

Technical Change and Productivity

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THE FUTURE OF PRODUCTIVITY: CAN DIGITAL TRANSFORMATION MAKE A DIFFERENCE?

Productivity Commission

Wellington, 13 February 2018

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Outline

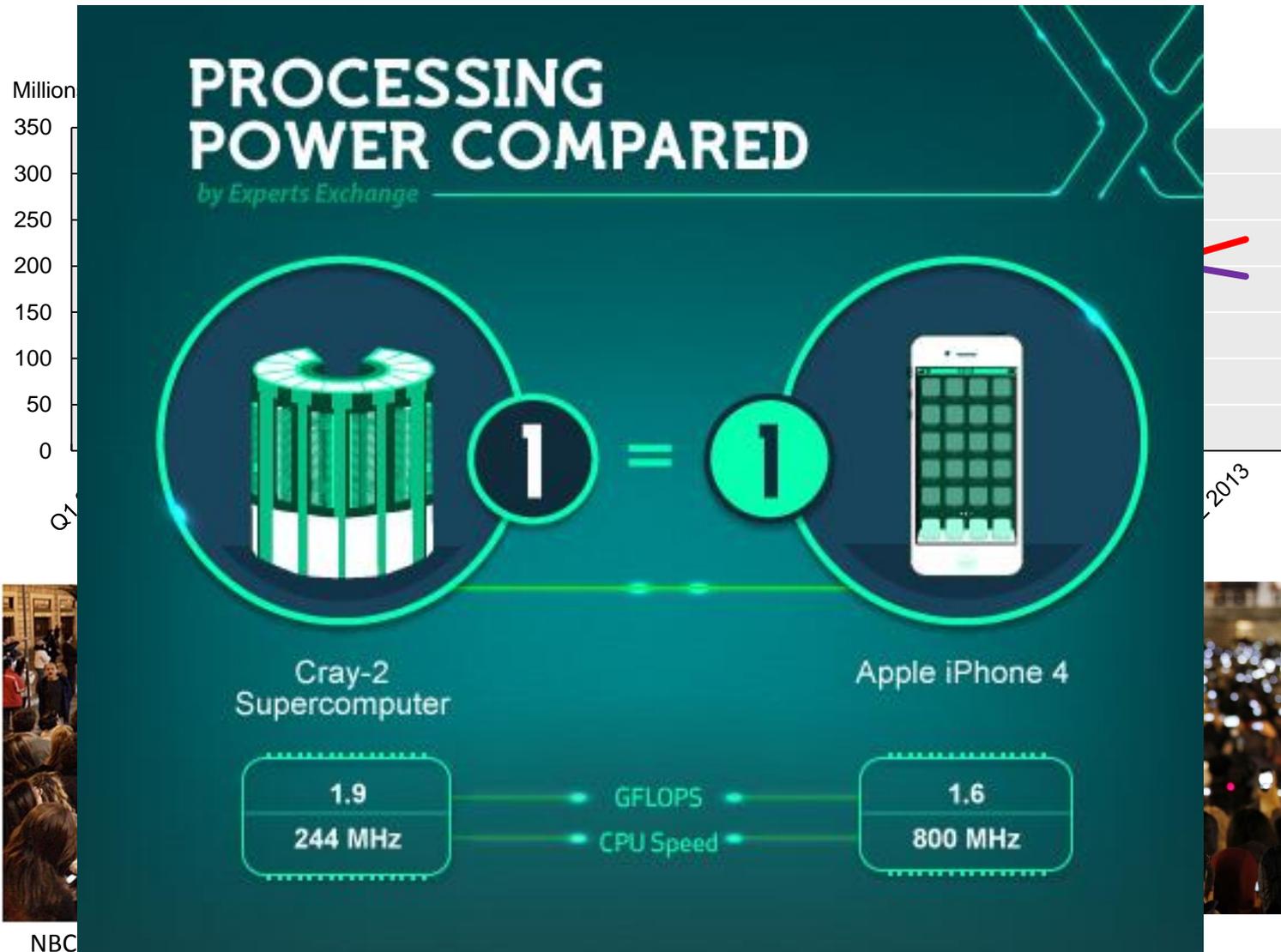


1. The OECD's Going Digital Project
2. Some data on productivity growth
3. Possible drivers and policy issues
 - Diffusion
 - Structural change and resource allocation
 - Competition and business dynamics
 - Measurement
4. Some conclusions and policy implications



1. THE OECD'S GOING DIGITAL PROJECT

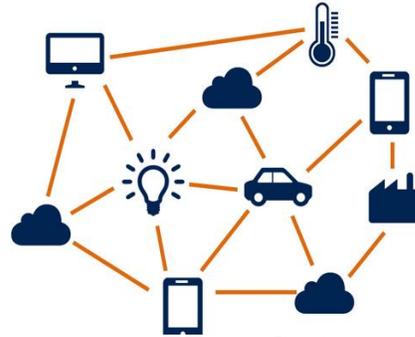
1. We are in a new phase of the digital transformation, ...



... with a wide range of new digital technologies emerging ...



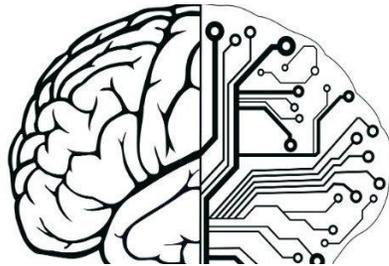
Cloud computing



Internet of Things



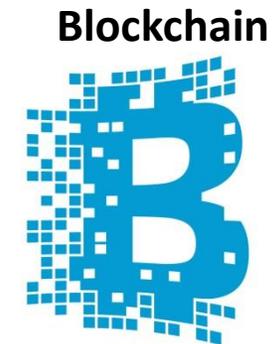
Big data



**Artificial
intelligence**



3D printing



Blockchain

..., that provide new opportunities for all sectors in the economy



Public Admin.



Health

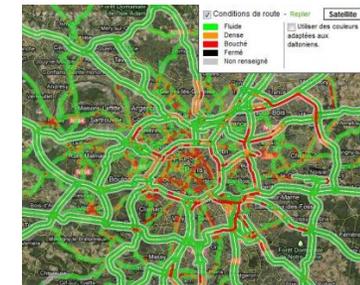


Retail



Agriculture

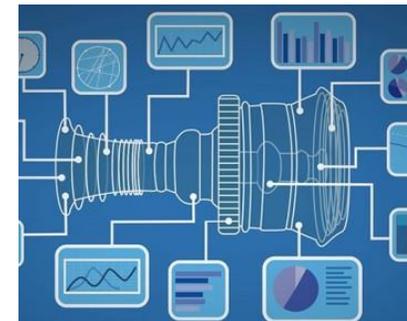
Digitalisation



Transportation



Science & Education



Manufacturing

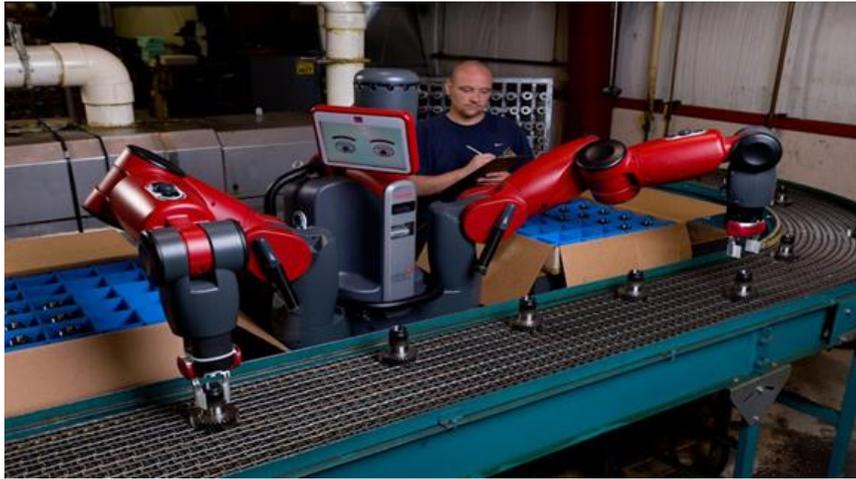
OECD Going Digital Project, ...



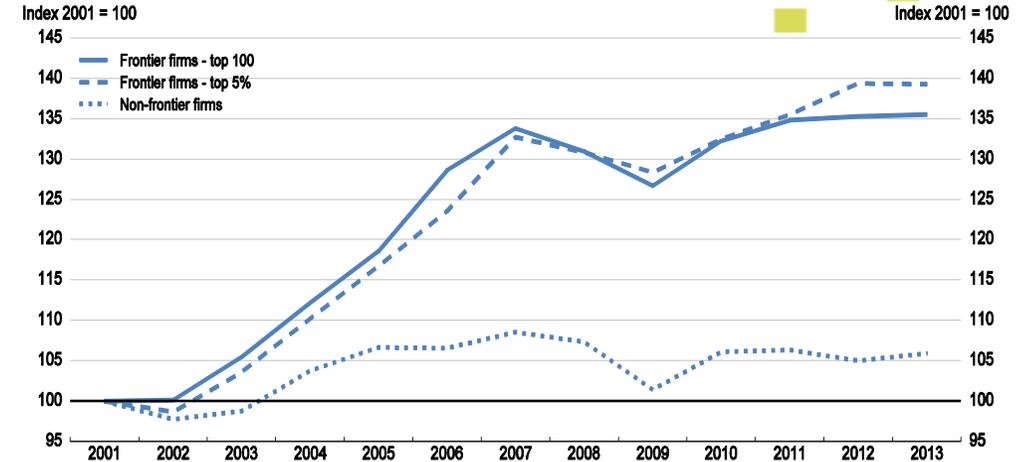
Horizontal initiative across the OECD (involving all key policy areas), mandated by Ministers, to:

1. Better understand the digital transformation and its impacts on the economy and society;
2. Provide policy makers with the tools needed to develop a pro-active, whole-of-government policy response;
3. Help overcome the gap between technological change and policy development.

... includes in-depth work on some key policy questions, such as productivity growth



Jobs, skills and the nature of work



Productivity, competition & market openness



Well-being & inclusion



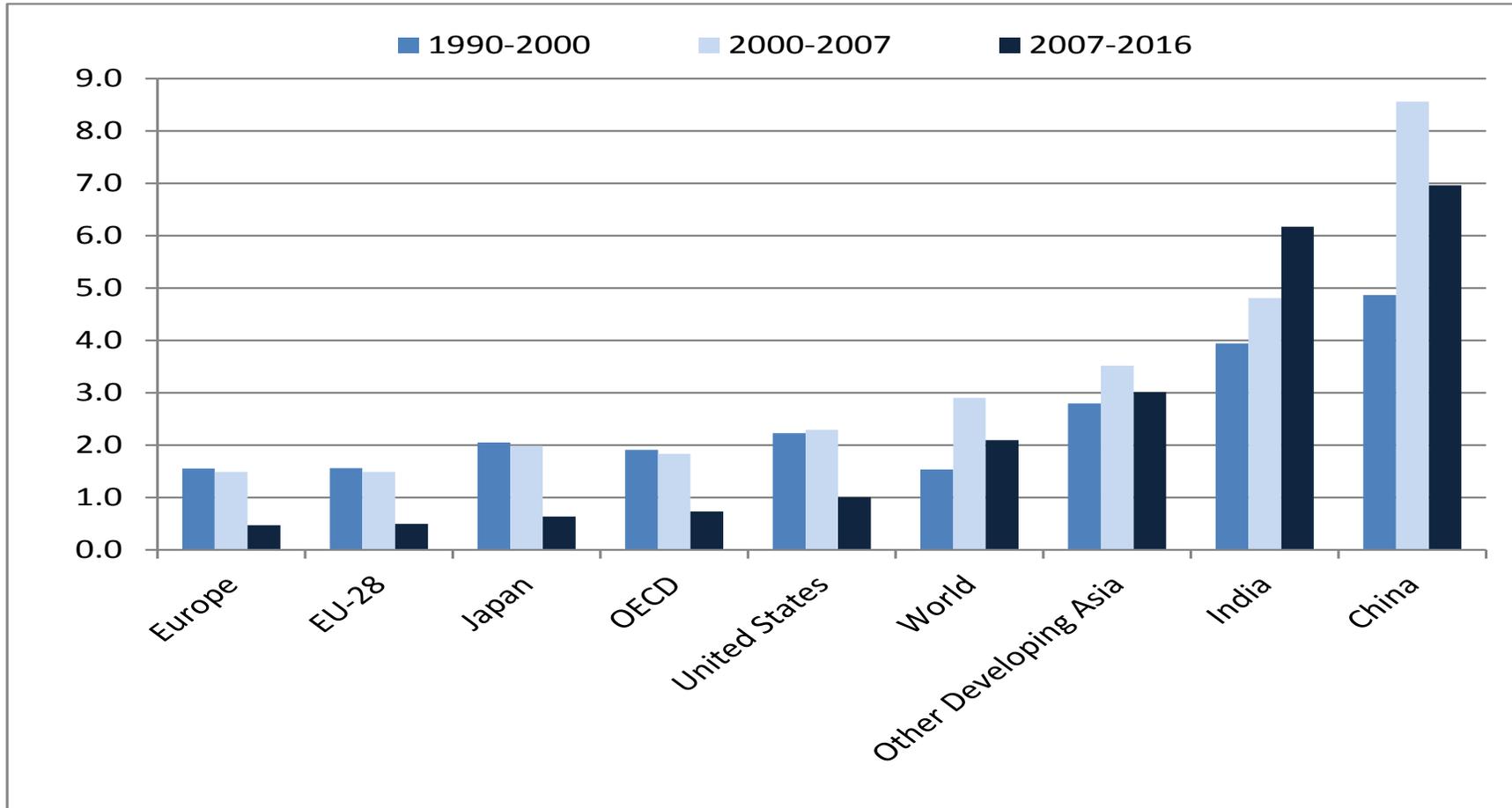
Measurement



2. SOME EVIDENCE ON PRODUCTIVITY GROWTH

2. Productivity growth has **slowed down** in much of the world ...

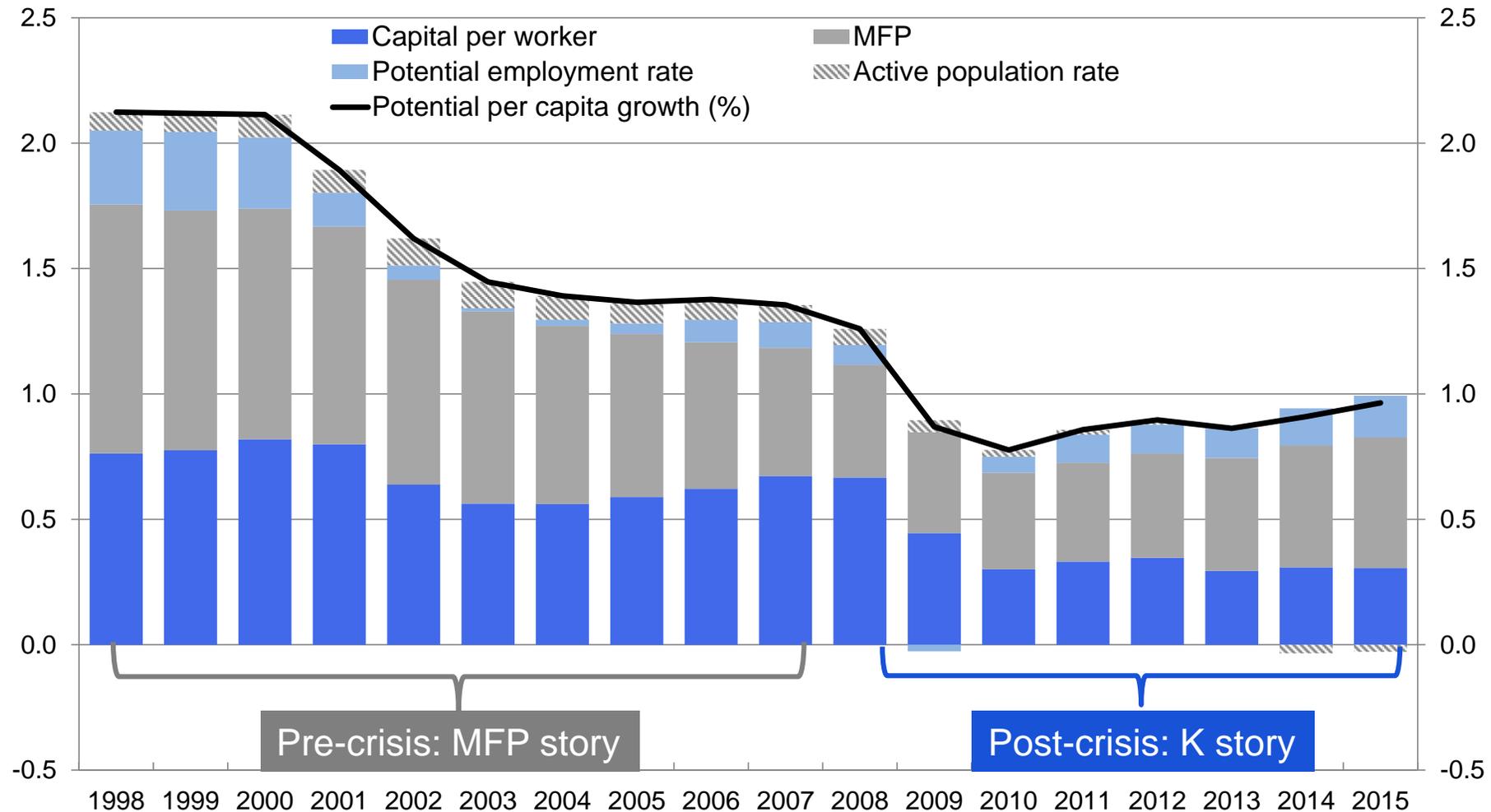
Annualised growth of labour productivity (GDP per hour worked)



Source: OECD estimations based on Conference Board, Total Economy Database, Regional Aggregates, May 2017.

... and underpins the slowdown in OECD potential growth ...

Contribution to potential per capita output growth (% pts unless otherwise noted)



Source: OECD Economic Outlook 2016, Volume 1.

The slowdown has ignited a spirited debate

T-Pessimists:

- Gordon
- Cowen
- Thiel
- ...



T-Optimists:

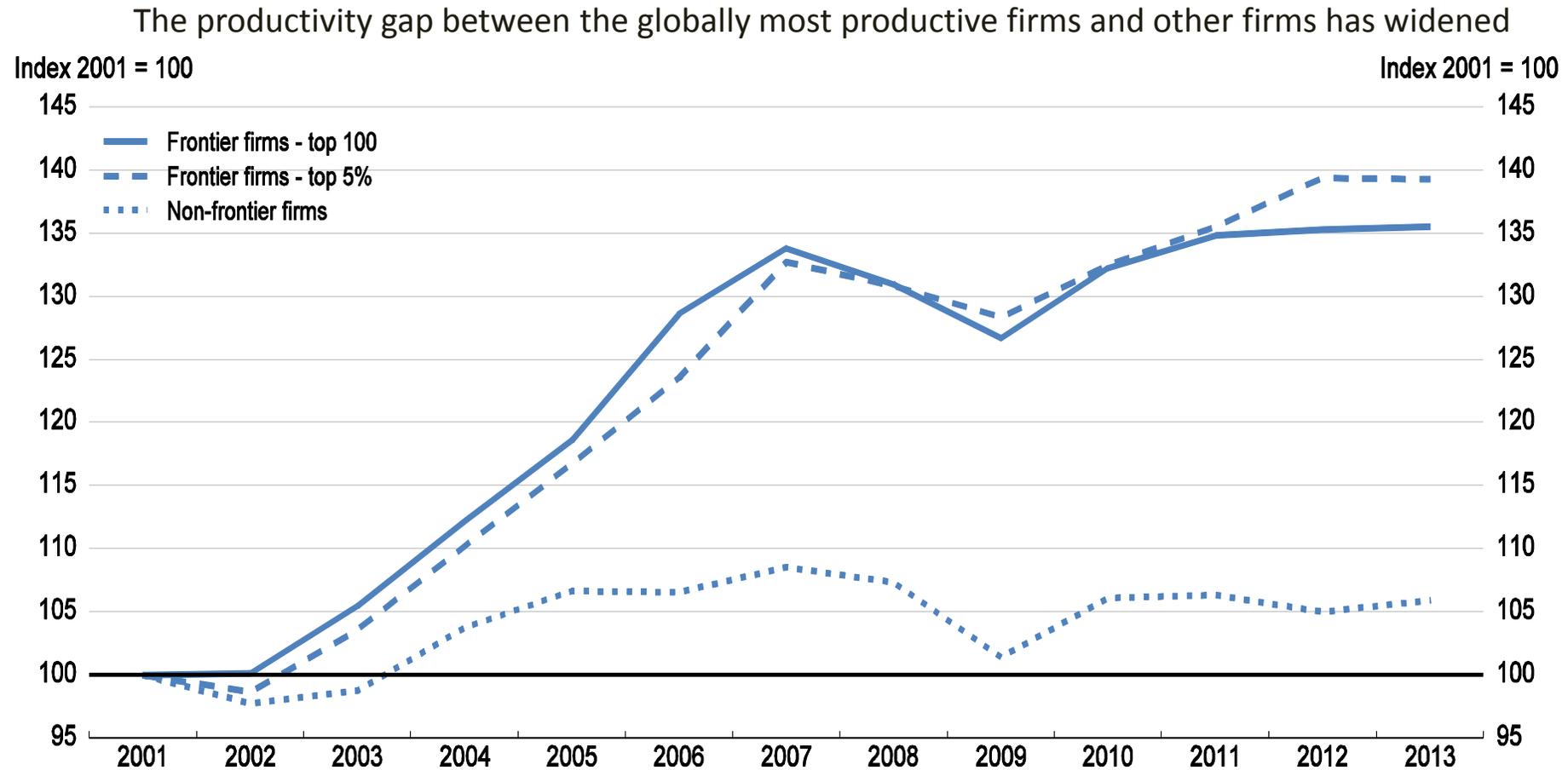
- Brynjolfsson
- McAfee
- Mokyr
- Jovanovic
- ...



There are many possible explanations for the slowdown

1. Technological factors
 - “transition costs” of Adoption and diffusion of GPT (Griliches, 1957; David, 1991; Jovanovic and Rousseau, 2005)
2. A “return to normal” effect ...after nearly a decade of exceptional IT-fueled gains (Fernald, 2014)
3. Transitional productivity growth dynamics due to rising resource misallocation (Gopinath et al., 2015):
4. Cyclical factors – e.g. demand conditions and monetary policy (Anzoategui, et al., 2016)
5. Measurement (Byrne, et al., 2016)? (...or not)

Despite the slowdown, the world's most productive firms still manage rapid productivity growth, ...



Note: "Frontier firms" is the average labour productivity (value added per worker) of the 100 or 5% globally most productive firms in each two-digit industry. "Non-frontier firms" is the average of all firms, except the 5% globally most productive firms.

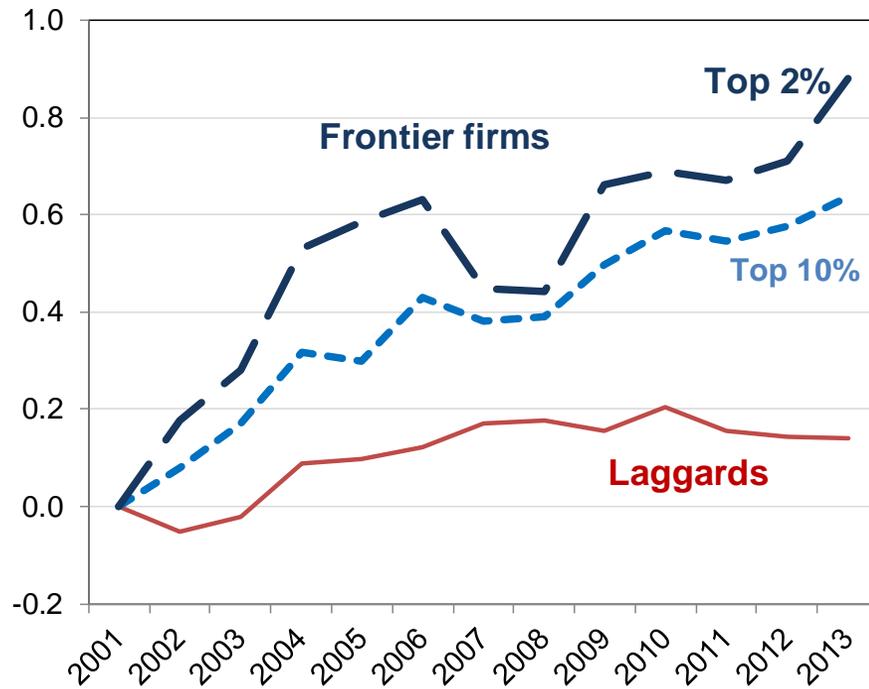
Source: OECD preliminary results based on Andrews, D., C. Criscuolo and P. Gal (2016), "Mind the Gap: Productivity Divergence between the Global Frontier and Laggard Firms", OECD Productivity Working Papers, forthcoming; Orbis database of Bureau van Dijk.

In some sectors, the productivity divergence between leaders and laggards is even more marked

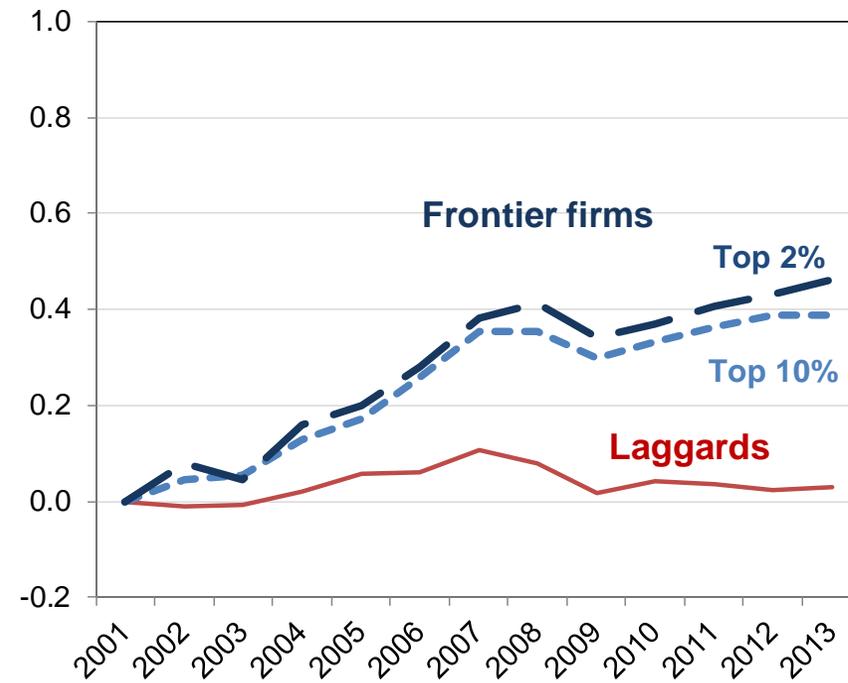


The divergence in multi-factor productivity growth

ICT services



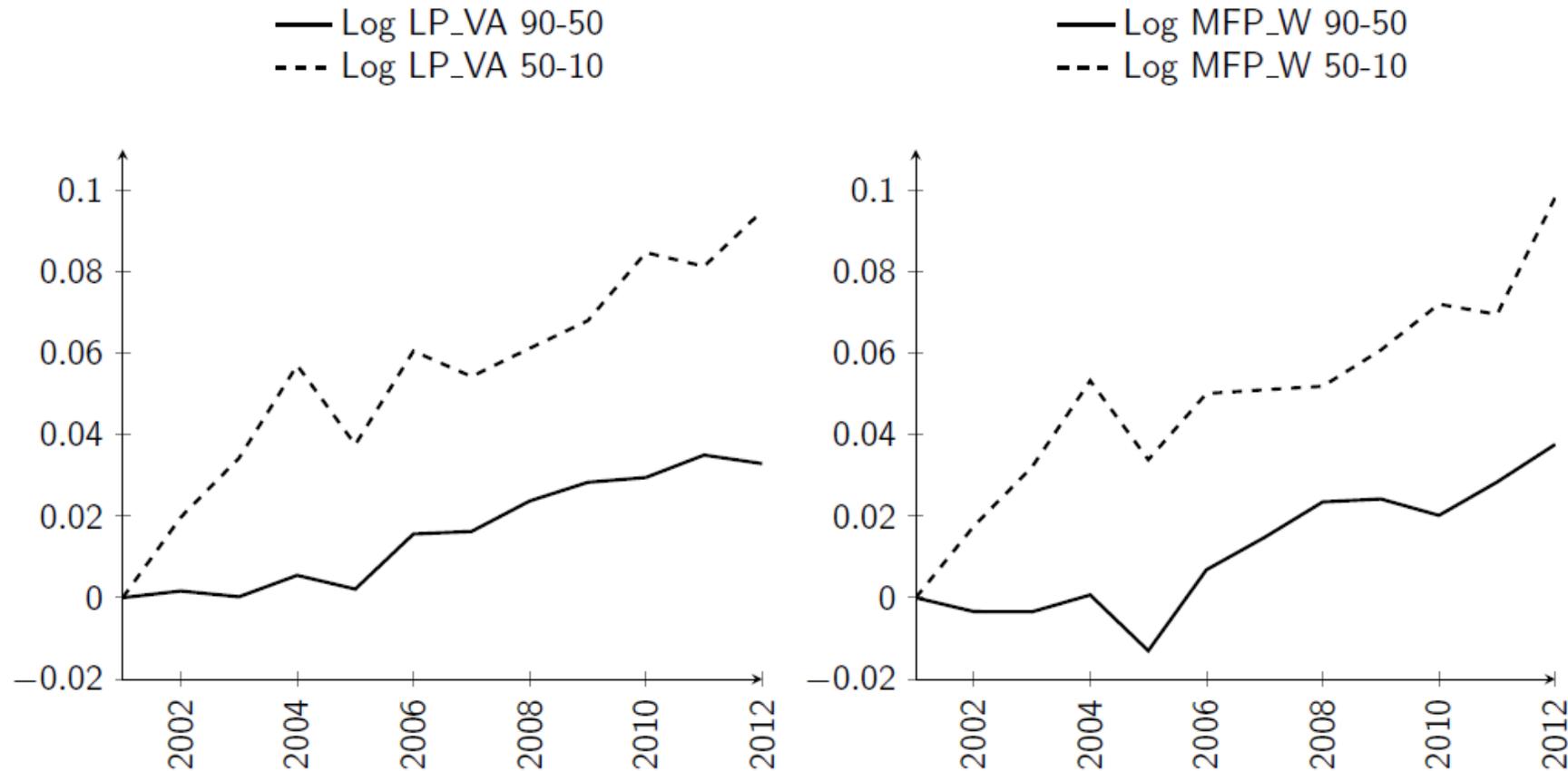
Non-ICT services



Note: Excluding the financial sector

Source: Andrews, D., Criscuolo C., and Gal P. N., "The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy", OECD Productivity Working Papers, 2016-05, OECD Publishing, Paris.

At the national level, the divergence in productivity is more marked at the bottom of the distribution



Source: OECD MultiProd project, March 2017.

Note: The figure plots the estimated year dummies of a regression of log-productivity dispersion (labour productivity, LP, on the left, and multifactor productivity à la Wooldridge, MFP_W, on the right), respectively, at the top (90th and 50th percentiles ratio, solid line) and at the bottom (50th and 10th percentiles ratio, dashed line) within country-sector pairs, using data from the following countries: AUS, AUT, BEL, CHL, DNK, FIN, FRA, HUN, ITA, JPN, NLD, NOR, NZL, SWE. The graphs can be interpreted as the cumulated growth rates of dispersion at the top and the bottom of the distribution within each country and sector over the period. For instance, in 2012 LP dispersion in manufacturing is roughly 3% higher than in 2001 for the top, and 10% for the bottom.



3. SOME DRIVERS AND POLICY ISSUES

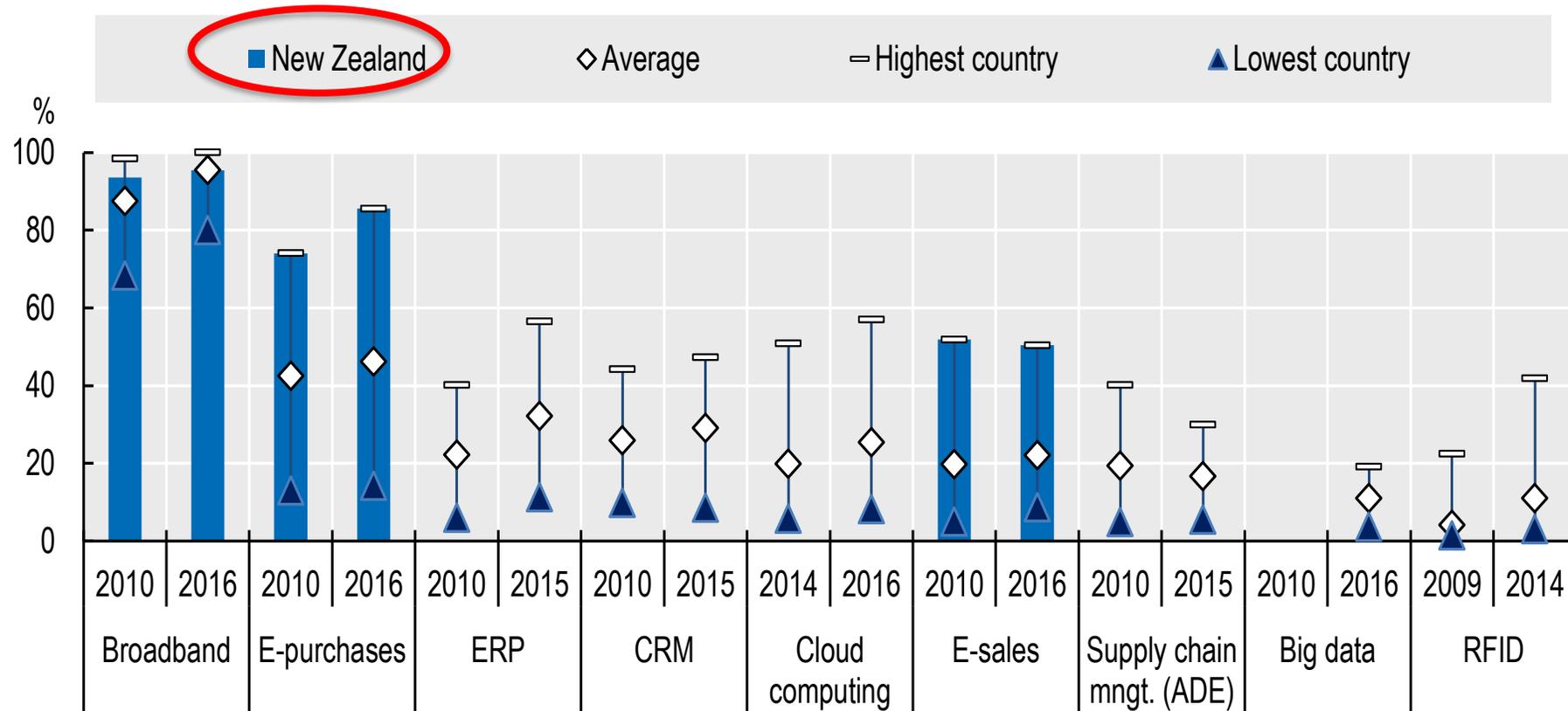
A new version of Solow's productivity paradox? Some factors may play a role:

- Diffusion
- Structural change and resource allocation
- Competition and business dynamics
- Measurement

A. Diffusion: While most firms are connected, few make effective use of advanced ICT ...

Diffusion of selected ICT tools and activities in enterprises, OECD countries, 2010 and 2016

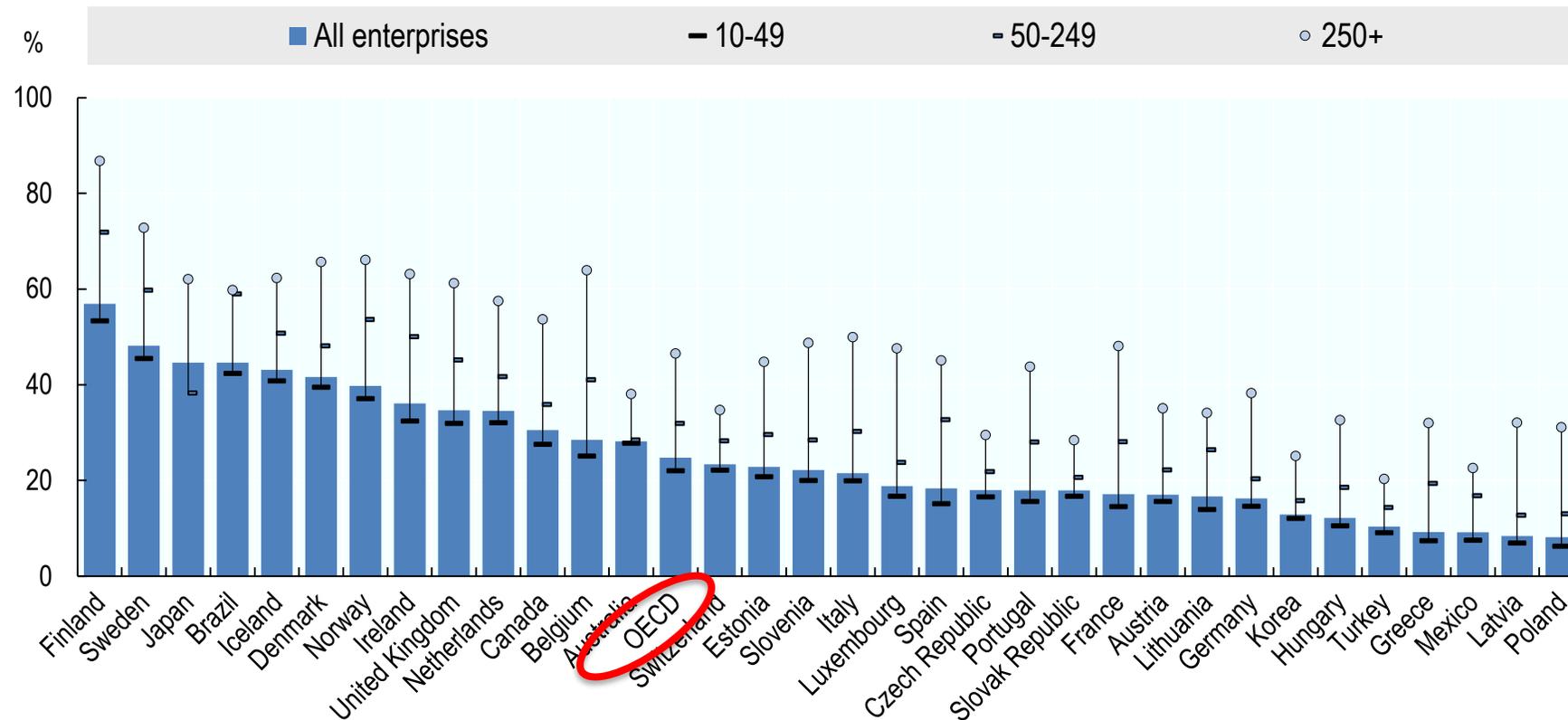
As a percentage of enterprises in each employment size class



... and SMEs are lagging, even in technologies well suited to them

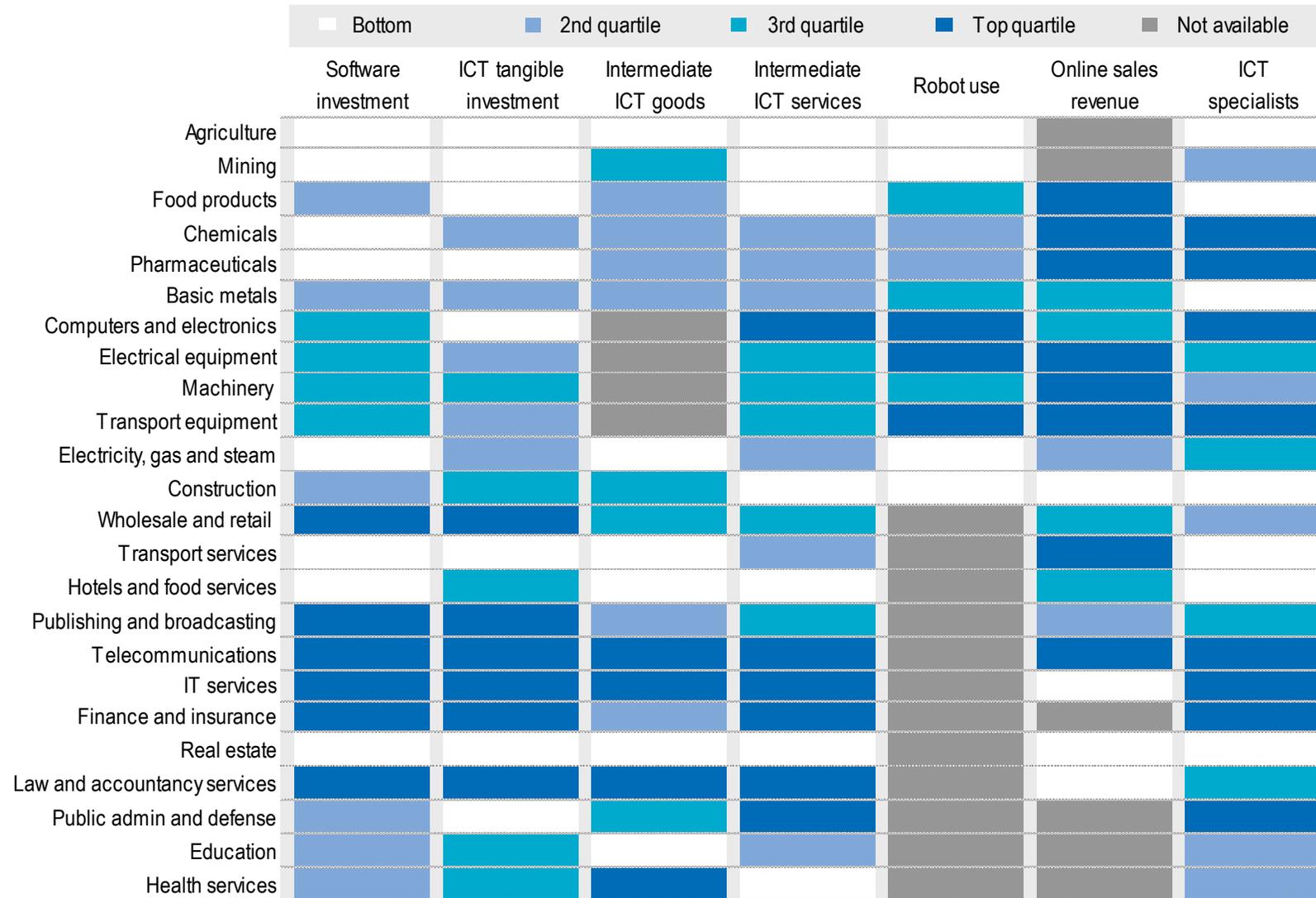
Enterprises using cloud computing services, by firm size, 2016

As a percentage of enterprises in each employment size class



There are also still large differences in digital intensity by industry ...

Taxonomy of sectors by quartile of digital intensity, 2013-15



Source: OECD, *OECD Science, Technology and Industry Scoreboard 2017*, OECD Publishing, Paris.

... and we know little about the spread of **business models & the role of complementary investment**



Design



+ Services

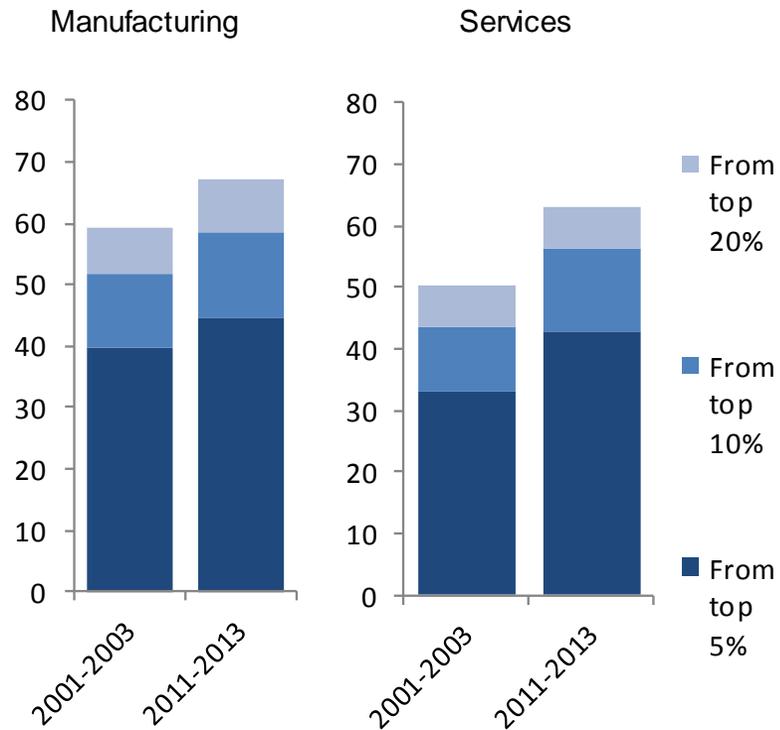
Branding



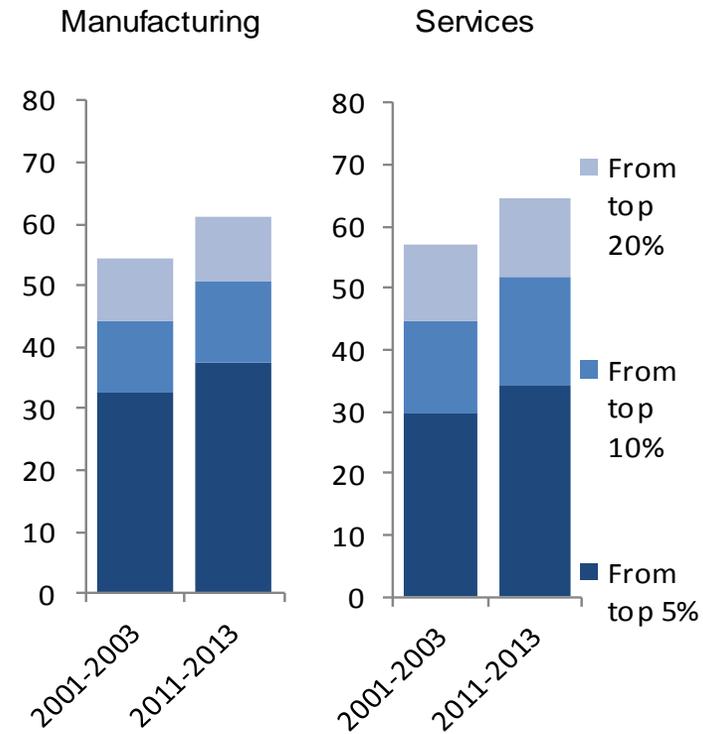
B. Structural Change: Entry into the global frontier has become more entrenched amongst the top firms ...

Proportion of frontier firms in time t according to their frontier status in $t-2$

A: MFPR



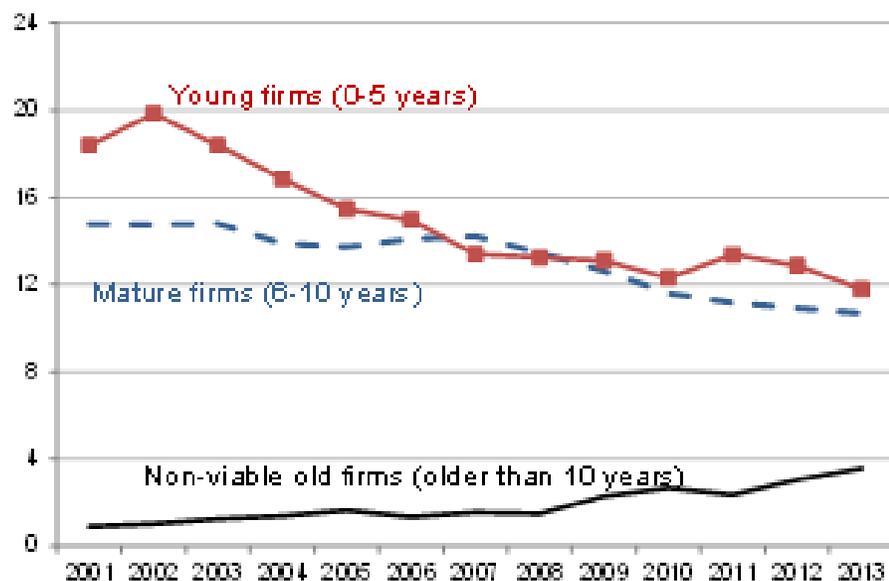
B: Mark-up corrected MFPR



... while the share of young firms is declining, and that of non-viable old firms is growing

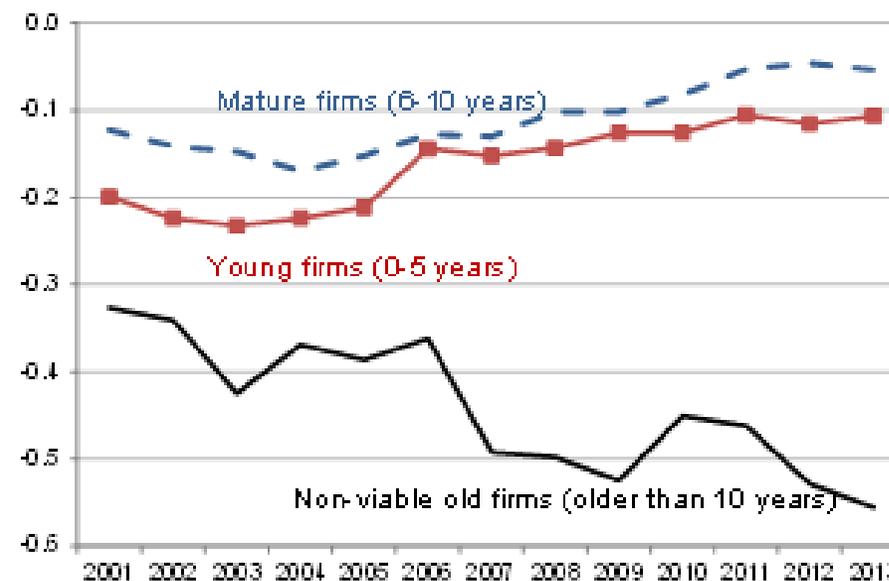


Share of firms
Per cent



Declining firm turnover: fewer young firms, while marginal firms increasingly survive.

MFPR relative to viable old firms
Log point differential



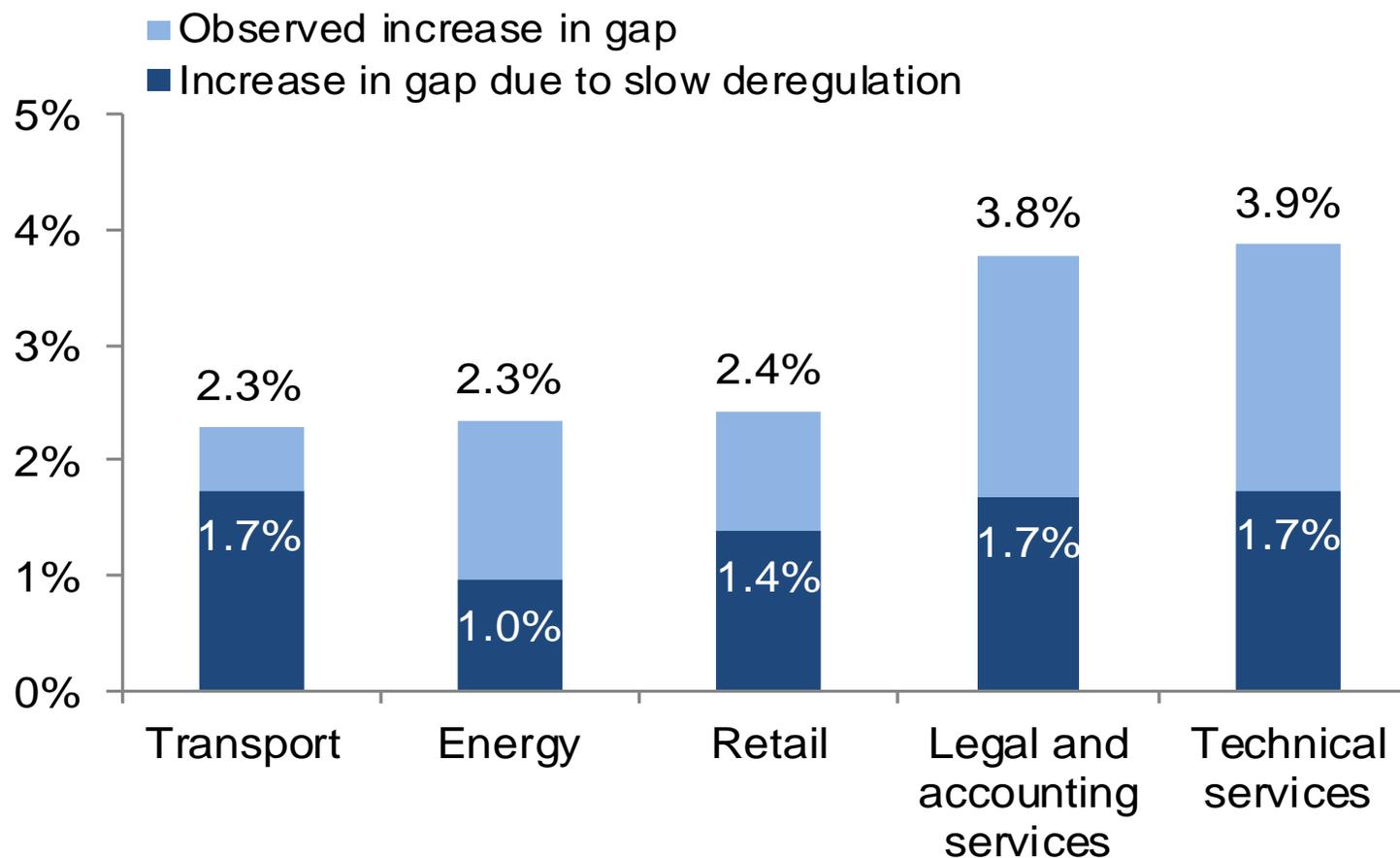
A higher productivity threshold for entry, while marginal firms survive despite a collapse in their MFPR

Notes: Non-viable old firms are those older than 10 years that record negative profits over at least two consecutive years. The omitted group are firms older than 10 years that do not record negative profits over at least two consecutive years (viable old firms).

Source: Andrews, D., C. Criscuolo and P. Gal (2016), "The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy", OECD Productivity Working Papers, No. 5, OECD

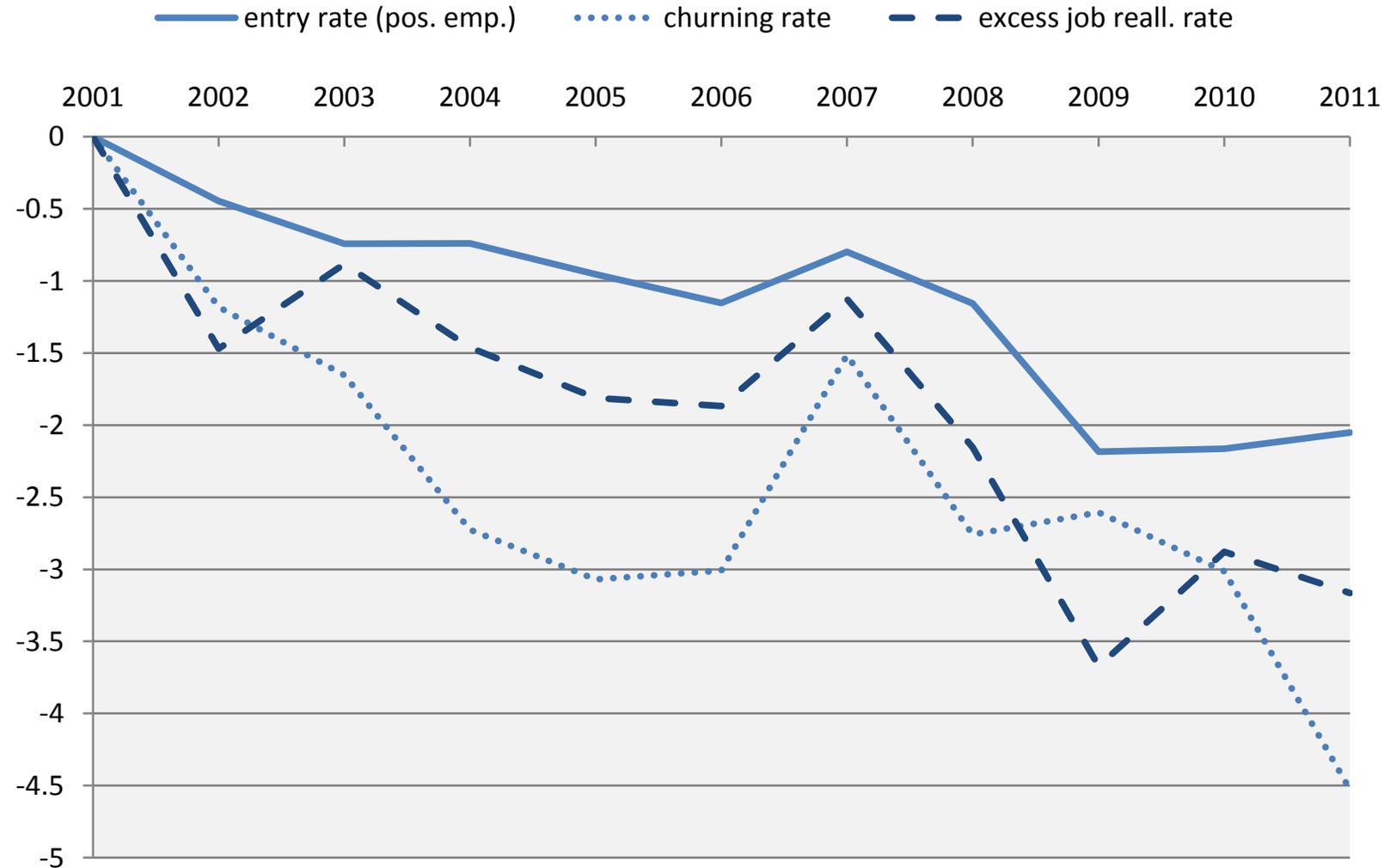
Sluggish product market reform in services has also amplified the MFP divergence

Estimated contribution to the annual change in the MFP gap of the slower pace of reform relative to the fastest reforming industry (telecoms)



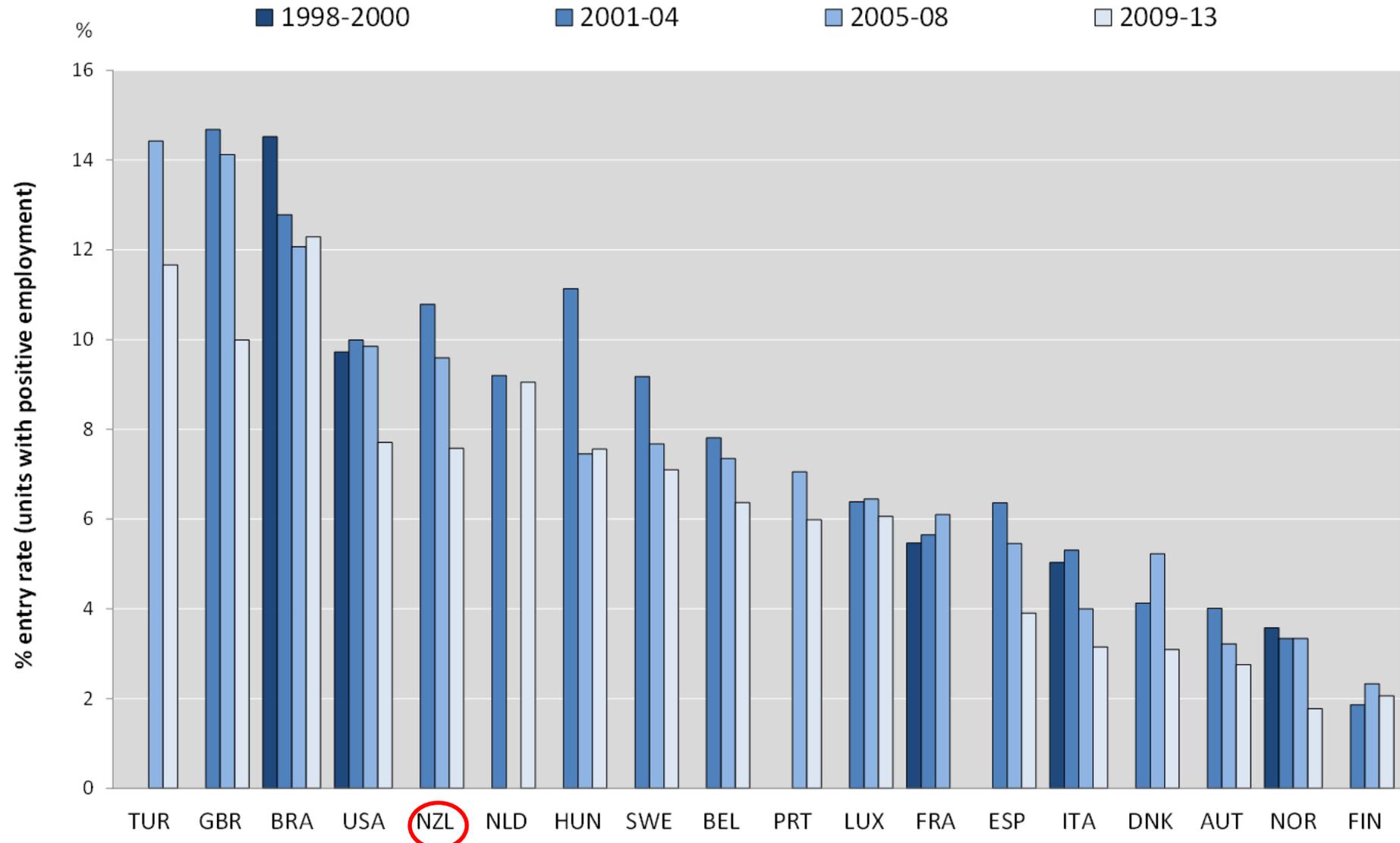
MFP divergence was perhaps inevitable due to structural changes in the global economy but policy could have worked harder

C. Business Dynamism: More generally, business dynamism across OECD countries is in decline, ...

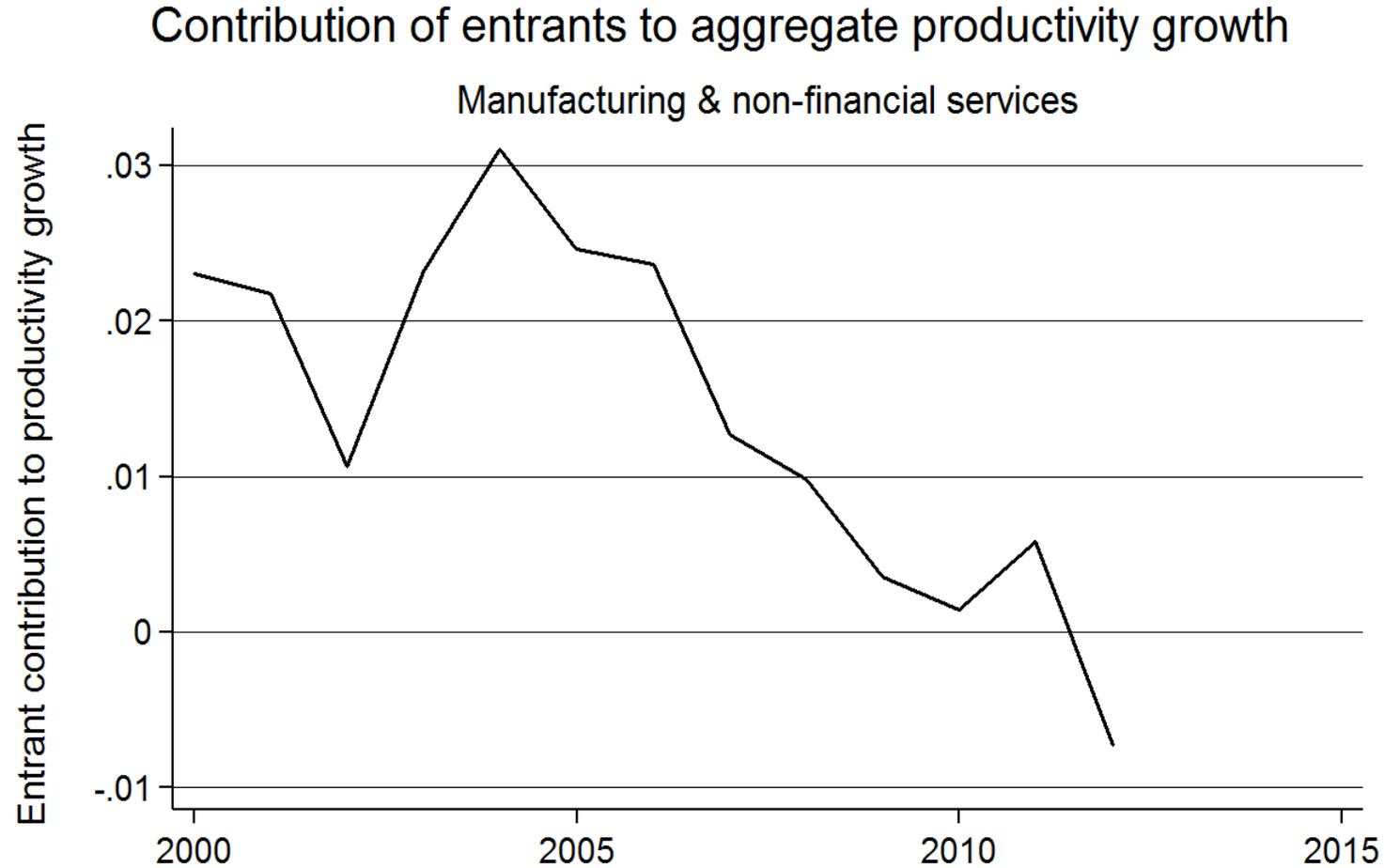


Source: OECD DynEmp v.2 database.

... reflecting a broad-based decline in entry rates,



... and a declining contribution of entrants to aggregate productivity growth ...

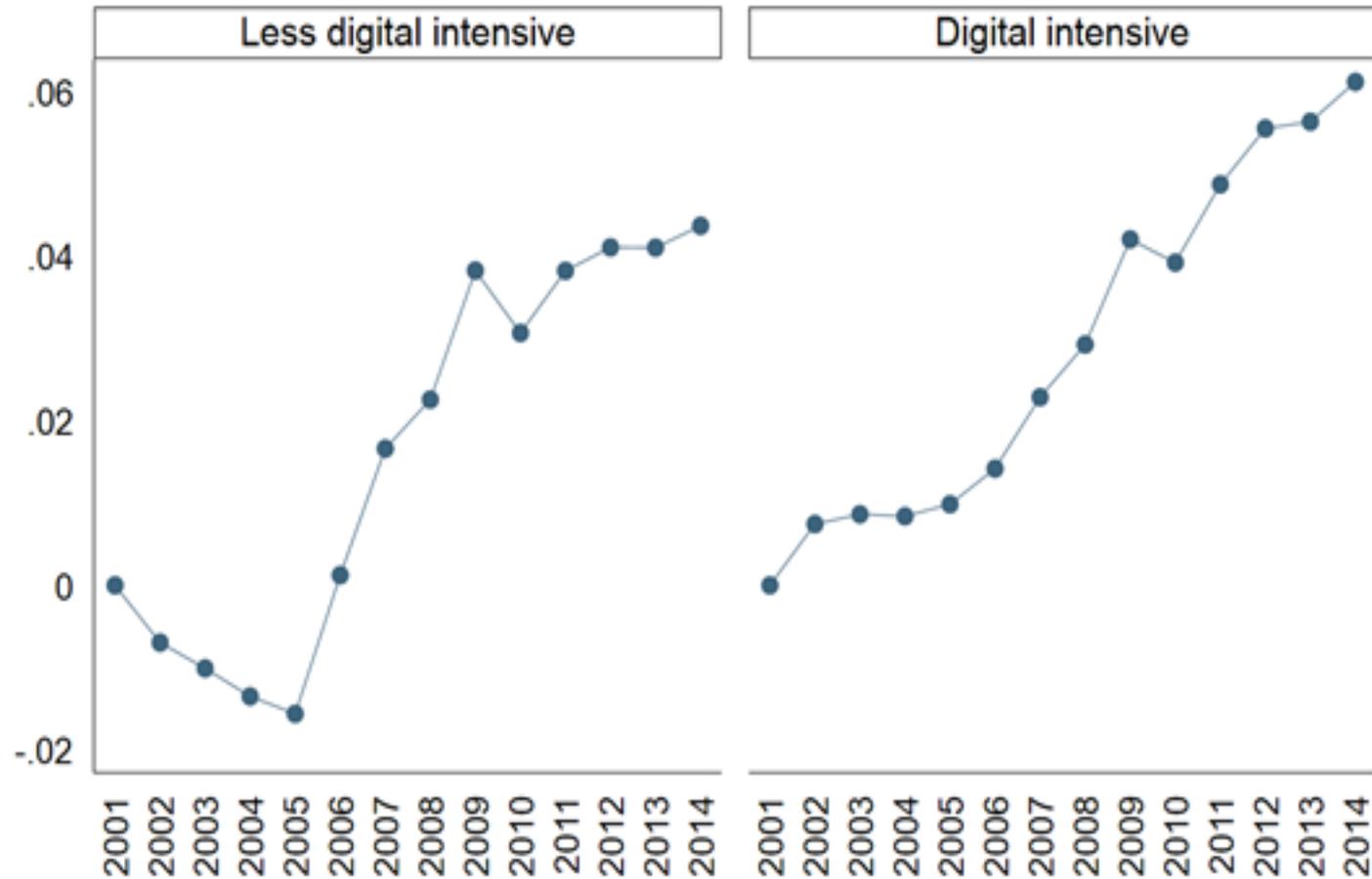


Graphs by Industry classification: 7 macro-sectors derived from OECD STAN A21

Source: OECD Multiprod, May 2017

... as well as a growth in mark-ups, in particular in digitally intensive sectors

Mark-up growth in digital intensive vs less digital intensive sectors, 2001-2014



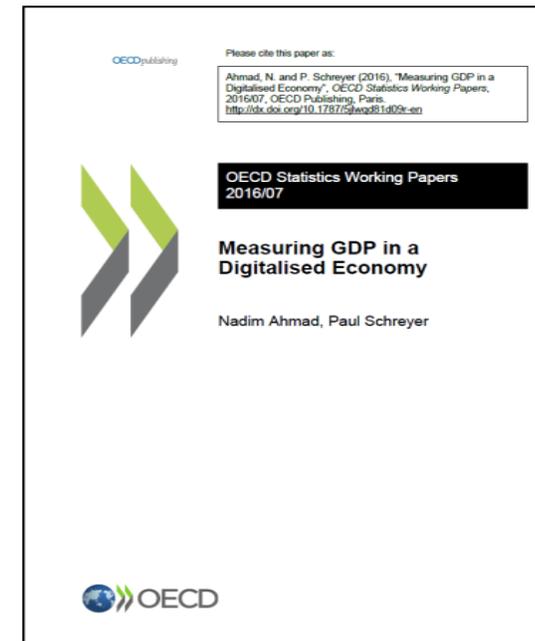
Source: OECD estimates based on Orbis® data.

Some possible factors influencing the decline in business dynamism (to be explored further)

- Decline in growth of labour force and ageing (Karahan, et al., 2016)
- Concentration effects and winner-take-all/most dynamics (especially in some sectors)
- Automation
- Globalisation (Decker, et al., 2016) – young firms may be able to grow in other countries – plus impact of growing import penetration
- Sensitivity to credit constraints, housing market dynamics (David and Haltiwanger, 2014)
- Increases in the costs of job search
-
- Thus far: **mainly US literature (and recent work in Australia)**, even though phenomenon is a much broader one.

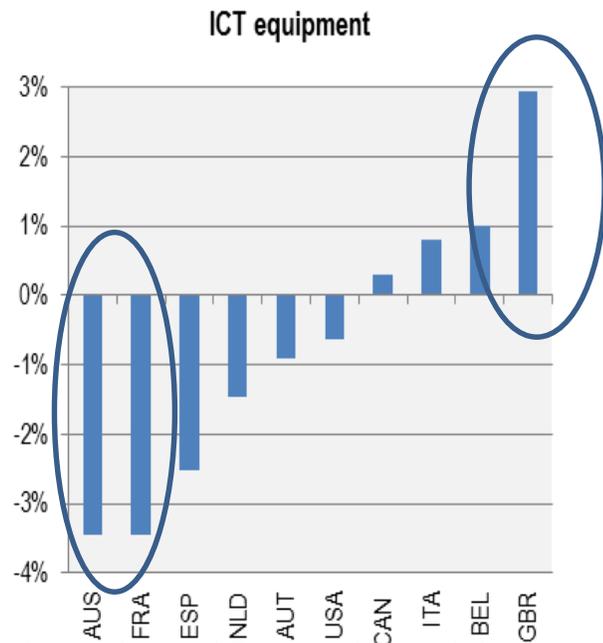
D. Is measurement the problem?

- GDP is an adequate concept to measure market production, but concerns have arisen over a number of areas...
 - Prices and volumes
 - New forms of intermediation services
 - Free and subsidised consumer products
 - Consumers as producers
 - Certain assets not being measured
 - Cross border flows

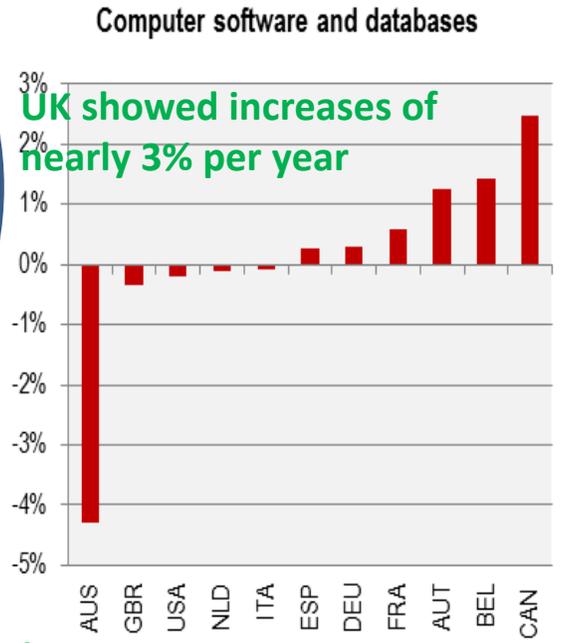


... e.g. price indices for ICT assets and communication services, ...

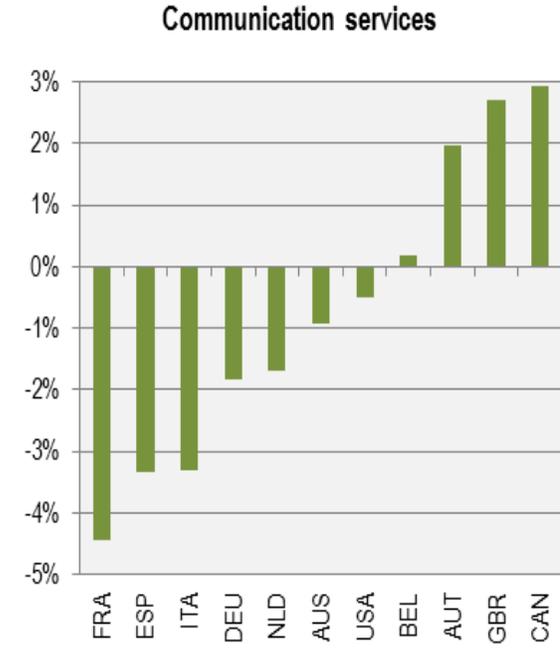
Average annual growth rate in percentage, 2010-2015 (or latest available year)



Australia and France showed declines of more than 3% per year



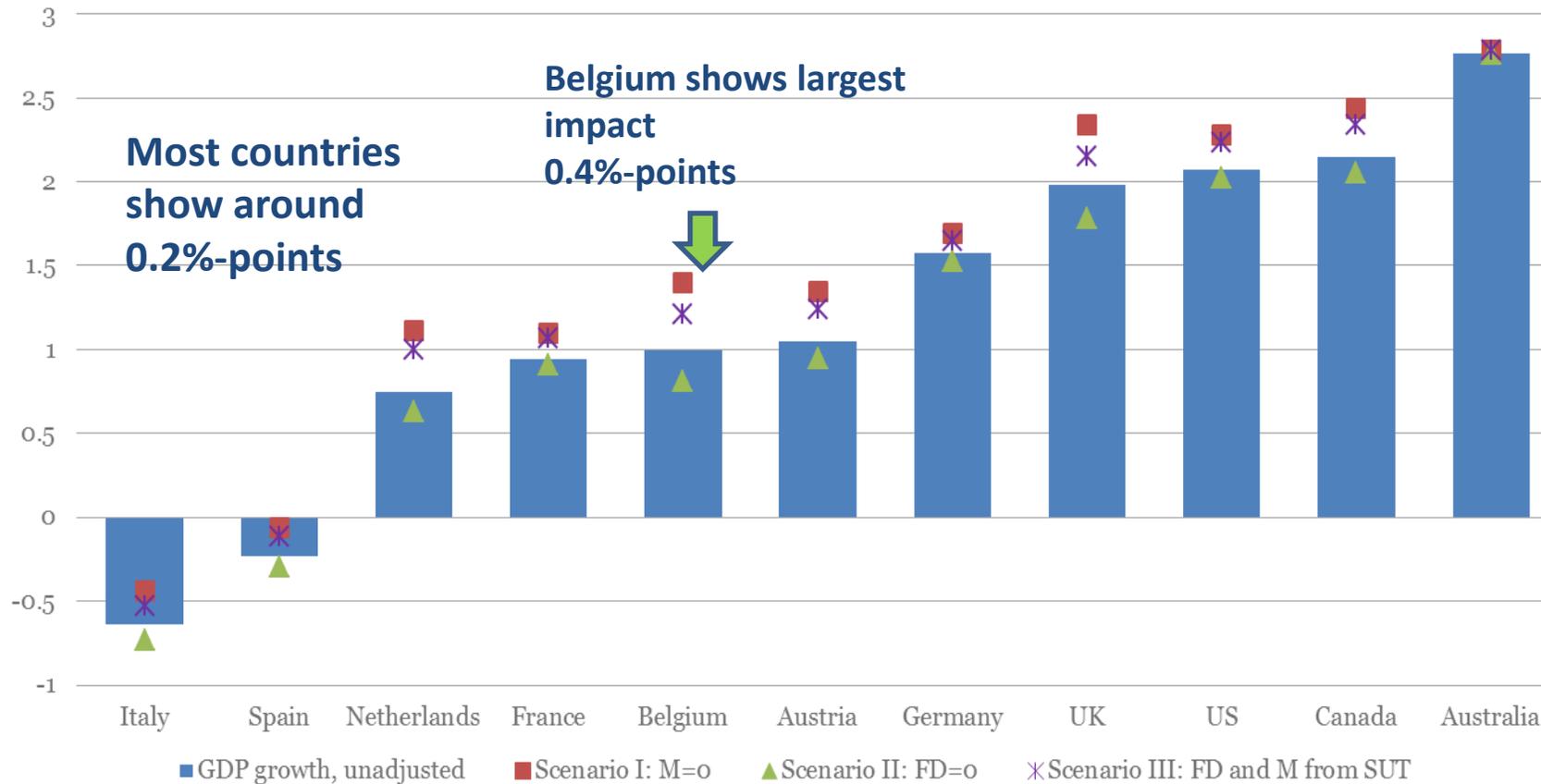
UK showed increases of nearly 3% per year



Notes: Data reported for Spain for ICT equipment and Computer software and database correspond to the period 2010-2014. Data reported for Austria for Communication services correspond to the period 2011-2015.
 Source: OECD National Accounts Statistics, OECD Productivity Database, OECD Prices and Purchasing Power Parities database, Australian Bureau of Statistics, U.S. Bureau of Economic Analyses and Statistics Canada, February 2017

... with important potential impacts on GDP growth

Average annual growth rate in percentage, 2010-2015 (or latest available year)
Using lower bound price indices





4. CONCLUSIONS AND POLICY IMPLICATIONS

Some thoughts on the **future of productivity** ...

- The **diffusion** of advanced digital technologies (e.g. big data, robotics, AI) in OECD countries **is still underway** – it will take time, especially for SMEs, and in many sectors.
- It's **not just about technology diffusion** – changes in organisations, business models, worker's skills and processes will take even more time (and may be difficult for many firms).
- The impacts of digital technologies will also **require more structural change** within & across industries, as digitally-intensive firms grow and less digitally-intensive firms decline.
- The **slowdown in business dynamism and the slow pace of structural reform** also limits the impacts of digital technologies
- There are growing questions and some emerging evidence on the state of **competition in the digital economy**
- Inadequate **measurement** likely plays a role

... and **policies** that may be appropriate

- **The good news:** the impacts of digital transformation are likely still to come and some firms are already reaping the benefits – emerging skills shortages may accelerate the productivity gains
- **Policy can help** in several ways to strengthen these impacts, notably by:
 - Fostering **investment** in tangible and intangible capital
 - Strengthening **diffusion of technologies, practices and business models**
 - Improving **skills** of workers and management
 - Facilitating **structural change** and business dynamics – where certain sectors may require more policy attention
 - Ensuring **sound competition**.
- Improving **measurement** is important to improve the evidence base on productivity and the digital economy

Thank you



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