



LONG-RUN PRODUCTIVITY

... productivity isn't everything, but in the long run it is almost everything.

Paul Krugman, 1994

Dan Andrews

Senior Economist

Economics Department

Organisation for Economic Co-operation & Development

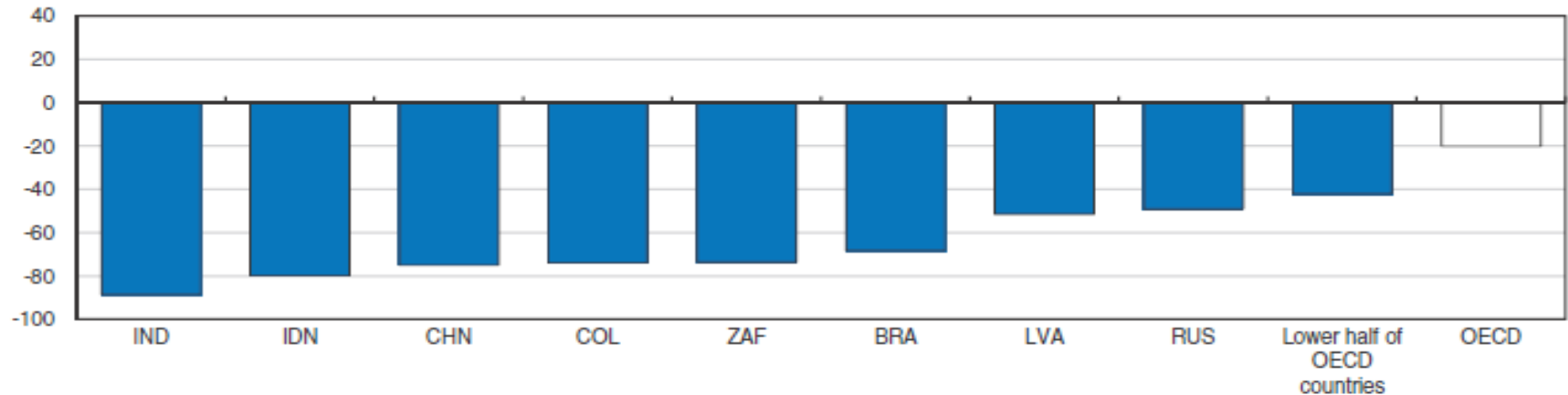
Meeting with Norwegian Productivity Commission

Based on joint work with the Directorate for Science, Technology and Innovation

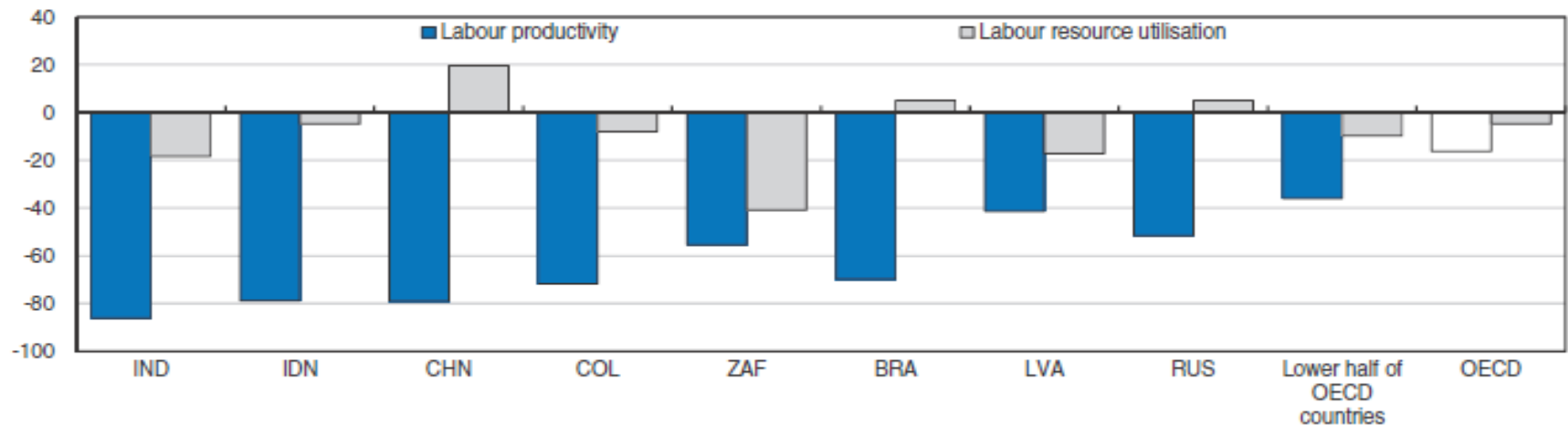


Cross-country gaps in GDP per capita mainly reflects productivity shortfalls

A. Percentage GDP per capita difference compared with the upper half of OECD countries¹



B. Percentage difference in labour resource utilisation and labour productivity²



Note: $GDP/Population = (GDP/Employment) * (Employment/Population)$

Source: OECD (2015), *Economic Policy Reforms: Going for Growth*



The future of productivity

3 key questions:

- How do we **think** about long-run productivity performance?
- Should we be **worried** about recent evidence and emerging trends?
- What are the relevant **policy issues** for future productivity?

Caveat: the analysis largely focuses on policy issues that are relevant to the typical OECD economy and we deal less with some specific issues – *i.e.* informality, infrastructure & quantity of human capital – that may matter for Brazil.



Relevance for NAEC

New Approaches

Changing the unit of analysis: **firm level** perspective to complement the traditional aggregate view.

Addressing future challenges

Future economic growth will increasingly depend on multi-factor productivity (MFP).

Some sources of productivity growth, while relevant for past performance, may be increasingly difficult to harness in the future,
→ focus on policy issues that may become increasingly relevant.

Relevance for public policy

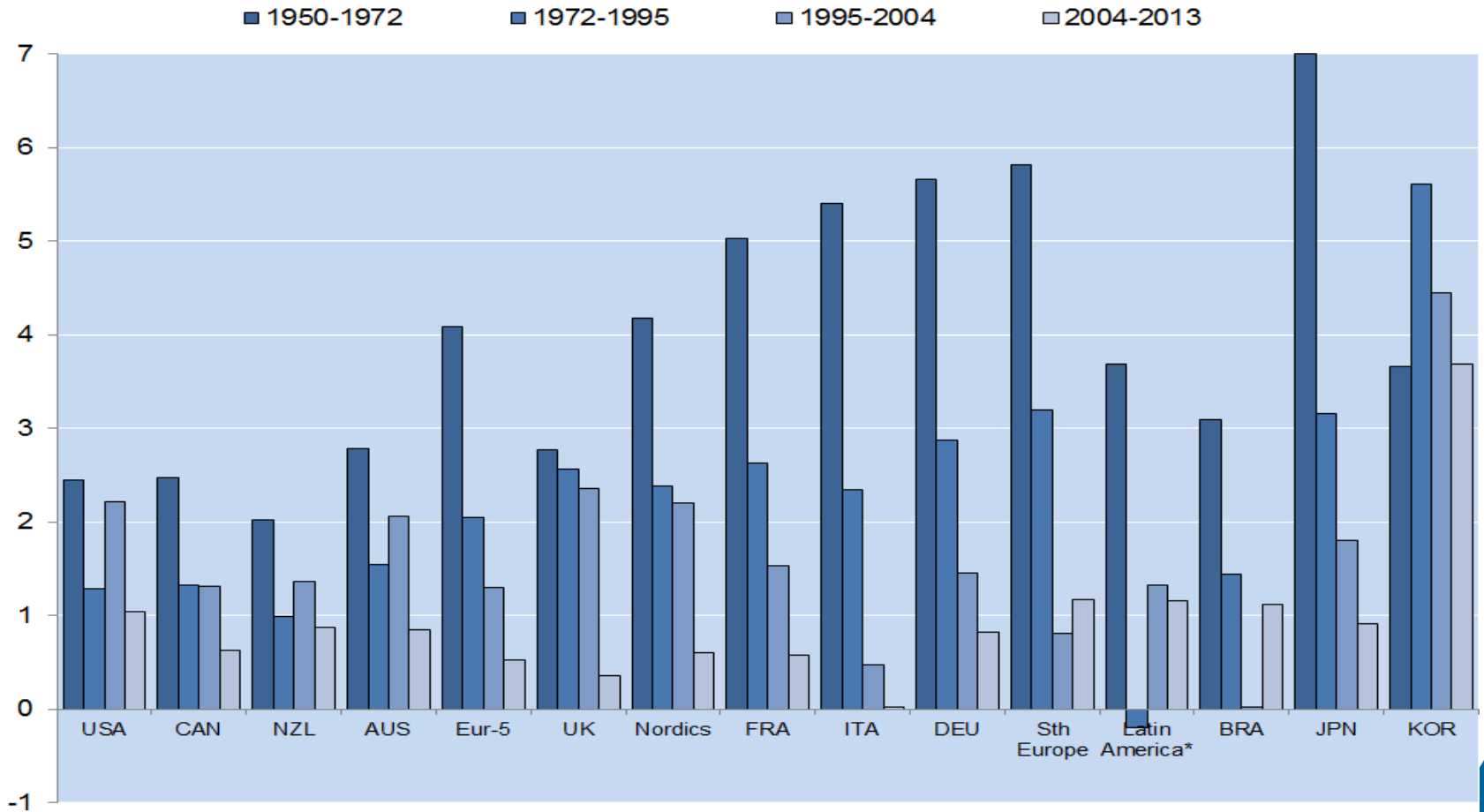
Firm level perspective and forward-looking approach to identify relevant issues → important policy recommendations.

- 1. Anatomy of the productivity slowdown**
- 2. Analytical framework**
- 3. Key policy issues and selected structural policy recommendations**



The productivity slowdown in long run perspective

GDP per hour worked
Annual average growth (%)

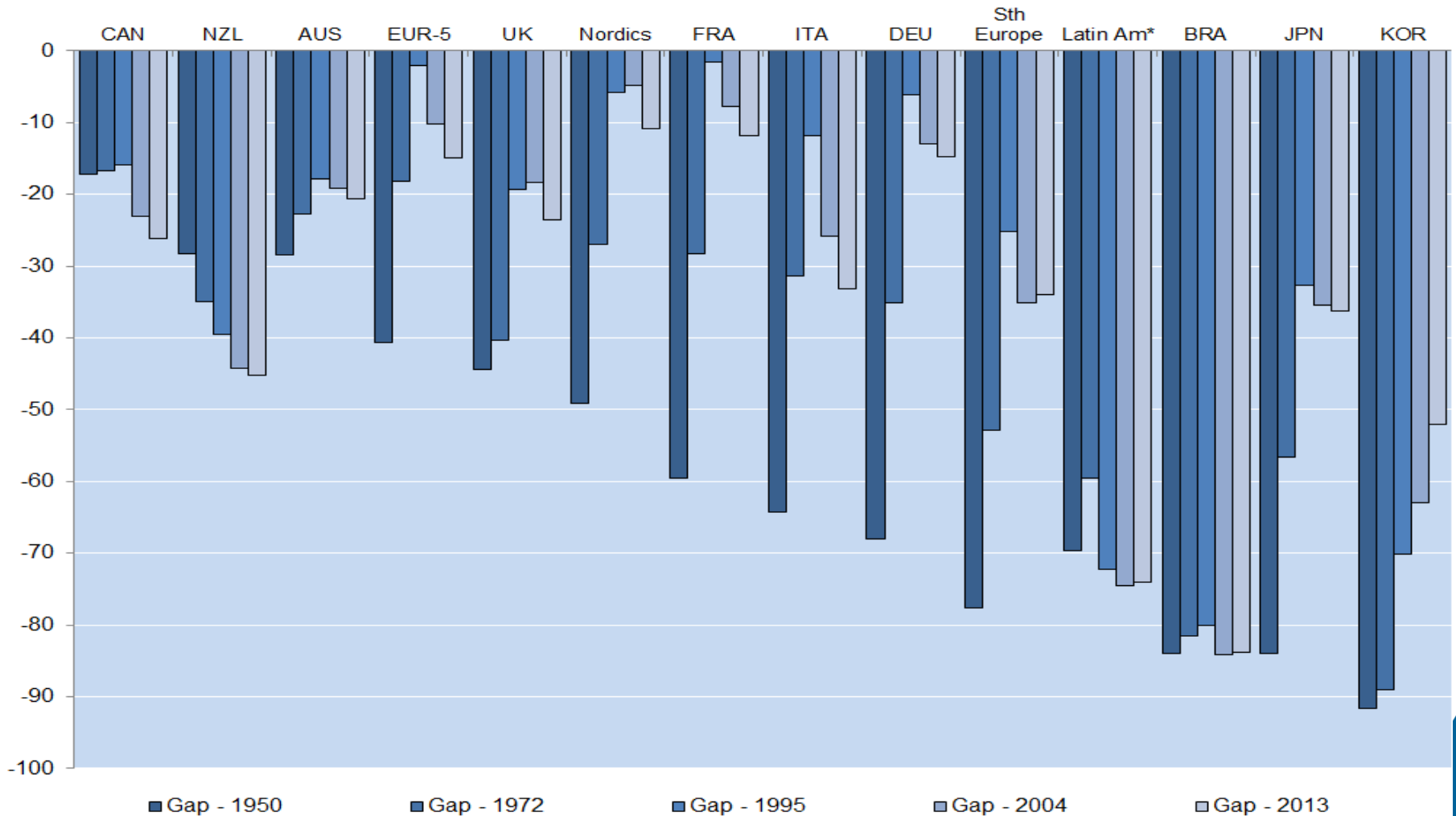


Source: Conference Board Total Economy Database



Stalling convergence...

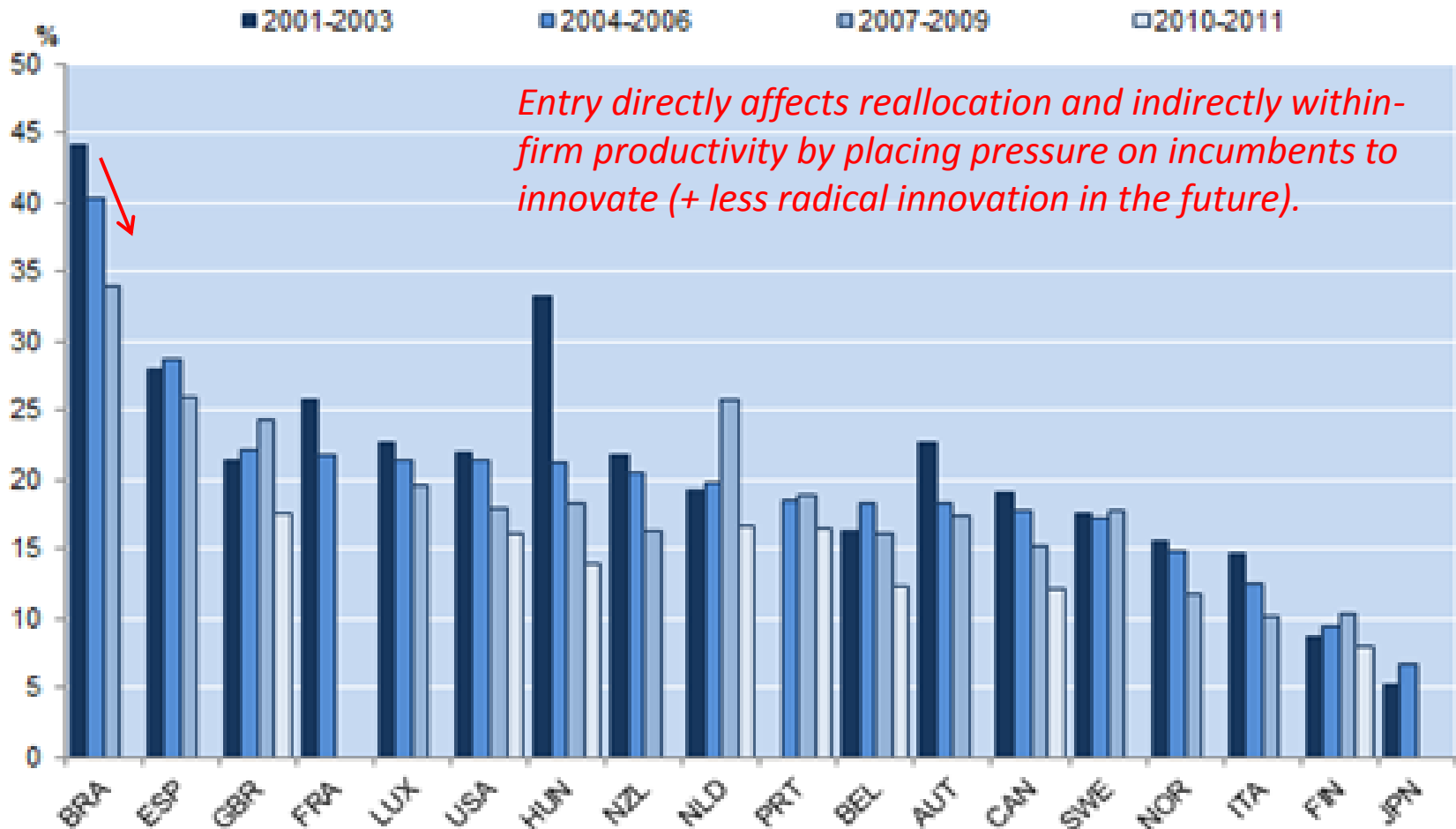
Per cent gap in GDP per hour worked with the United States





Structural dimensions to the slowdown: an entry story?

Declining start-up rates across OECD countries



Source: C. Criscuolo, P. N. Gal and C. Menon (2014), "The Dynamics of Employment Growth: New Evidence from 18 Countries", OECD Science, Technology and Industry Policy Papers no. 14.

1. Anatomy of the productivity slowdown
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Technological forces shaping aggregate productivity growth

If technology flows freely across borders, aggregate productivity growth is a positive function of:

- Productivity growth rate of the **global frontier** → diffusion of new innovations from the frontier.
- An economy's (static) **productivity gap** with the global productivity frontier → *catch-up* driven growth based on adoption of unexploited existing technologies.

BUT the process of productivity convergence is not automatic



Analytical framework:

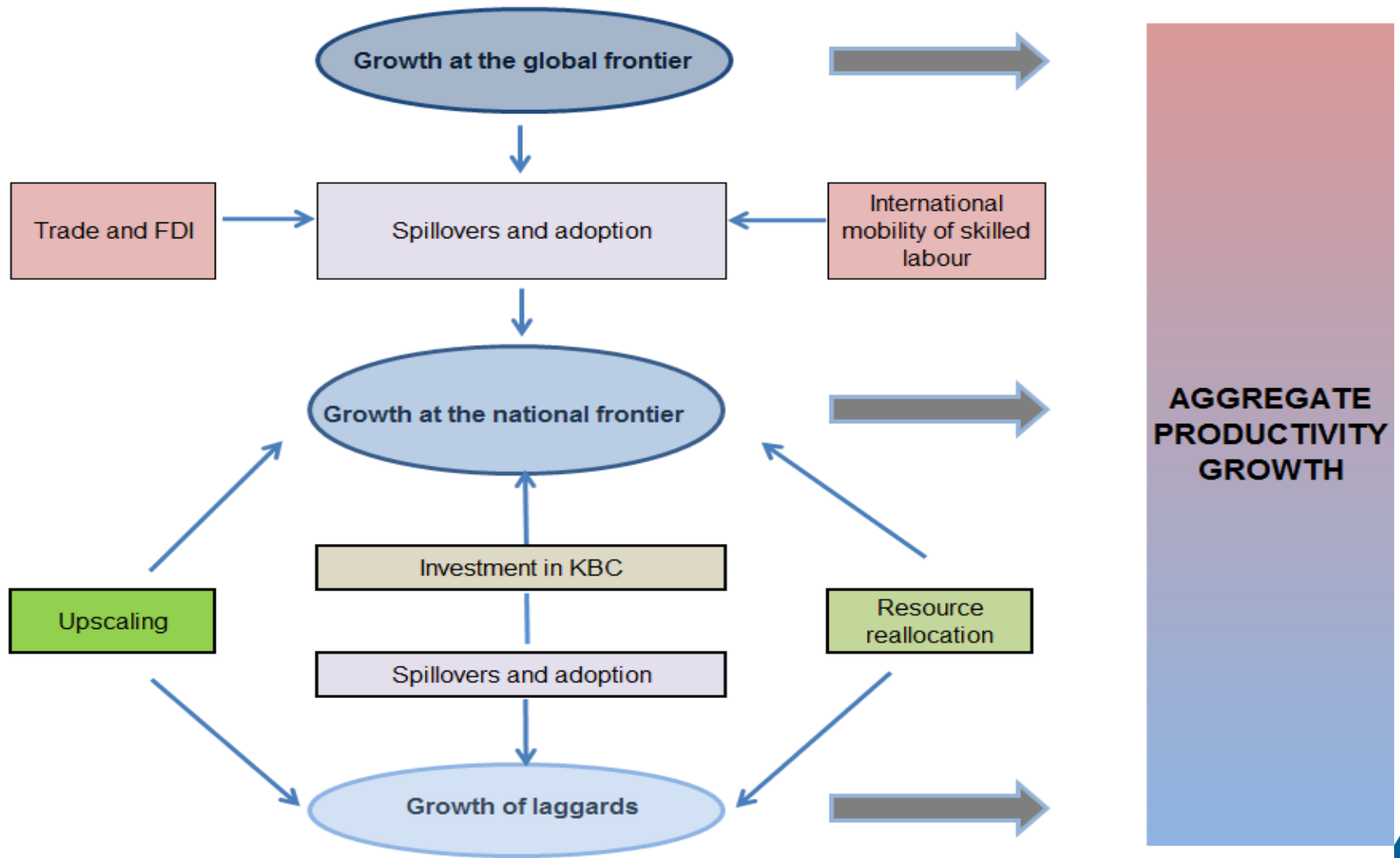
3 types of firms + 2 technologies

1. Widespread **heterogeneity**: very high MFP and very low MFP firms coincide within narrowly-defined industries.
2. **Adoption lags** for new technologies across countries have fallen, but long-run **penetration rates** once technologies are adopted have diverged (Comin & Mestieri, 2013).
3. MFP growth of **laggard** firms is more closely related to productivity developments at the **national frontier** (NF), as opposed to the **global frontier** (GF).

New GF technologies do not immediately diffuse to all firms. They are first adopted by NF firms, and only diffuse to laggards once they are adapted to national circumstances.



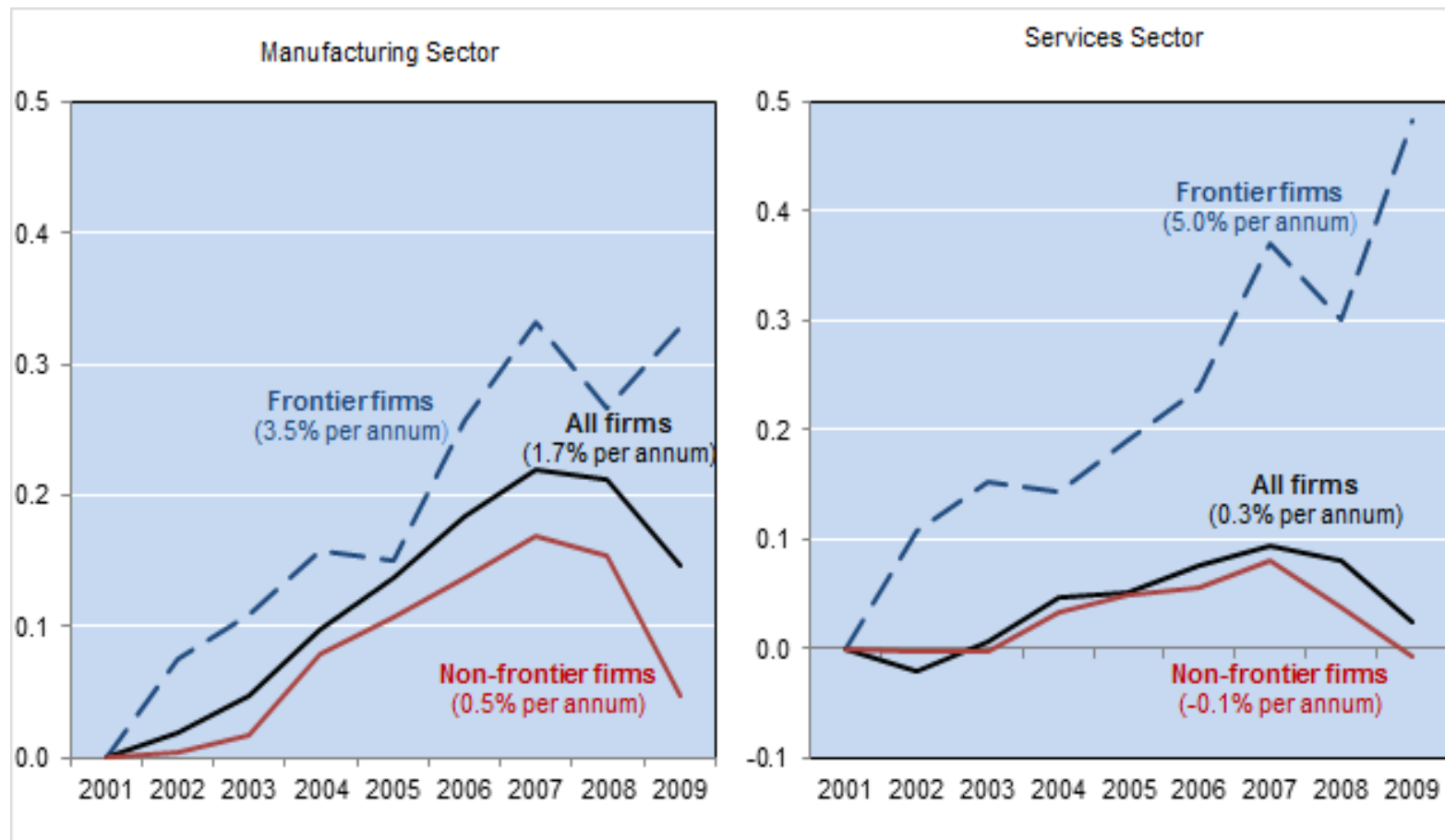
The economic forces shaping aggregate productivity growth





What's happening at the global productivity frontier?

Solid growth at the global productivity frontier but spillovers disappointed
Labour productivity; index 2001=0



Source: Andrews, Criscuolo and Gal (2015), "Frontier firms, technology diffusion and public policy: micro evidence from OECD countries" forthcoming OECD Working Paper.

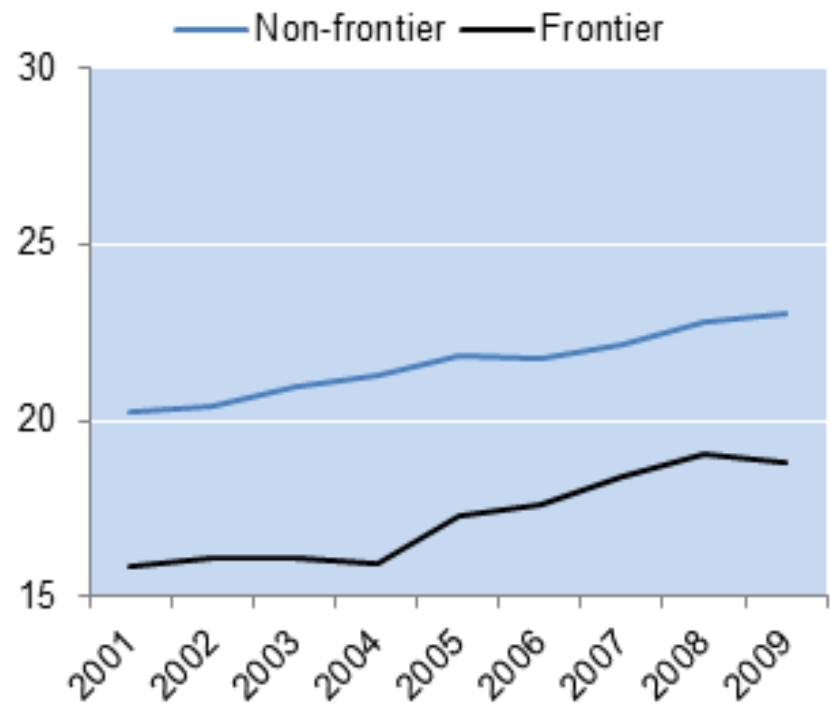
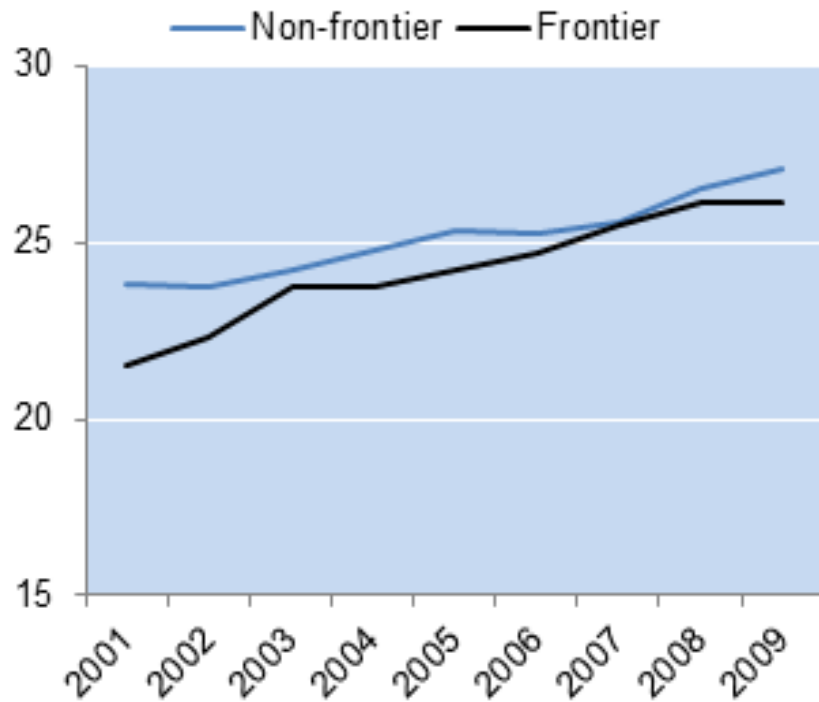


Firms at the global productivity frontier have become older

Average age (years) of firms in the frontier and non-frontier groups

Manufacturing

Services



Notes: Frontier is measured by the top 100 firms in each 2-digit industry and each year, based on Solow residual-based MFP.

Source: Andrews, Criscuolo and Gal (2015), "Frontier firms, technology diffusion and public policy: micro evidence from OECD countries" forthcoming OECD Working Paper.



Outline

1. **Anatomy of the productivity slowdown**
2. **Analytical framework**
3. **Key policy issues and selected structural policy recommendations**



Key issues for policymakers

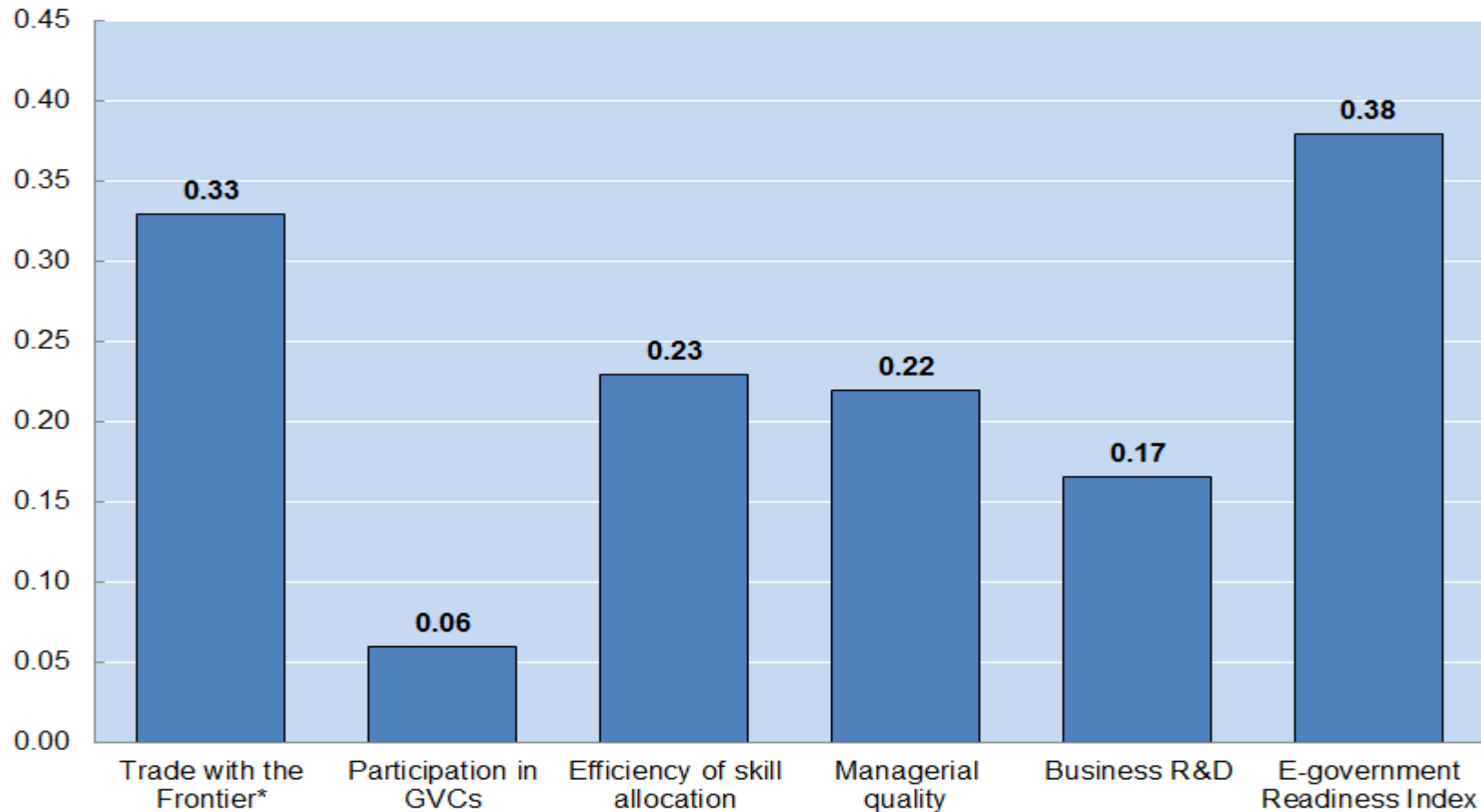
1. Support innovation in firms at the global frontier (GF)
2. Facilitate the diffusion of:
 - New technologies from the GF to NF firms
 - Existing technologies from the NF to the laggards
3. Reallocate scarce resources to the most productive firms
 - Up-scaling and resource reallocation more generally.
 - Allocate human capital efficiently.

Scope for productivity growth via these channels, particularly #2 & #3, is influenced by the policy environment within countries.



Structural factors shaping the diffusion of new innovations from the global frontier

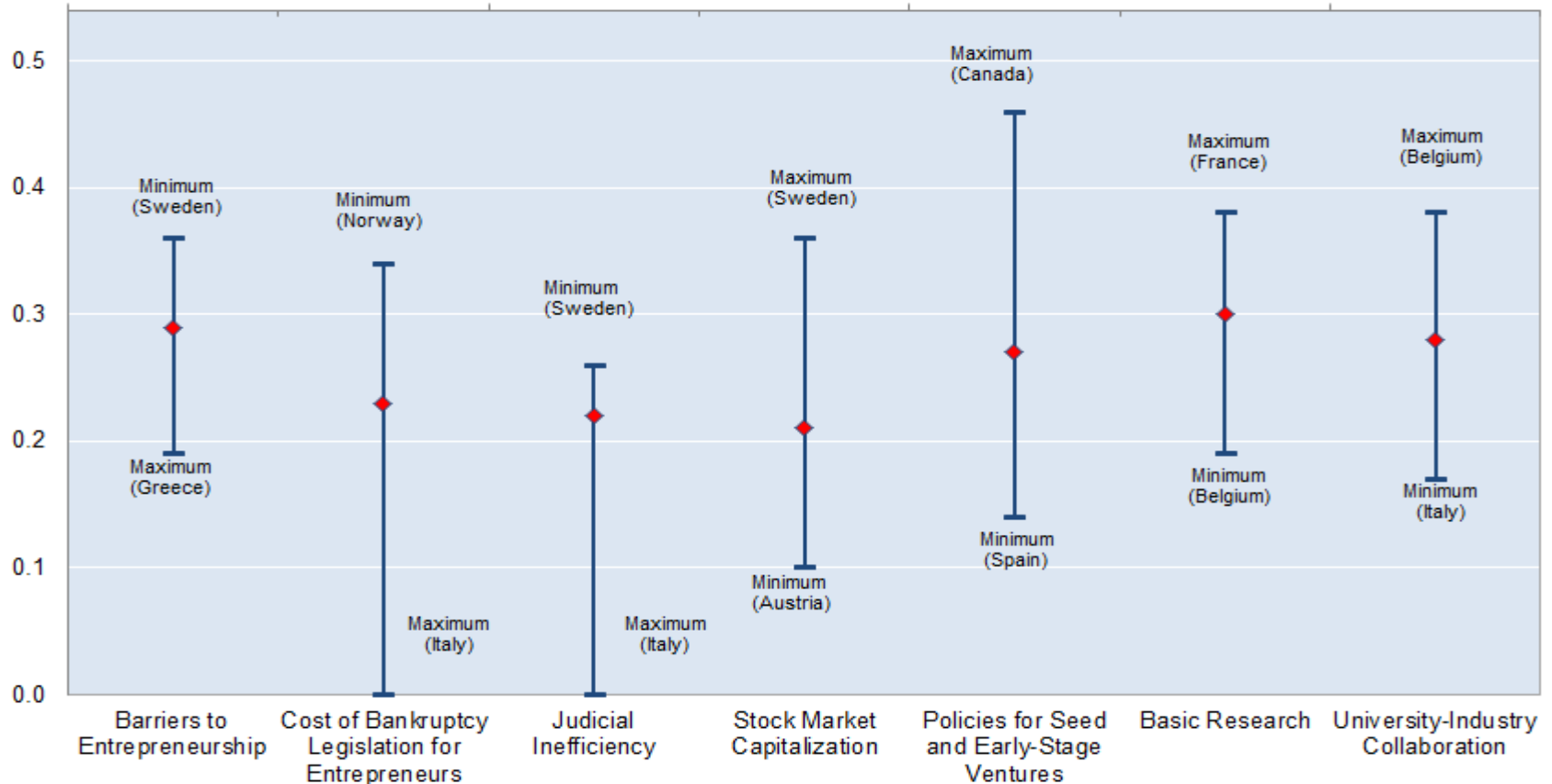
% difference in frontier spillover effect between maximum and minimum value of each structural variable, assuming 2% MFP growth at the frontier





Public policies shape the diffusion of new innovations from the global frontier

Estimated frontier spillover (% pa) associated with a 2% point increase in MFP growth at the frontier

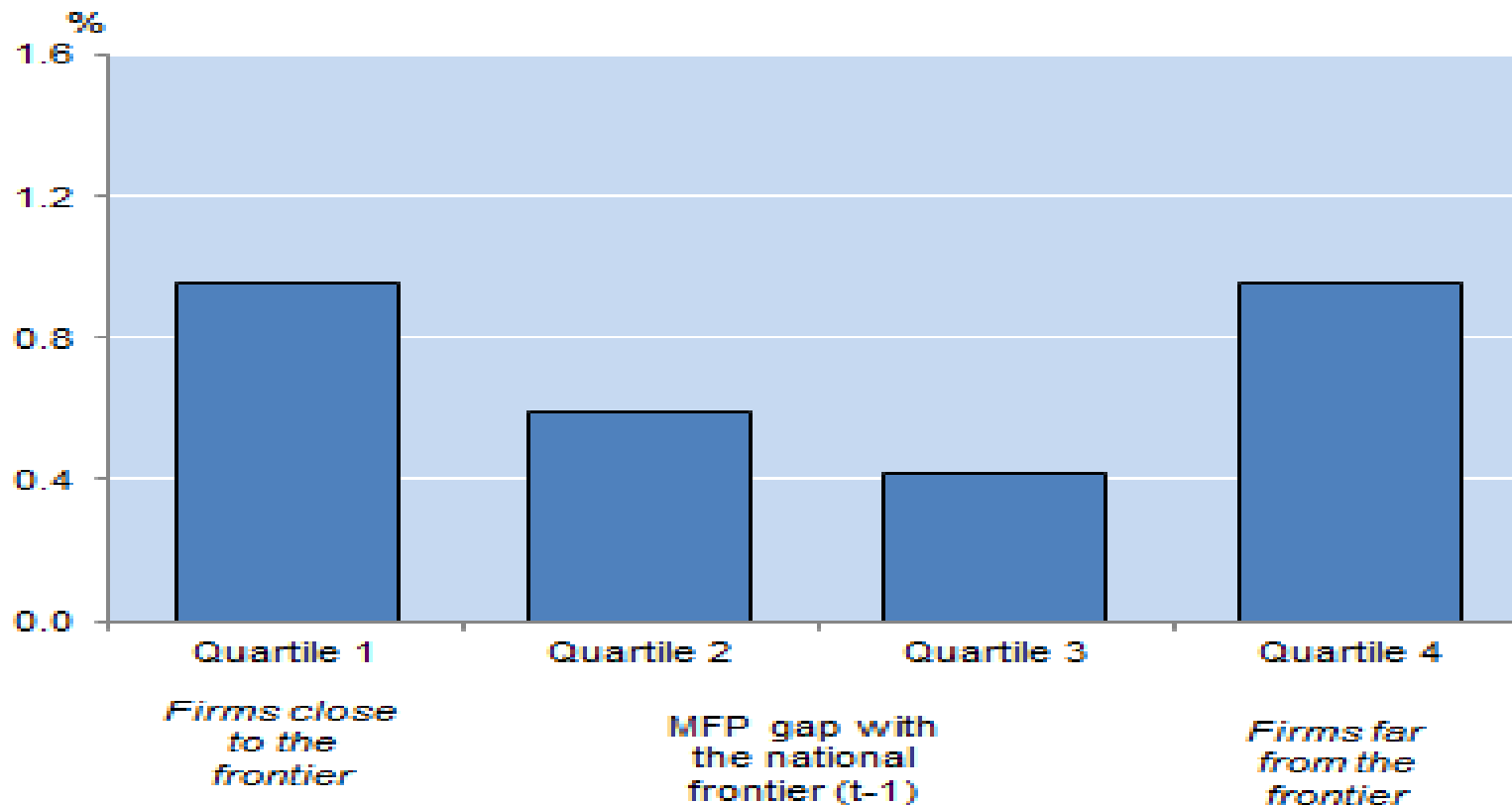




Pro-competition PMR can facilitate catch-up of laggards to the NF

Impact of policy reforms on the MFP growth of laggard firms, 2005

Reducing PMR from high level in Greece to the OECD average
% difference between industries with high and low firm turnover



Source: Andrews, Criscuolo and Gal (2015), "Frontier firms, technology diffusion and public policy: micro evidence from OECD countries" forthcoming OECD Working Paper.



Key issues for policymakers

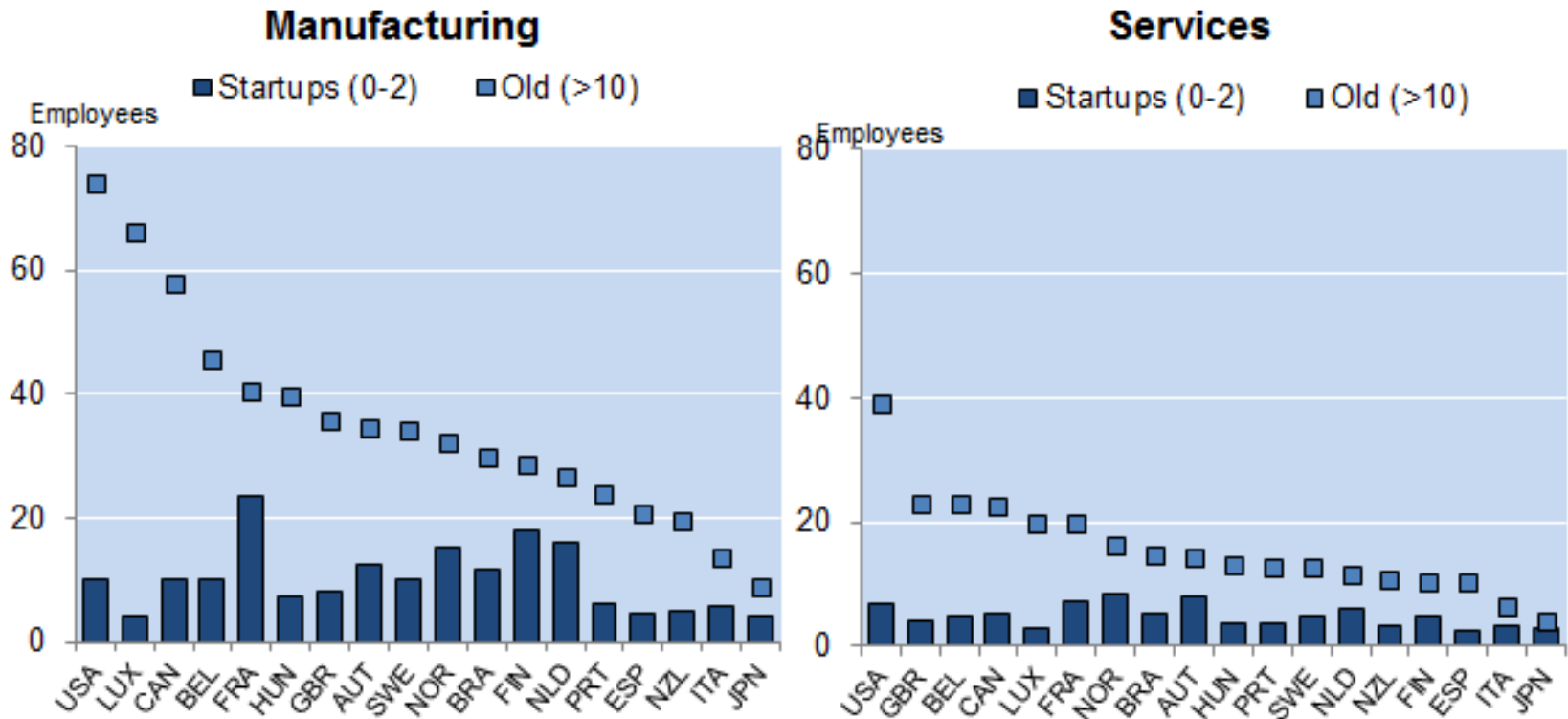
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Significant differences in up-scaling potential across countries

Post-entry growth - average size of young and old firms



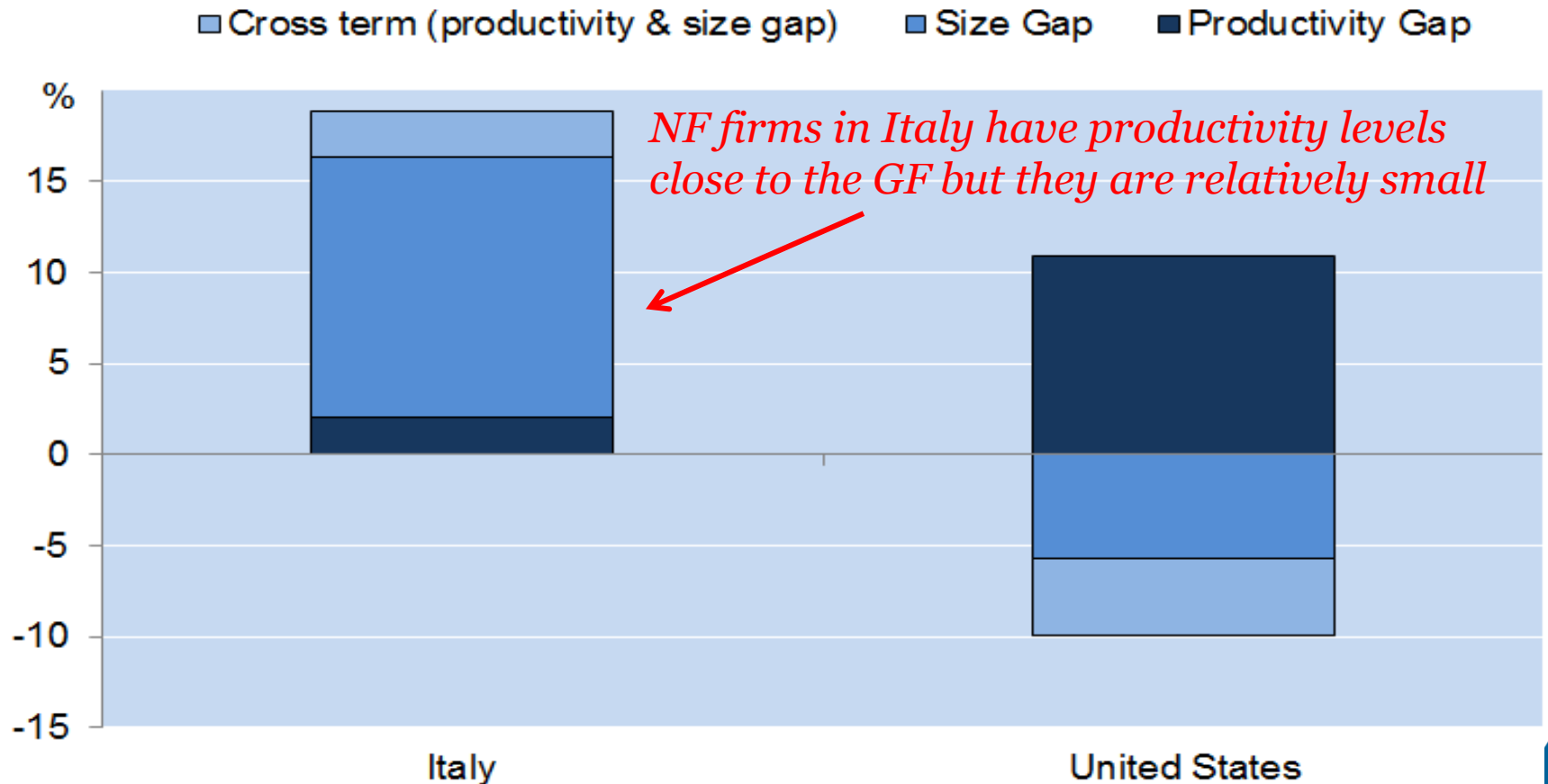
Source: C. Criscuolo, P. N. Gal and C. Menon (2014), “The Dynamics of Employment Growth: New Evidence from 18 Countries”, OECD Science, Technology and Industry Policy Papers no. 14.

International trade is a key vehicle for technological diffusion but firms typically need to reach sufficient scale, before entry to international markets, given the fixed costs of trade.



Barriers to up-scaling can reduce the aggregate impact of NF firms

How much higher would overall manufacturing sector labour productivity be if NF firms were as productive and large as GF firms?

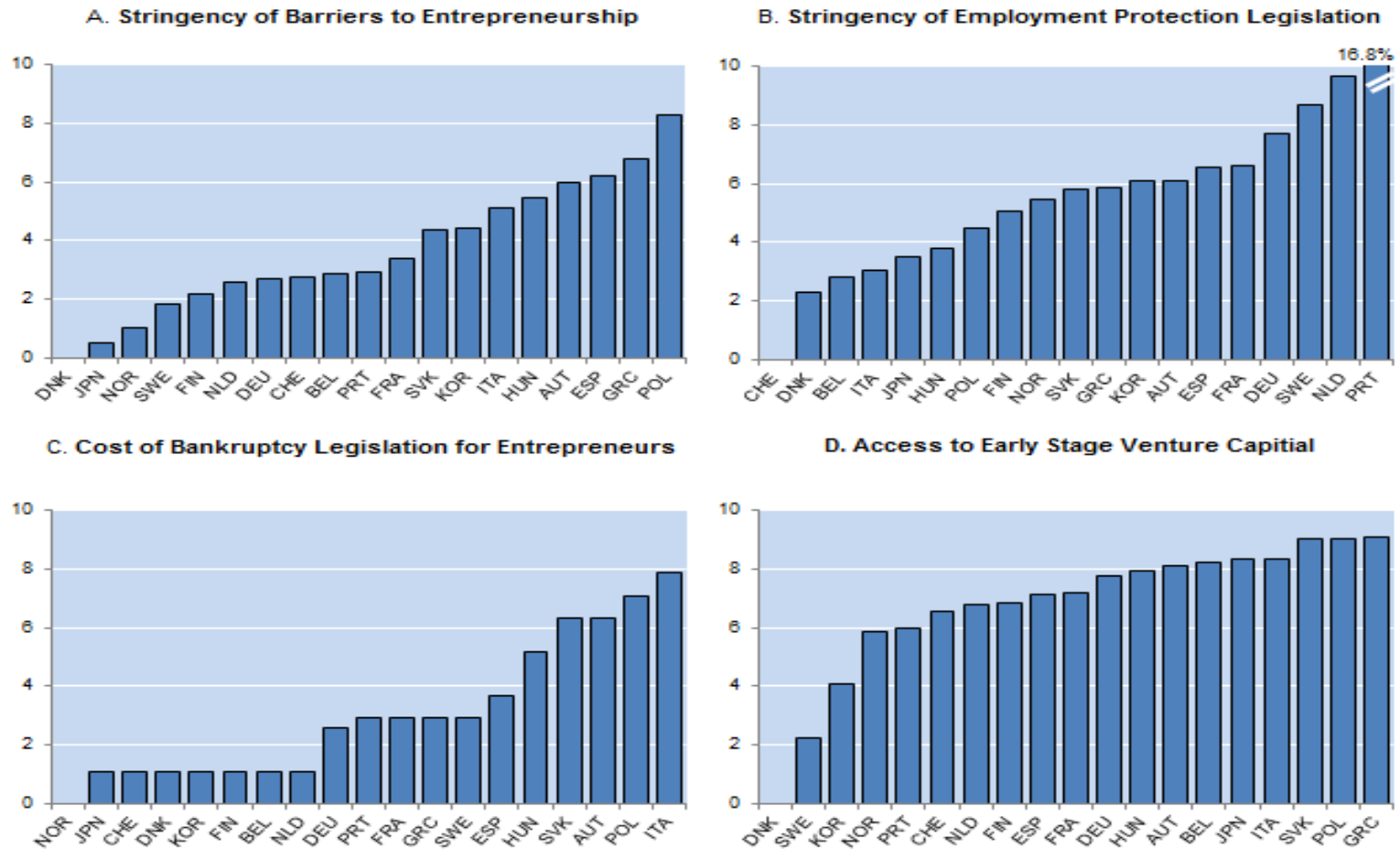


Source: Andrews, Criscuolo and Gal (2015), “Frontier firms, technology diffusion and public policy: micro evidence from OECD countries” forthcoming OECD Working Paper.



Policy reforms that facilitate the growth of NF firms can boost labour productivity

Impact of policy reform to best practice on level of industry productivity
 % difference between industries with high and low exposure to the policy



Source: Andrews, Criscuolo and Gal (2015), “Frontier firms, technology diffusion and public policy: micro evidence from OECD countries ” forthcoming OECD Working Paper.



Key issues for policymakers

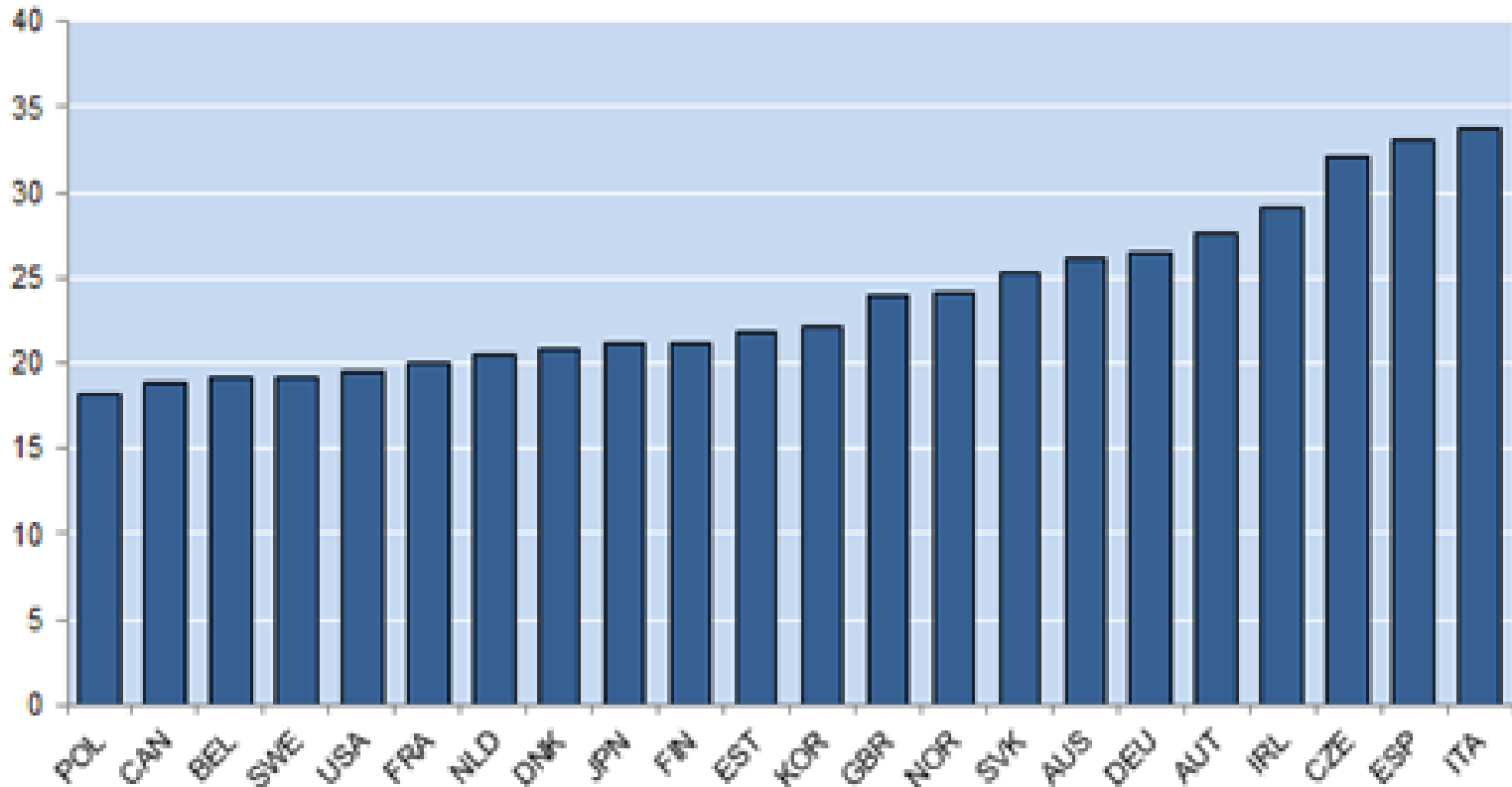
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Cross-country differences in skill mismatch are significant

Percentage of workers with skill mismatch; selected OECD countries, 2011-12

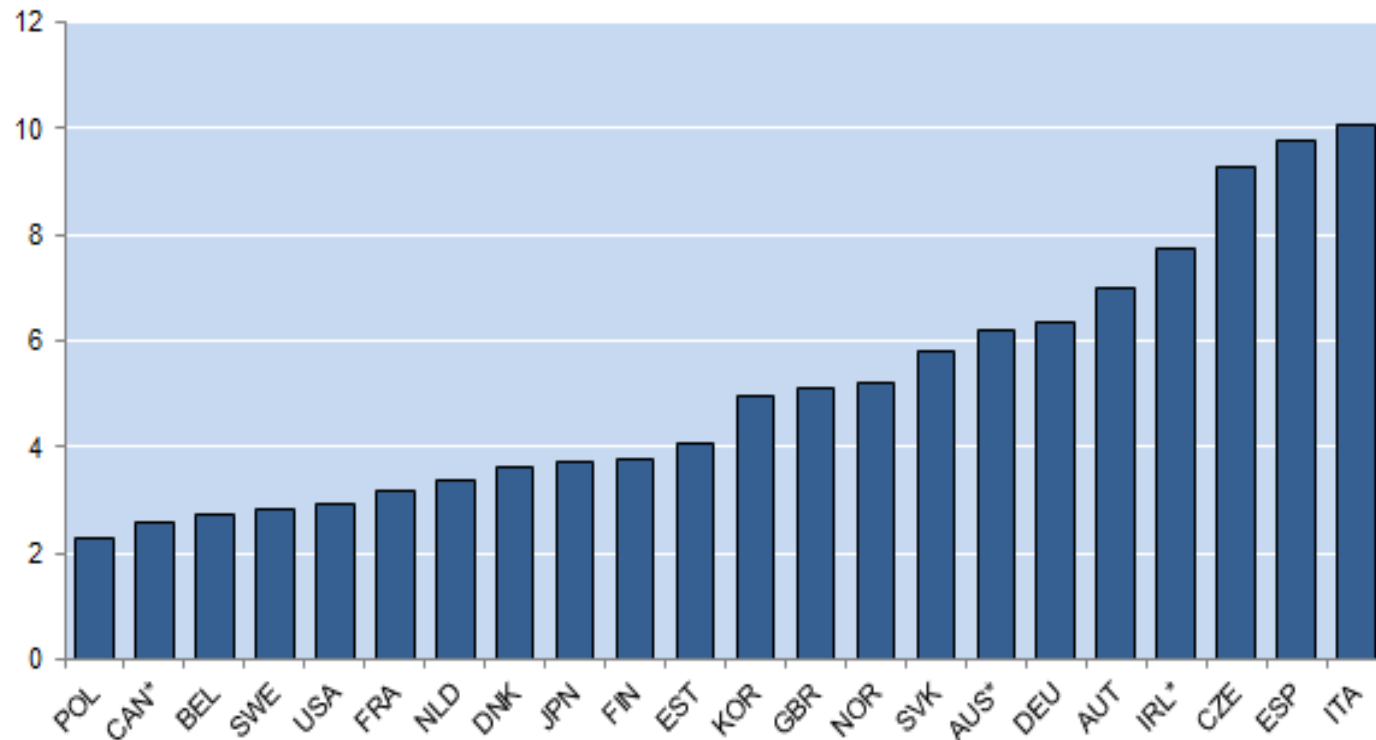


Source: Adalet McGowan and Andrews (2015), "Labour market mismatch and labour productivity: evidence from PIAAC data" *forthcoming* OECD Working Paper.



But the improving the allocation of skills also matters for productivity

Simulated gains to labour productivity from reducing skill mismatch to the lowest level (%)



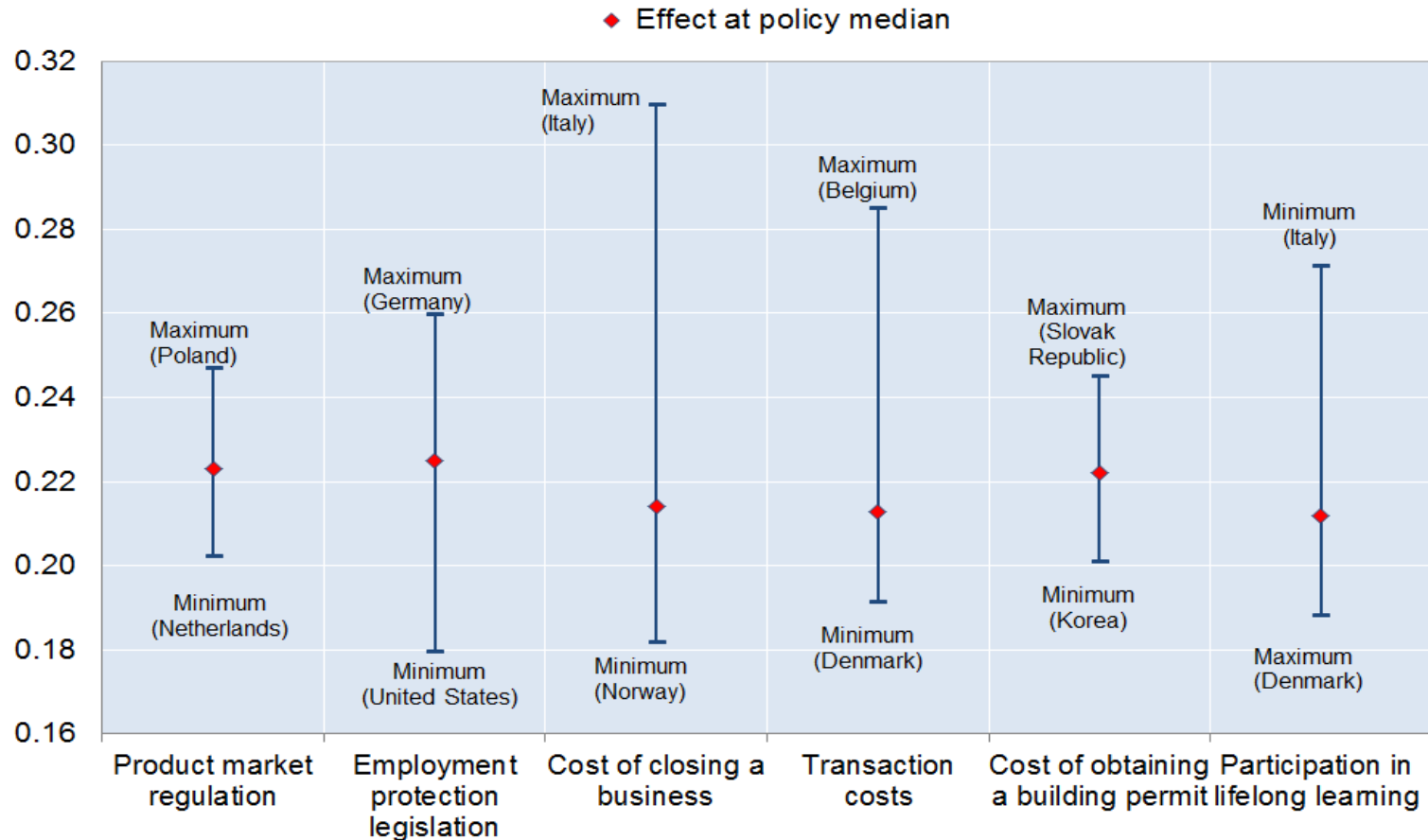
Skill mismatch, particularly over-skilling, is harmful for productivity because it constrains the ability of innovative firms to attract skilled workers and grow.

Source: Adalet McGowan and Andrews (2015), "Labour market mismatch and labour productivity: evidence from PIAAC data" forthcoming OECD Working Paper.



Reducing skill mismatch requires a range of policies

The probability of skill mismatch and public policies



Source: Adalet McGowan and Andrews (2015), “Skill Mismatch and Public Policy in OECD Countries” *forthcoming* OECD Working Paper.

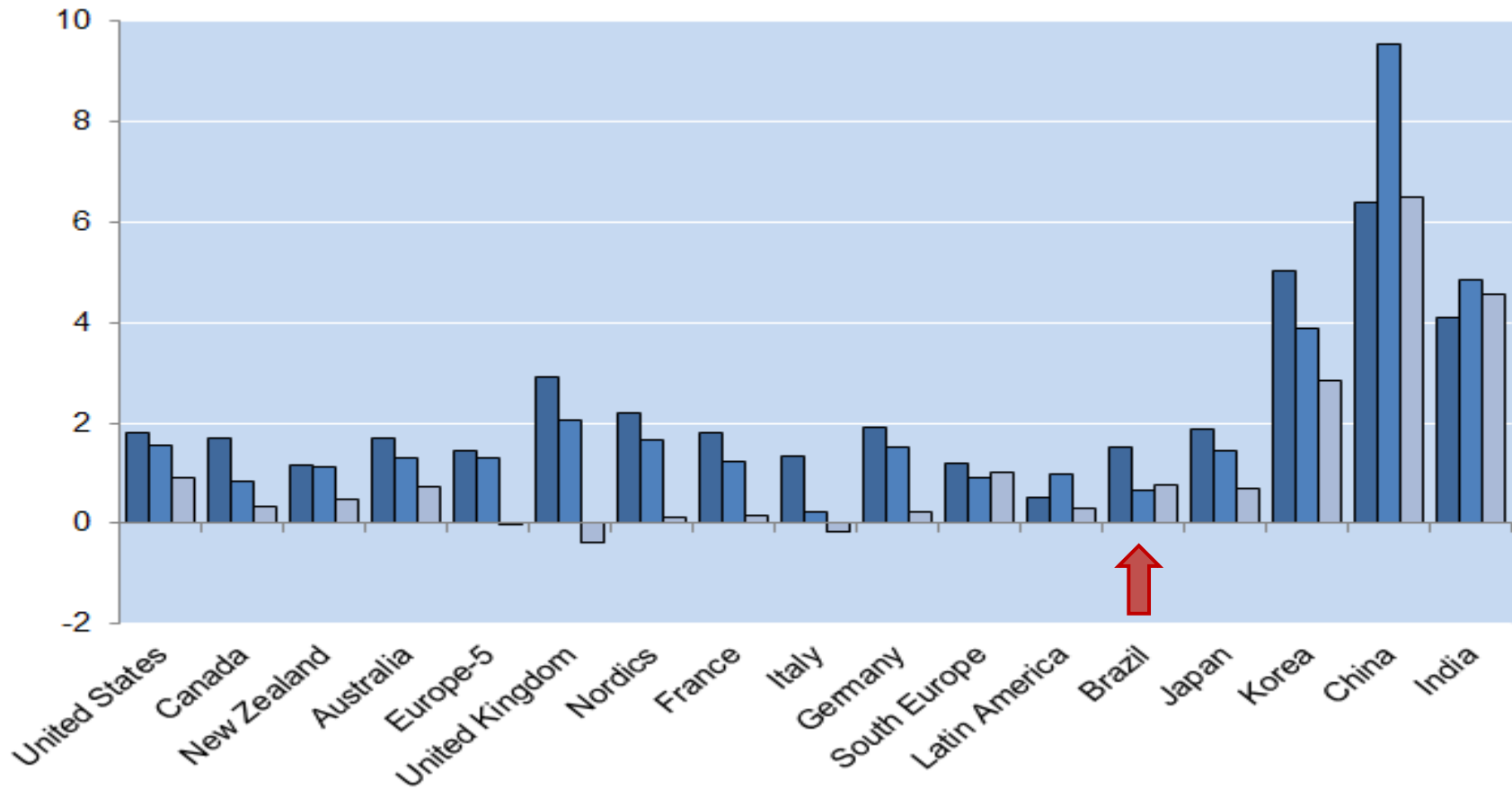




A1. Labour productivity growth slowed even before the crisis

GDP per hour worked
Annual average growth (%)

■ 1990-2000 ■ 2000-2007 ■ 2007-2013

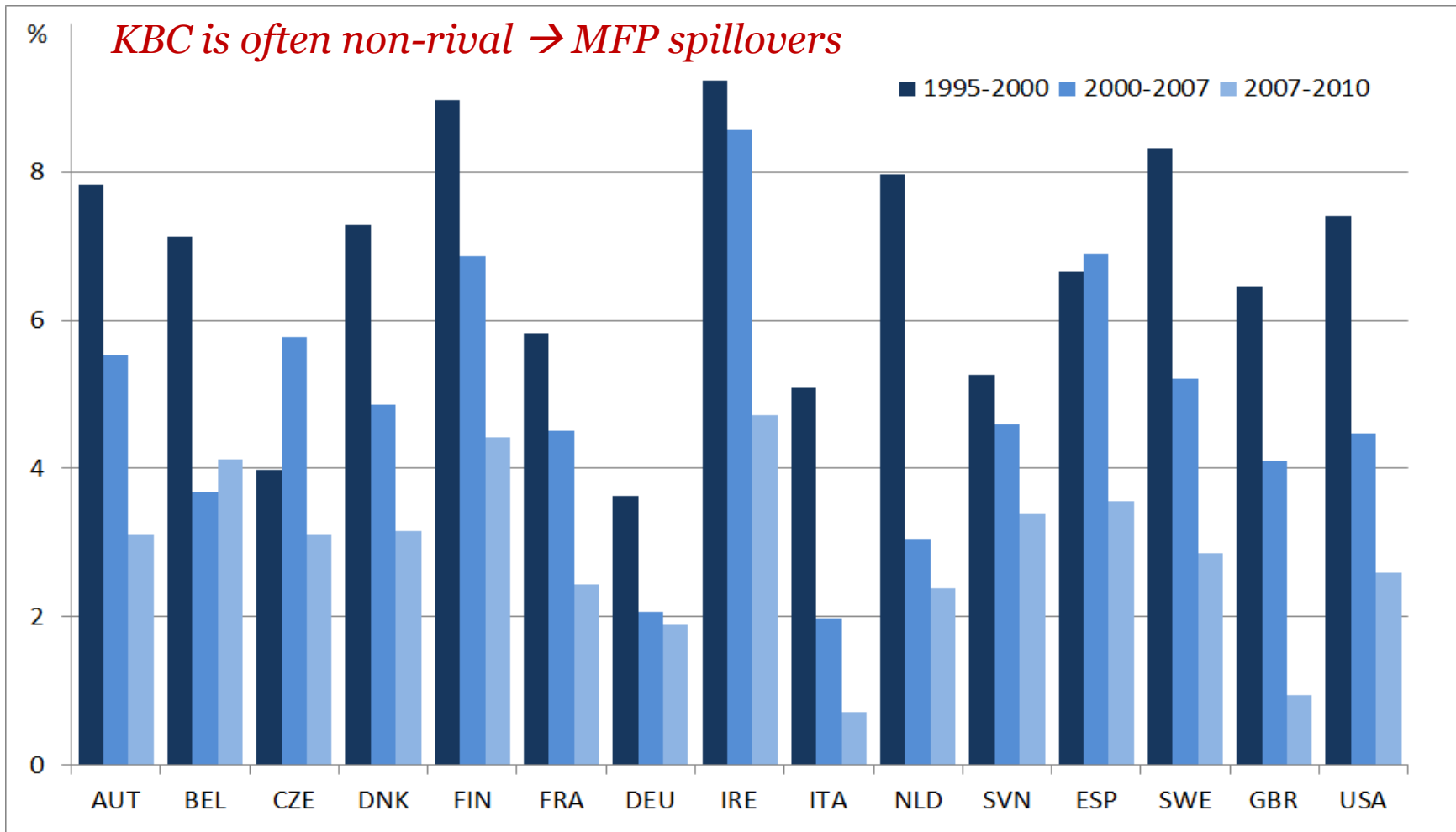


Source: Conference Board Total Economy Database



A2. Structural dimensions to the slowdown: KBC

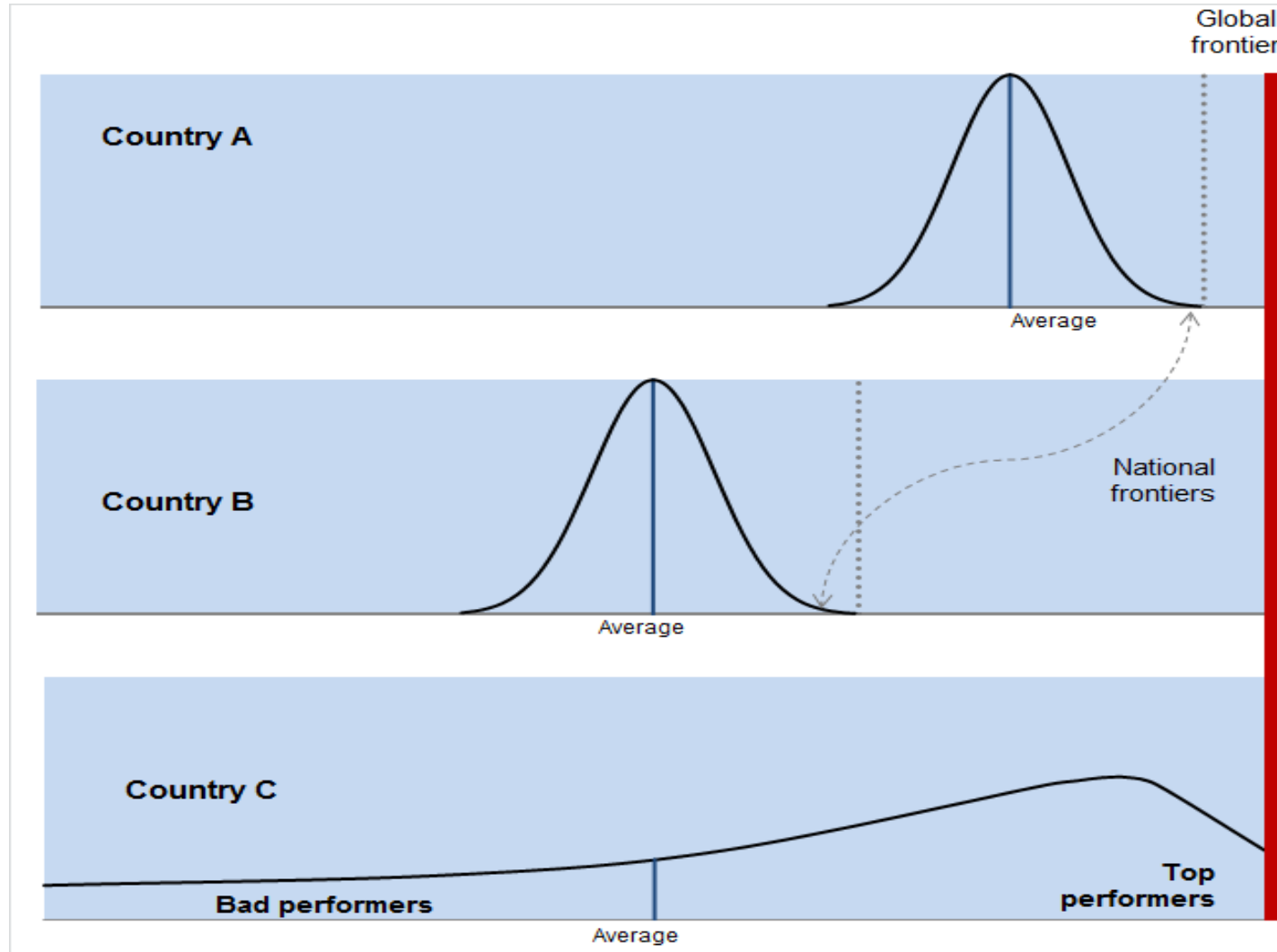
Investment in Knowledge-Based Capital; average annual growth



Source: calculations based on Corrado et al., (2012).



A3. The shape and distribution of firm performance matters...



Source: Adapted from Bartelsman et al (2008)

A4. The globally most productive firms – who are they?

Mean firm characteristics: frontier firms and non-frontier firms

Selected OECD Countries, 2005 (unless otherwise noted)

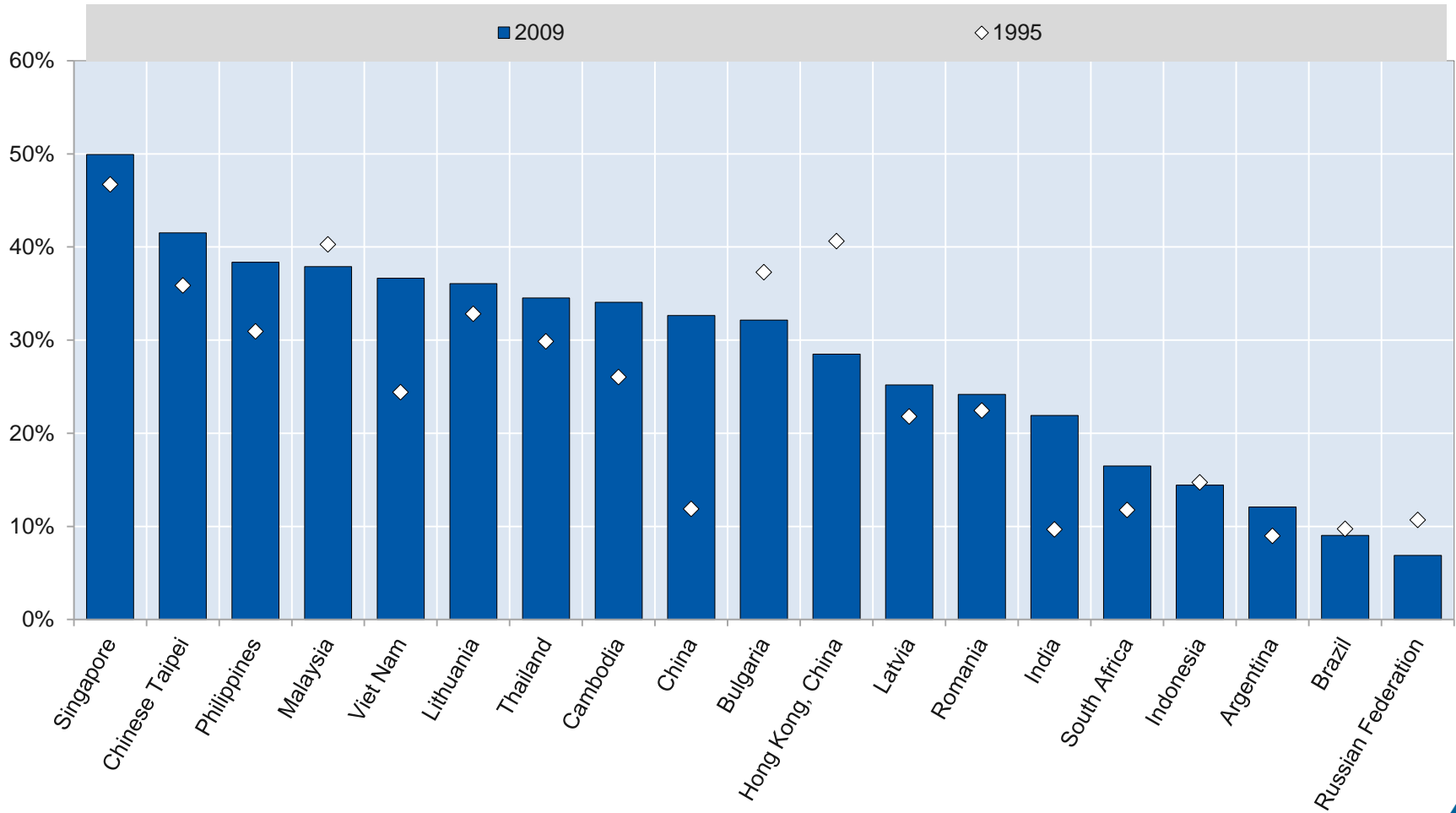
	Global Frontier Firms		Non-Frontier Firms		Difference in means
	Mean	Std Dev	Mean	Std Dev	
Multi Factor Productivity (Solow)					
Productivity	4.06	1.04	2.51	0.91	1.5 ***
Employment	309	3770	229	4119	81
Capital stock (€m)	31	355	19	343	12 **
Turnover (€m)	250	1731	59	754	191 ***
Profit rate	0.57	0.33	0.13	6.33	0.45 ***
Age	21.5	20.3	23.2	18.6	-1.7 ***
MNE status*					
<i>Probability</i>	0.47	0.50	0.28	0.45	0.19 ***
Depreciated patent stock	3.71	45.15	0.90	56.17	2.8 ***

Notes: * Data refer to 2008

Note: “Frontier firms” corresponds to the average labour productivity of the 50 globally most productive firms in each 2 digit sector in ORBIS. “Non-frontier firms” is the average of all other firms.

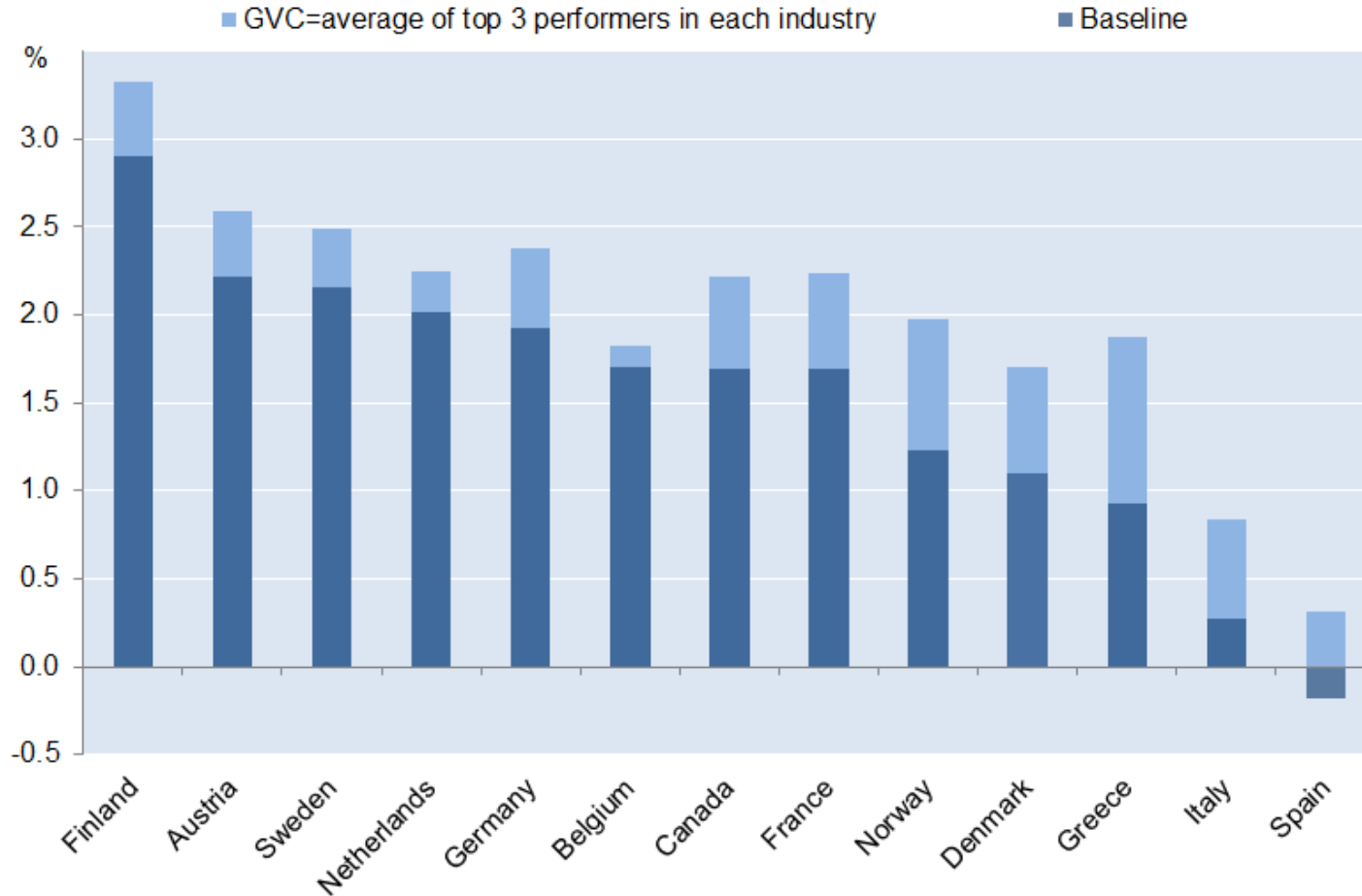


A5. GVC Participation





A6. Estimated gains to MFP growth associated with raising GVC participation





A7. Low managerial quality is a barrier to higher labour productivity in Brazil

Managerial quality differs across countries with important implications for productivity
Average management quality score in the manufacturing sector; selected countries

