PRODUCTIVITY COMMISSION NORWAY

22 June 2015, Paris

Investment, Innovation and Productivity – New Insights, New Directions

BETTER POLICIES FOR BETTER LIVES

Outline

1. Innovation, productivity and growth
2. Investing in innovation and the measurement of KBC
3. Innovation policies, including business-science relationships
4. Business dynamics, jobs and the role of experimentation
5. New insights on global value chains

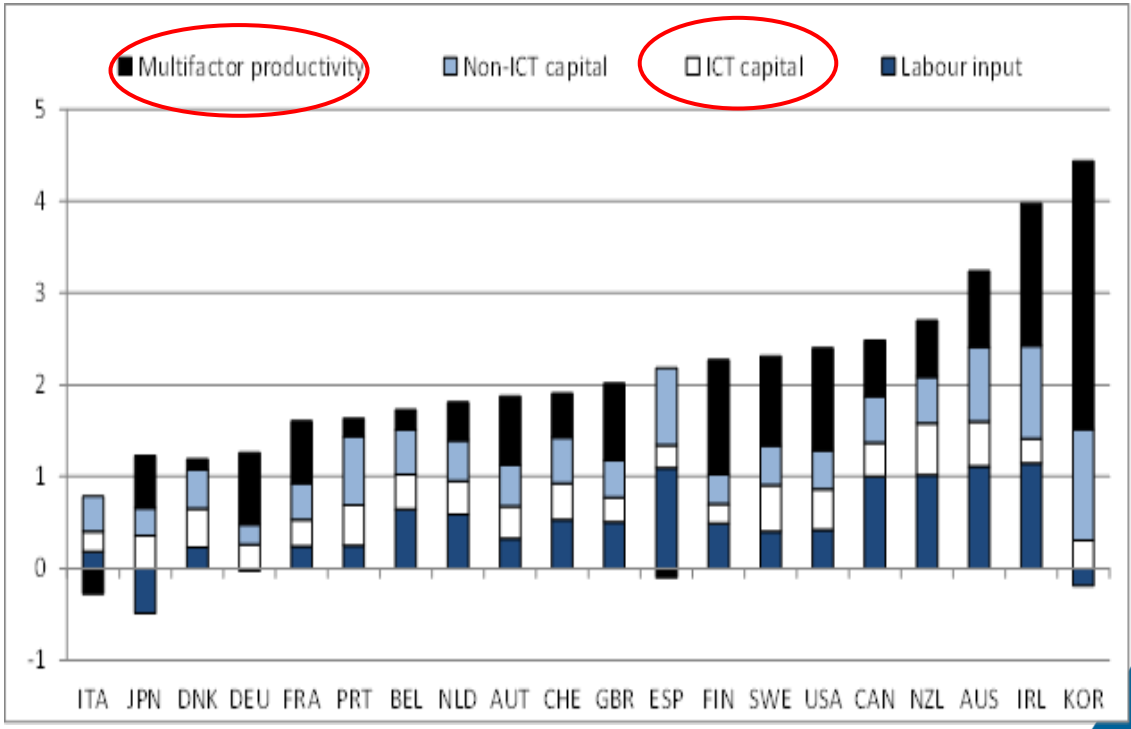
1. Innovation is one of the main drivers of growth …

Innovation key **driver of growth**, through:

1. Technology embodied in fixed capital, e.g. ICT
2. Investment in knowledge-based capital (later slides)
3. Productivity growth due to innovation (MFP)
4. Creative destruction and business dynamism (later slides)

Innovation's role **will have to grow in future**, e.g. due to ageing.

Figure 1. Contributions to GDP growth
Total economy, annual percentage point contribution, 1995-2013

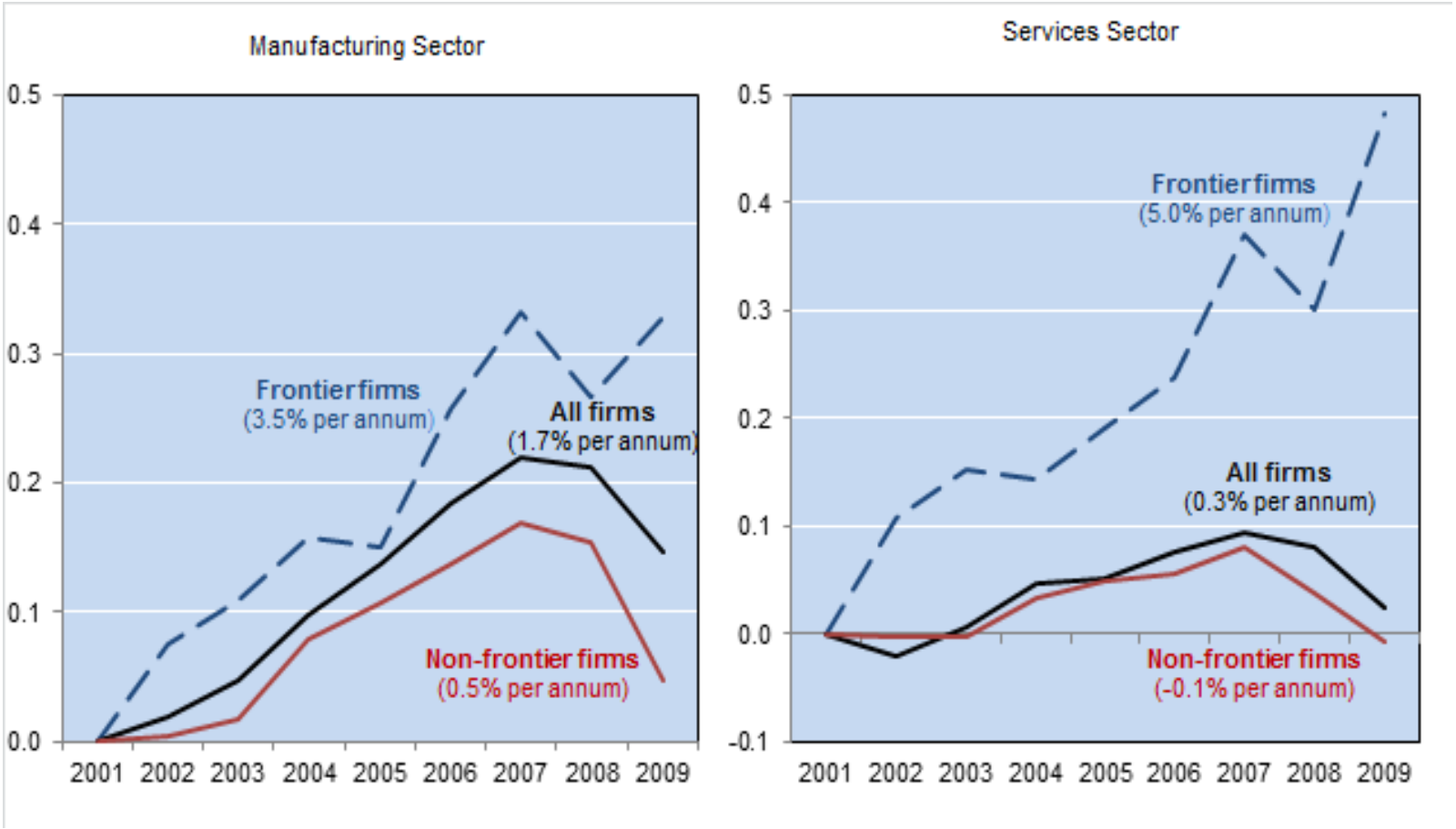


Source: OECD Productivity Database, January 2015, and OECD (2015a), OECD Compendium of Productivity Indicators, 2015.

… as the global productivity frontier is still going strong, but diffusion is lagging

Solid growth at the global productivity frontier but spillovers disappoint

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.

The globally most productive firms: who are they?

Mean firm characteristics: frontier firms and non-frontier firms

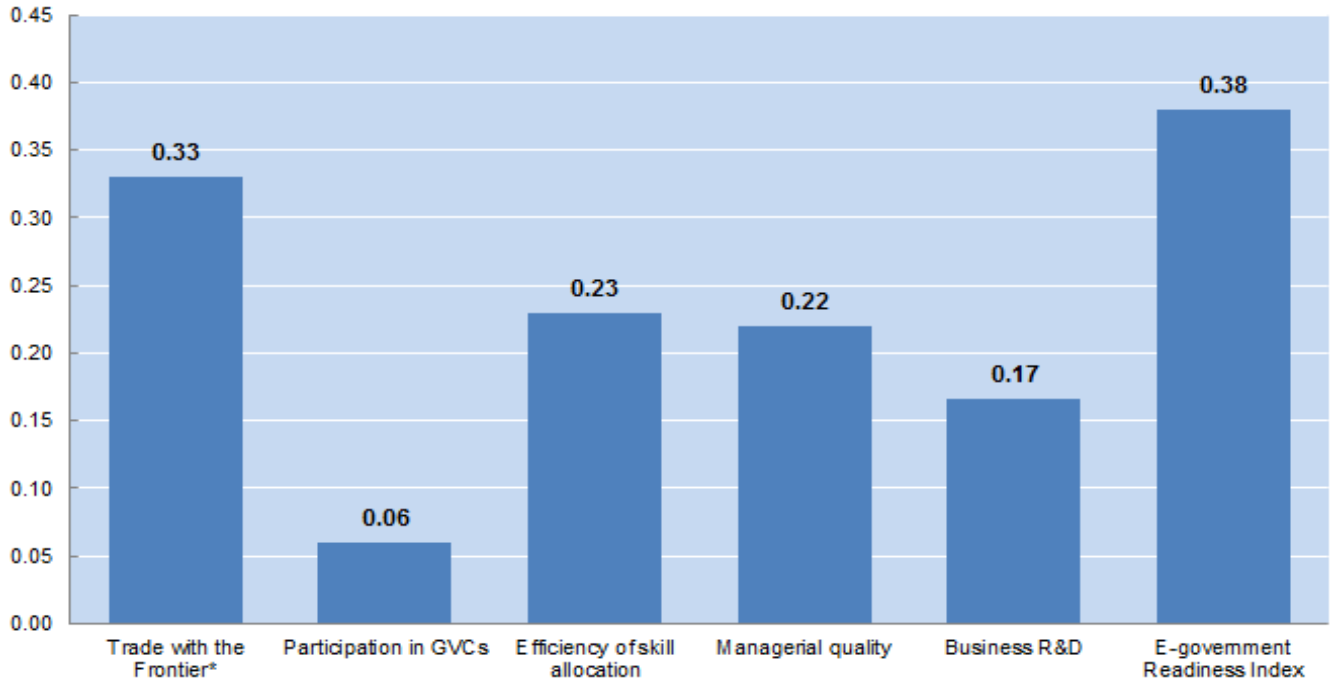
Selected OECD Countries, 2005 (unless otherwise noted)

	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*					
Probability	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.

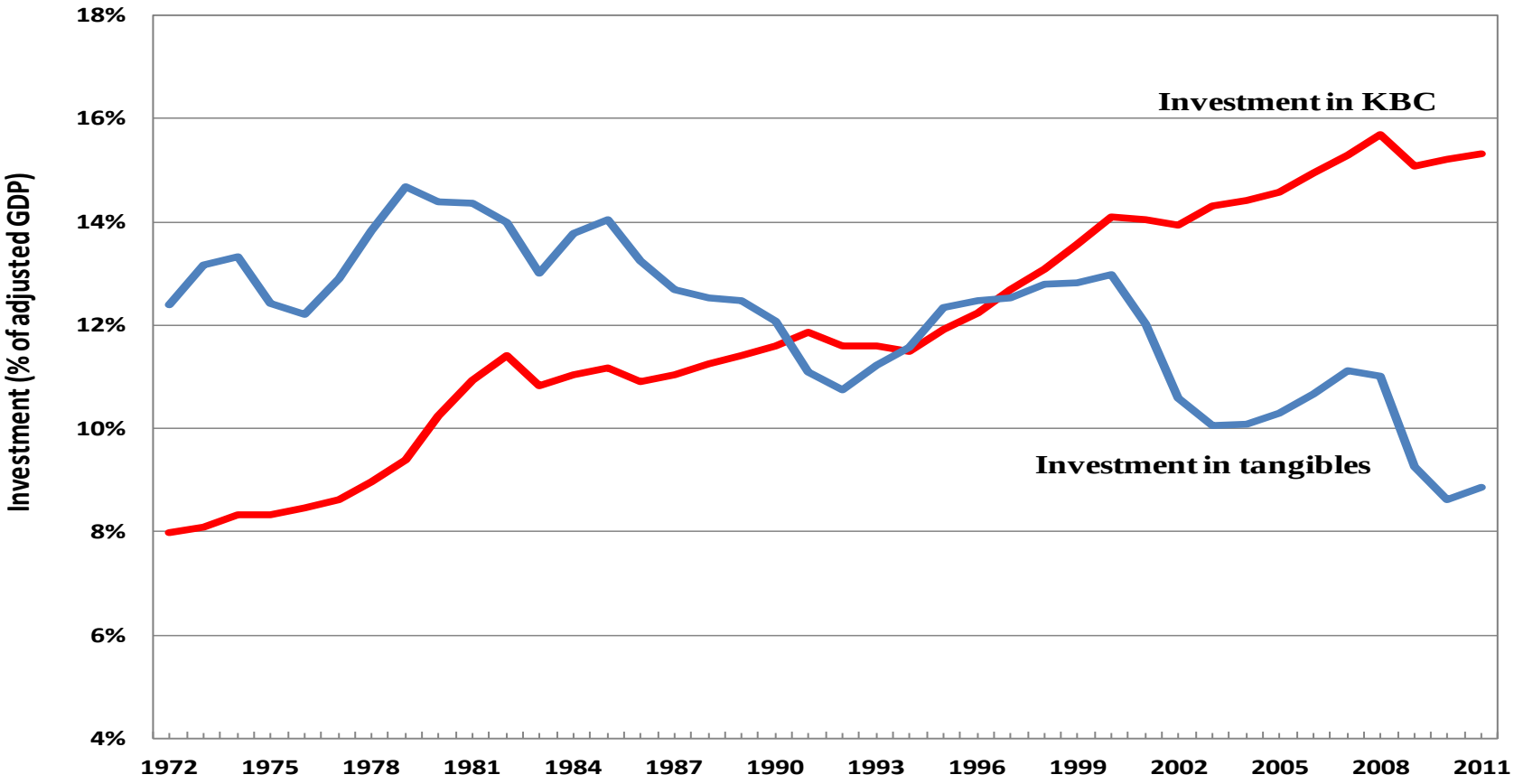
Learning from the global frontier is shaped by key structural factors



Source: Saia, Andrews and Albrizio (2015) % difference in frontier spillover effect between maximum and minimum value of each structural variable, assuming 2% MFP growth at the frontier

2. A growing share of business investment is related to innovation …

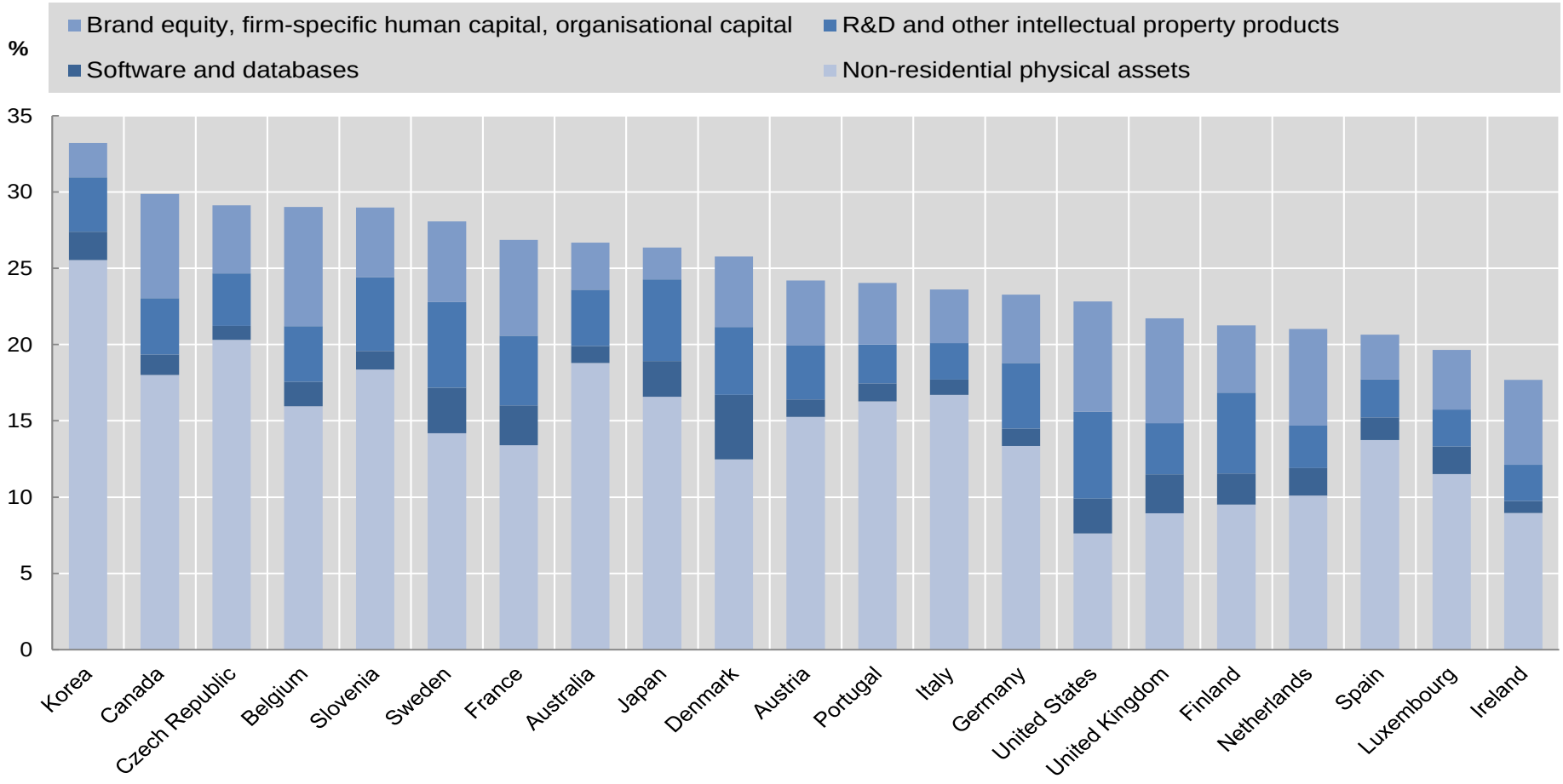
Business investment in KBC and tangible assets in the United States
(% GDP, 1972-2011)



Source: Corrado et al. (2012).

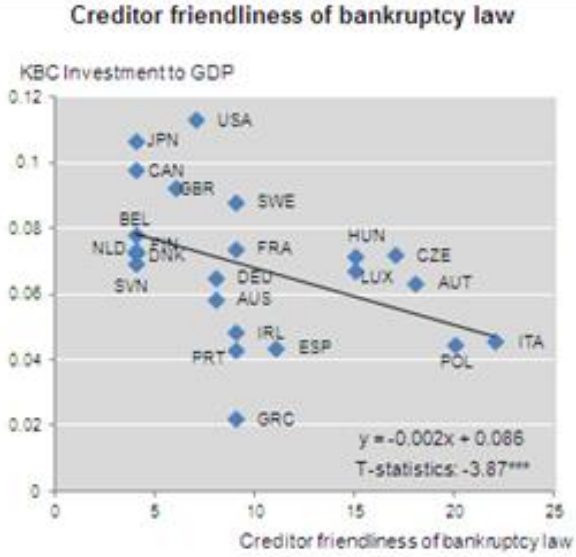
… as knowledge-based capital accounts for over half of all business investment

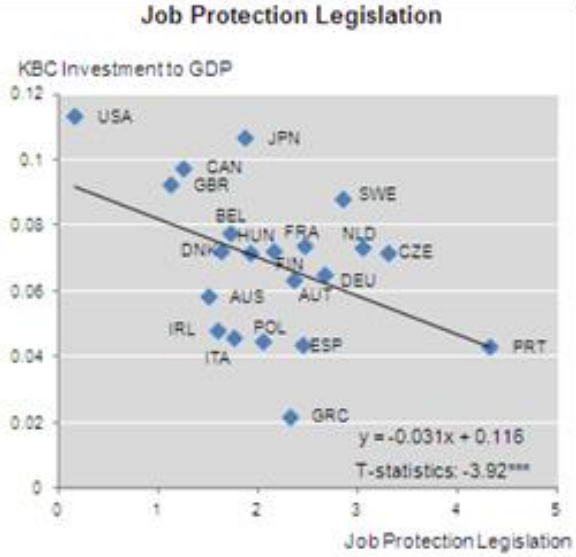
Business investment in KBC and tangible assets (as % of business sector value added, 2010)

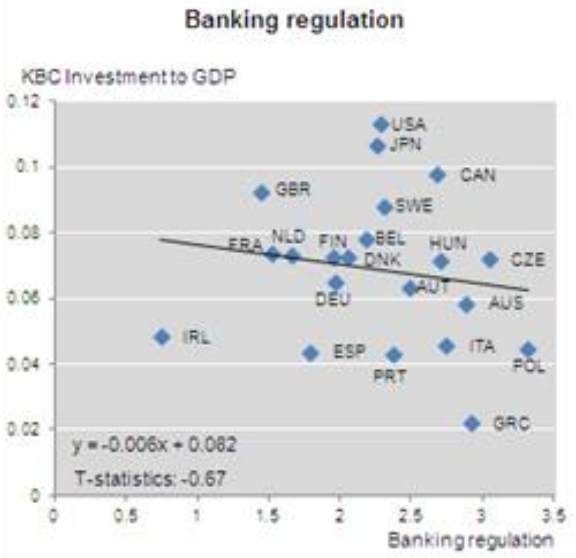


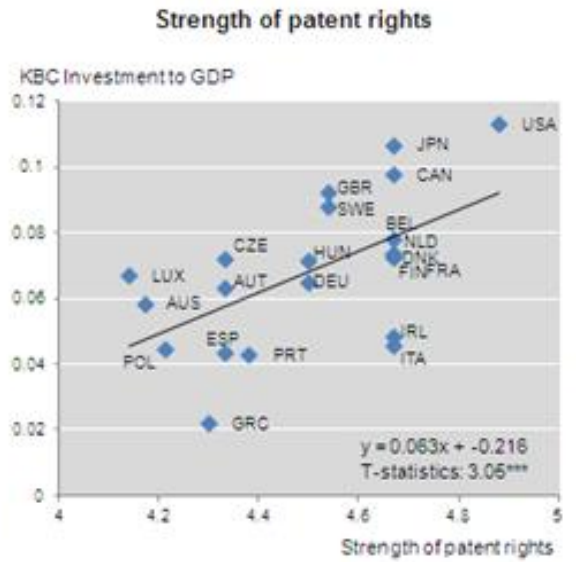
Source: OECD calculations based on INTAN-Invest, Eurostat and multiple national sources.

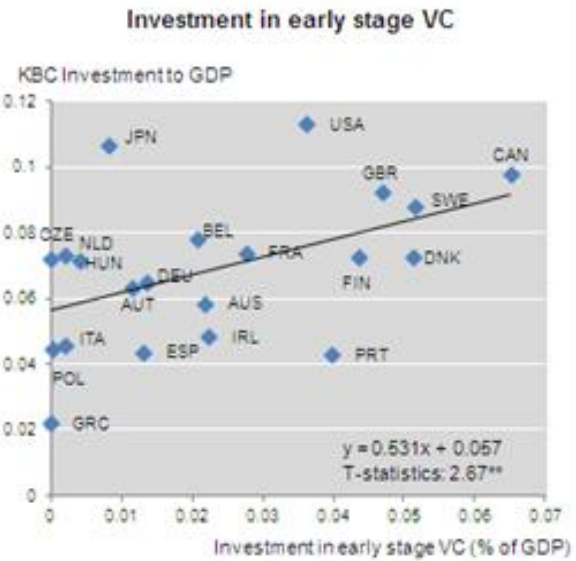
Good framework policies are associated with investment in innovation …











Measurement of KBC

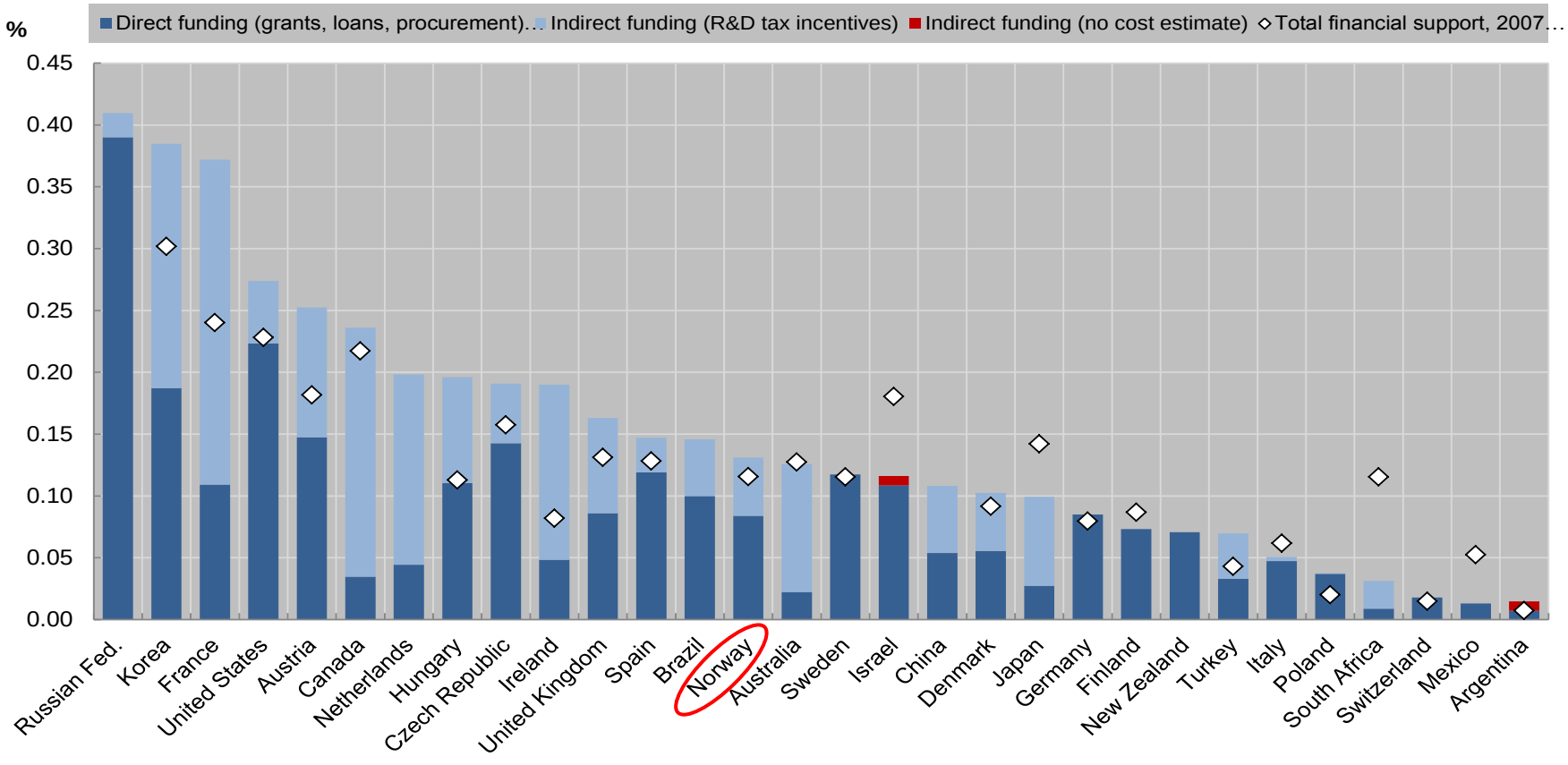
- Pursue a task-based human capital-centred approach to measuring investment in KBC:
  - Knowledge is embodied in people => Investment in KBC mainly results from investment in human capital
  - Human capital emerges from workers' knowledge base, skills and abilities;
  - KBC is generated through the performance of specific tasks;
- Focus on hard-to-measure economic competencies, not included in official statistics:
  - *Organisational capital*. Defined as the firm-specific human capital (i.e. workers) performing sets of tasks that affect the medium and long-term functioning of firms.
    OC correlates positively with firm performance and productivity.
  - *Training*. Endows workers with skills and competences that firms need. Improves workers' performance, their ability to adapt to technological and organisational change, and relates positively to productivity growth.

Investment in innovation: key policy issues

- Business investment in innovation is not just technology and R&D – **complementarities and policies affecting other assets are important,** e.g. data, design, management, organisational capital, …
- **As these new assets grow in importance, so do the policies affecting them** – e.g. are our IPR systems still fit for 21st century innovation? Is policy ready for big data?
- **Public investment to support private investment in some areas of innovation**, e.g. R&D, education and broadband networks.

3. The specific mix of policies to support innovation matters, …

Direct funding of business R&D and R&D tax incentives,
as a percentage of GDP, 2012



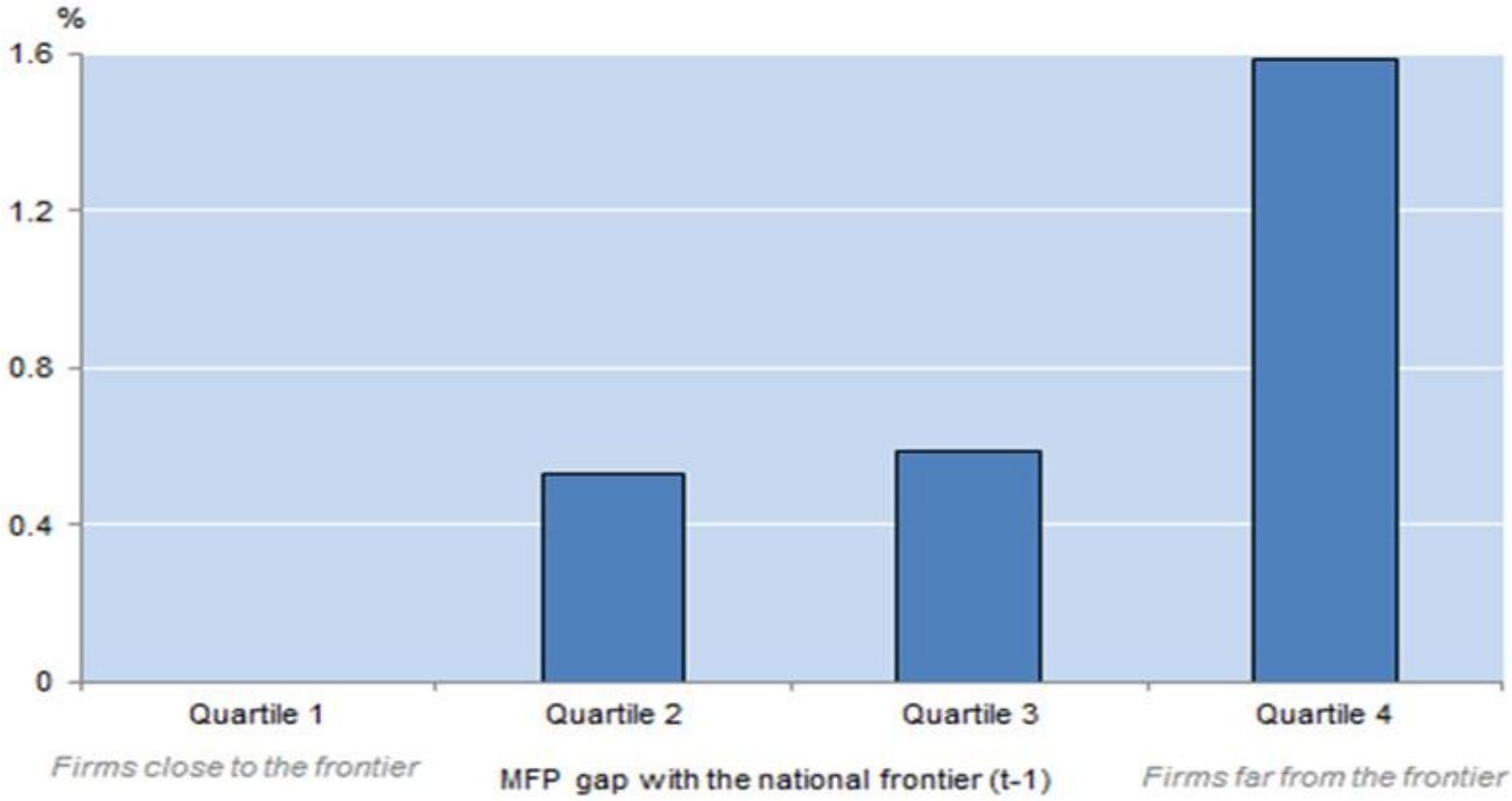
Source: OECD R&D Tax Incentive Indicators, www.oecd.org/sti/rd-tax-stats.htm

… such as university – industry collaboration, which can facilitate catch-up of laggards to national frontier

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

Increasing Collaboration from low level in France to the OECD average

% difference between industries with high and low knowledge intensity

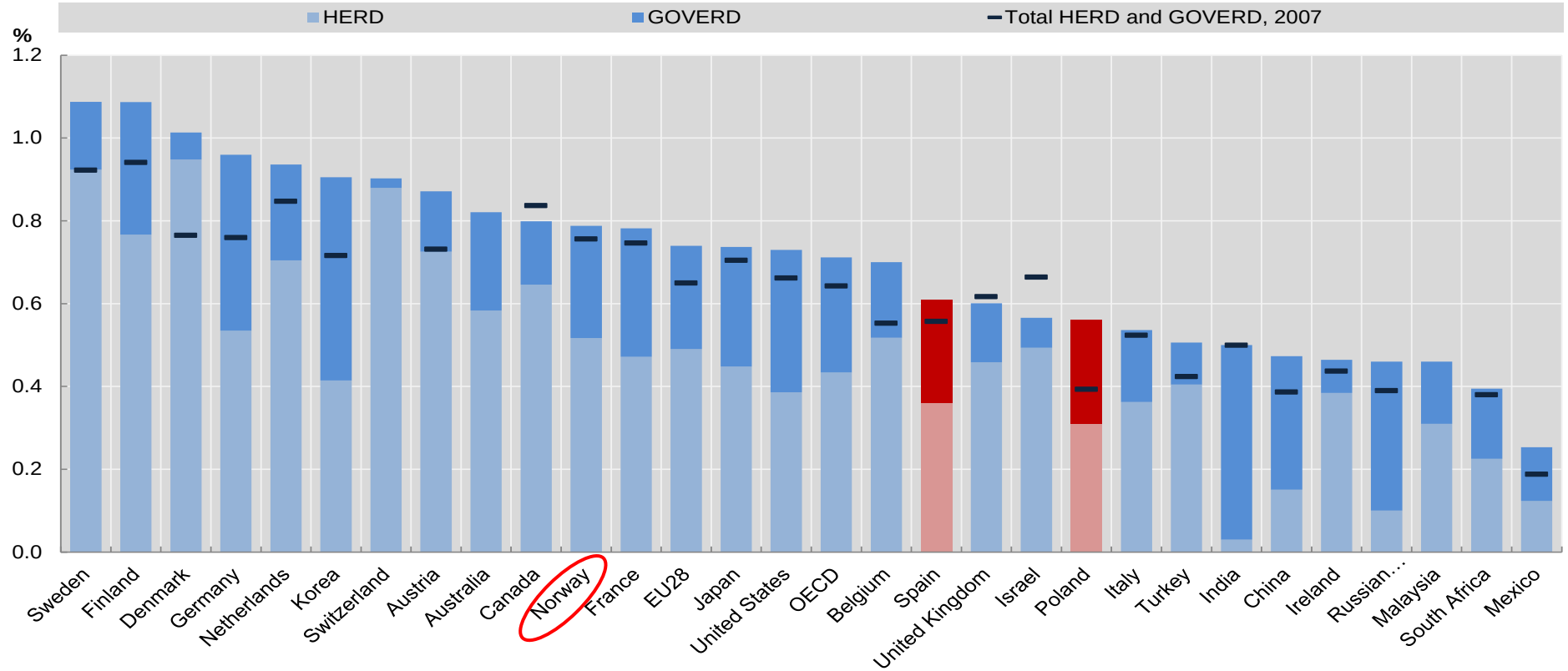


Source: Andrews, Criscuolo and Gal (2015), "Frontier firms, technology diffusion and public policy: micro evidence from OECD countries " *forthcoming* OECD Working Paper.

Investment in public research matters, …

Public R&D expenditure by type of research system

HERD and GOVERD, as a percentage of GDP, 2012, and total HERD and GOVERD in 2007

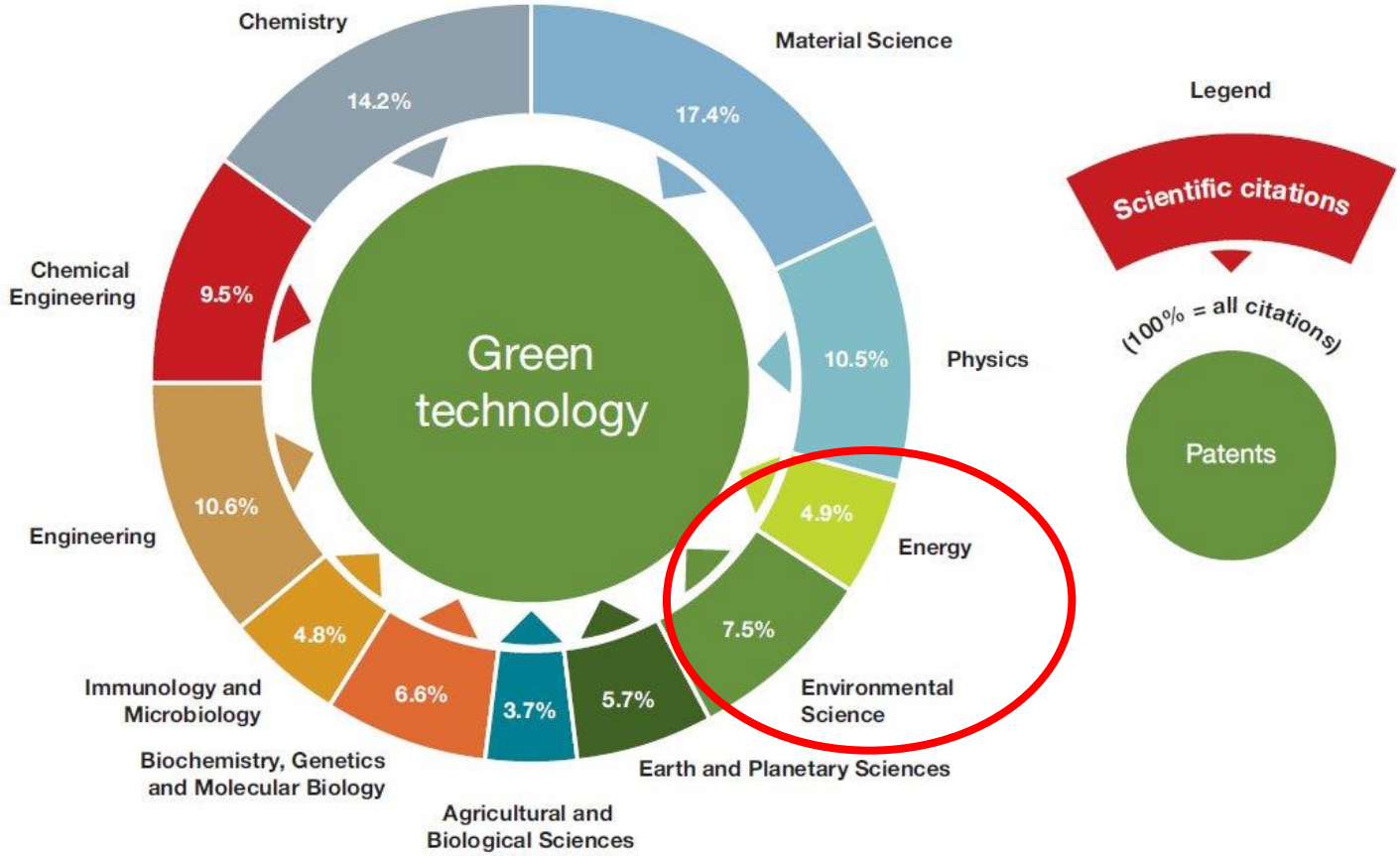


Source: OECD, Science, Technology and Industry Outlook 2014, based on OECD, *MSTI Database*, June 2014, *www.oecd.org/sti/msti*. *http://dx.doi.org/10.1787/888933151601*

… though what to fund is not always obvious

The innovation-science link in selected green technologies

Patent-science link via citations, 2000-07



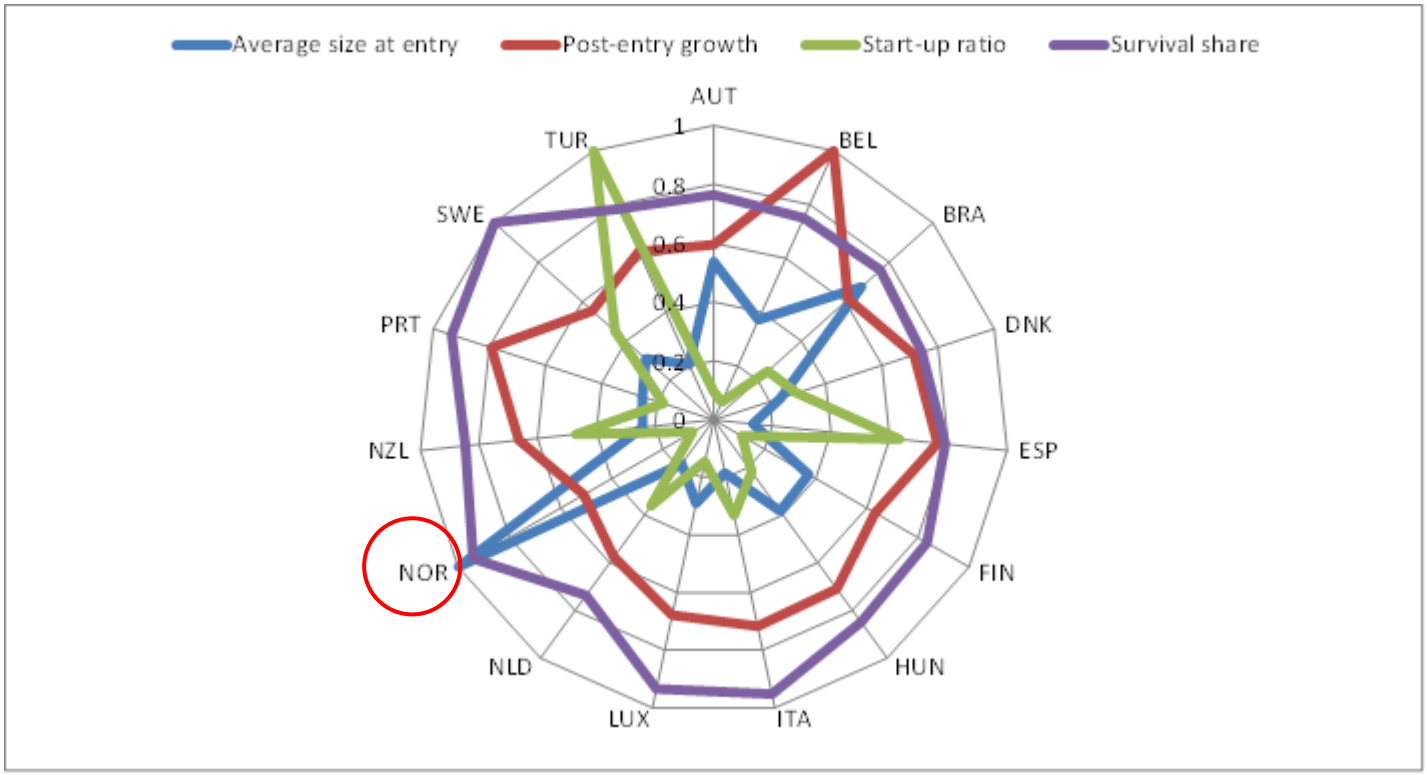
Source: OECD (2010), *Measuring Innovation – A New Perspective*, based on Scopus Custom Data, Elsevier, July 2009; OECD, Patent Database, January 2010; and EPO, Worldwide Patent Statistical Database, September 2009.

Innovation and research: key policy issues

- European countries have increasingly emphasized **R&D tax incentives**, but these have several drawbacks in strengthening innovation
- **Well-designed direct support for business innovation**, e.g. Fraunhofer Institutes, accelerators, etc., are better suited to building innovation capabilities.
- Need for long-term and stable investment in public research, notably basic and mission-oriented research – **risk of short term focus and fragmentation**
- Balance breakthrough and incremental innovation, **explore new ways of making more informed strategic choices**.

4. Business Dynamism and The Life Cycle of the Firm: Norway Relative to Others

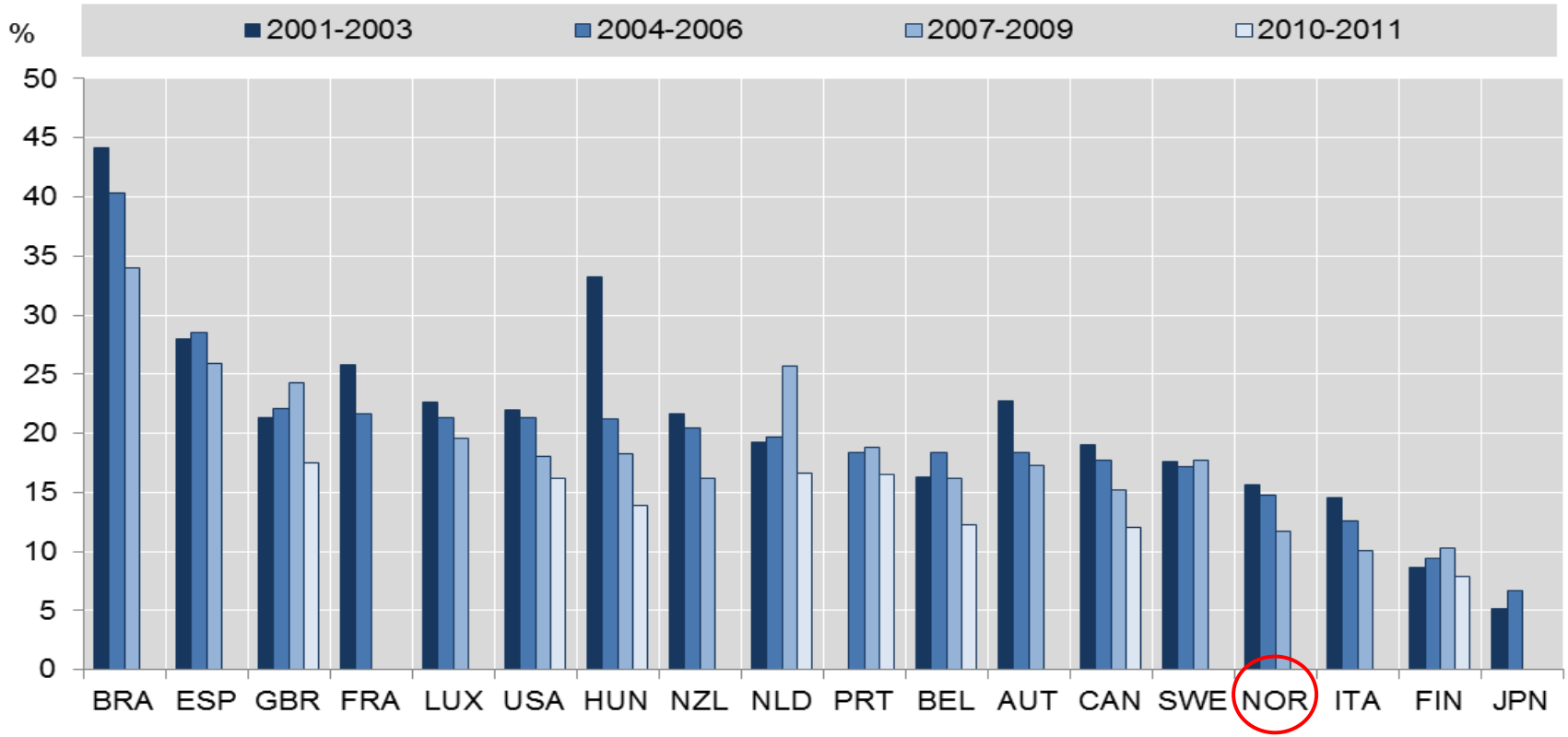
Preliminary Results from Dynemp V2: High Avg Size at Entry and Survival; Low Start-Up Rate



Note: the graph illustrates the four components of the growth decomposition normalized over the maximum value across all countries included in the sample.
Source: OECD DynEmp v.2 database. Data for some countries are still preliminary.

A concern: the share of start-ups is declining in many OECD countries

Share of start-ups among all firms

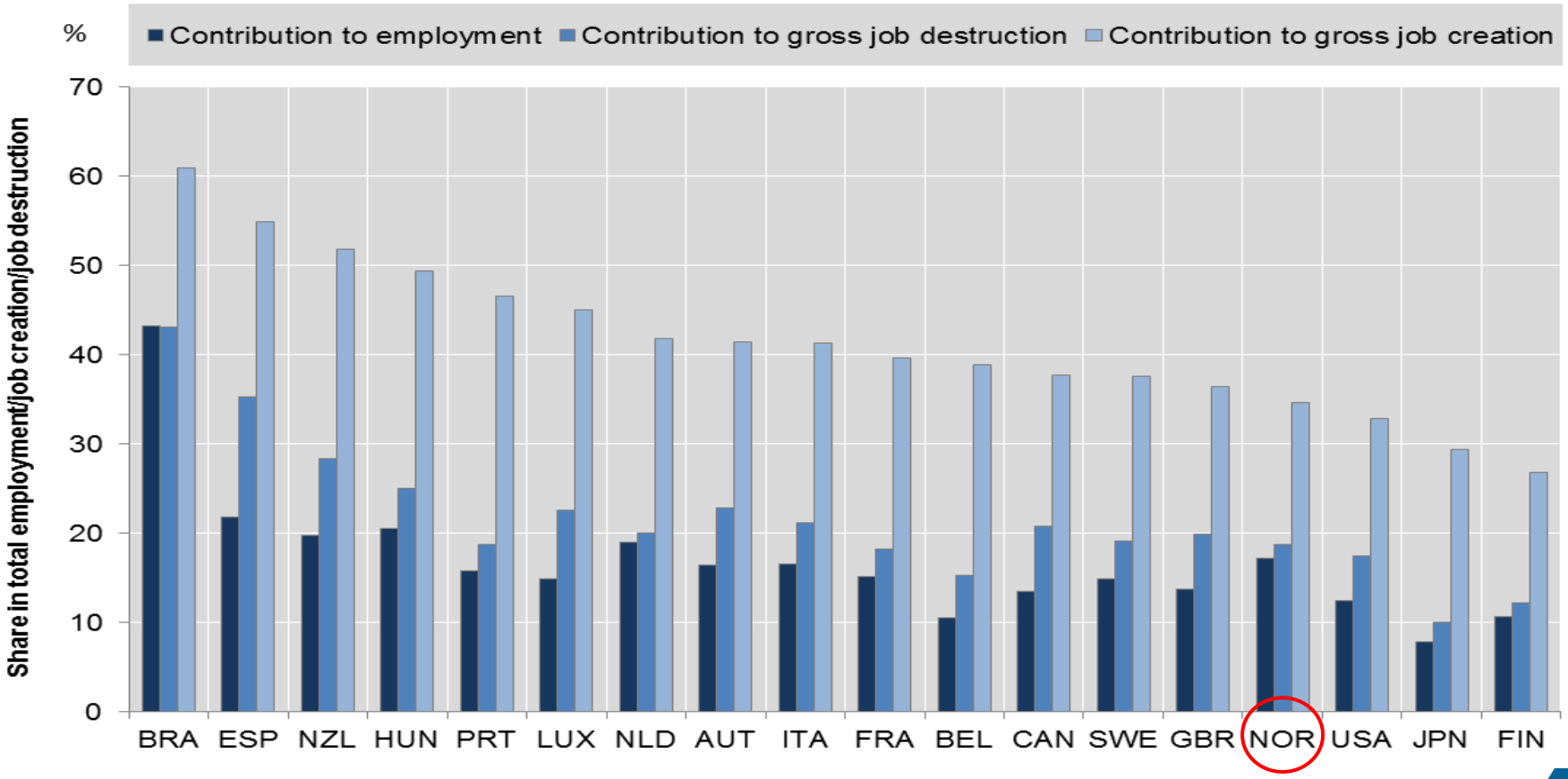


Note: As a percent of all firms in the total private business sector. Startups are firms aged from 0 to 2. Data for Japan refers to establishment in the manufacturing sector.

Source: OECD, Dynemp Express – preliminary results.

Young firms create new opportunities …

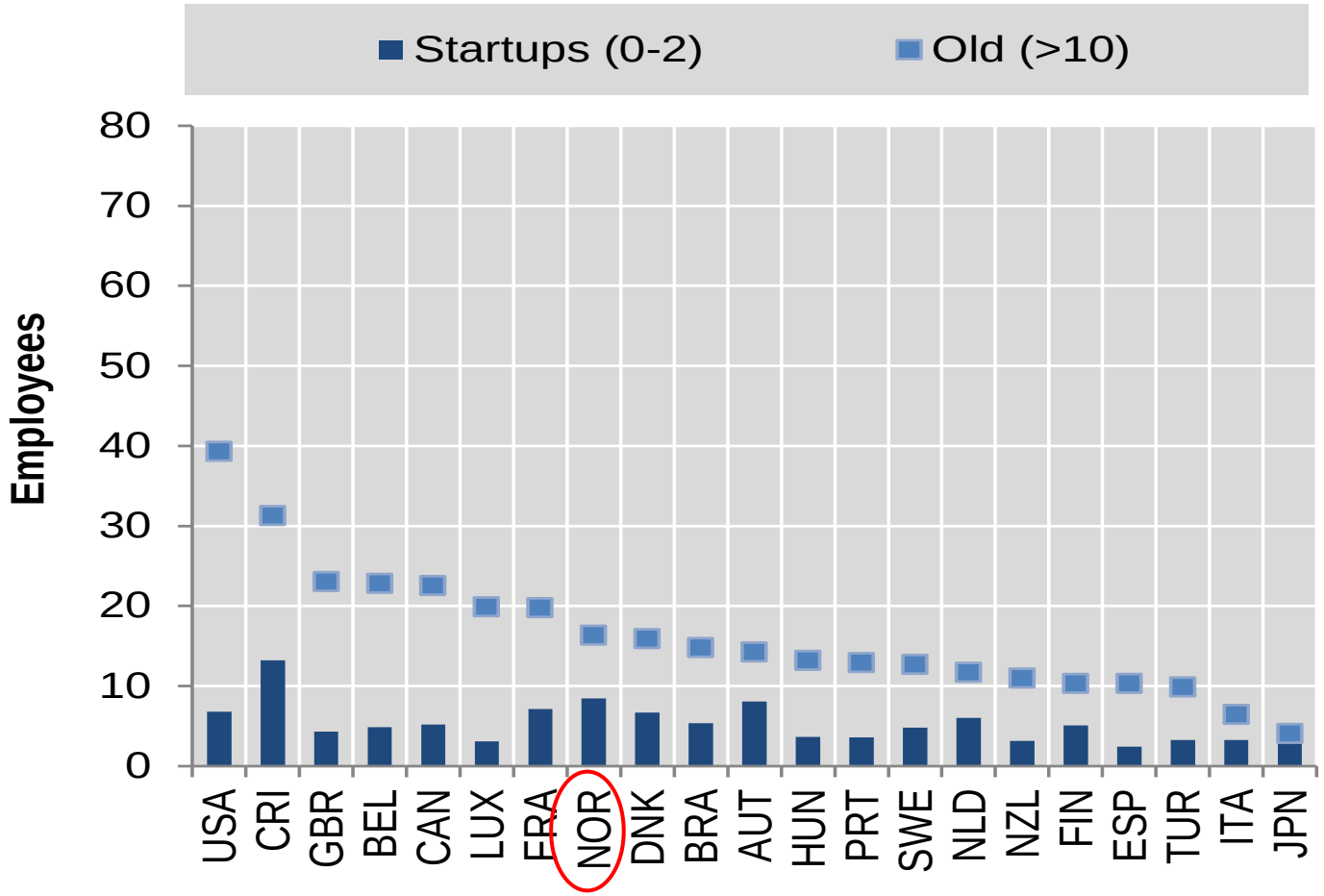
Contributions of young firms to employment, job creation and job destruction, 2001-2011



Source: Criscuolo, Gal and Menon (2014), www.oecd.org/sti/dynemp.htm

… but scaling of young innovative firms is a challenge in many OECD countries …

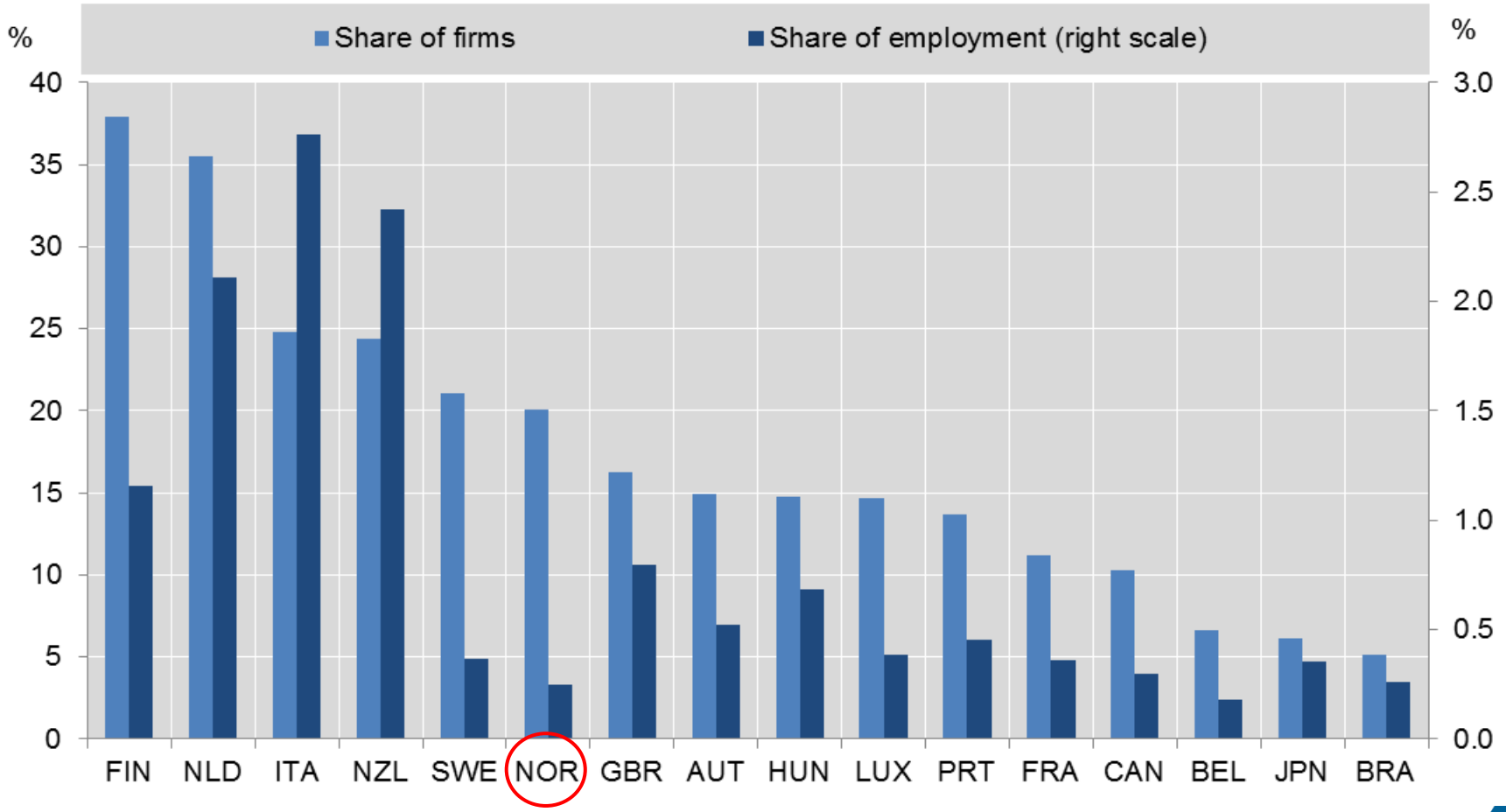
Average size of start-ups and old firms, in persons employed, services sector



Source: Updated from Criscuolo, Gal and Menon (2014), www.oecd.org/sti/dynemp.htm

… with a substantial share of firms never growing above one employee …

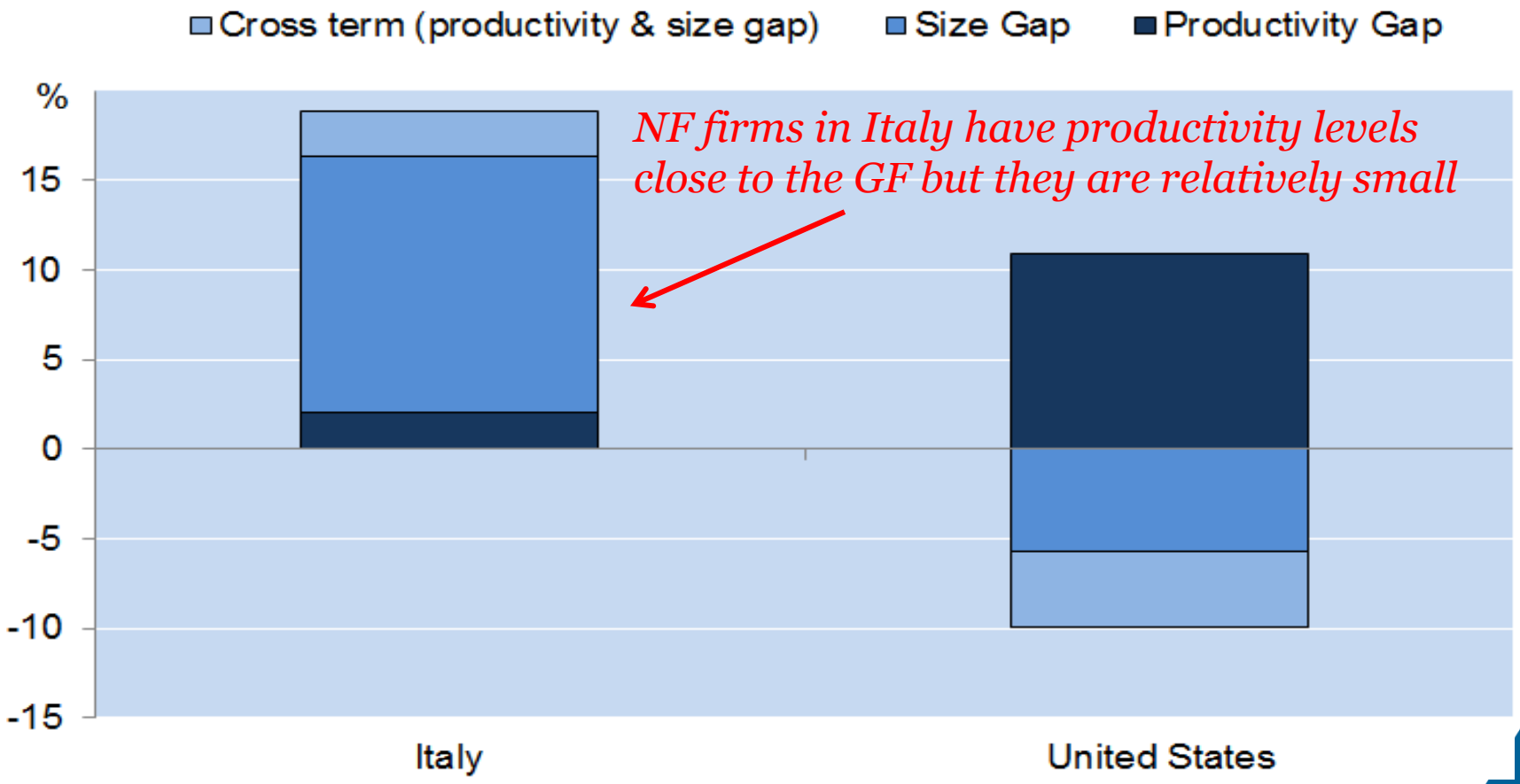
Share of firms and employment never growing above one employee, services sector



Source: Criscuolo, Gal and Menon (2014), www.oecd.org/sti/dynemp.htm

Reducing barriers to scaling increases the impact of firms at the national frontier on productivity

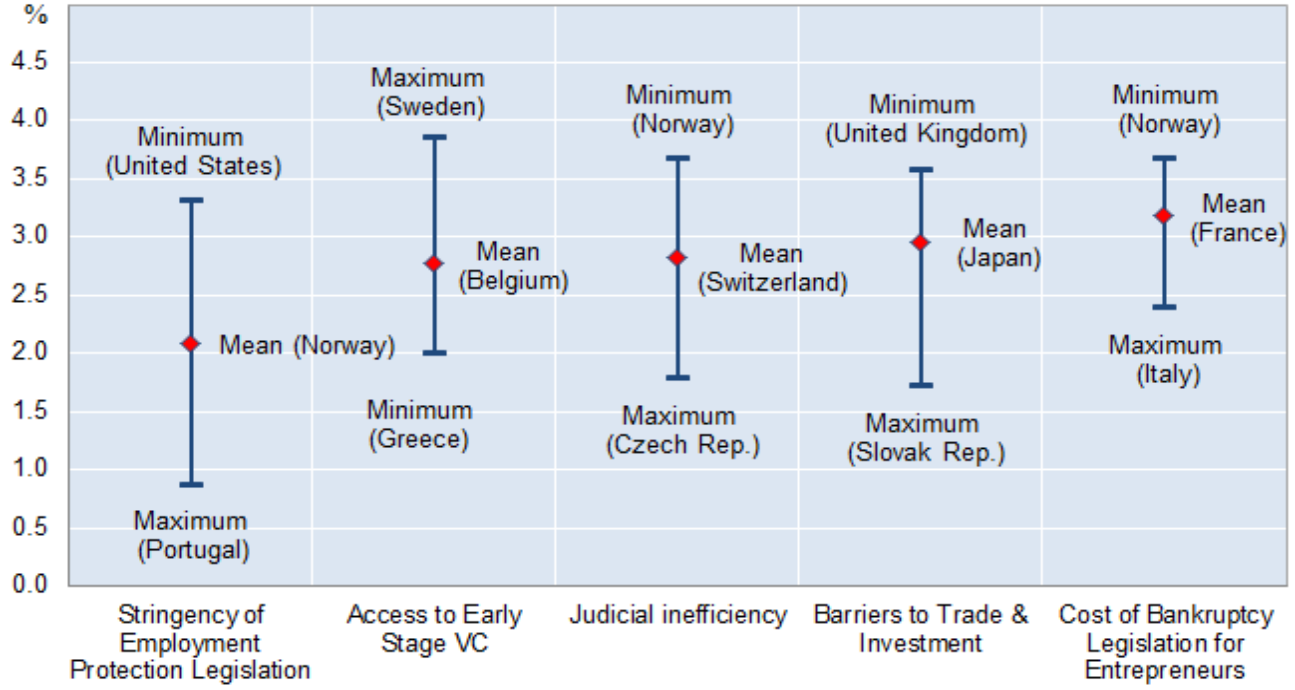
How much higher would overall manufacturing sector labour productivity be if NF firms were as productive and large as GF firms?



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

Access to Finance and other Policy Factors Encourage Scaling of Innovative Firms

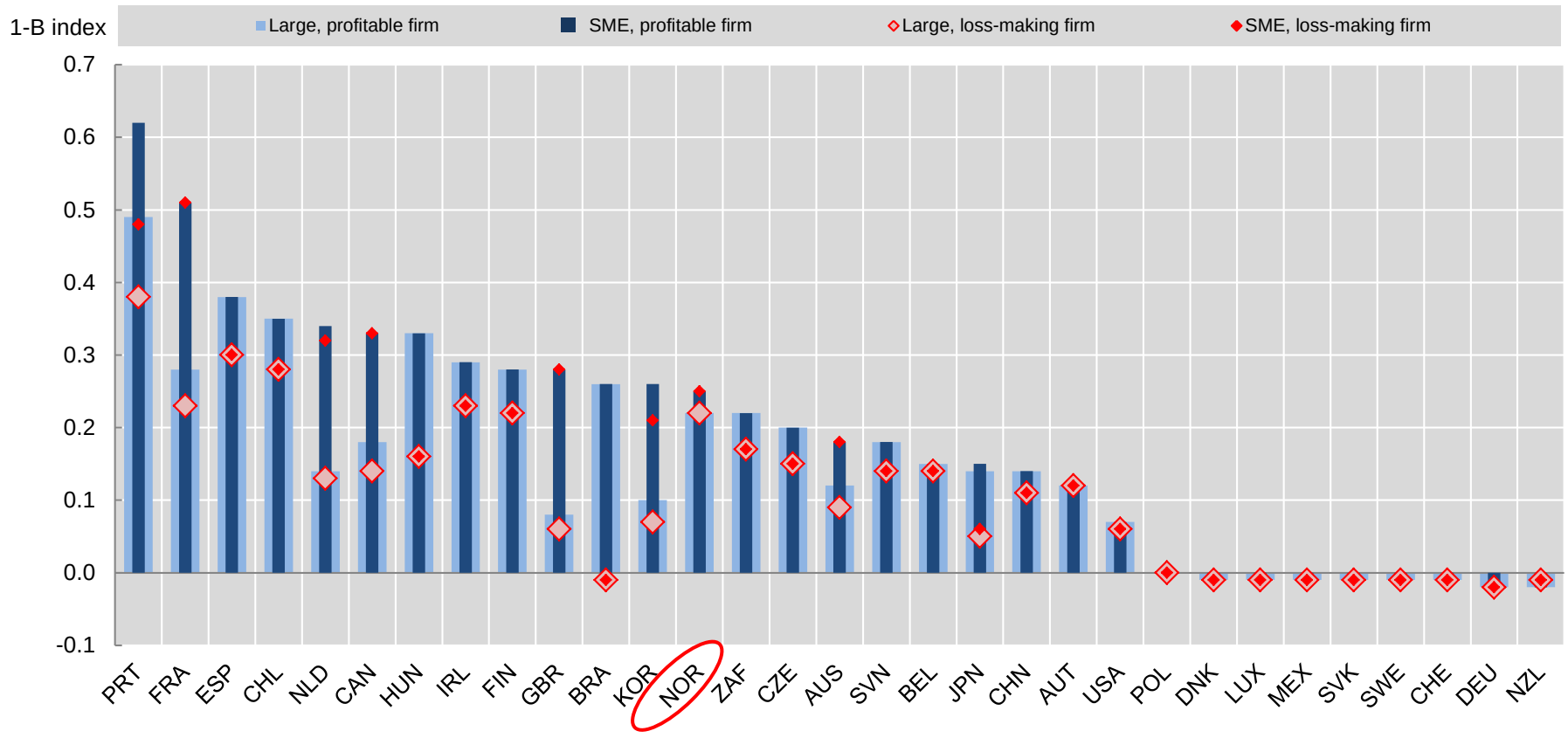
Additional capital attracted by a firm that increases its patent stock by 10%, 2002-10



The estimated impact of various policies on the responsiveness of the firm investment to patenting

Source: Andrews, Criscuolo and Menon (2013).

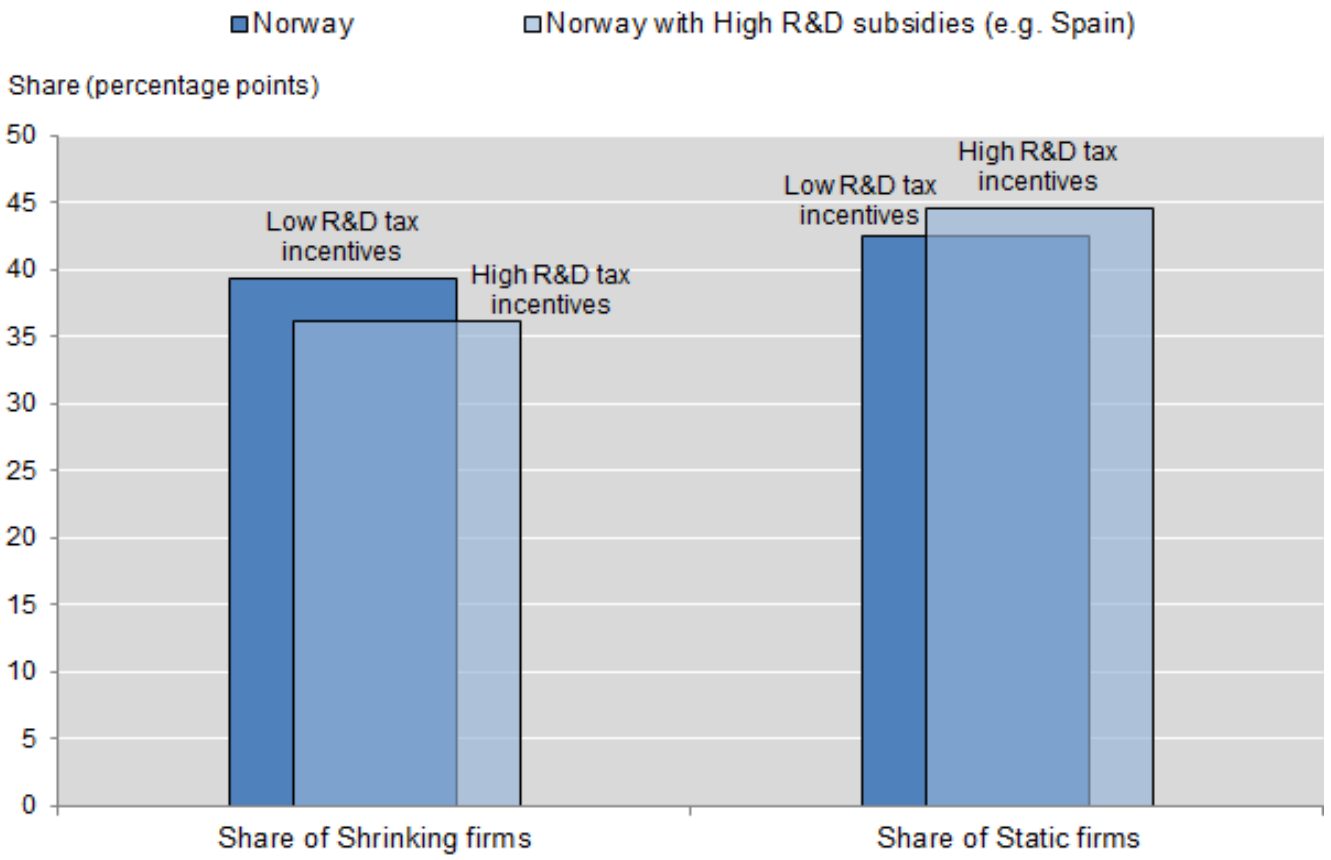
Policies: The Incidence of Benefits of R&D Tax Incentives across firm types….



Source: OECD R&D Tax Incentives Indicators; based on the 2013 OECD-NESTI data collection on tax incentives support for R&D expenditures http://www.oecd.org/sti/rd-tax-stats.htm).

…. can favour incumbent firms

More generous R&D tax incentives are associated with a more static distribution of firm growth in R&D intensive sectors. Differential impact of R&D tax incentives on the share of firms in each employment growth grouping



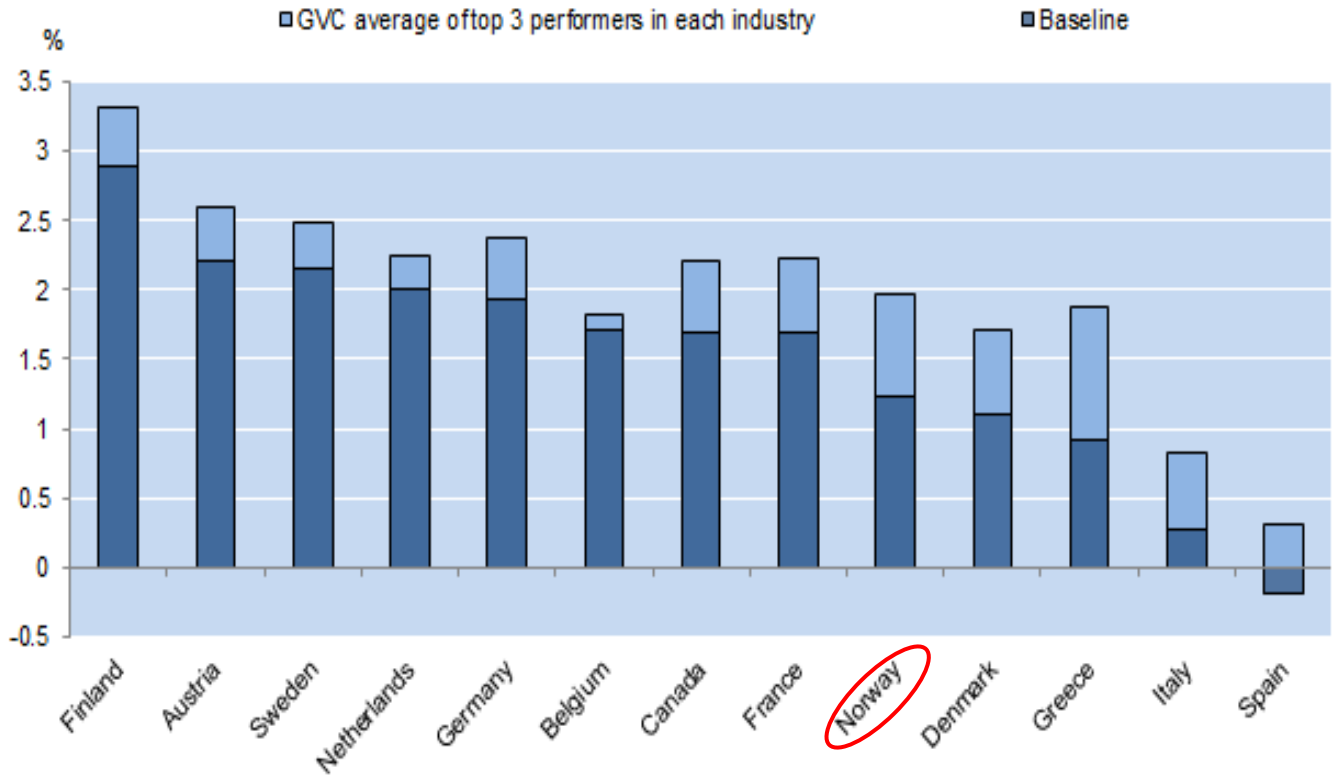
Source: Bravo-Biosca, Criscuolo and Menon (2013) based on aggregated micro-data from national business registers.

Entrepreneurship and business dynamism – key policy issues

- **Enable experimentation and firm growth**: Reduce barriers to entry (e.g. red tape), growth (e.g. size-specific regulations), and exit/failure of firms (e.g. penalising bankruptcy legislation, overly strict employment protection legislation).
- **Keep the unborn in mind**: Policies often favour incumbents and MNEs (e.g. R&D tax credits, some environmental regulations, incumbent subsidies that delay exit).
- **Strengthen the innovation system for innovative firms**, e.g. through enhanced access to (risk) capital, network development, mentoring of entrepreneurs, skills development, etc.
- **Complete the Single Market and reduce trade barriers**, so firms can scale more easily across borders.
- **Celebrate entrepreneurship**.

5. Global value chains: Realising the Benefits

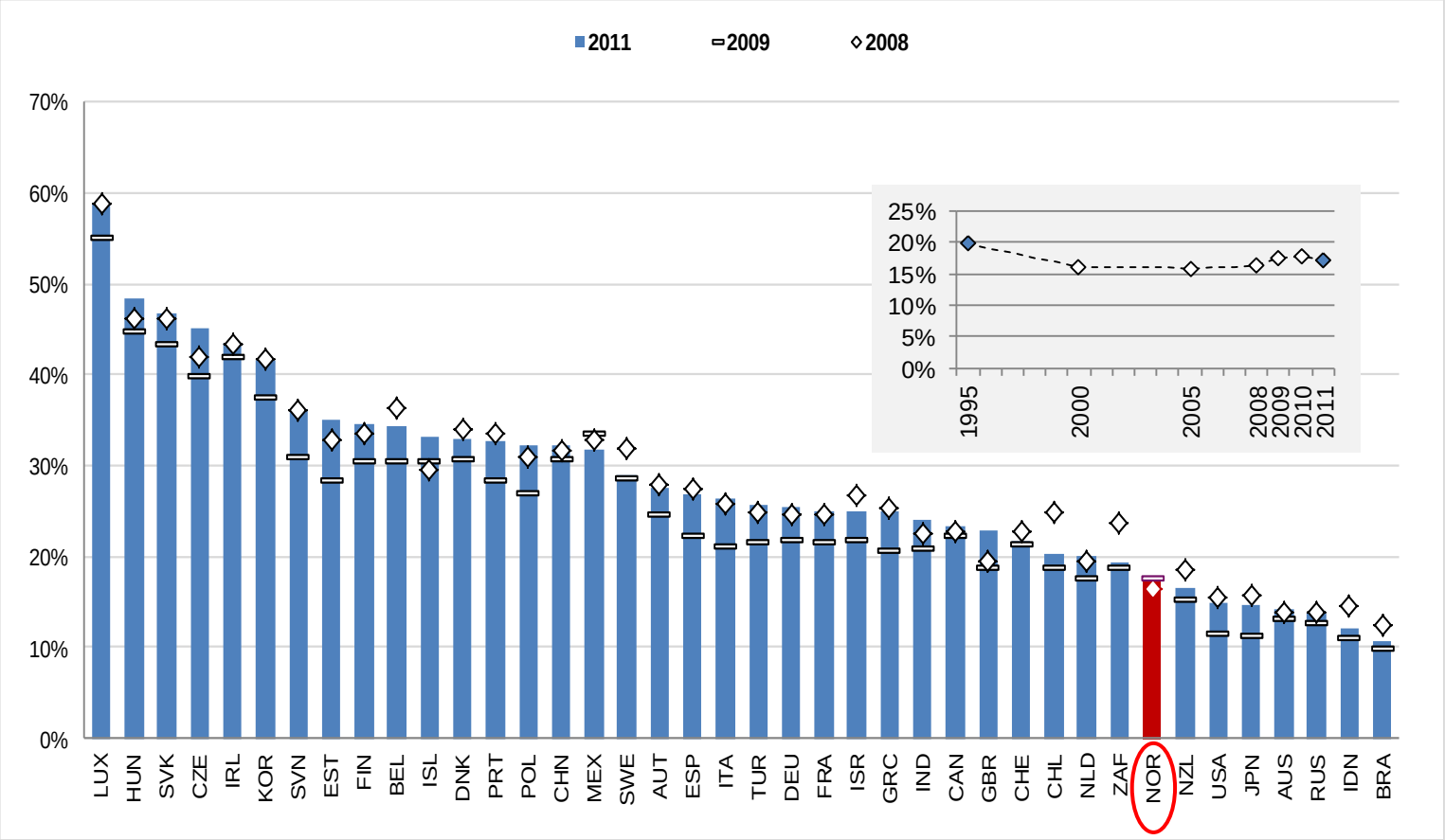
Estimated gains to MFP growth associated with raising GVC participation



Source: ECO/CPE/WP1(2015)6/ANN5.

Global value chains (Norway - 1)

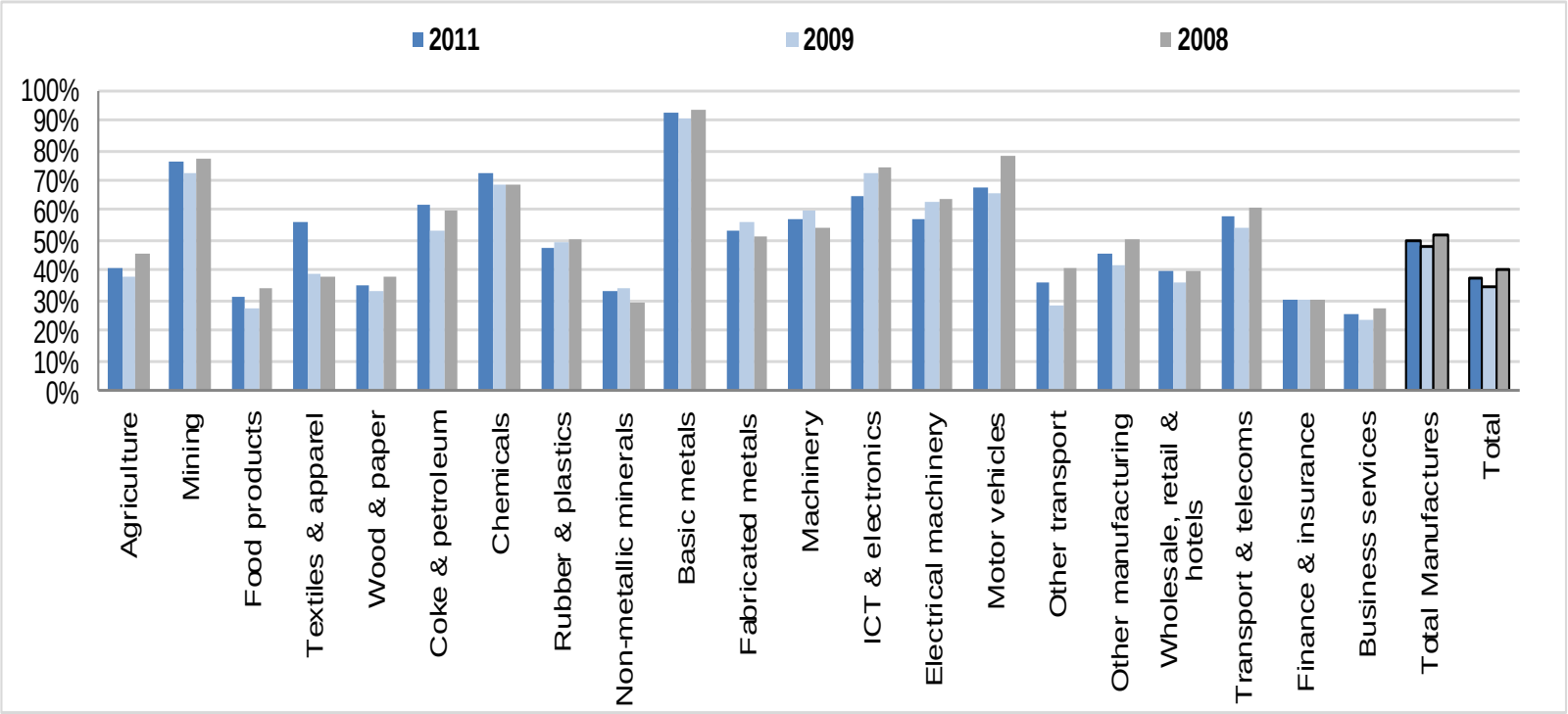
Foreign value added content of gross exports by country
percent, 2008, 2009, and 2011 (right insert = time series for Norway)



Source: OECD-WTO TiVA database, July 2015

Global value chains (Norway - 2)

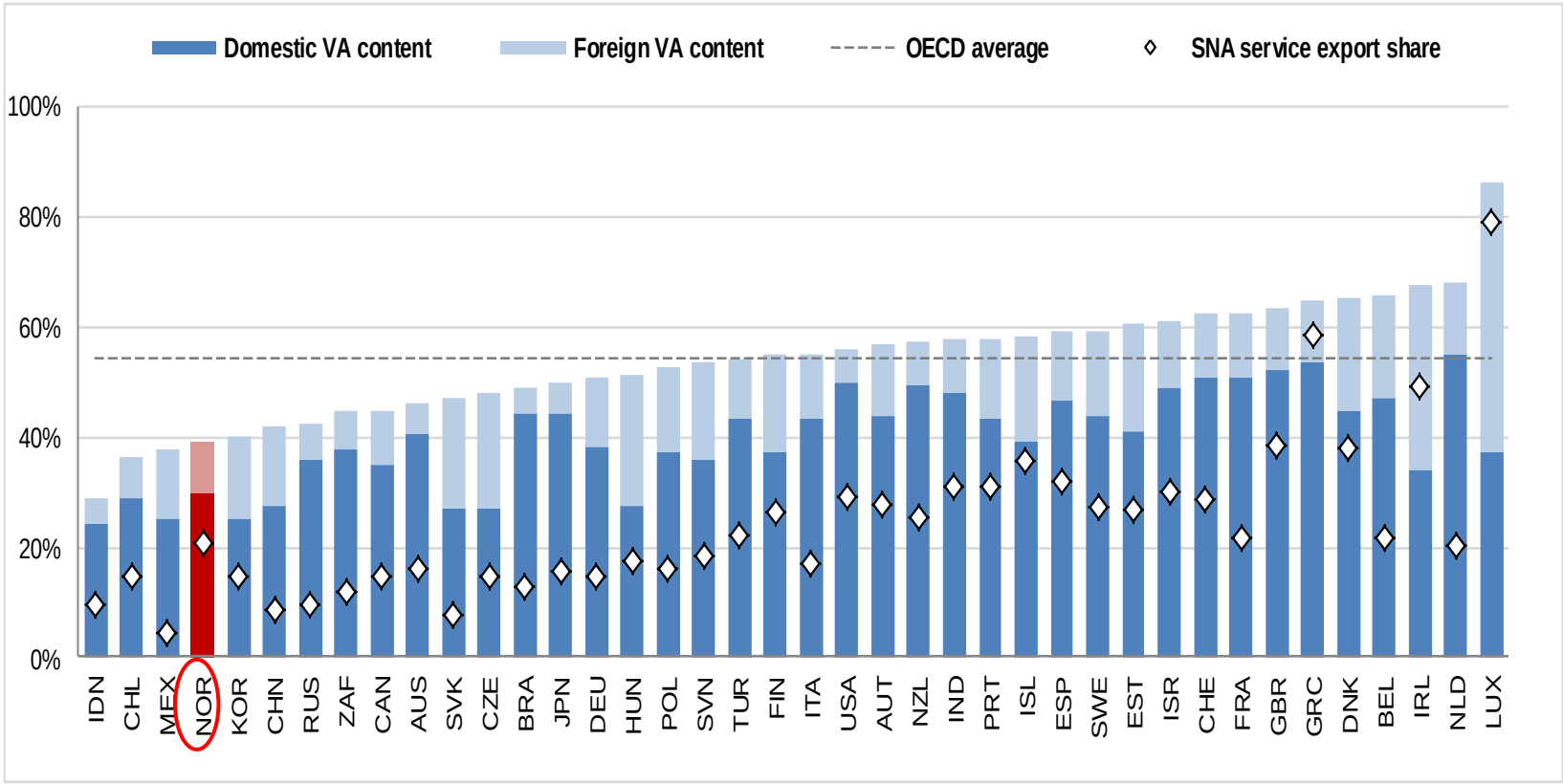
Norway's domestic value added in foreign final demand
percent of value added by industry, 2008, 2009, and 2011



Source: OECD-WTO TiVA database, July 2015

Global value chains (Norway - 3)

Services content of gross exports by country, gross and value-added terms, percent of total gross exports, 2011



Source: OECD-WTO TiVA database, July 2015

Routine intensity and offshorability

Occupations differ in their routine intensity, and industries differ in the share of routine-intensive tasks.

Differences in frequency of routine-intensive occupations relate to employment across countries and degree of participation in GVCs & TiVA.

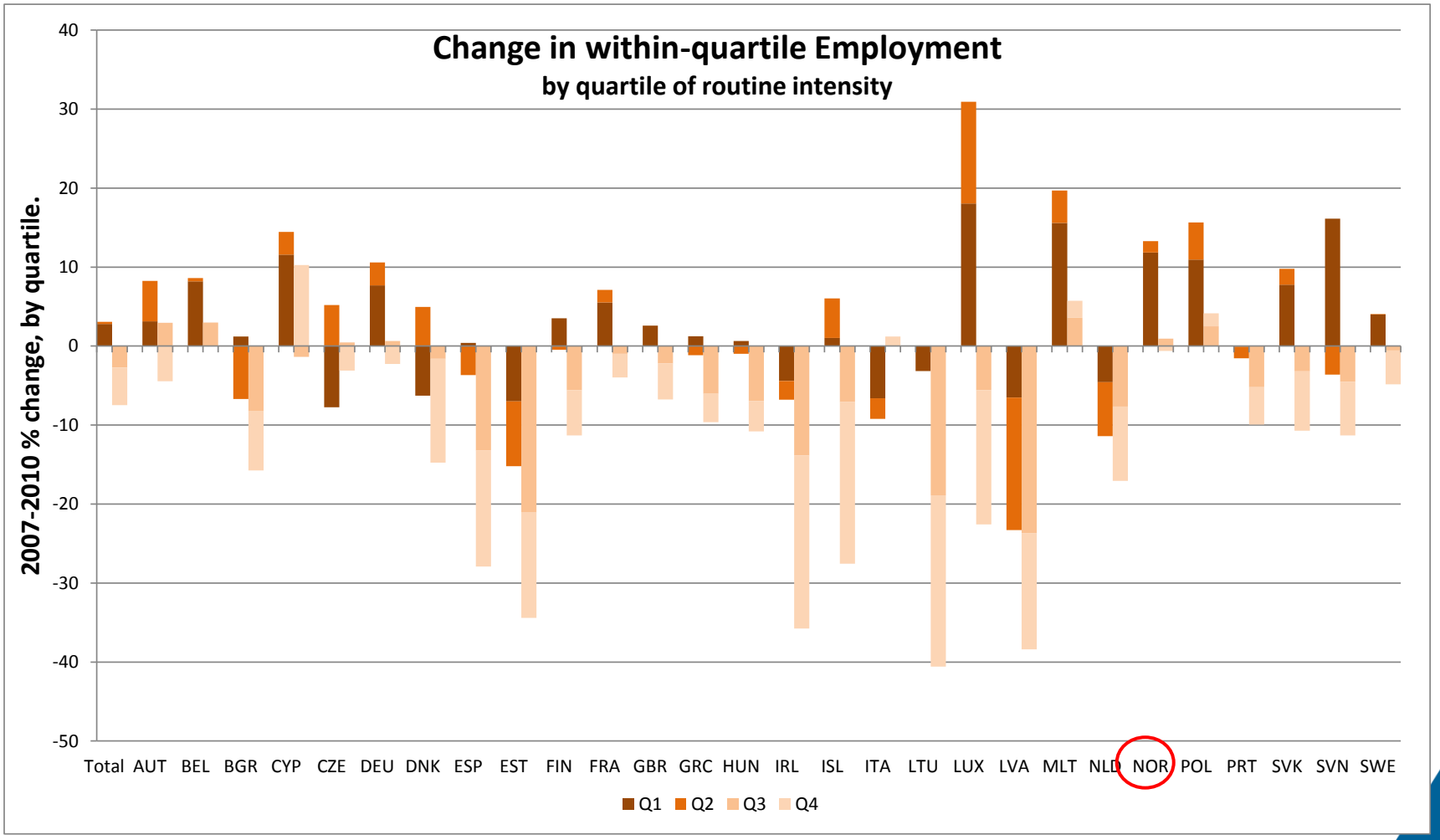
Explore links between routine intensity, KBC, participation in GVCs, and employment patterns, and skill content of routine-intensive jobs.

Experimental PIAAC –based methodology uses 4 routine-intensity (RI) related questions to rank occupations (3-digit ISCO) and industries (34 TiVA list) depending on routine intensity:

- Q1= low-routine-intensive (e.g. Managing directors)
- Q2= medium-low-routine-intensive (e.g. secondary education teachers)
- Q3 = medium-high-routine intensive (e.g. Machinery mechanics)
- Q4= highly-routine-intensive occupations (e.g. money collectors)

Routine intensity and employment

During the crisis:



Source: Marcolin, Miroudot and Squicciarini (2015, forthcoming)

Thank you

Contact: Dirk.Pilat@oecd.org

Read more about our work

Follow us on Twitter:
@OECDinnovation

Website: www.oecd.org/sti

Newsletter: www.oecd.org/sti/news.htm