R&D INTENSITY

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This presentation draws on joint work with and material provided by Silvia App
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BETTER POLICIES FOR BETTER LIVES

Outline

- Some key notions and descriptive statistics
- Insights from NESTI analytical work
  - Quantification of selected policy drivers of business R&D – the case of R&D tax incentives.
    - Aggregate regression results.
  - Specific emphasis on the micro-based (NESTI+CIIE) microBeRD project on the nature and policy drivers of changes of business R&D intensity

Demystifying R&D intensity

Ratio of two economic variables
- Influenced by changes of both numerator and denominator
- In "steady state" should be stable, grow for catching-up economies
- Policy interest in attaining a higher steady-state level if investment in R&D less than socially optimal

Cost of R&D activities carried out **by** units within scope, regardless of who funds
GERD=economy level, decomposable

$$RDint = \frac{R\&D\ Expenditure}{Gross\ Value\ Added}$$

Stock of R&D

Published at economy level in
http://oe.cd/msti

Latest commentary
http://www.oecd.org/sti/msti2019.pdf
- Based on OECD RDS DB – http://oe.cd/rds and National Accounts data

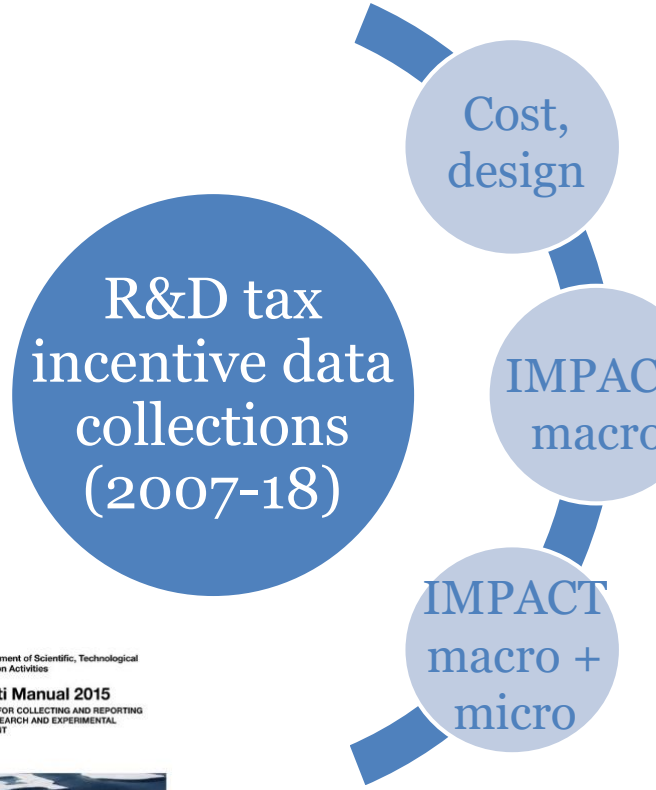
Normalising var for comparisons
GVA=GDP at economy level
Since SNA2008, GVA incorporates capital formation relating to R&D assets
Not all countries have adopted

See expl note:
http://www.oecd.org/sti/inno/Note_MSTI2013_2.pdf

Why measure R&D tax incentives?

- Direct support understates total government support to business
- Common policy objective(s):
  - Generate more of an activity (R&D) that is considered to be undersupplied, esp. by the business sector specialising in the "D" part of R&D
  - Minimise "interference" in the business choice of R&D projects (multiple reasons).
  - Expectation that increase in R&D activity will also result in desirable outcomes: Innovation, broader economic outcomes.
- In 2018, 30 out of 36 OECD countries offer R&D tax incentives, up from 19 in 2000
  - In 17 out of 30 countries policy mix shifted towards tax

Building evidence on R&D tax incentives



OECD R&D tax incentive database

First curated time-series:

- Government tax relief for R&D (GTARD)
- R&D tax subsidy rates (1-B-Index)
- Qualitative policy information

Cross-country analysis

- Based on new time-series data
- STI working paper (forthcoming)

OECD microBERD project

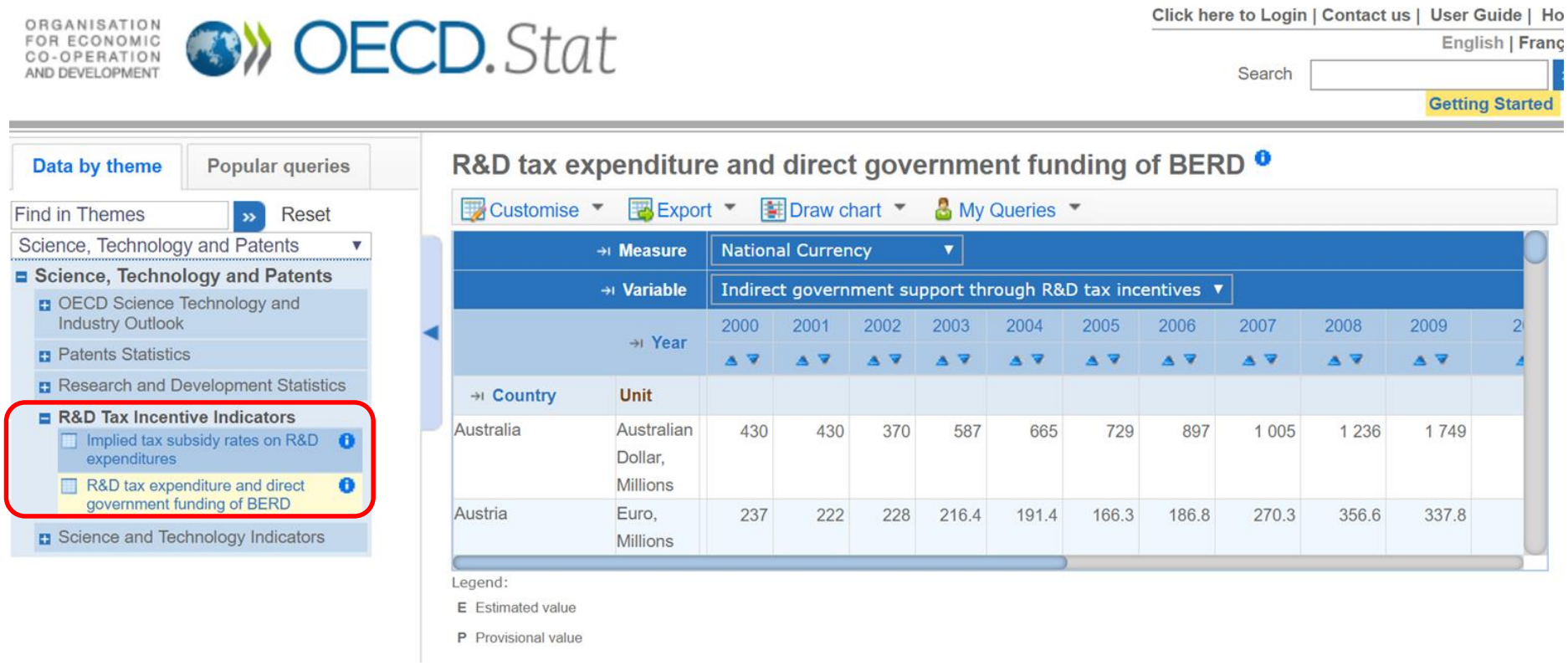
Distributed analysis (~20 countries)

- Microdata aggregated regressions
- Firm-level regressions

European Commission
HORIZON 2020
The EU Framework Programme for Research and Innovation

OECD R&D Tax Incentive database
https://oe.cd/rdtax

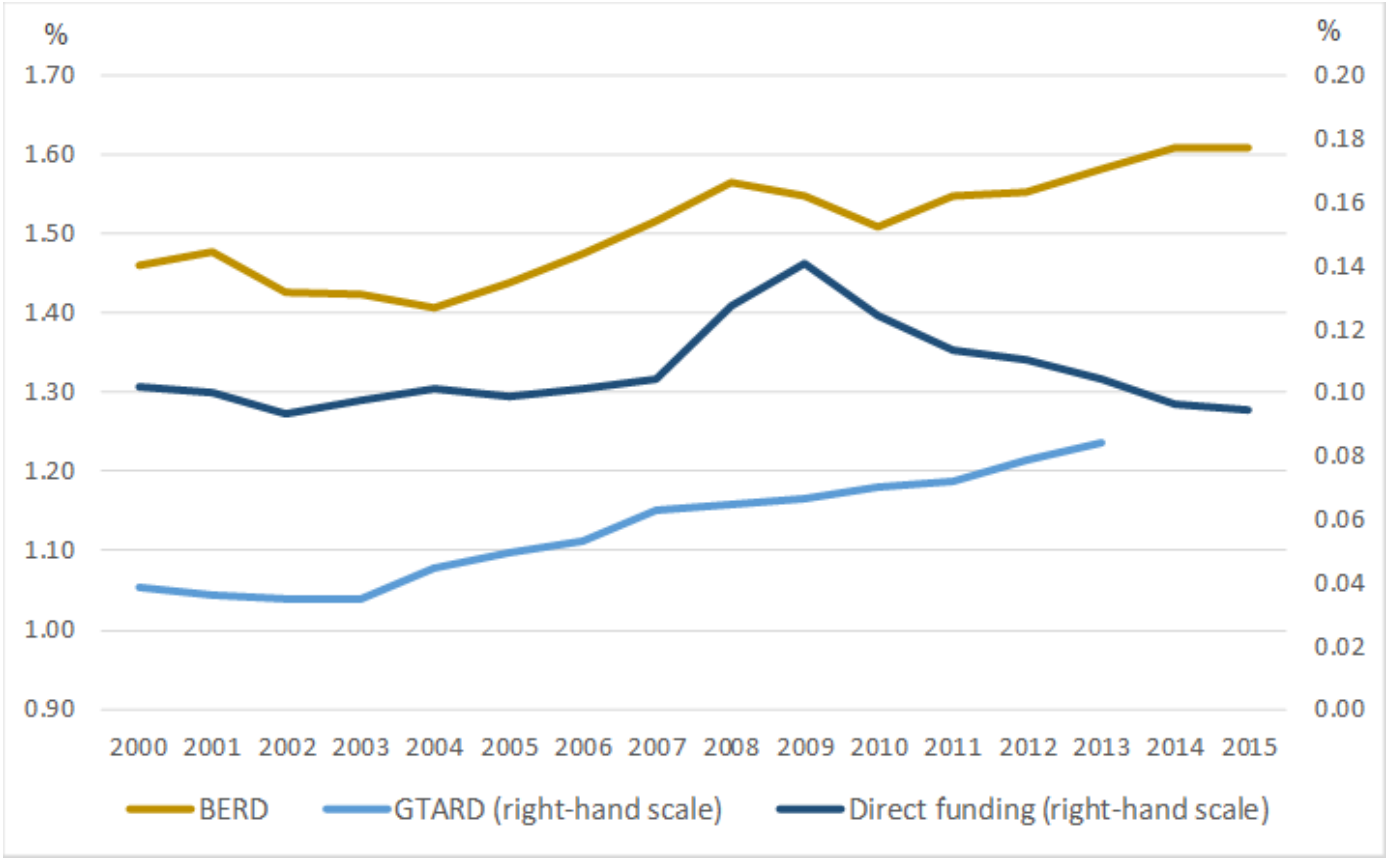
- Released Nov 2018 - integrated in Corporate Tax Statistics database
- NEW: GTARD (2000-16), R&D tax subsidy rate (2000-18)



Linking tax and direct support for BERD with BERD intensity at OECD level

BERD, tax and direct support for BERD, 2000-15

As a percentage of GDP, weighted OECD* average

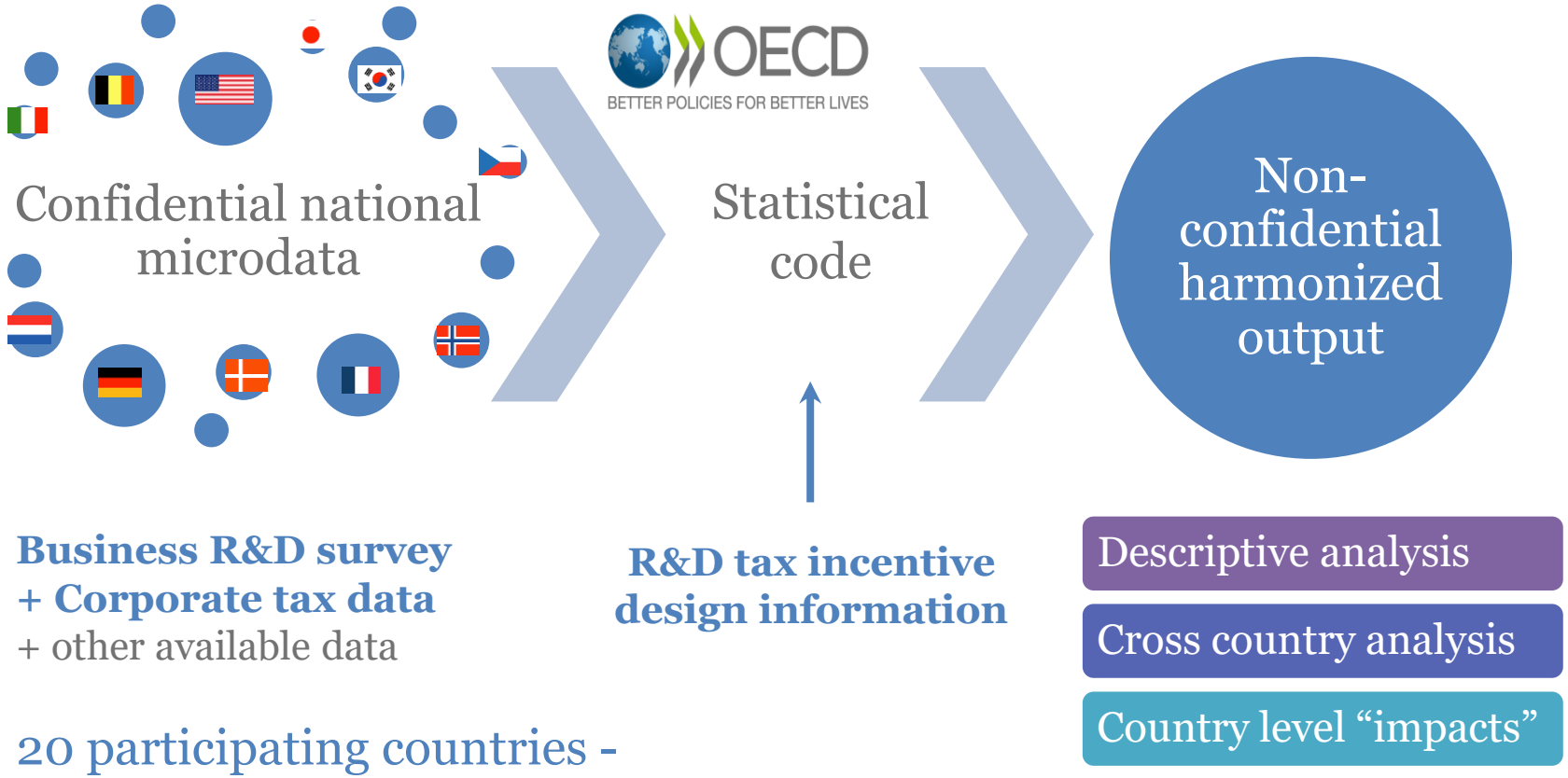


*Note: Figures exclude CHE, GRC, ISR, LUX where relevant data are not available or only partially.

Source: OECD R&D Tax Incentive Database, https://oe.cd/rdtax, March 2019

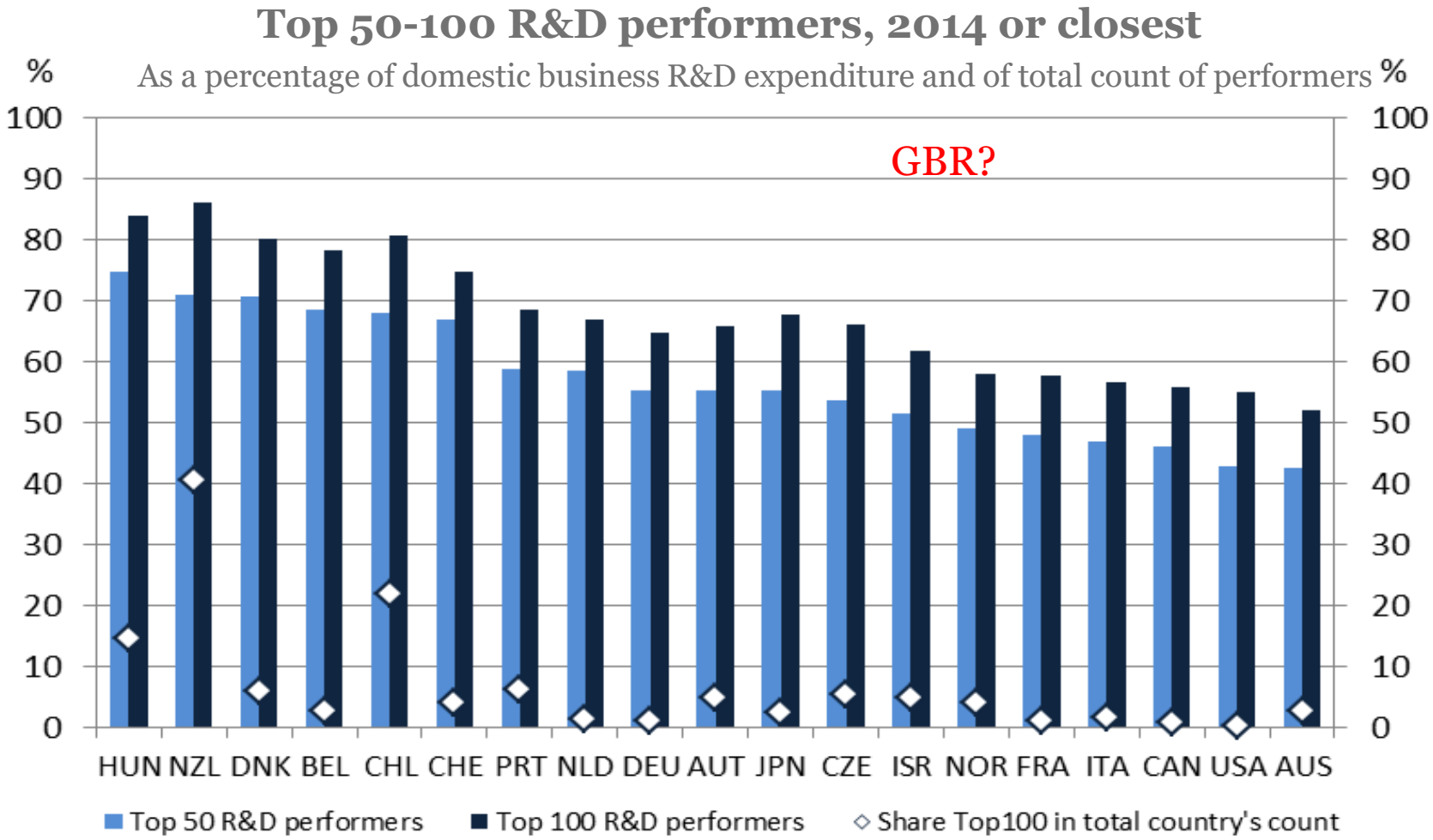
OECD microBeRD project - how it works

https://oe.cd/microberd



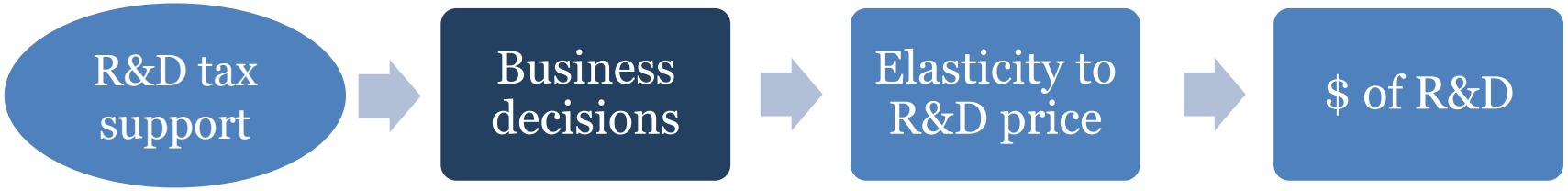
20 participating countries -
3 more joining in

Top 50 R&D performers account for 40-70% of BERD – BERD highly concentrated across OECD countries



Source: OECD, based on preliminary results from the OECD microBeRD project, http://oe.cd/microberd , Dec 2017.

microBeRD – Initial results from the microdata based impact analysis



CROSS COUNTRY ANALYSIS (MICRO AGGREGATED DATA)

- **Price of R&D** (B-Index) **~-0.7%** **~1.00 $**

FIRM-LEVEL IMPACT ANALYSIS

- **Price of R&D**
- **Policy changes**
- **Tax relief users vs. non-users**

-0.2 to -5% **0.4 - 3.1 $**

Heterogeneity: country, industry, firm size, design

Source: DSTI/CIIE/STP(2018)2 (not for broader circulation)

microBeRD – first results from the microdata based impact analysis

- Stronger effects for:
  - Smaller companies
  - Experimental development (vs. research)
- Variation of effects by type of R&D expenditure
  - Differences across firm sizes?
- Increase in R&D employment (vs. wages)
- Increase in R&D □ existing & new R&D performers
- Design matters – policy predictability (preliminary)

➡ More on firm characteristics, design features, direct funding - project publication (Q3 2019)

What mix? Comparing direct and tax support

Issues to consider

- Relative management costs
- Discretionality – additionality as criterion
- Limited scope for discretionary support / picking winners

Aggregate estimates of R&D input additionality (Different specifications)

Direct funding	A	B	C	D
Incrementality ratio	1.180	1.212	1.362	1.412
Standard error	*0.171*	*0.169*	*0.165*	*0.163*

Tax support	A	B	C	D
Incrementality ratio	0.365	0.571	0.317	0.643
Standard error	*0.082*	*0.222*	*0.079*	*0.229*

Source: Forthcoming STI WP.

Ongoing work to produce comparable estimates at the micro level through microBeRD.

Thank YOU

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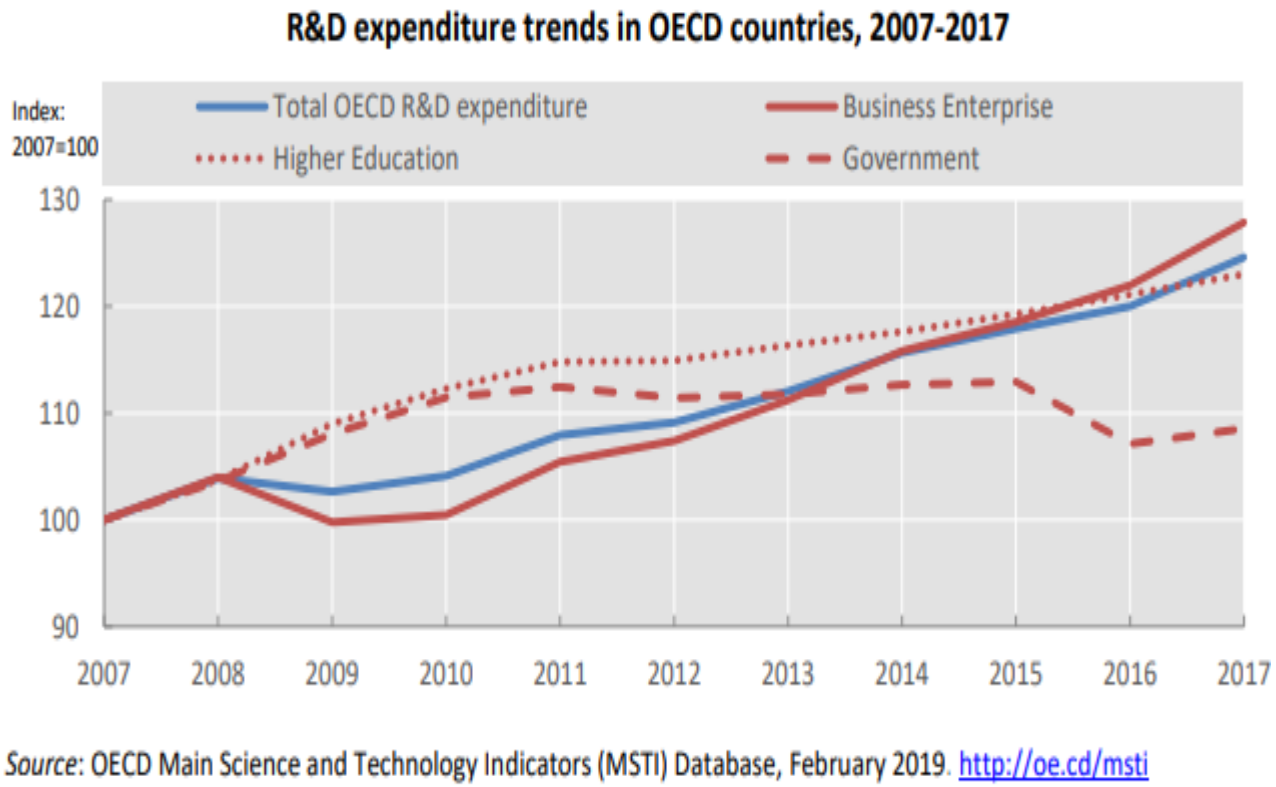
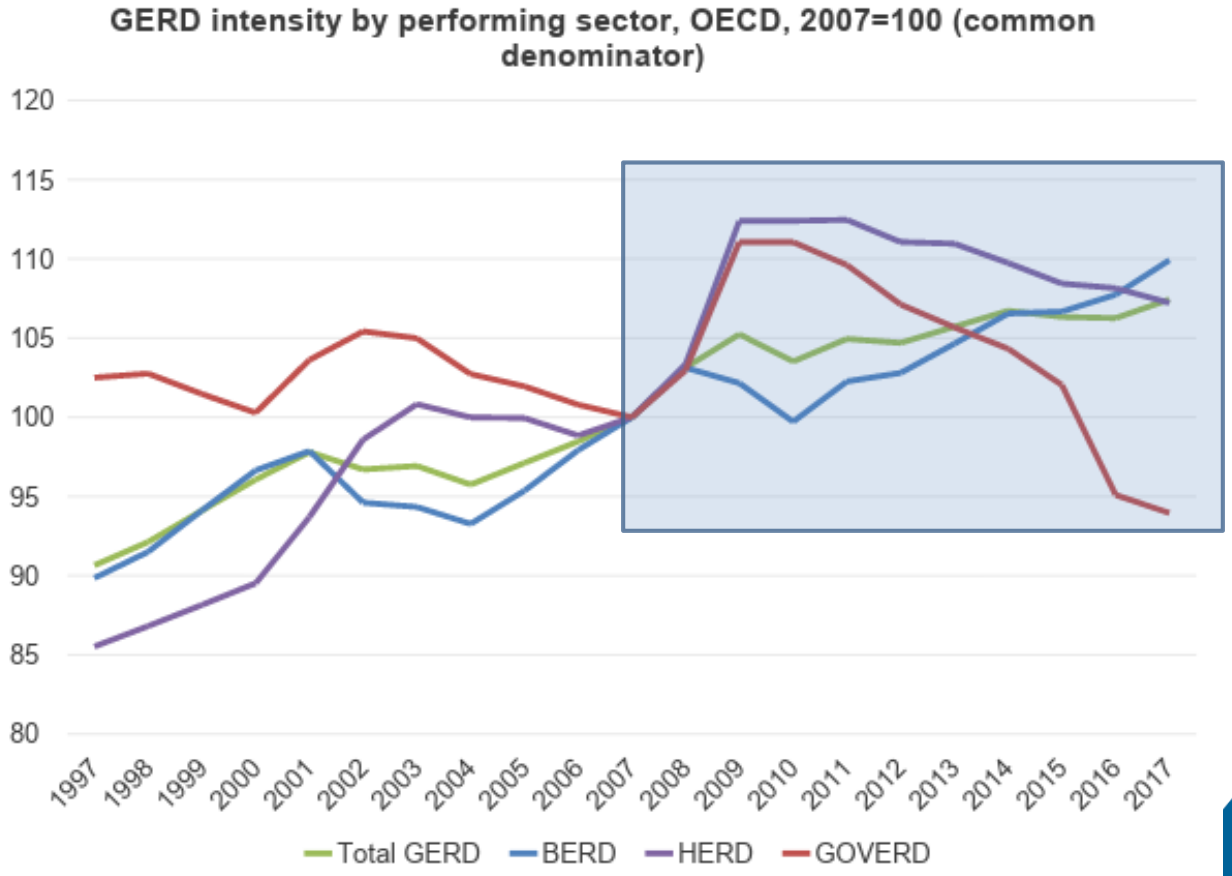
OECD R&D Tax Incentives: http://oe.cd/rdtax

BACKGROUND MATERIAL ON R&D INTENSITY

Looking at levels of R&D and intensity ratios

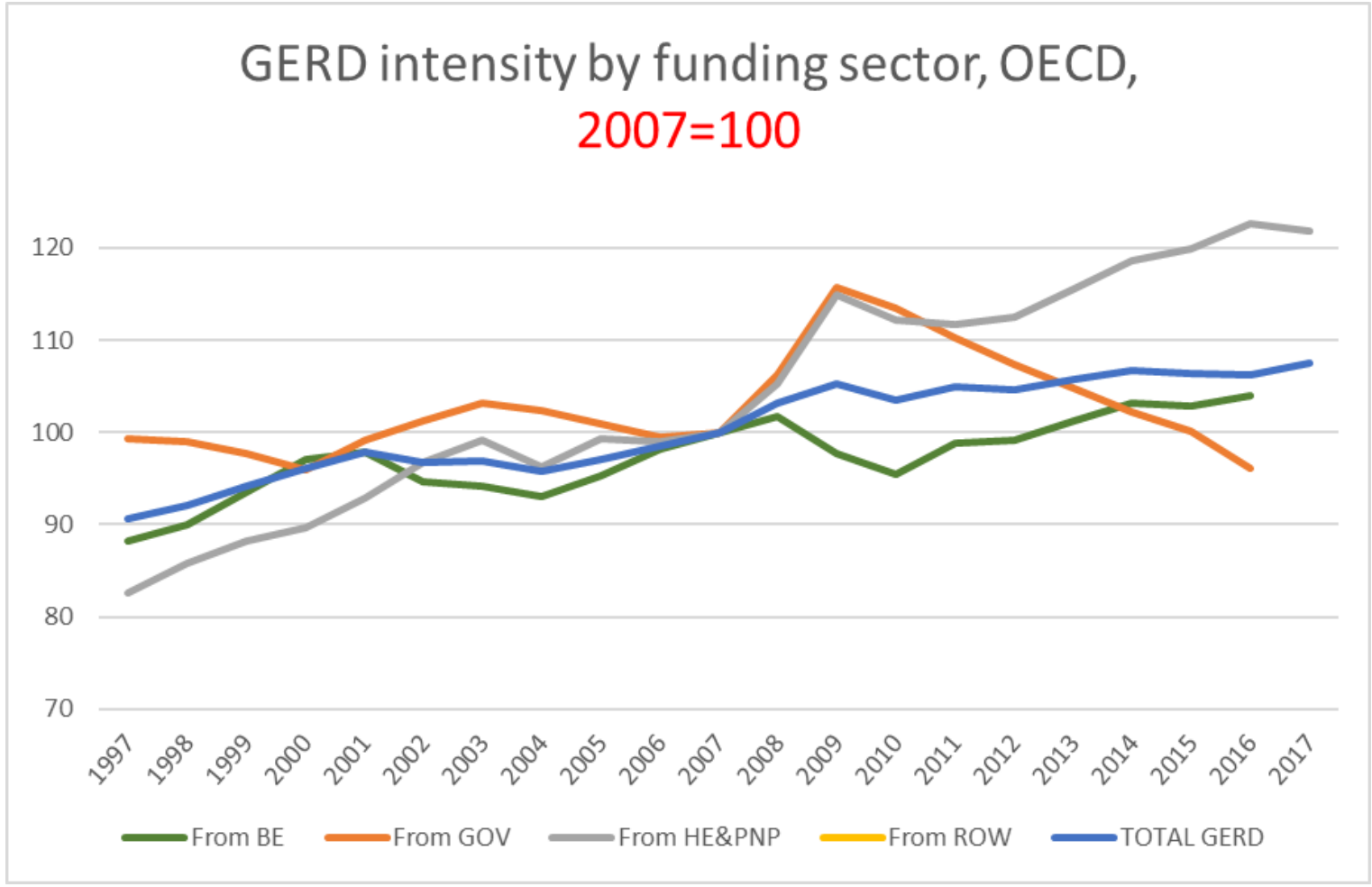


Source: OECD Main Science and Technology Indicators (MSTI) Database, February 2019. http://oe.cd/msti



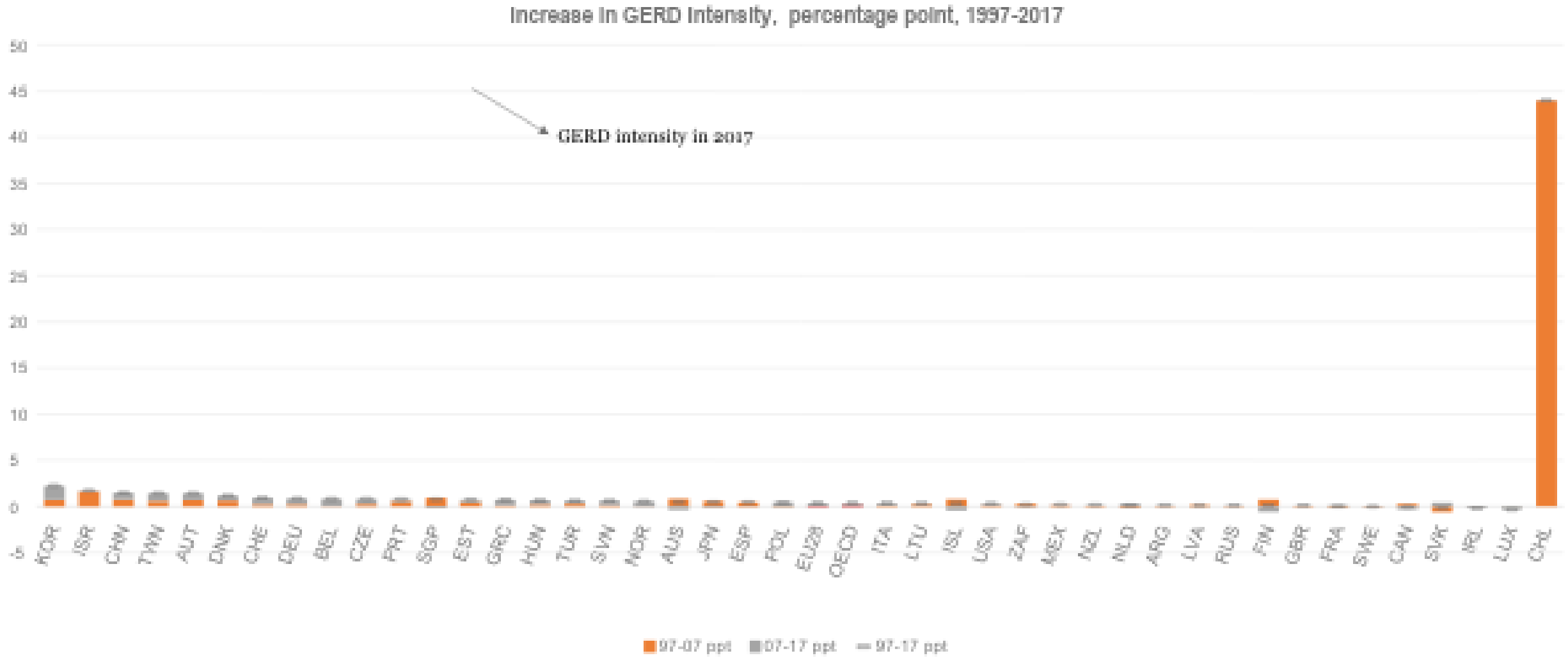
Source: OECD analysis based on MSTI. http://oe.cd/msti

Performance v funding

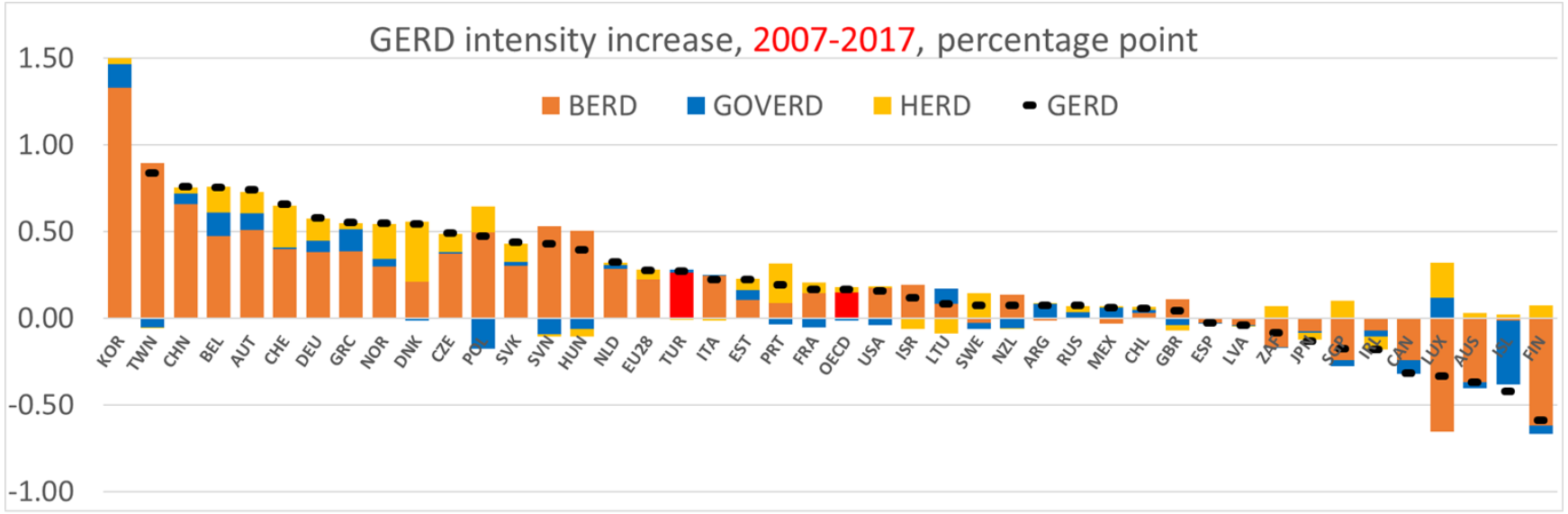


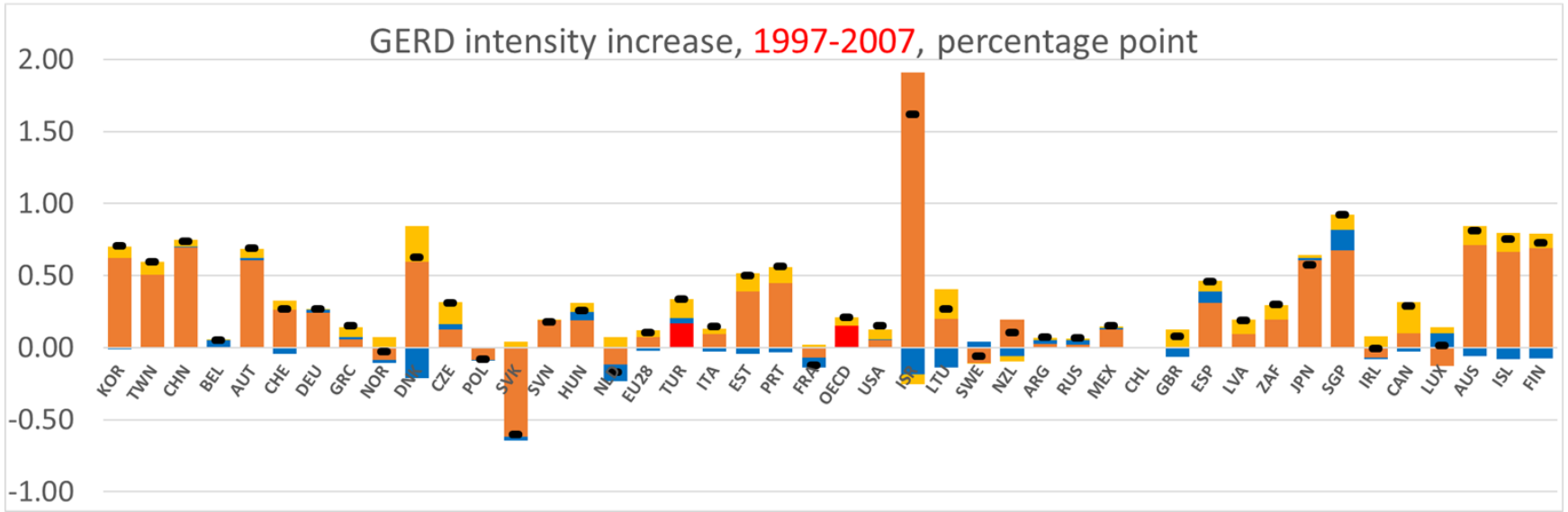
Source: OECD analysis based on MSTI. http://oe.cd/msti

Changes in R&D intensity at country level



Source: http://oe.cd/msti


GERD intensity increase, 2007-2017, percentage point
BERD
GOVERD
HERD
GERD
1.50
1.00
0.50
0.00
-0.50
-1.00
KOR TWN CHN BEL AUT CHE DEU GRC NOR DNK CZE POL SVK SVN HUN NLD EU28 TUR ITA EST PRT FRA OECD USA ISR LTU SWE NZL ARG RUS MEX CHL GBR ESP LVA ZAF JPN SGP IRL CAN LUX AUS ISL FIN


GERD intensity increase, 1997-2007, percentage point
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
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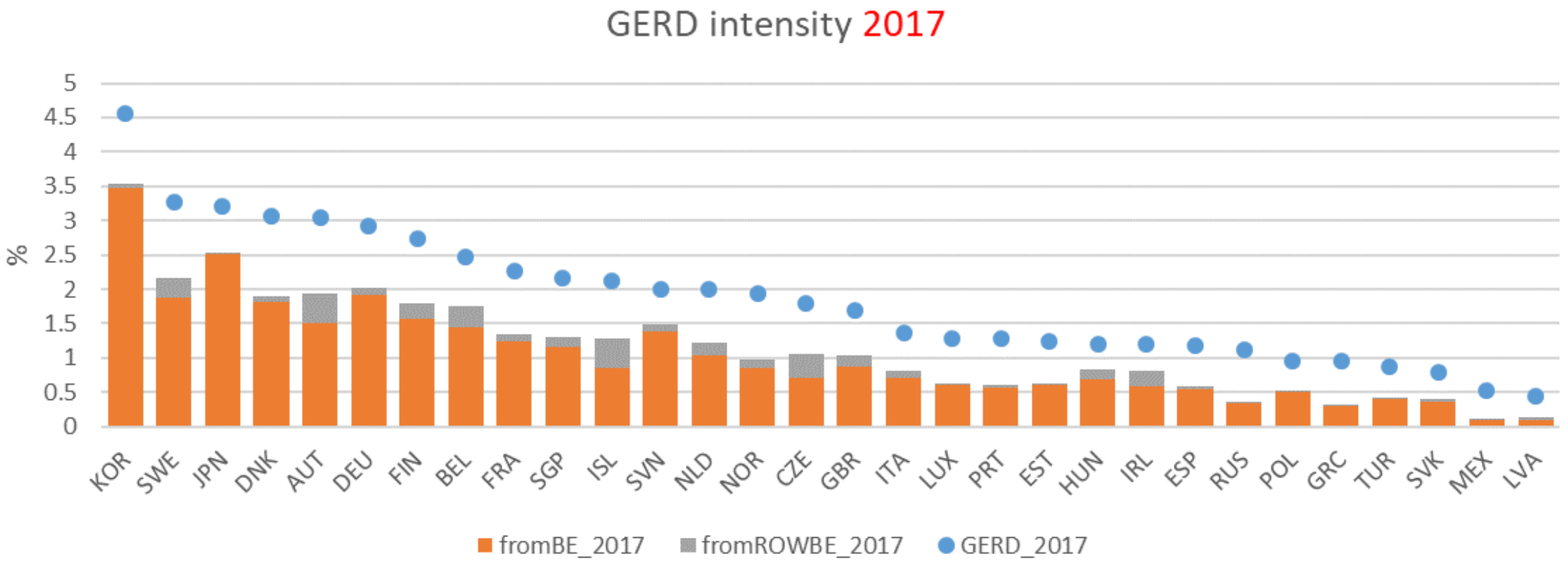
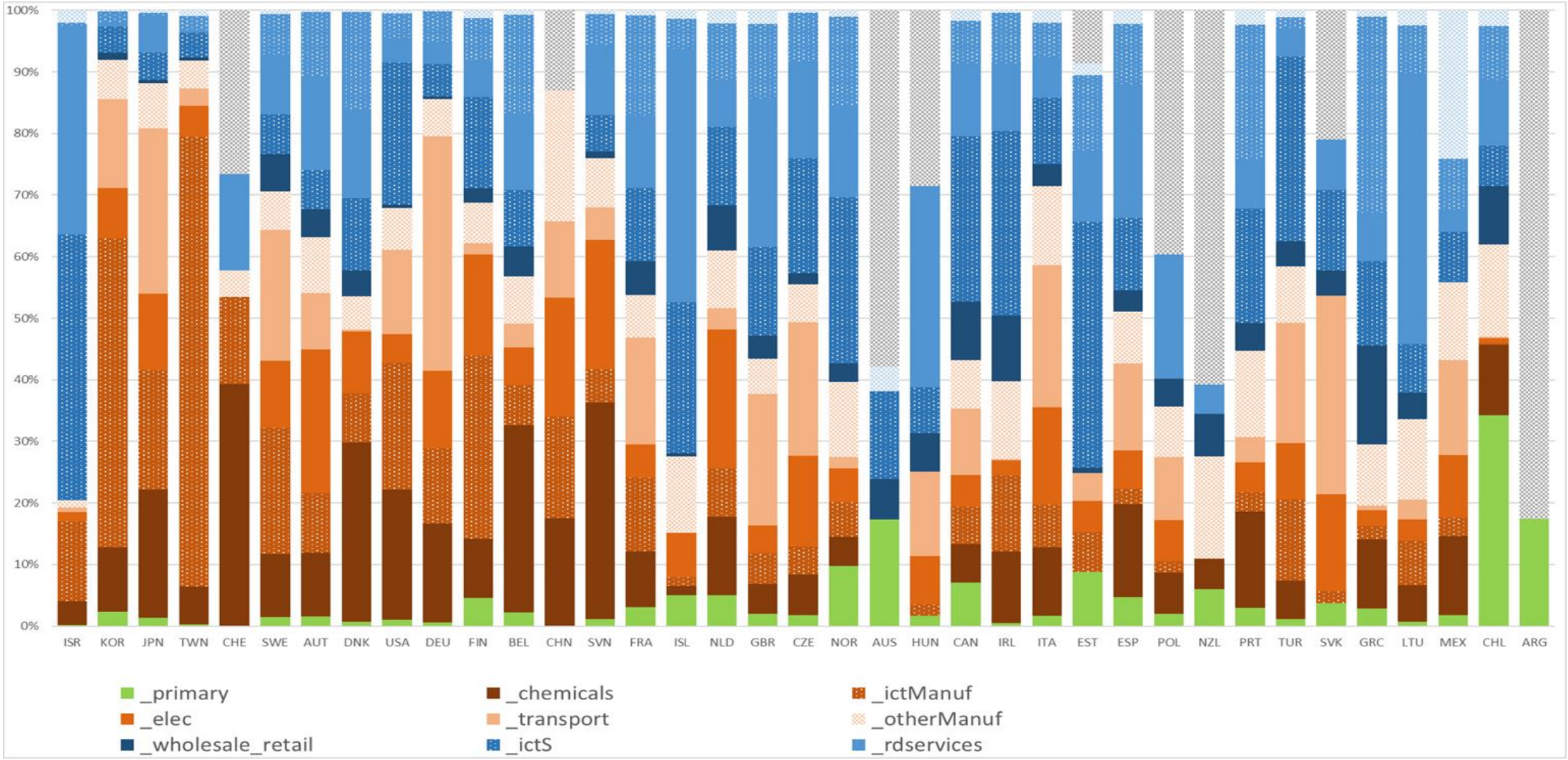
Funds from domestic and foreign busines



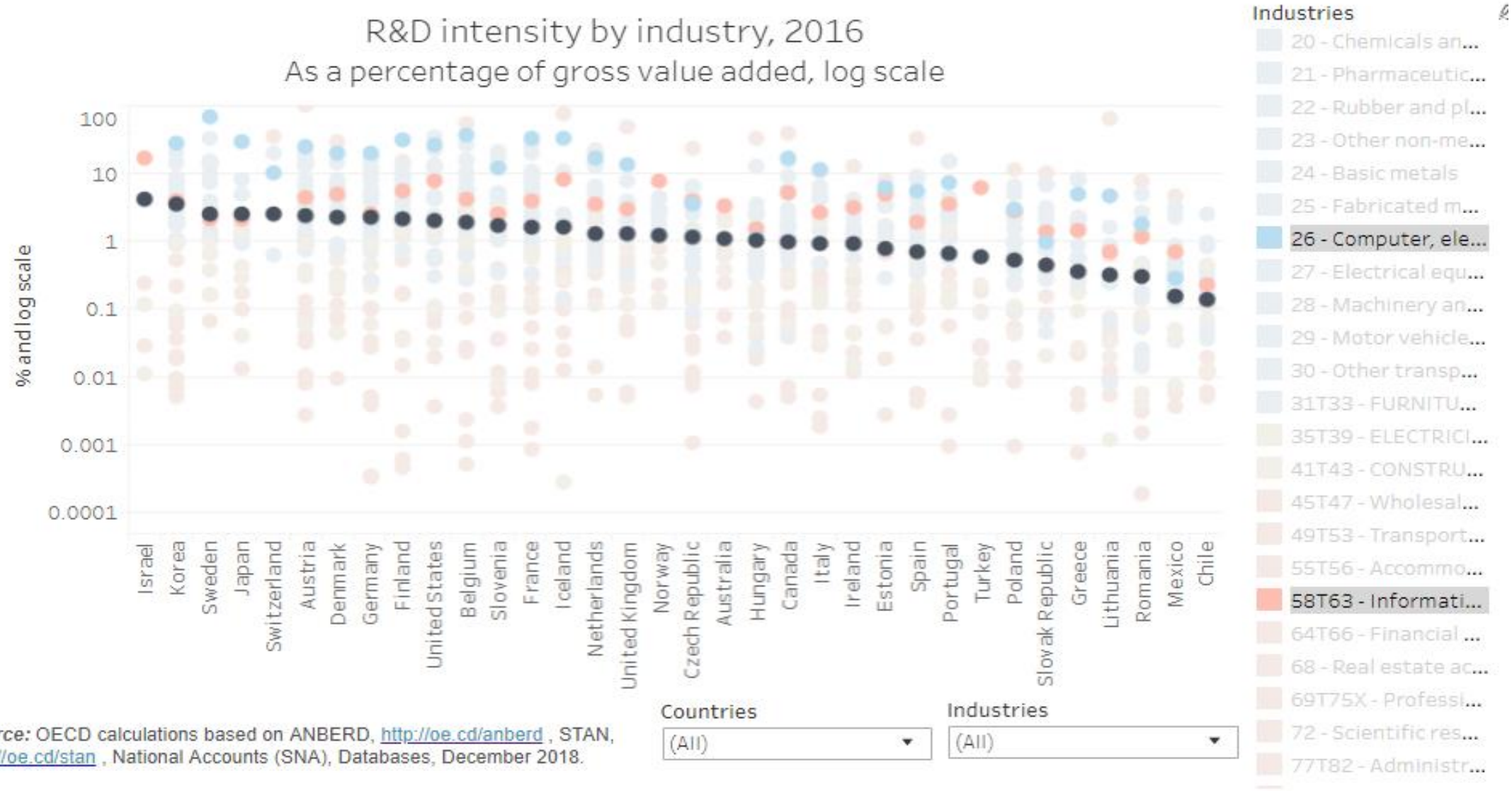
Source: http://oe.cd/msti and http://oe.cd/rds

Distribution of BERD by industry groups



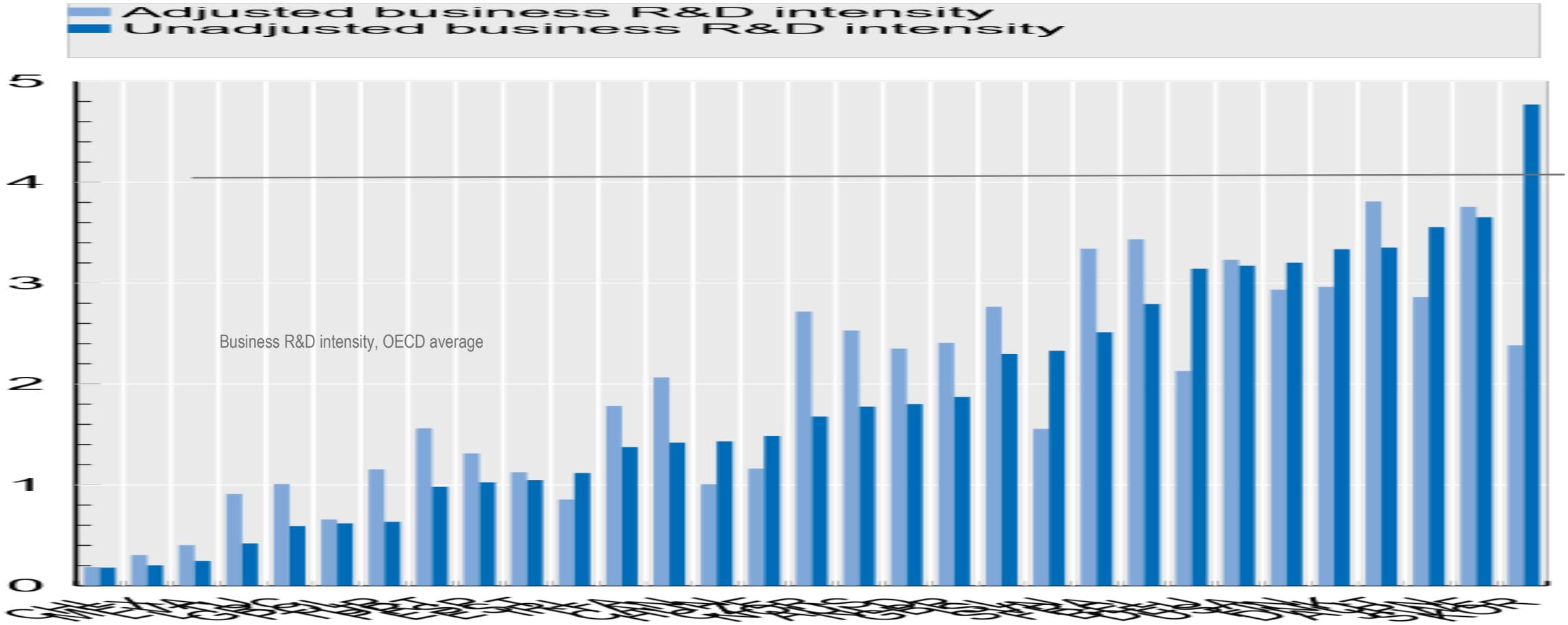
Source: http://oe.cd/anberd

Differences in R&D intensity across industries and countries



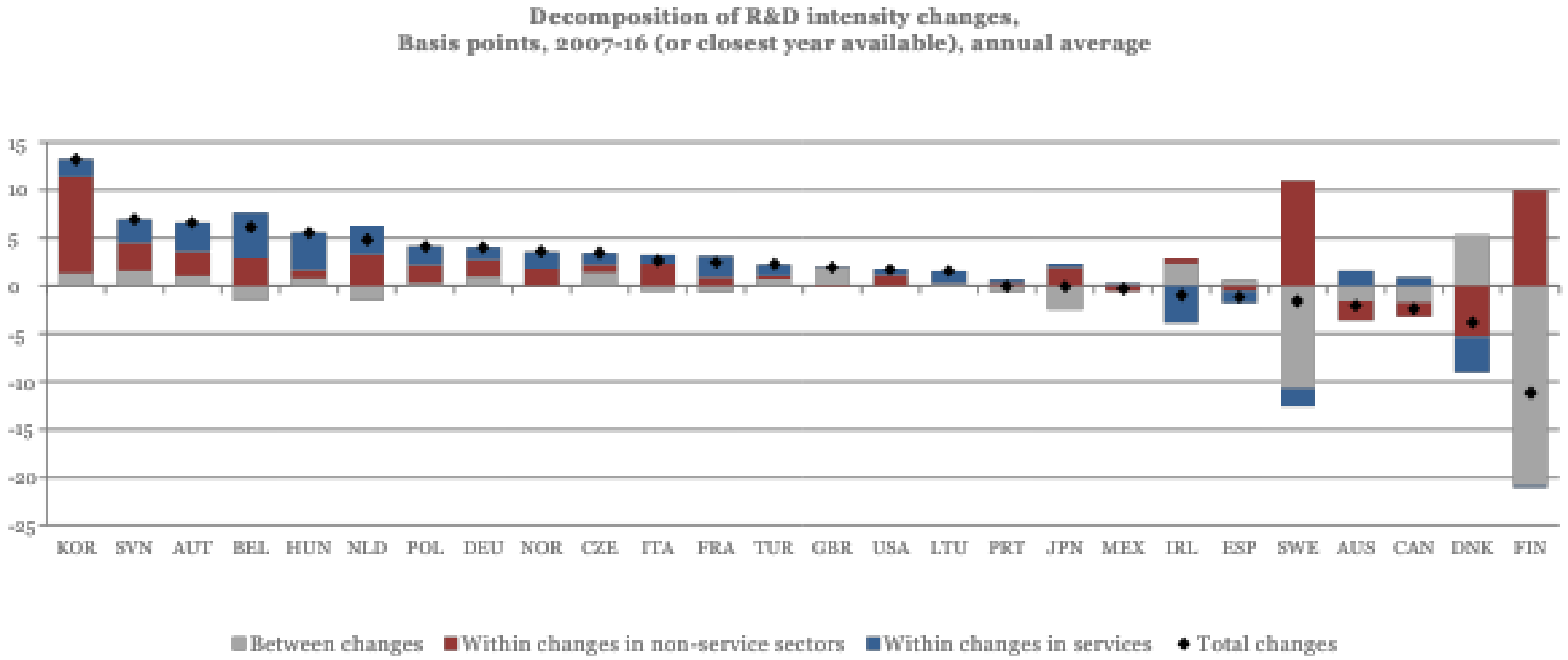
Source: OECD calculations based on ANBERD, http://oe.cd/anberd , STAN, http://oe.cd/stan , National Accounts (SNA), Databases, December 2018.

R&D intensity depends to a certain extent on the industrial structure of a country (2017 or most recent year)



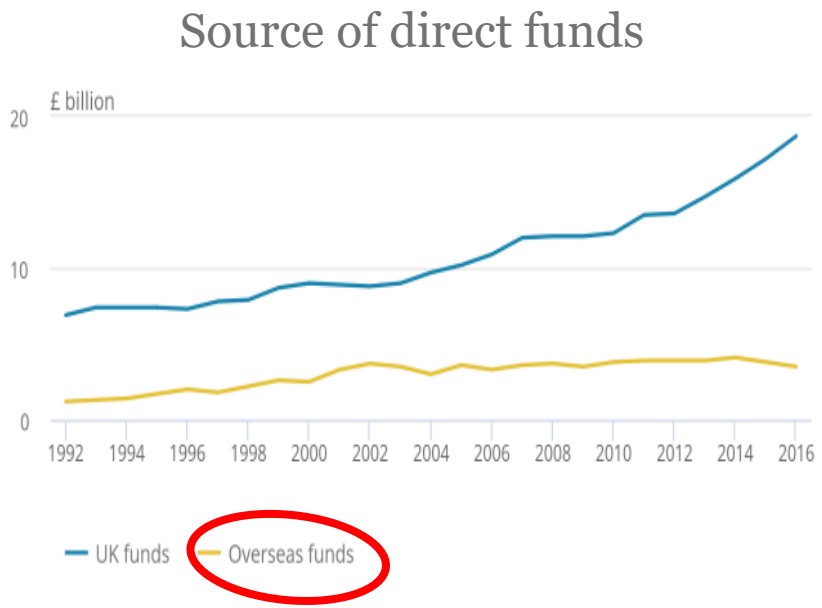
Source: OECD analysis based on ANBERD, 2019: http://oe.cd/anberd

Understanding industry contributions to R&D intensity changes over the past decade



Source: OECD analysis of ANBERD database: http://oe.cd/anberd

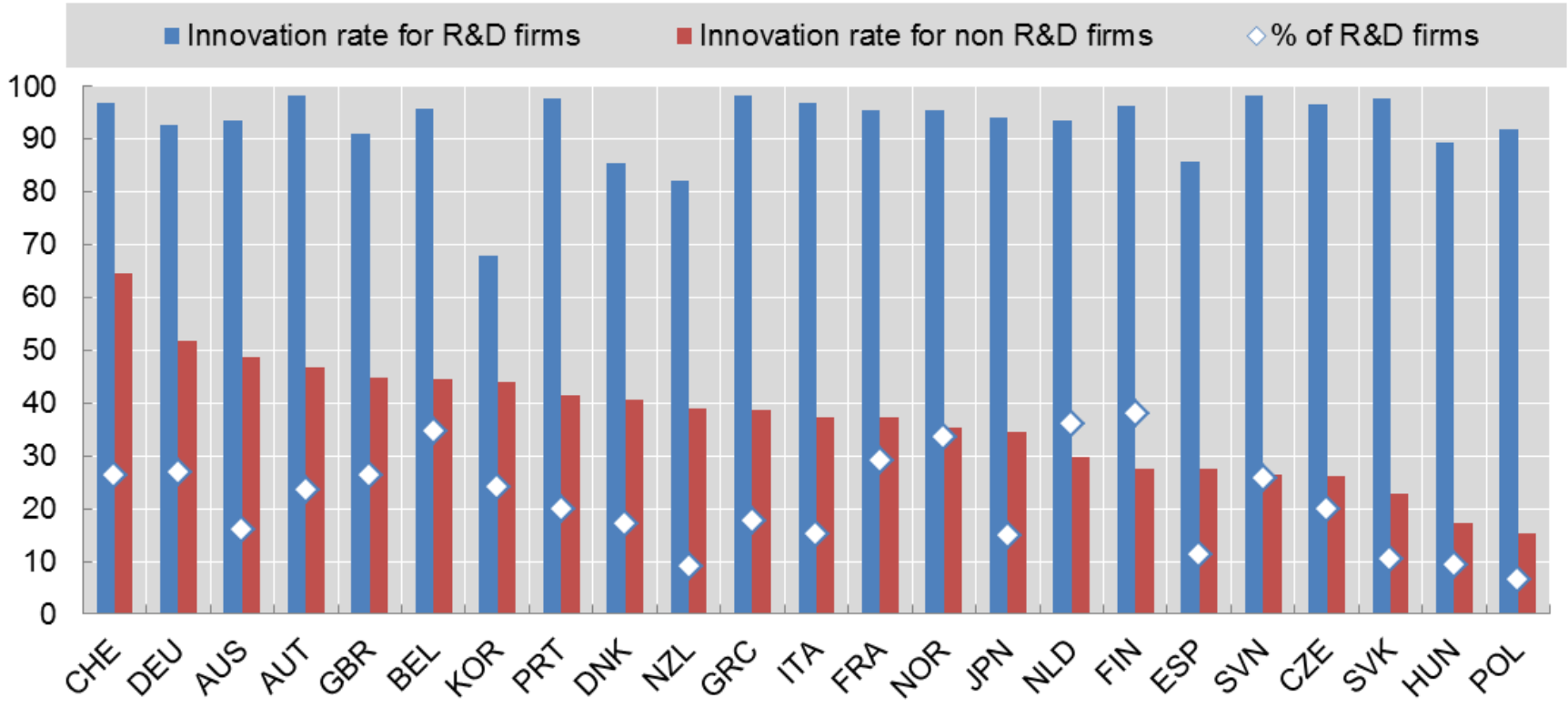
The role of R&D globalisation – the case of the UK



Source: ONS, Business enterprise research and development, UK: 2016

- More R&D performed by foreign owned firms
- Less R&D directly funded from abroad

Business R&D and innovation
Innovation propensity by R&D status



Source: OECD Innovation Statistics, http://oe.cd/inno-stats