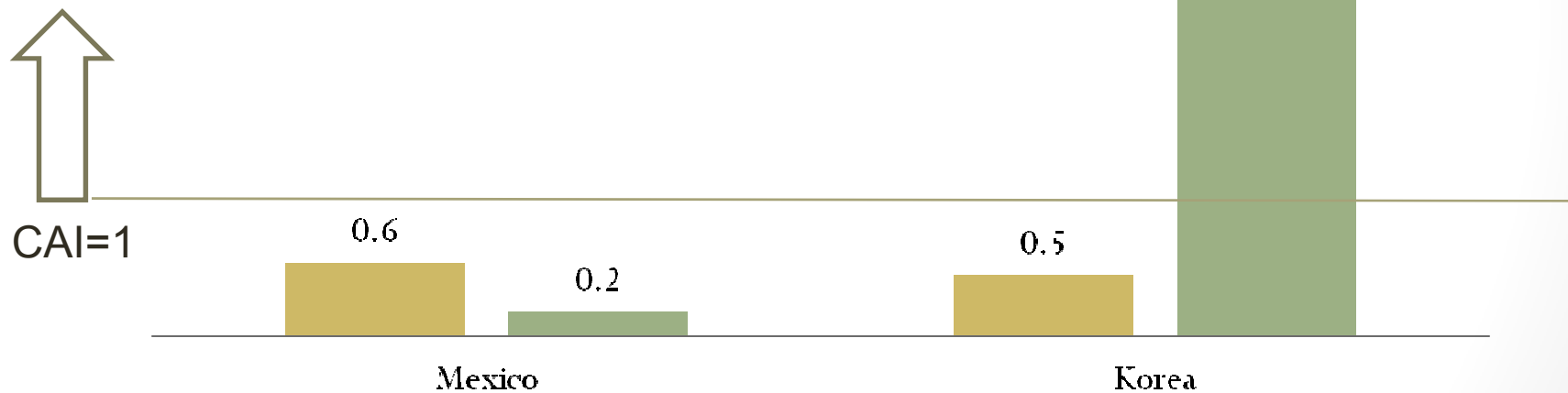
Is High Tech Necessarily High Tech?



Comparative Advantage in Innovation: Electronics

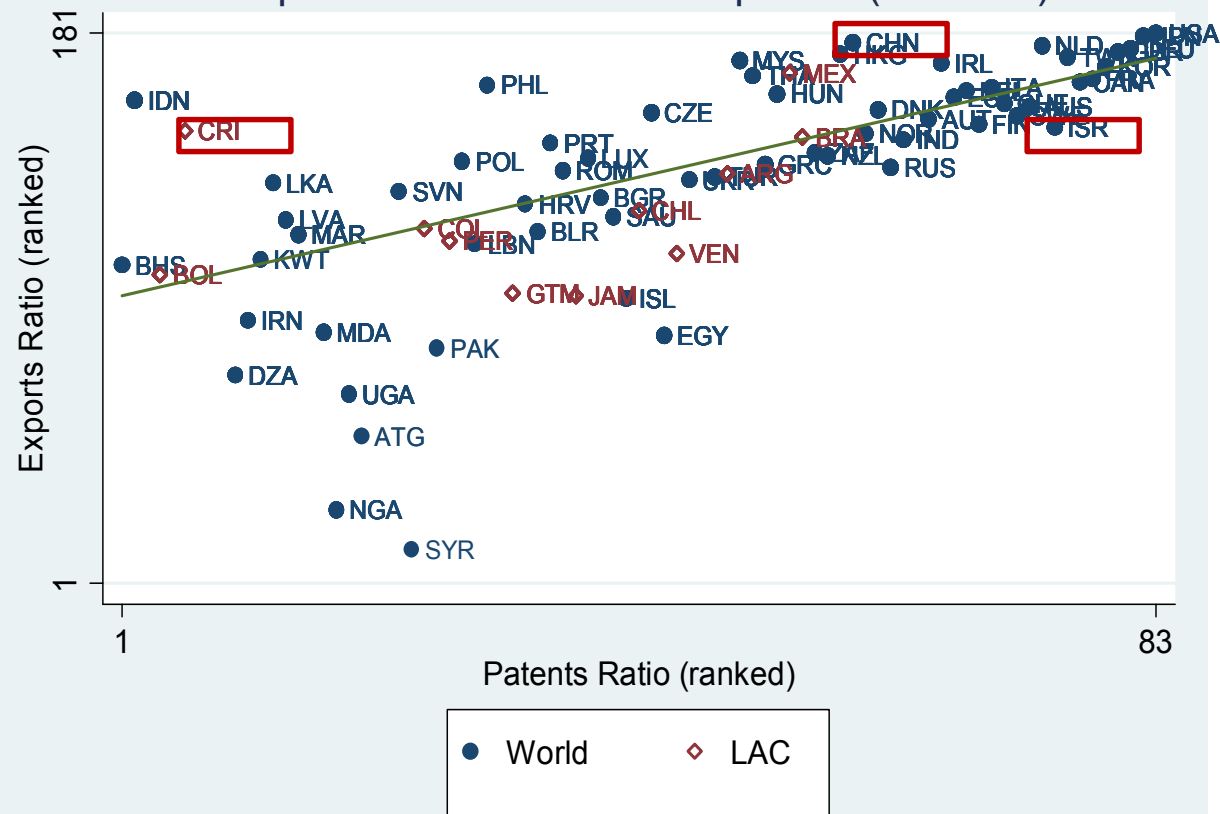


■ 1980 ■ 2000

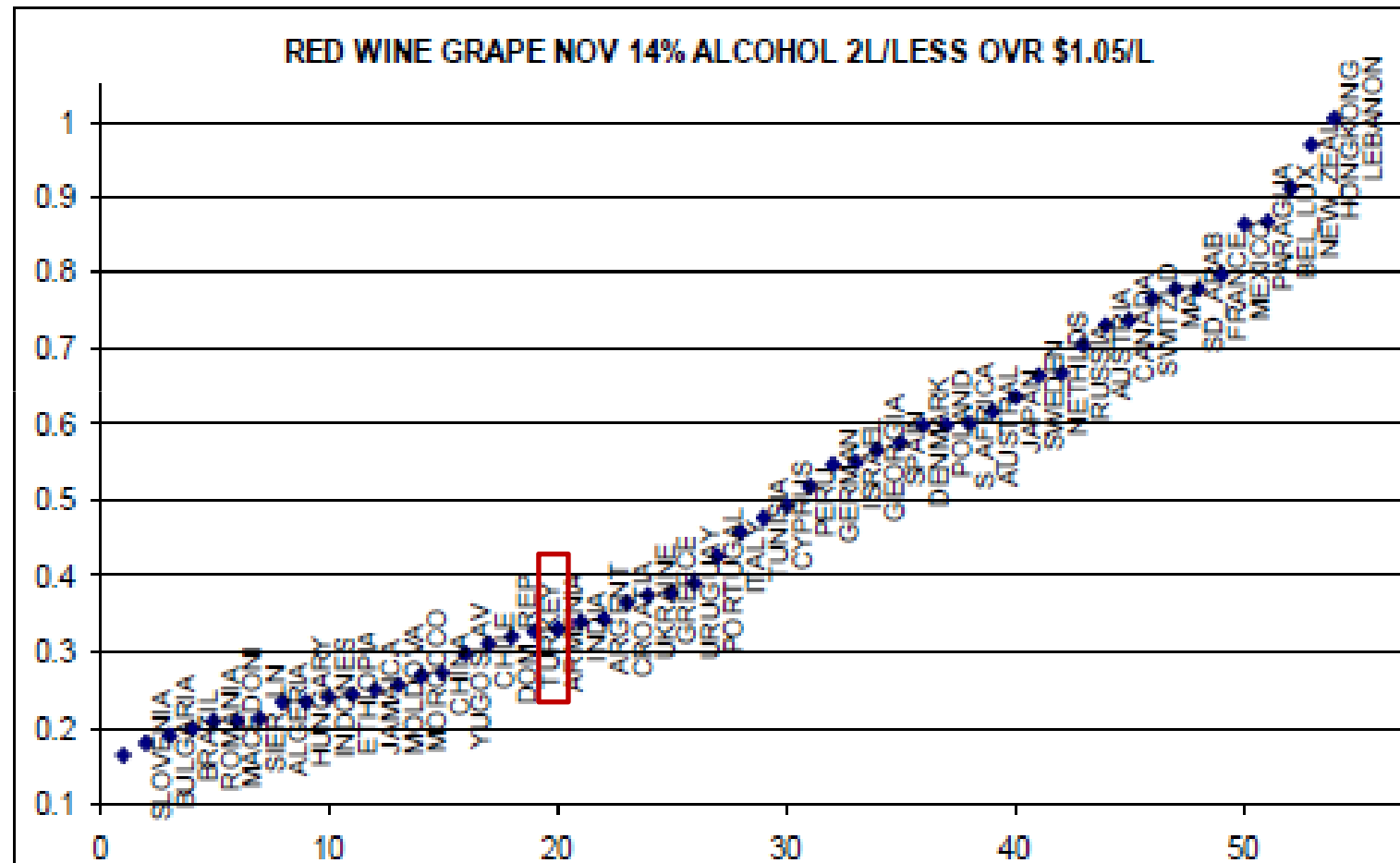


Fuente: Lederman and Maloney (2012)

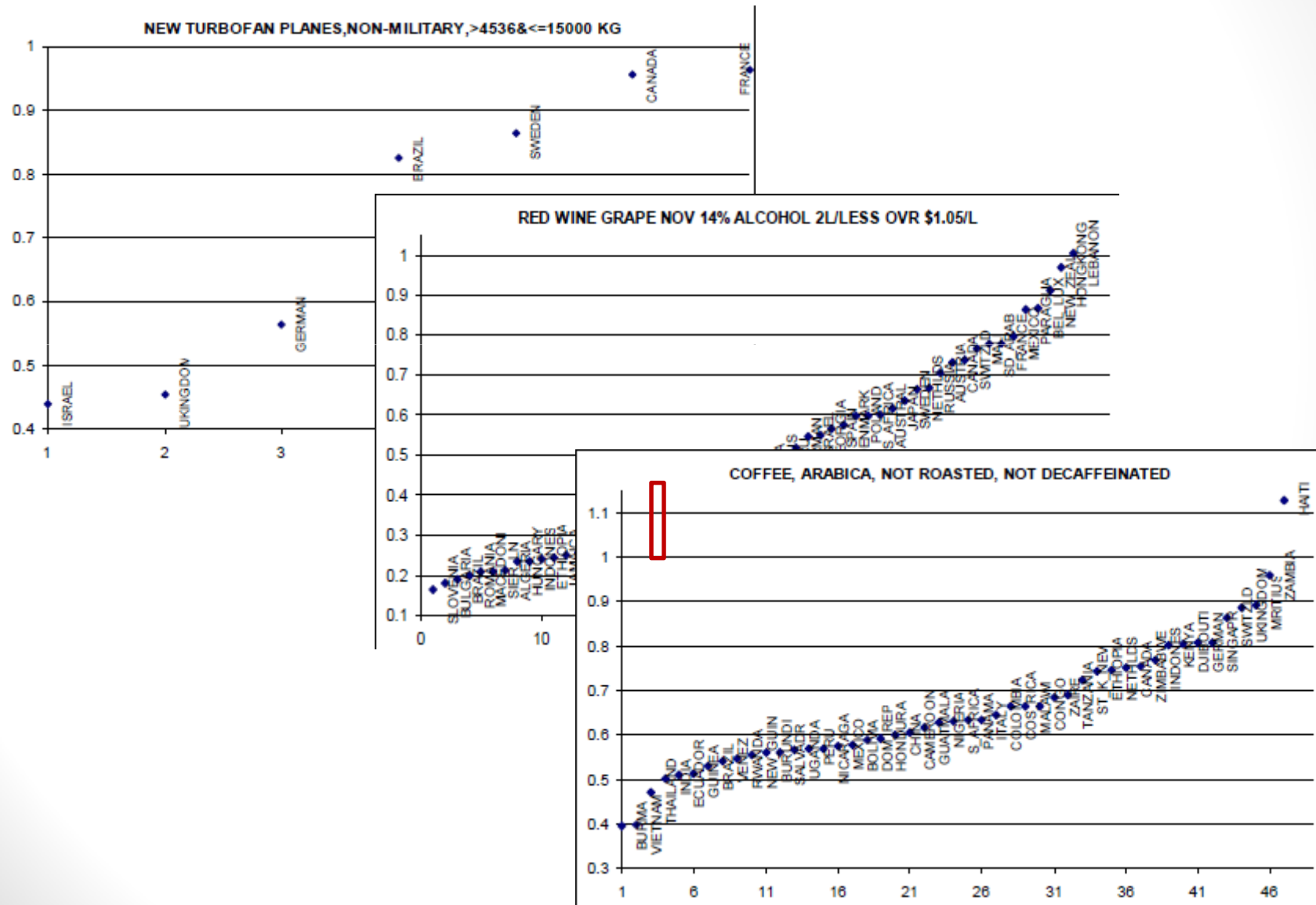
Exports vs Patents in Computers (SIC 357)



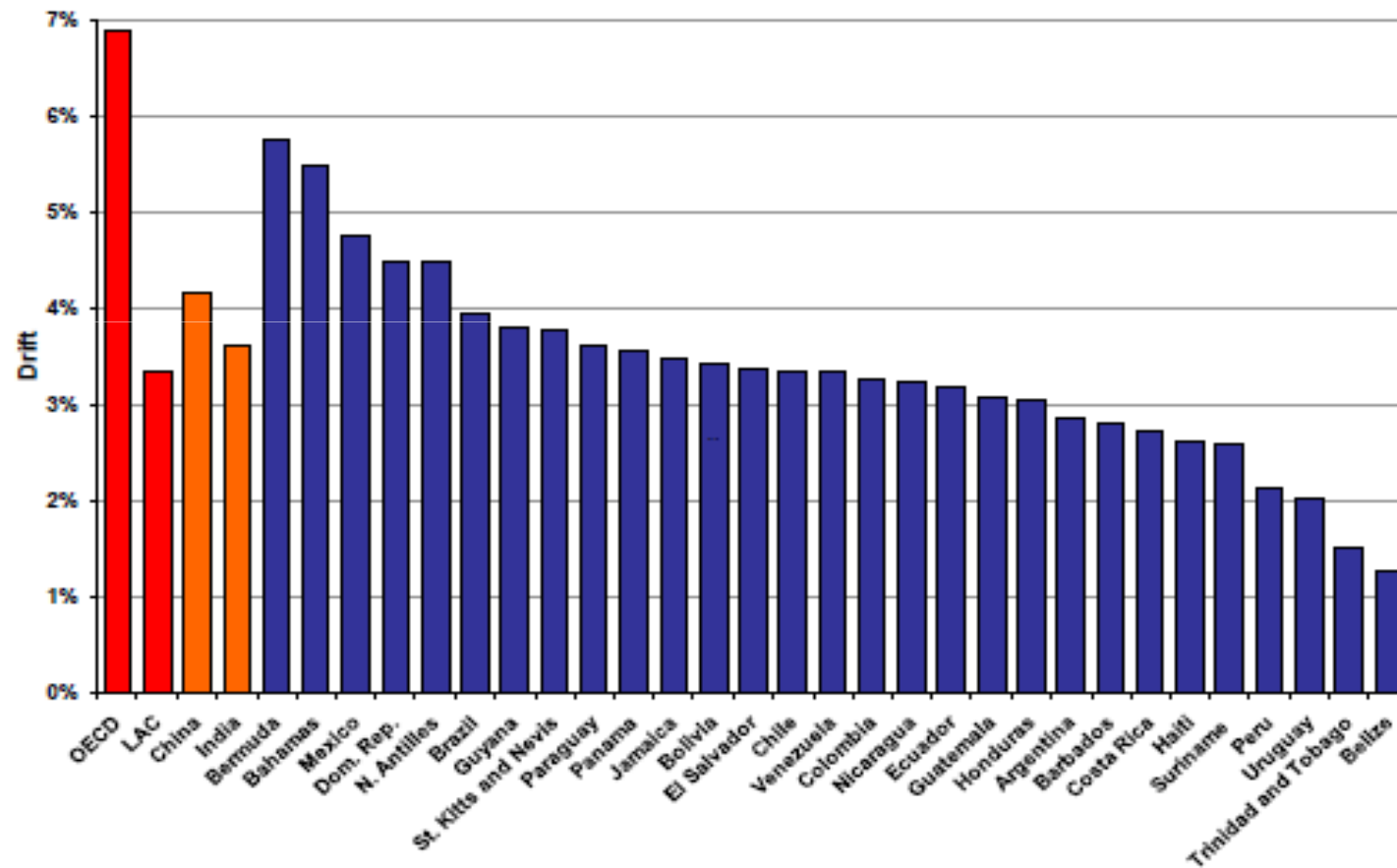
Heterogeneity in product quality is also huge (relative unit values, standardized)



Quality ladders by product and countries (relative unit values, standardized)

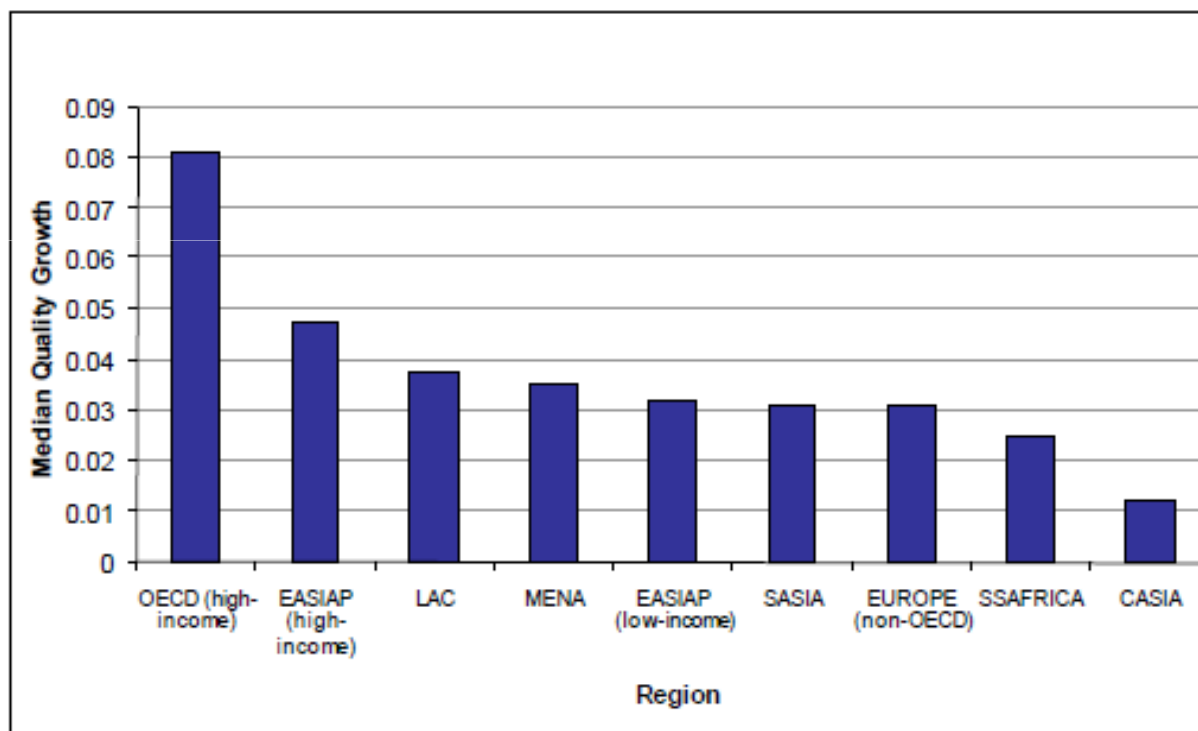


Export Quality Growth



Growth in Quality Driven by Both What and How

Figure 6.2a Quality Growth by Region 1990-2001



Source: Krishna and Maloney 2011

GOODS OR TASKS

Goods or Tasks: Does China really export the iPod?

Table 2 China: 10 Exports with the Lowest Domestic Value Added

Electronic computer	4.6
Telecommunication equipment	14.9
Cultural and office equipment	19.1
Other computer peripheral equipment	19.7
Electronic element and device	22.2
Radio, television, and communication equipment	35.5
Household electric appliances	37.2
Plastic products	37.4
Generators	39.6
Instruments, meters and other measuring equipment	42.2

China: 10 Exports with the Highest Domestic Value Added

Agriculture, forestry, animal husbandry and fishing machinery	81.8
Hemp textiles	82.7
Metalworking machinery	83.4
Steel pressing	83.4
Pottery, china and earthenware	83.4
Chemical fertilizers	84.0
Fireproof materials	84.7
Cement, lime and plaster	86.4
Other non-metallic mineral products	86.4
Coking	91.6

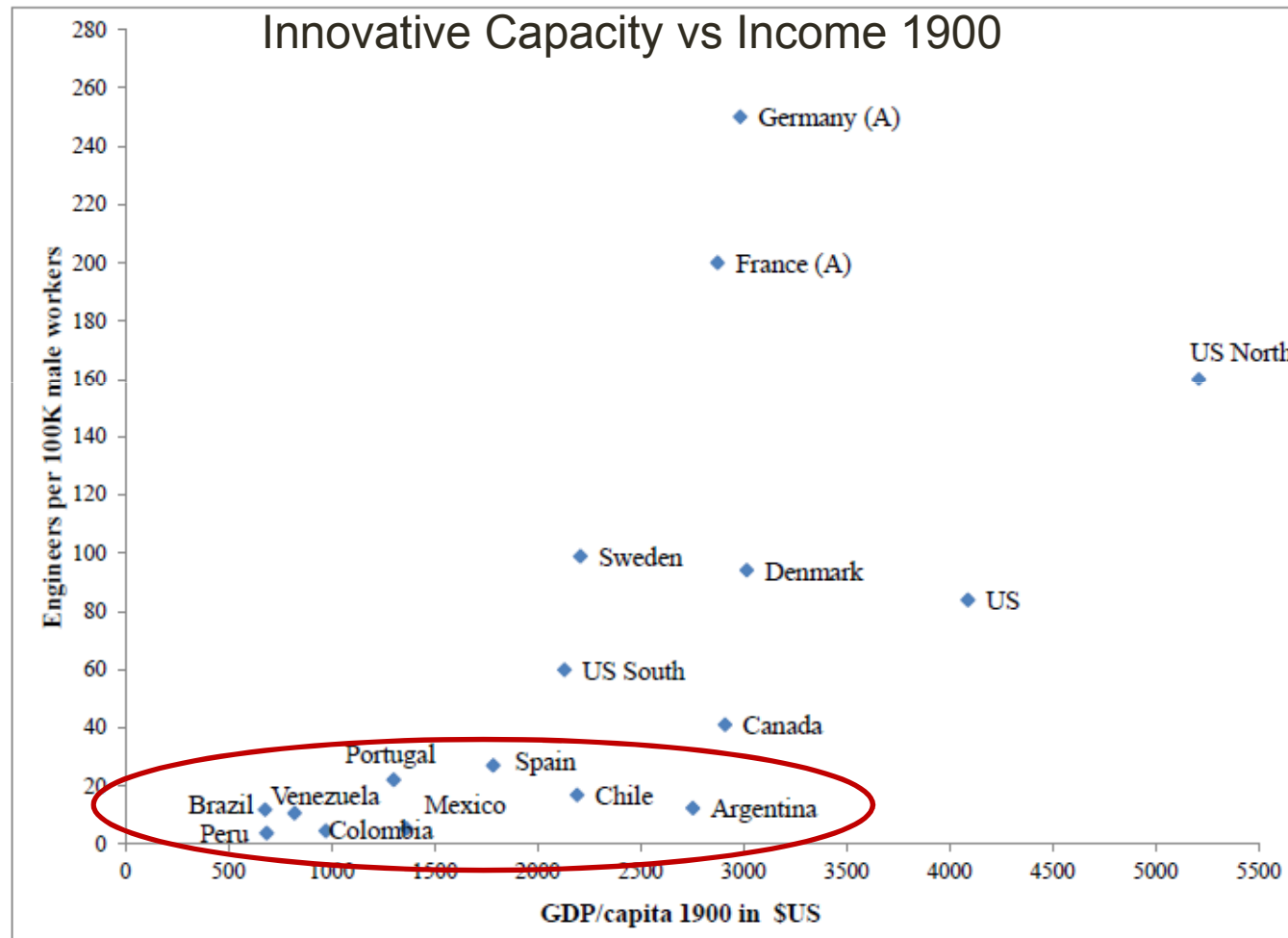
Source: Koopmans, Wang, and Wei (2008).

“..the electronic components we make in Singapore require less skill than that required by barbers or cooks, involving mostly repetitive manual operations”

Goh Keng Swee, Minister of Finance Singapore (1972)

Innovation: The Critical Agenda

Weak innovative capacity meant LA missed the 2nd Industrial Revolution



Source: Maloney y Valencia (2013)

Current literature focusing on R&D is not credible...

Estimated returns to R&D are very high...

- ▶ US firm level/industry data- social returns
 - ▶ Grilliches and Lichtenberg (1984) 71%
 - ▶ Terleckyj 1980, Scherer (1982) >100%
 - ▶ Griffith, Redding, Van Reenen (2004) 57%
 - ▶ Jones and Williams (1998) 28%
- ▶ X country
 - ▶ Coe and Helpman (1995) G7 123%
 - ▶ Van Pottlesberghe and Lichtenberg (2001) G7 68%
- ▶ ...And imply social rates of return far above private
 - ▶ Jones and Williams (1998): US should quadruple investment in RD

...and get higher with distance from the frontier

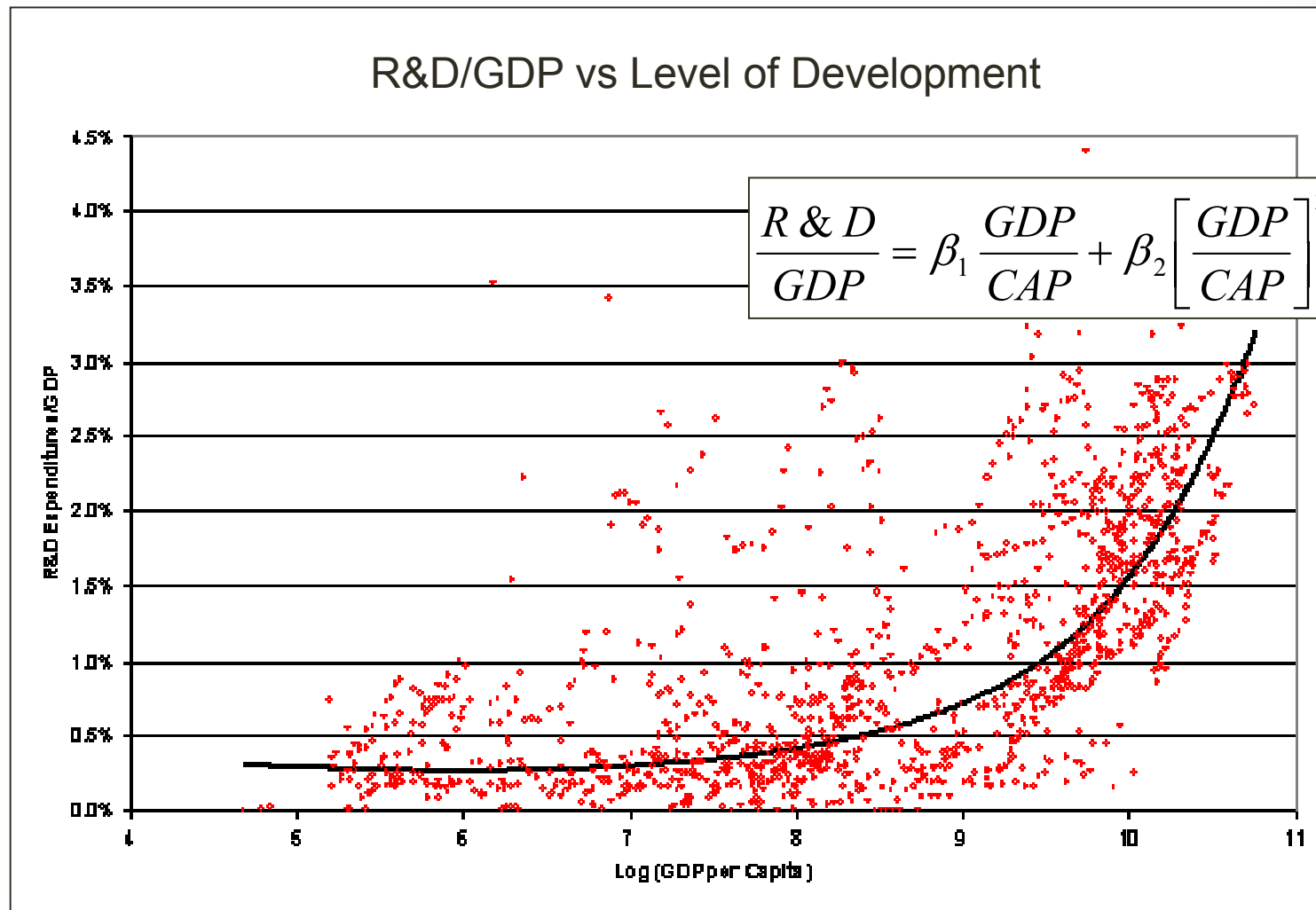
- ▶ Two Faces of R&D (Cohen and Levinthal 1989)
 - ▶ Invention
 - ▶ Learning\Catch-up
 - ▶ Poor countries should have much greater returns

- ▶ Griffith, Redding, Van Reenen (2004)

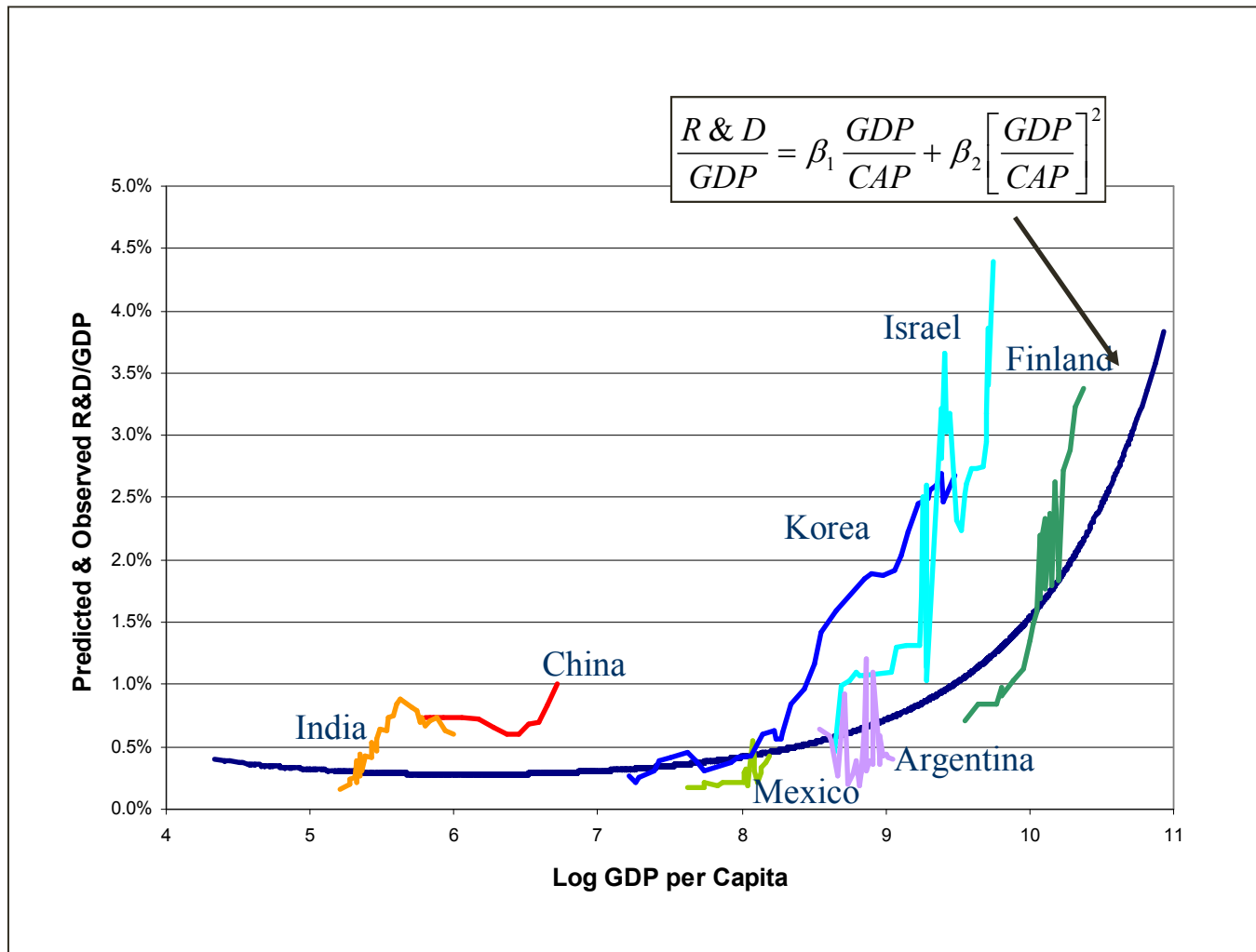
	Dist. Frontier	RoR R&D
▶ USA	-.18	57%
▶ UK	-.53	77%
▶ Italy	-.73	88%

- ▶ What should the rate of return be for Korea (-1.33), Malaysia (-2.28), Turkey (-2.5), Indonesia (-3.74)? 200%? 300%?

But poor countries do generally less R&D than rich countries...Why?

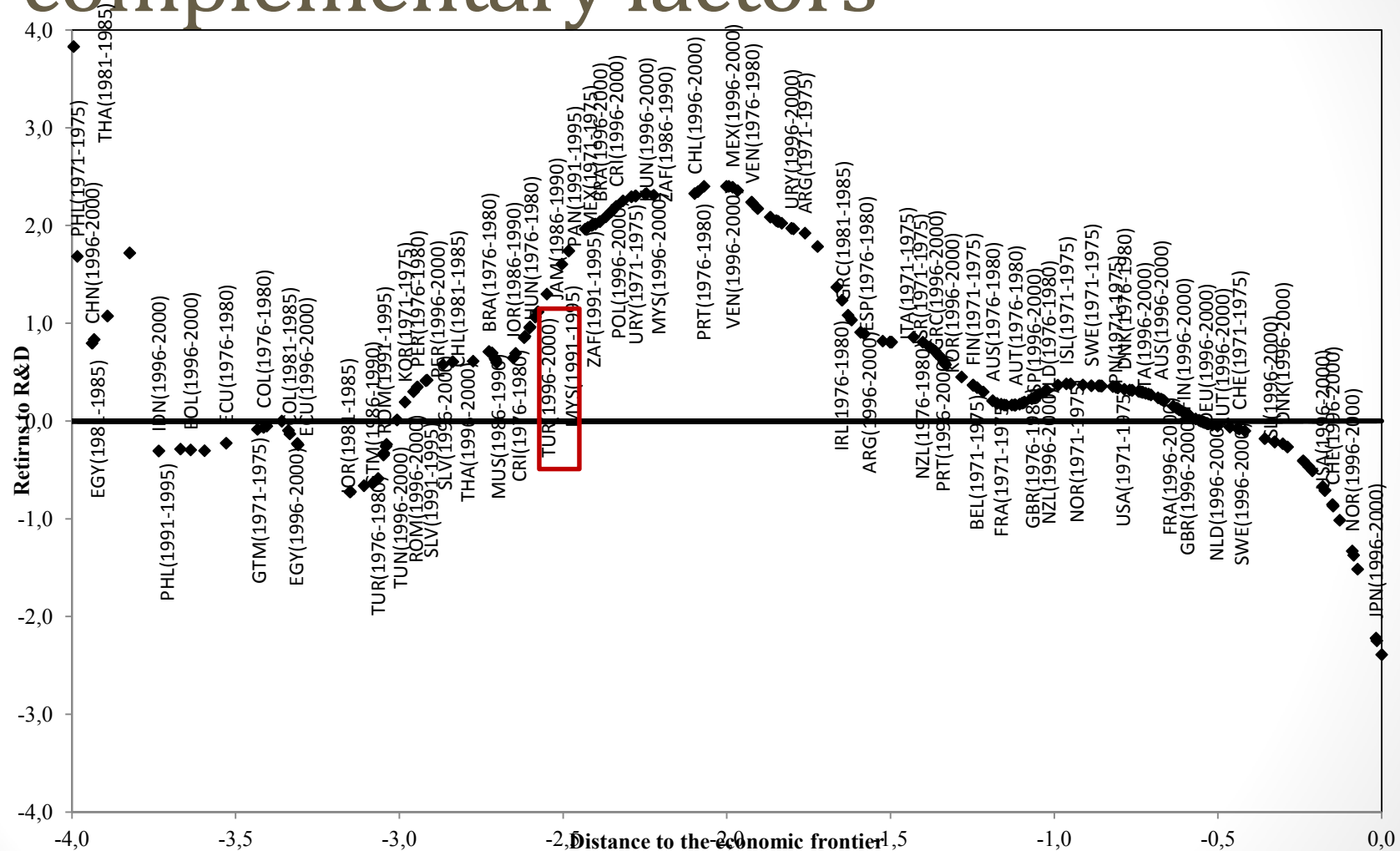


Innovation Superstars?



Source: Goni, Lederman, Maloney 2006

Rates of Return suggest missing complementary factors



Source: Goni and Maloney 2012

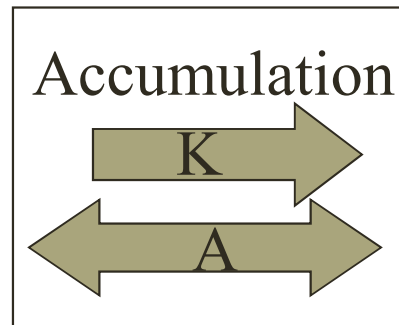
Innovation Ecosystem

Innovation “supply”

Universities/
Think tanks/CTs

Barriers to Innovation

Market Failures (&IP)
Seed/Venture capital
Poorly articulated S&T
system (including
discovery, oversight)
Labor regulation
Deficient human capital



Barriers to Accumulation

Credit
Entry/Exit barriers
Business/Regulatory
Climate

Demand Side

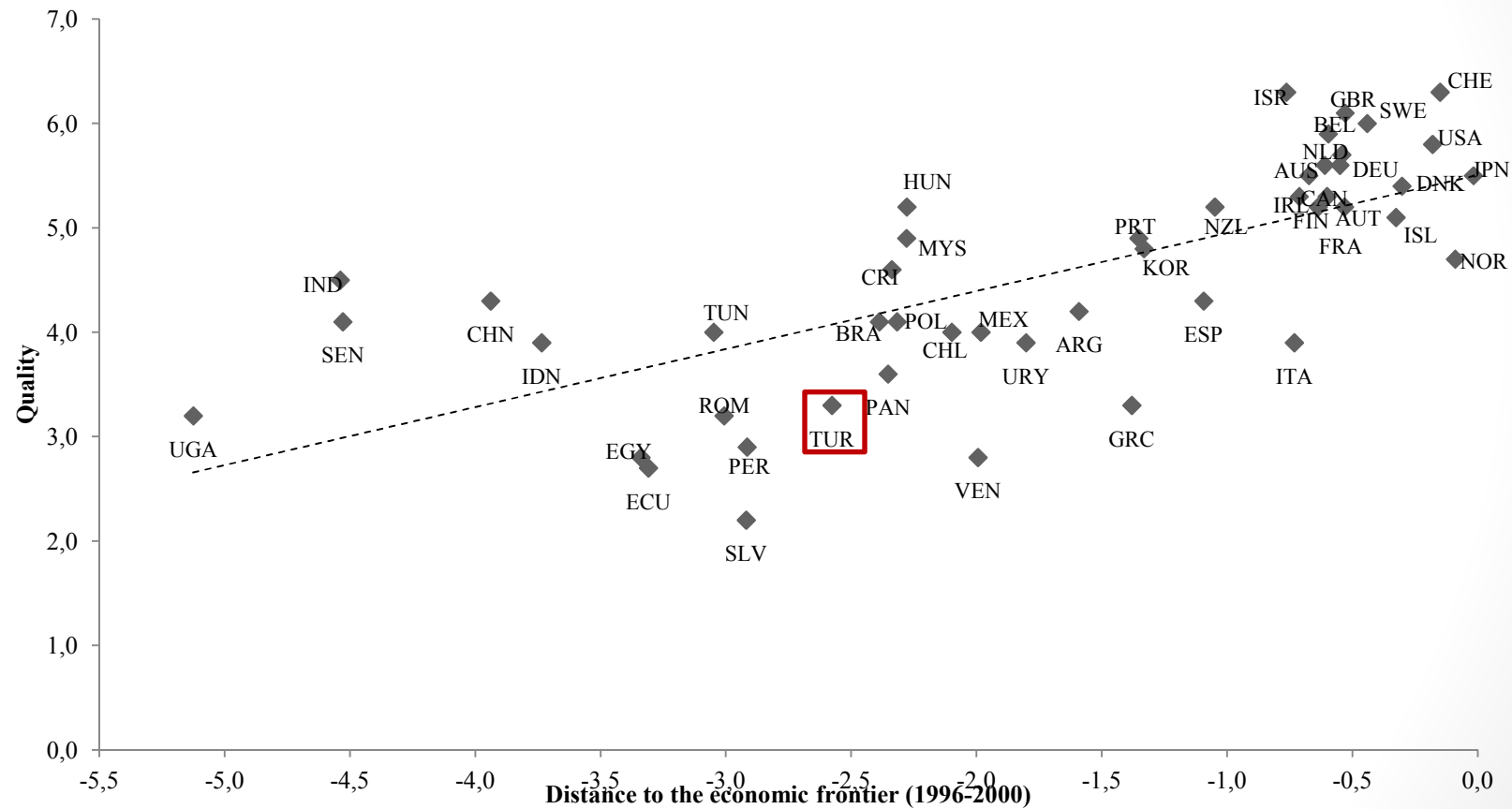
The firm

Barriers to Demand

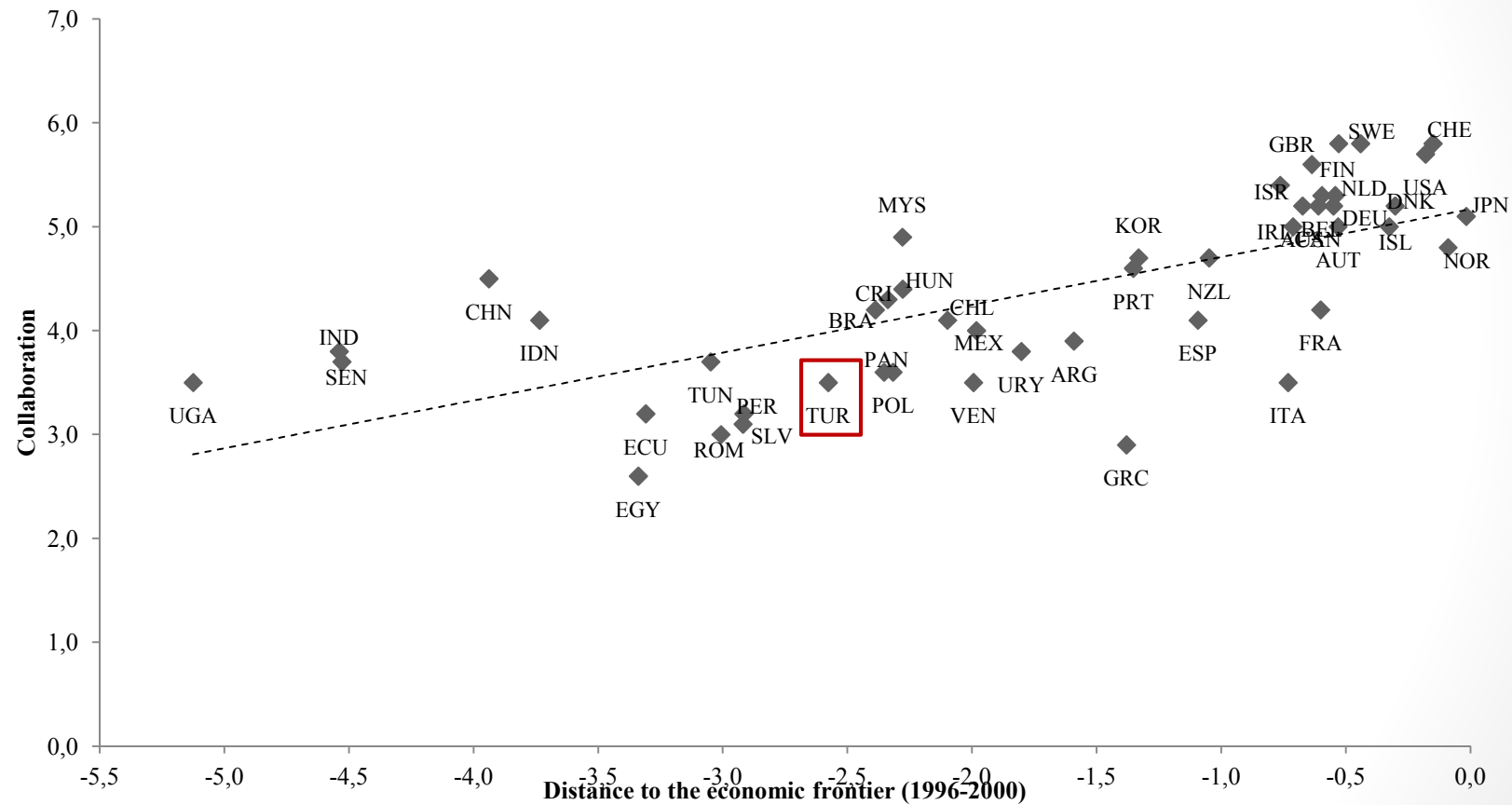
Macro Context
Trade Regime
International Marketing
Externalities
Competitive Structure
Entrepreneurship



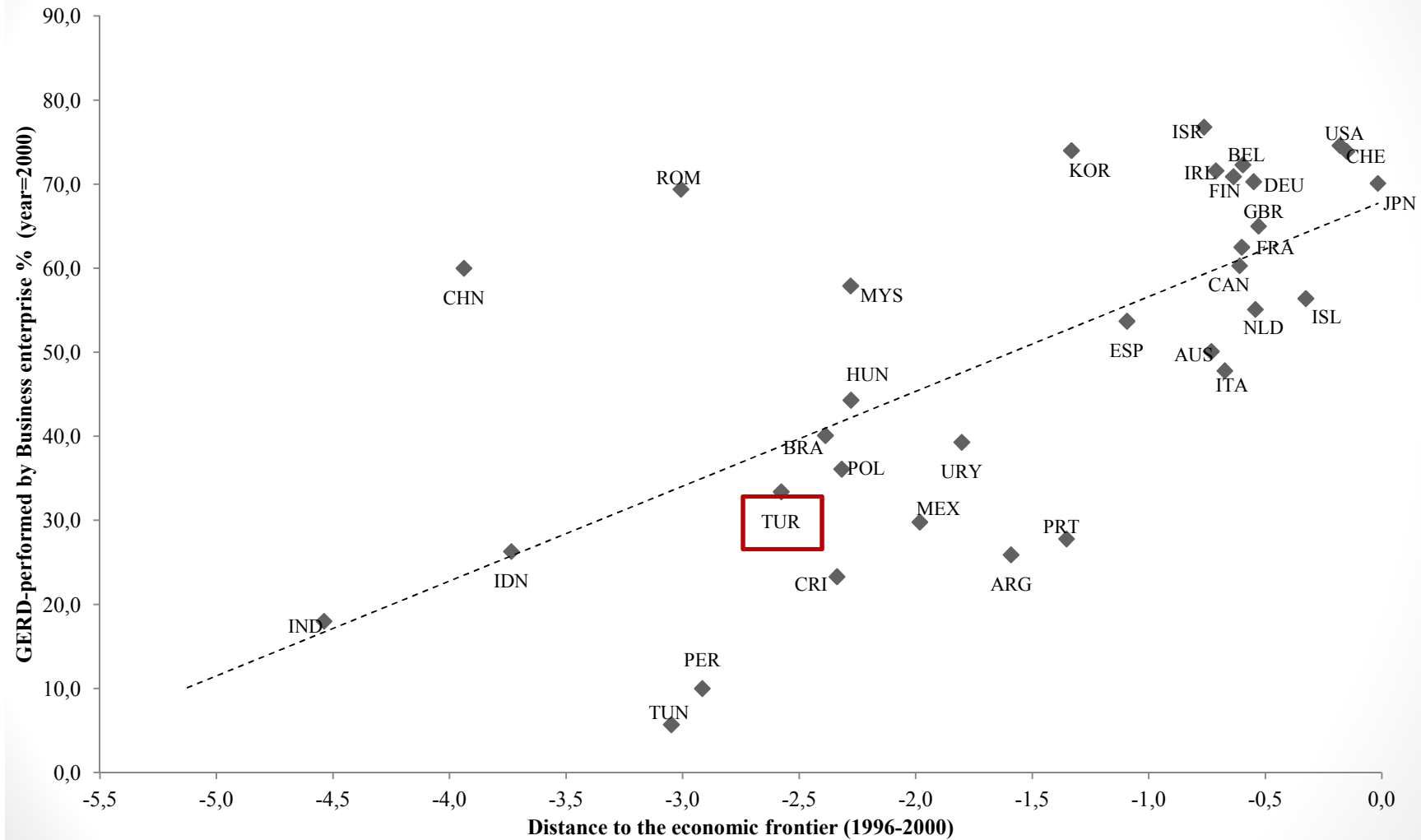
Perceived Quality of Research Institutions



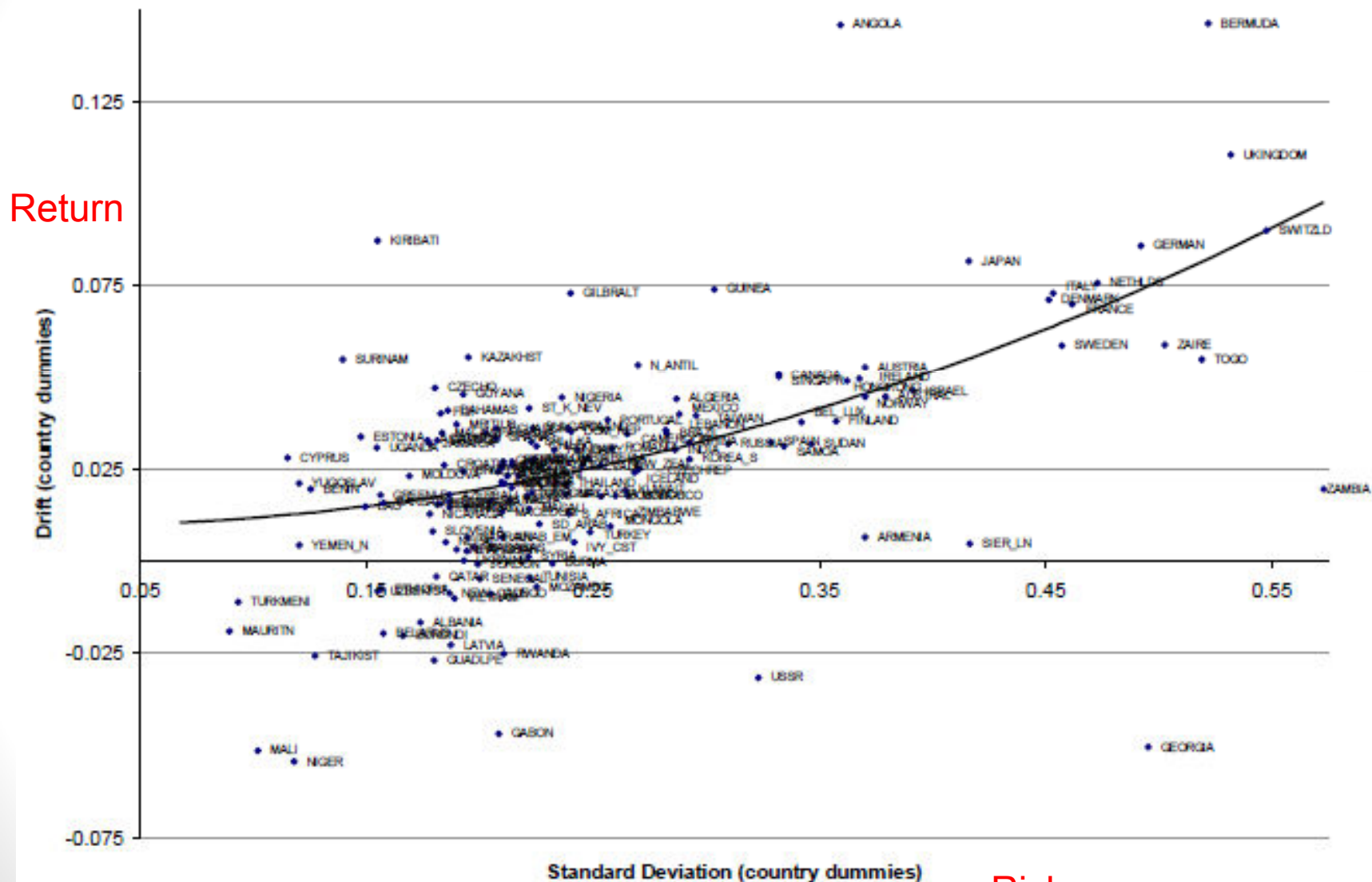
University-Industry Collaboration



Business Share in R&D



Managing Risky Ventures

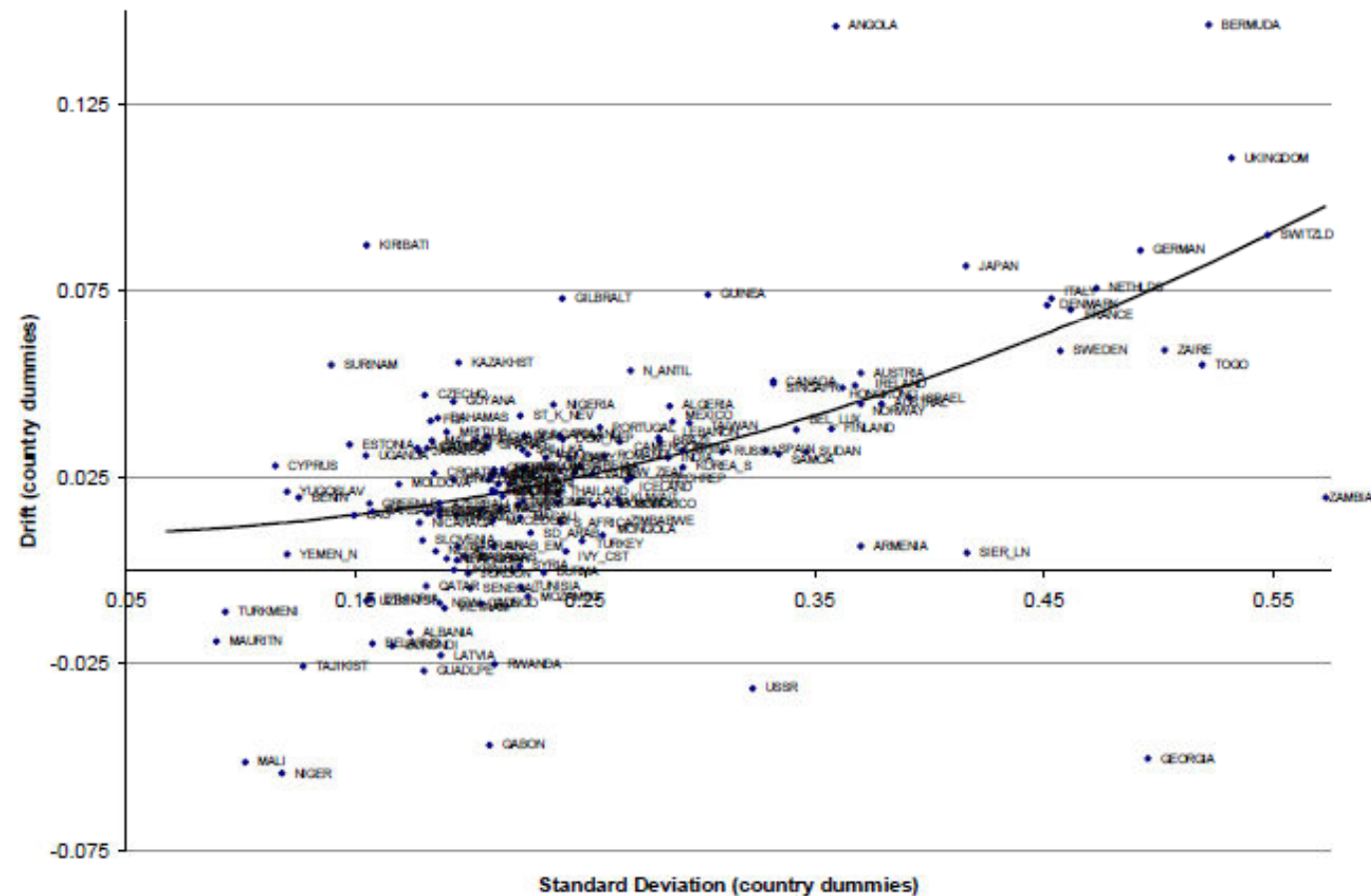


Krishna and Maloney 2011

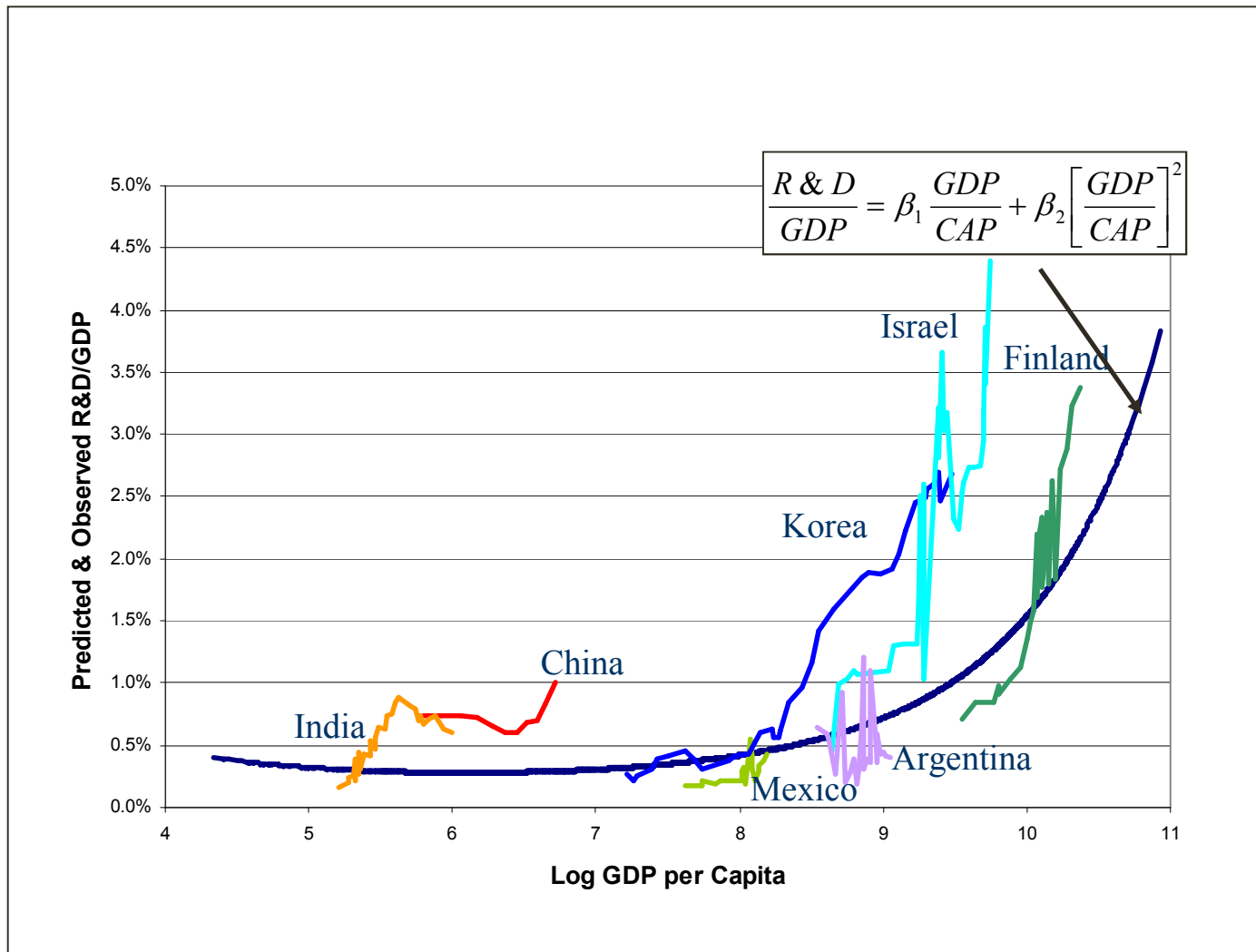
Risk

Ability to manage risk

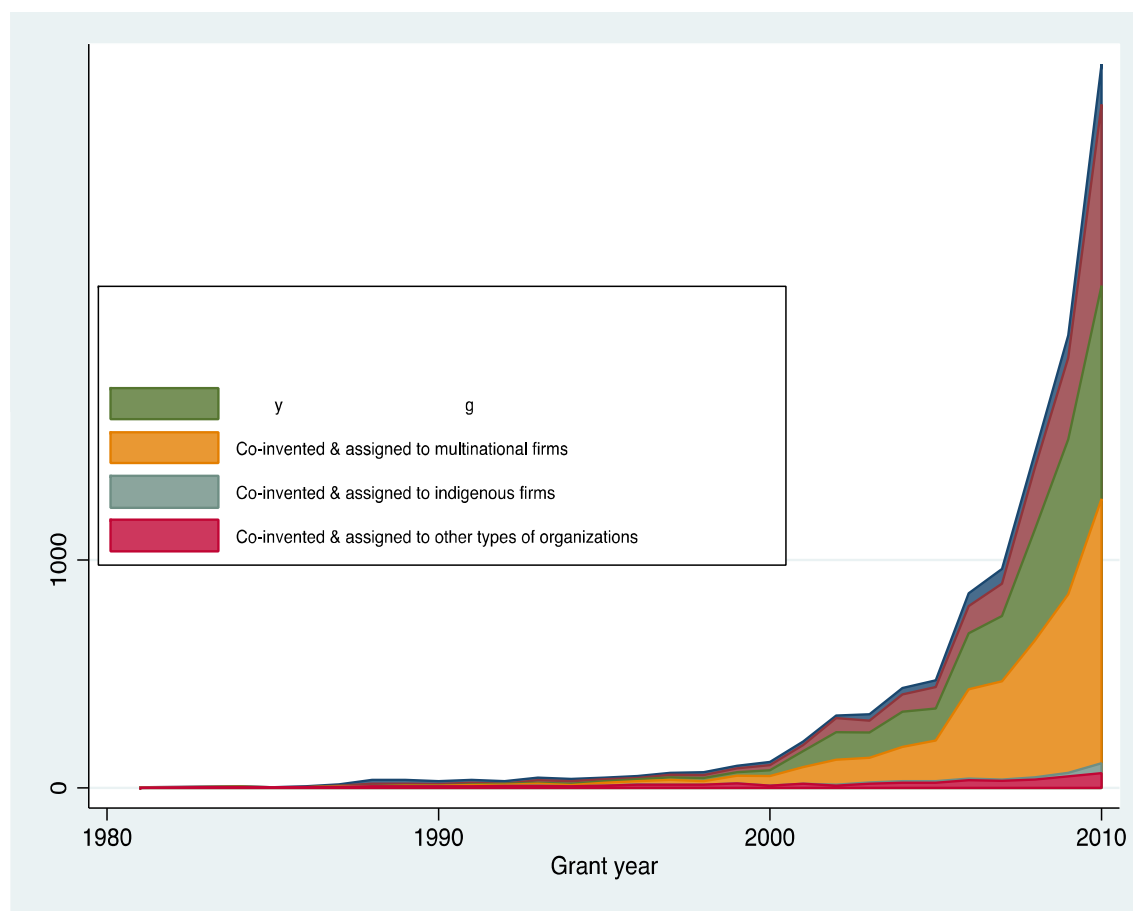
Export Quality Growth and Risk



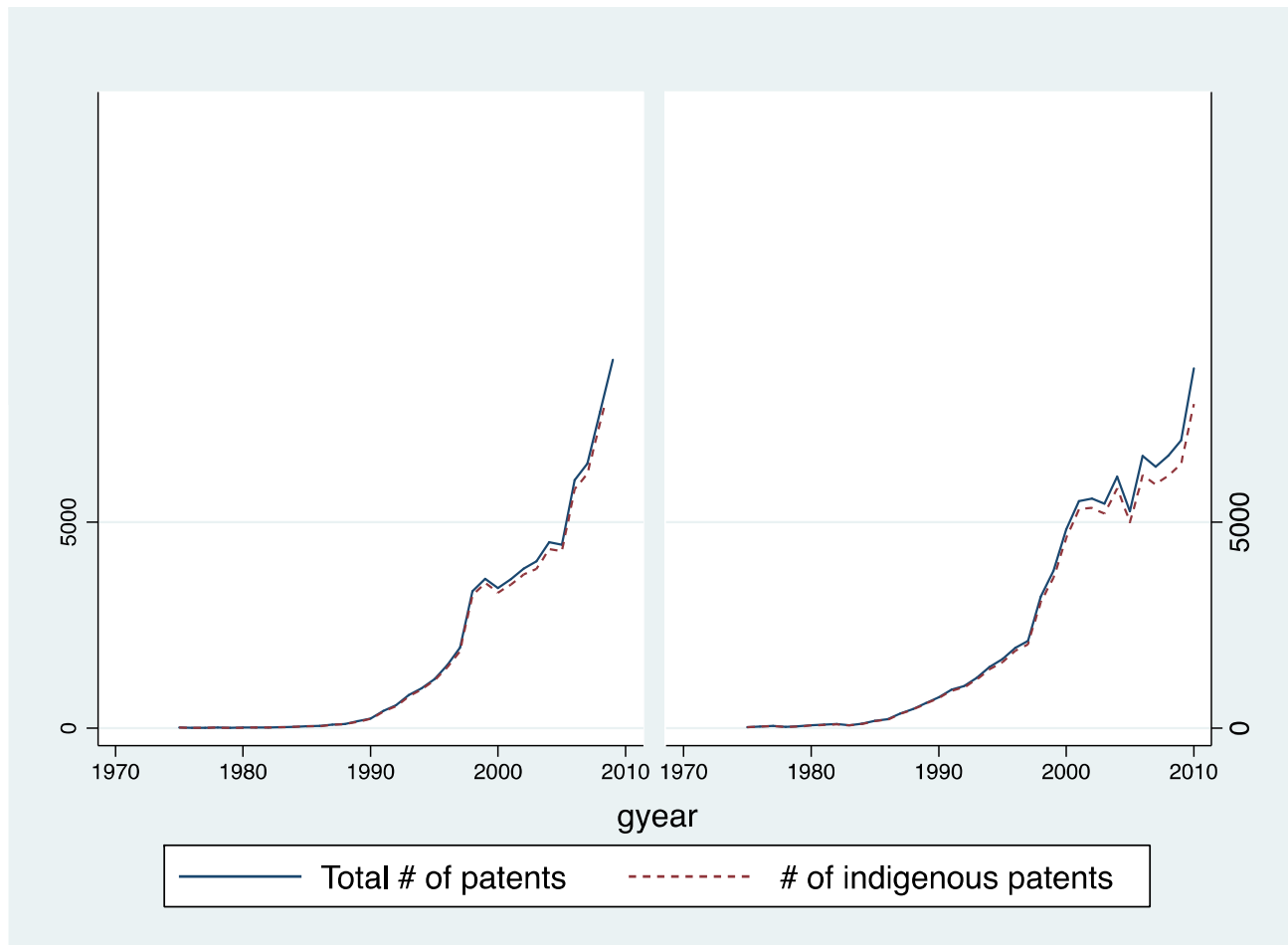
So, China: Waste or Wisdom?



Who's doing R&D? Patents granted by the USPTO to inventors based in China



China differs from Taiwan and Korea in the composition of their innovation surges



Branstetter (2012)

Pros and Cons

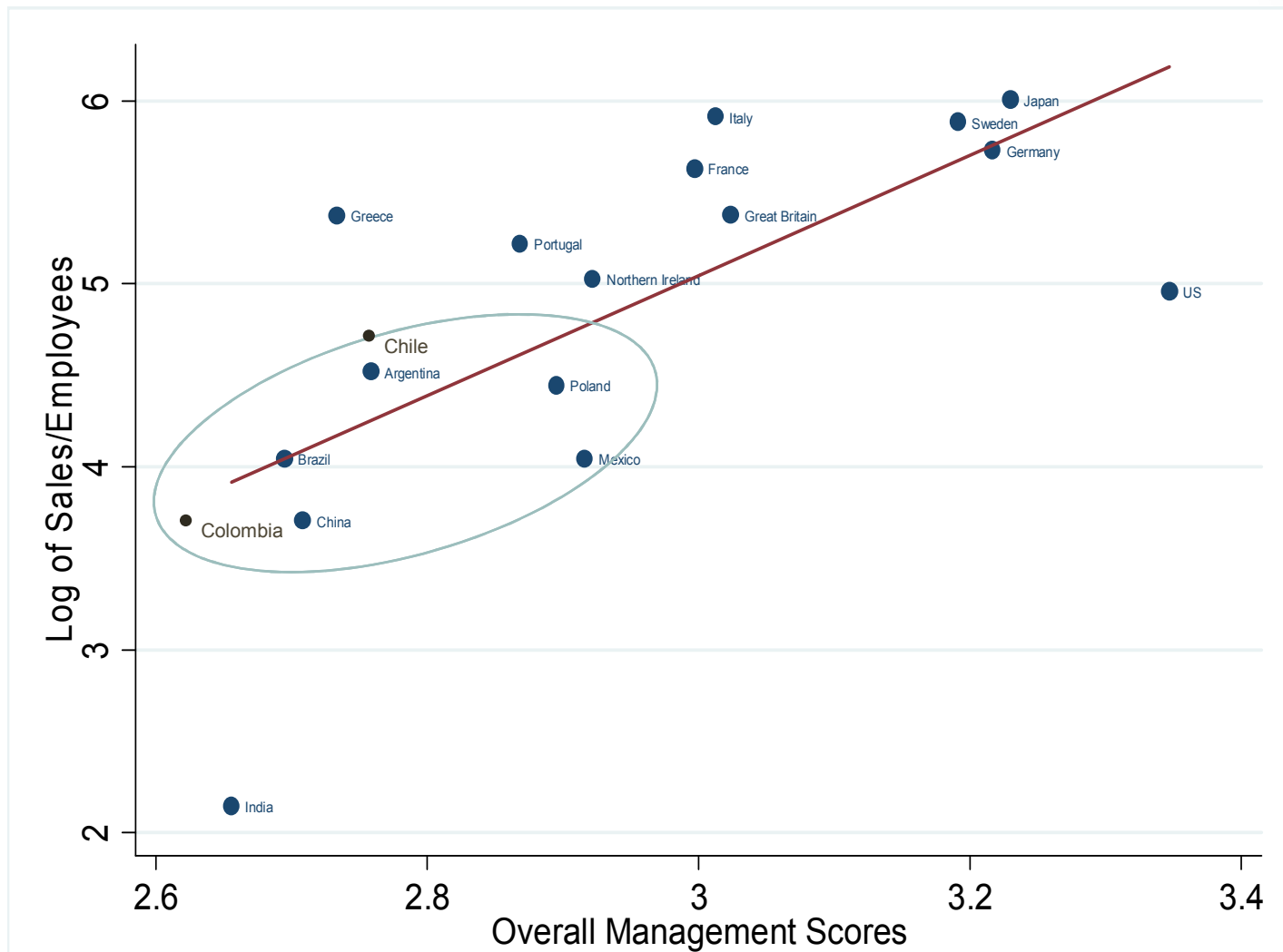
- MNCs providing eco-system: complementary factors
 - Most patents owned by MNCs
 - 50% are co-patented
- But will it maintain an autonomous innovative capacity?

Management Quality: A Missing Complement?

Management Quality and Productivity



Management Quality and Productivity



Fuente: Bloom et al. 2010+LAC, Sarrias and Maloney (2013)

China: Unprepared for indigenous Innovation

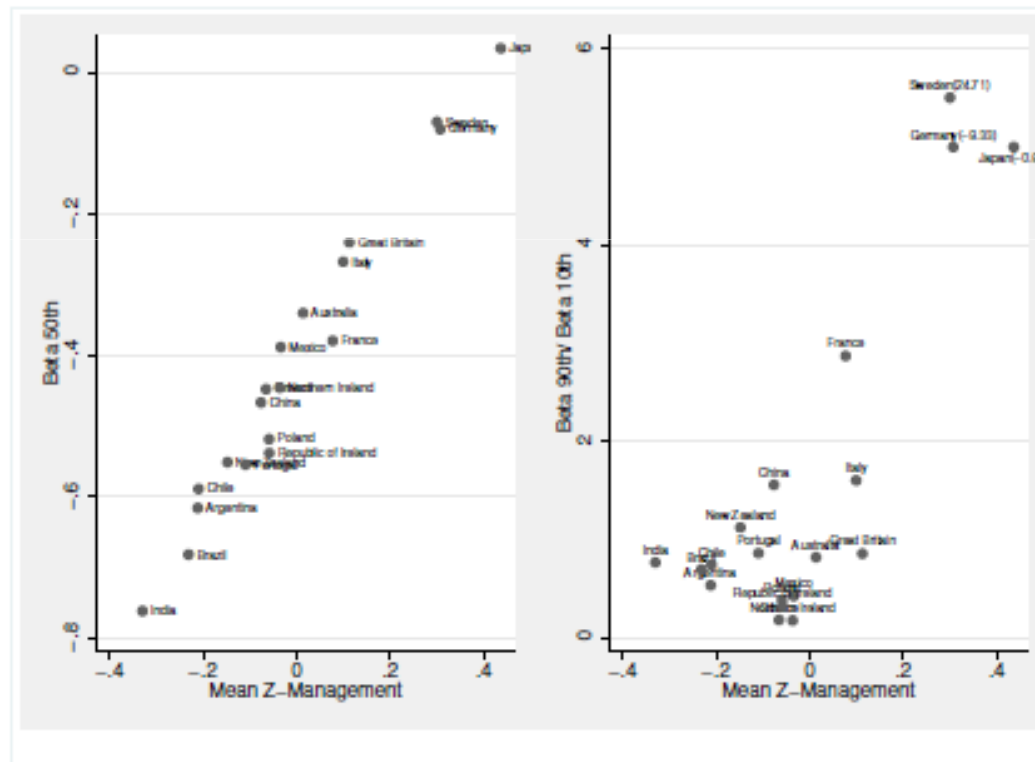
Table 2: China's Relative Ranking on Management scores

		Mean all countries	China's Value	Rank (of 21 countries)
Management	Average of all management questions	2.9391	2.8757	14
	Subcomponents			
Operations	Average of O1 & O2	2.8812	2.6006	17
Monitor	Average of M1 to M5	3.2298	3.1318	11
Target	Average T6 to T10	2.9001	2.8459	14
People	Average of P1 to P6	2.7485	2.7794	10
	Sub-subcomponents			
O1	Introduction to Lean (Modern) Manufacturing	2.8464	2.5917	16
O2	Rationale for Lean (Modern) Manufacturing	2.9161	2.6095	17
M1	Process Documentation	3.1904	2.9588	16
M2	Performance Tracking	3.3595	3.3941	8
M3	Performance Review	3.3236	3.4647	6
M4	Performance Dialogue	3.1674	2.9647	18
M5	Consequence Management	3.1082	2.8765	19
T1	Type of Targets	2.9063	2.5706	19
T2	Interconnection of Goals	3.0623	3.0882	9
T3	Time Horizon	2.8714	2.6294	17
T4	Goals are Stretching	2.9744	2.7588	17
T5	Clarity of Goals and Measurement	2.6862	3.1824	1
P1	Instilling a Talent Mindset	2.4244	2.5647	7
P2	Building a High-Performance Culture	2.5484	3.0765	2
P3	Making Room for Talent	3.0080	2.8765	14
P4	Developing Talent	2.9888	2.7353	17
P5	Creating a Distinctive EVP	3.0270	2.9941	13
P6	Retaining Talent	2.4948	2.4294	11

Source: Maloney 2013

Convergence to the management frontier-not just more competition

Figure 5: Change in distributions relative to the frontier with convergence: Quantile coefficients relative to the frontier (US) vs Mean Z-Score

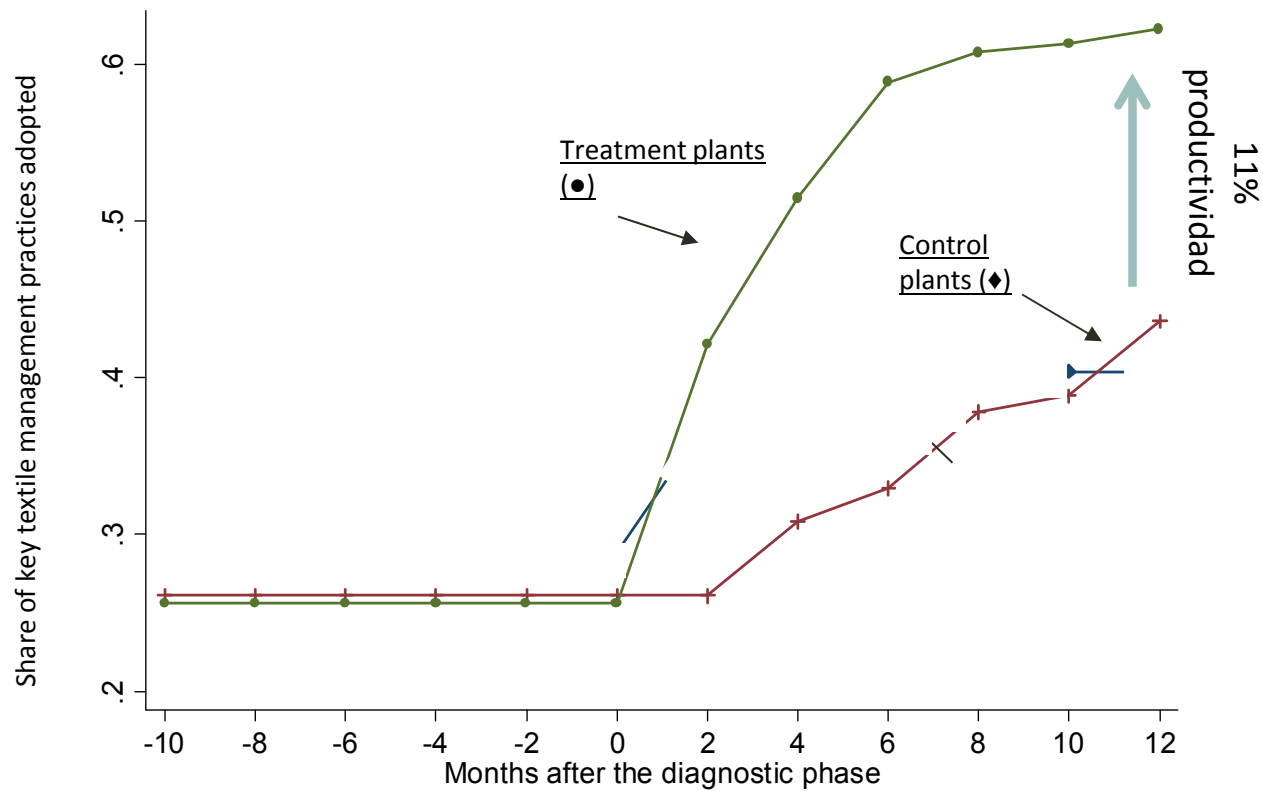


Note: First line: Plot of coefficient on country dummies at the 50th quantile (median) of management score on constant and country dummy vs. mean management score. 2. Plot of 90th coefficient over 10th. Second line, the same, but after conditioning for all available covariates.

Direct interventions in management quality?

- Japan, Korea, Singapore: All employed management promotion programs for SMEs
 - Korea: The Small and Medium Industries Promotion program
 - Singapore: Local Industry Upgrading Program (LIUP)
 - India
 - Colombia
- Lays the foundation for progressively more adoption and invention of new technologies.

India-Successful Management Intervention



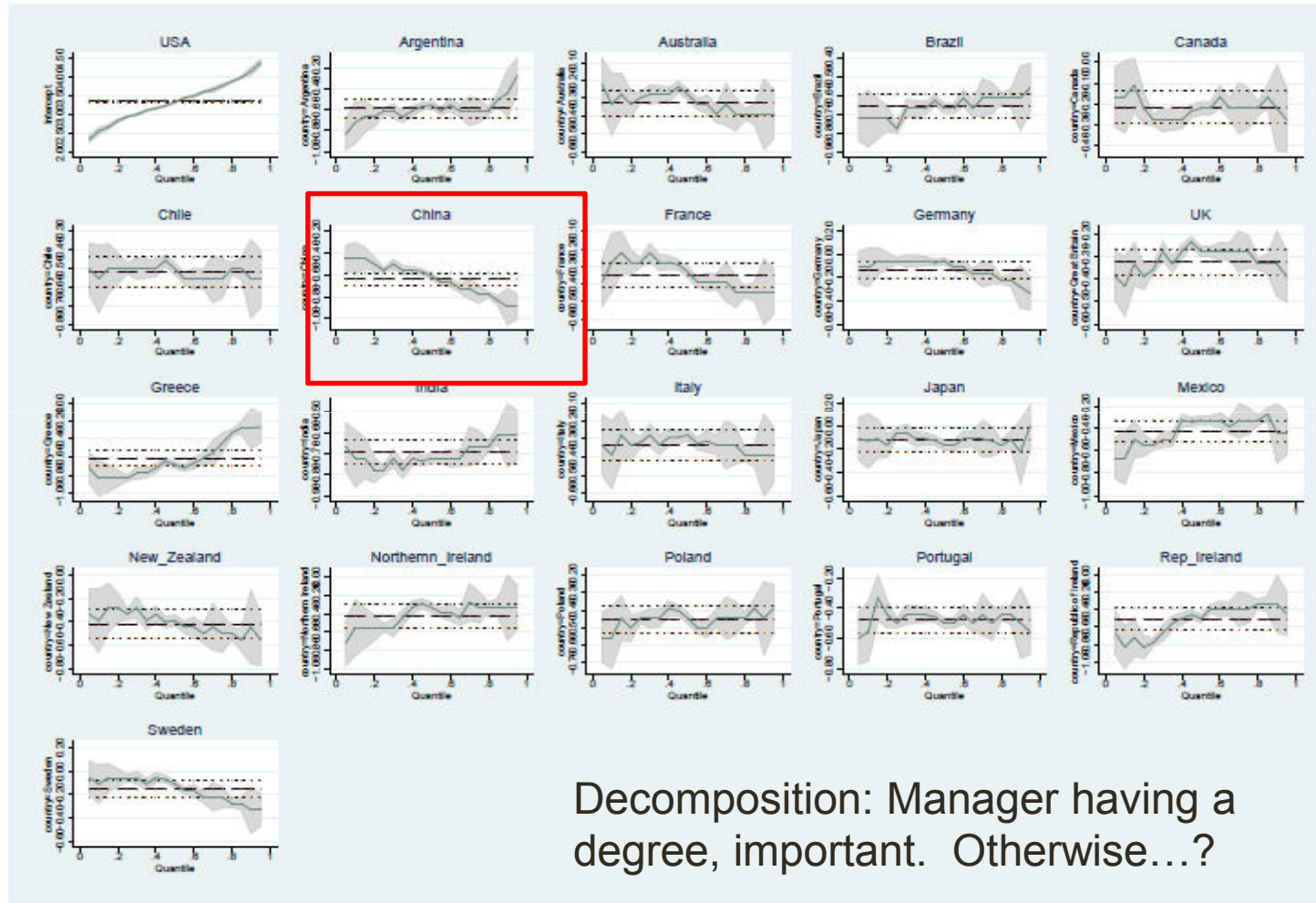
Source: Bloom, et al 2013

Colombia

- Technological Extension pilot-Autoparts
- RCT 180 firms
 - Individual company intervention
 - Group intervention- Lower cost, more dynamism?
- Current plans to scale up to whole sector

Thank You

Distribution relative to the US



Do Chinese managers know what they don't know?

Self Percieved vs. Actual Management Ability



Figures 9: Distribution of Chinese Management by Sub Category

