



DEVELOPMENTS IN THE MEASUREMENT OF R&D AND INNOVATION

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Measuring R&D – OECD role

The Measurement of Scientific, Technological
and Innovation Activities



Frascati Manual 2015

GUIDELINES FOR COLLECTING AND REPORTING
DATA ON RESEARCH AND EXPERIMENTAL
DEVELOPMENT

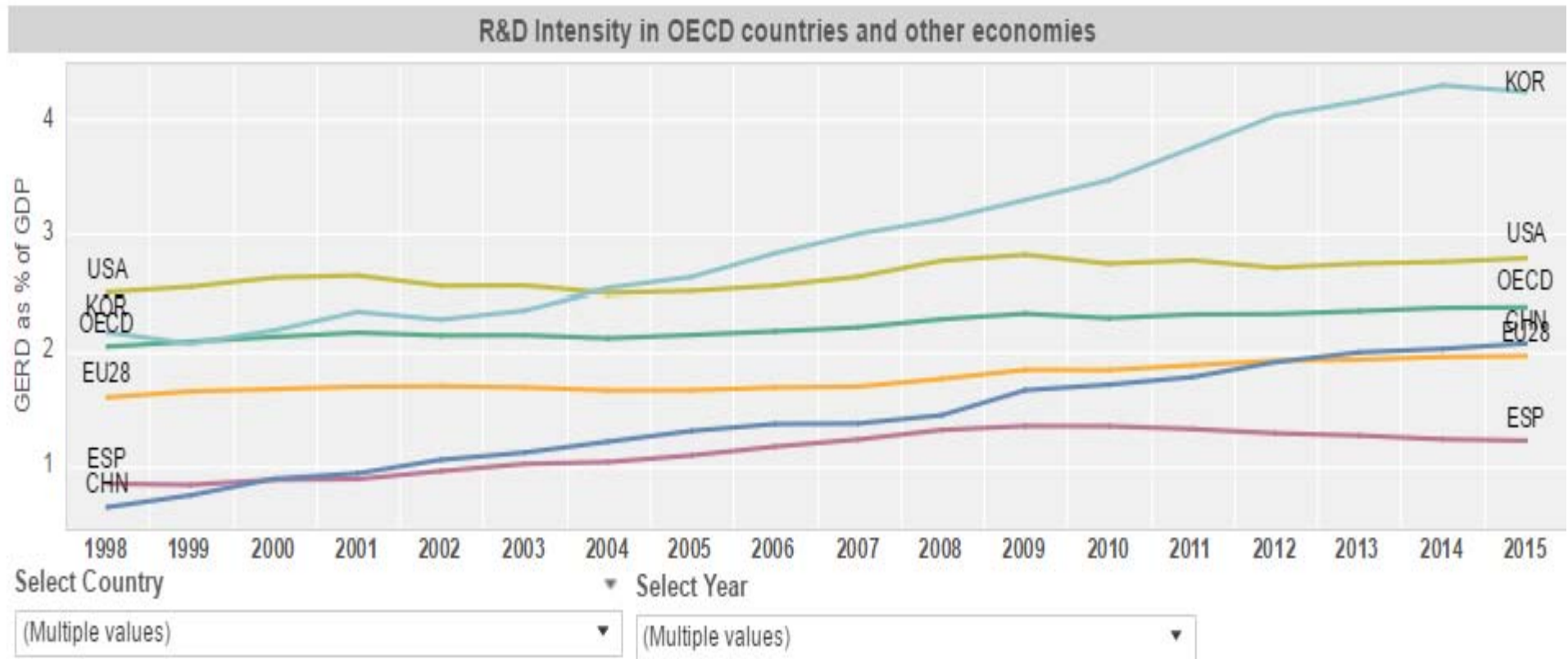


- International framework:
 - defining R&D
 - measuring financial, human inputs→ statistical and wider use (e.g. tax policy)
- R&D databases - OECD and key economies:
 - RDS (oe.cd/rds) – *the* place for the latest R&D data
 - MSTI (oe.cd/msti) – R&D and related indicators
 - ANBERD (oe.cd/anberd) – business R&D by industry with imputations
- R&D tax incentives (oe.cd/rdtax)

oe.cd/frascati



R&D intensity (R&D€/GDP)



Source: OECD estimates based on OECD Main Science and Technology Indicators Database, July 2017.

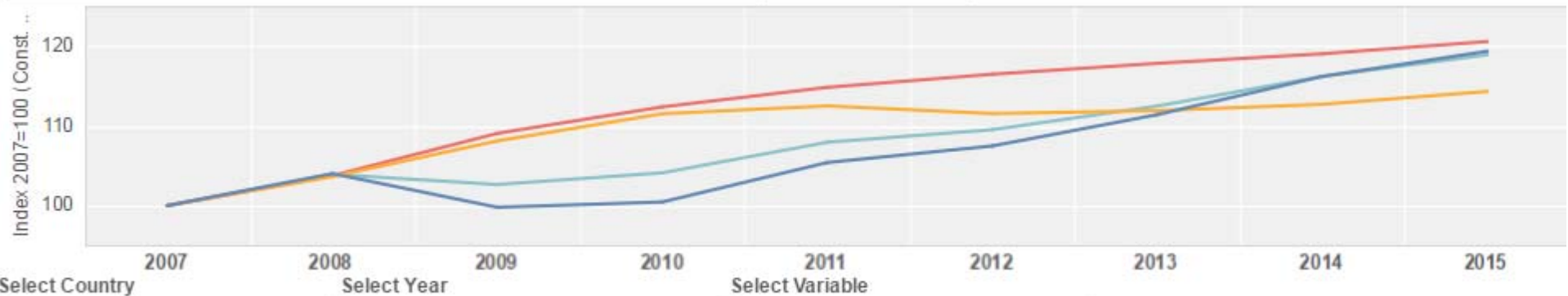
Data available here: http://www.oecd.org/sti/inno/rd_intensities.xls

Source: <http://oe.cd/msti>



Business R&D “off the chart” in Spain

Gross domestic expenditures on R&D by performing sector
Index 2007=100 (Constant USD PPPs)



Select Country

Select Year

Select Variable

OECD

(All)

(Multiple values)

Business

Higher educa...

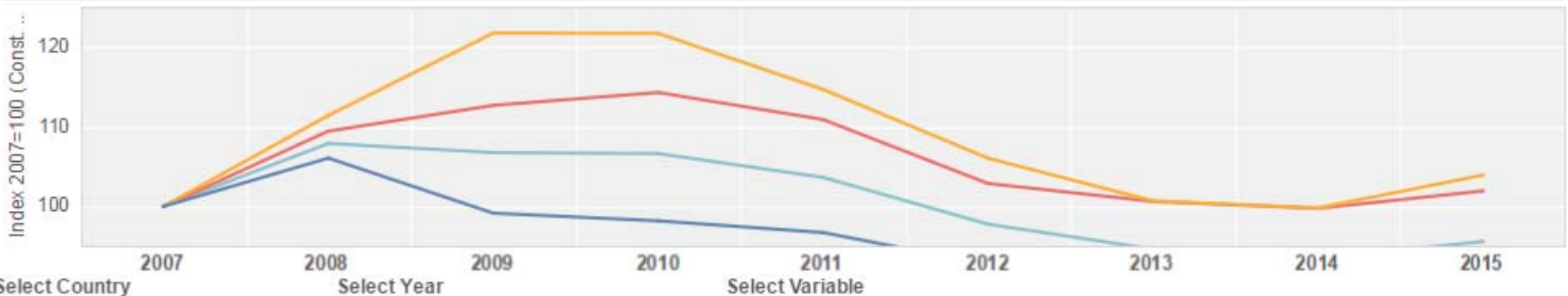
Government

Total R&D

Source: OECD estimates based on OECD Main Science and Technology Indicators Database, July 2017.

Data available here: http://www.oecd.org/sti/inno/gerd_by_sector.xls

Gross domestic expenditures on R&D by performing sector
Index 2007=100 (Constant USD PPPs)



Select Country

Select Year

Select Variable

ESP

(All)

(Multiple values)

Business

Higher educa...

Government

Total R&D

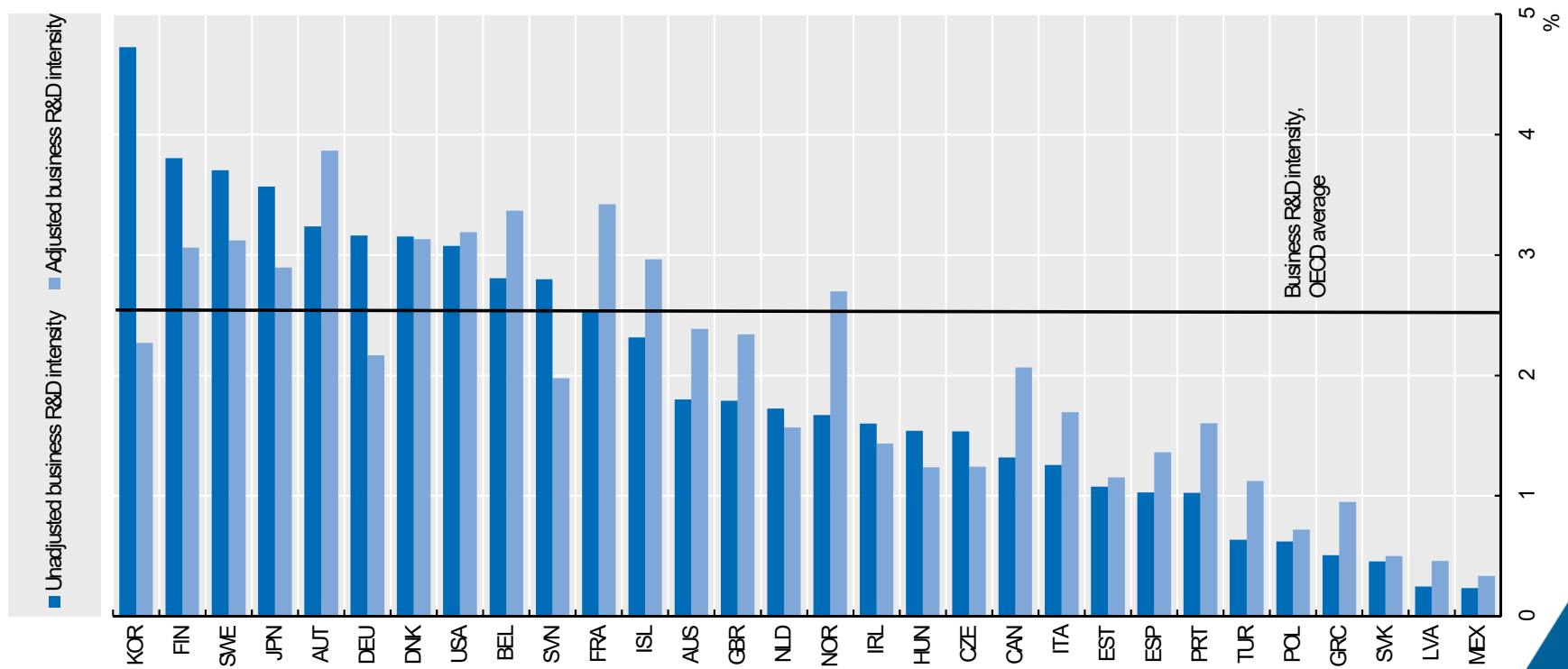
Source: OECD estimates based on OECD Main Science and Technology Indicators Database, July 2017.

Data available here: http://www.oecd.org/sti/inno/gerd_by_sector.xls



Adjusting for differing industrial structures

Business R&D intensity adjusted for industrial structure, 2015
% of value added by business sector





Government support for business R&D

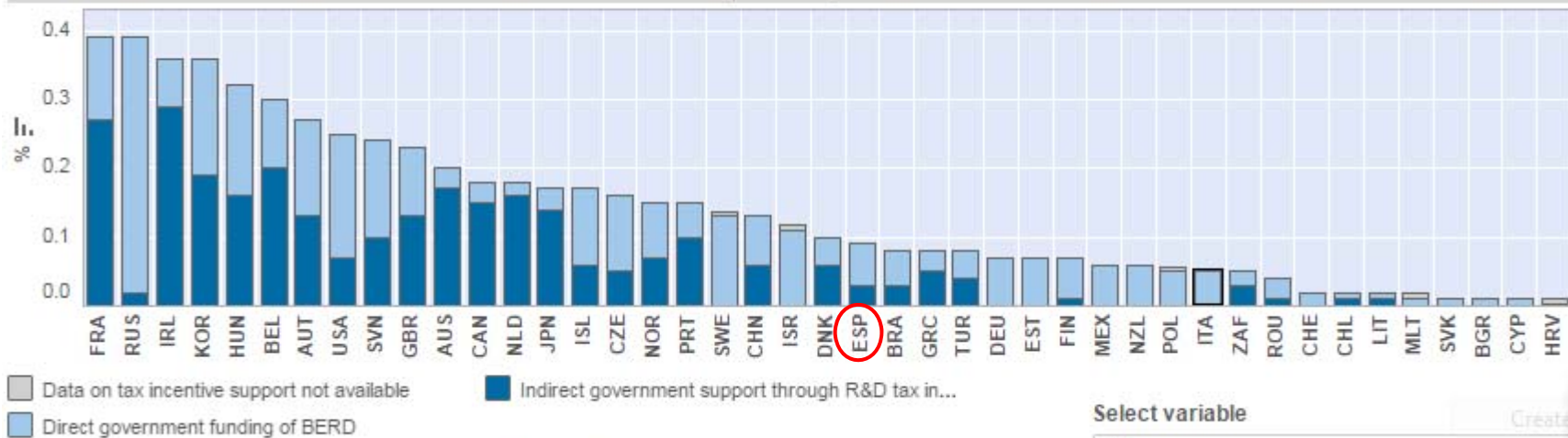
Tax subsidy rates on R&D expenditures, 2016

1-B-Index, by firm size and profit scenario



Direct government funding of business R&D and tax incentives for R&D, 2014

As a percentage of GDP



Data and notes are available here: <http://www.oecd.org/sti/Direct-govfund.xls>



Creation of “ideas” counted in GDP... Measuring R&D investment - context

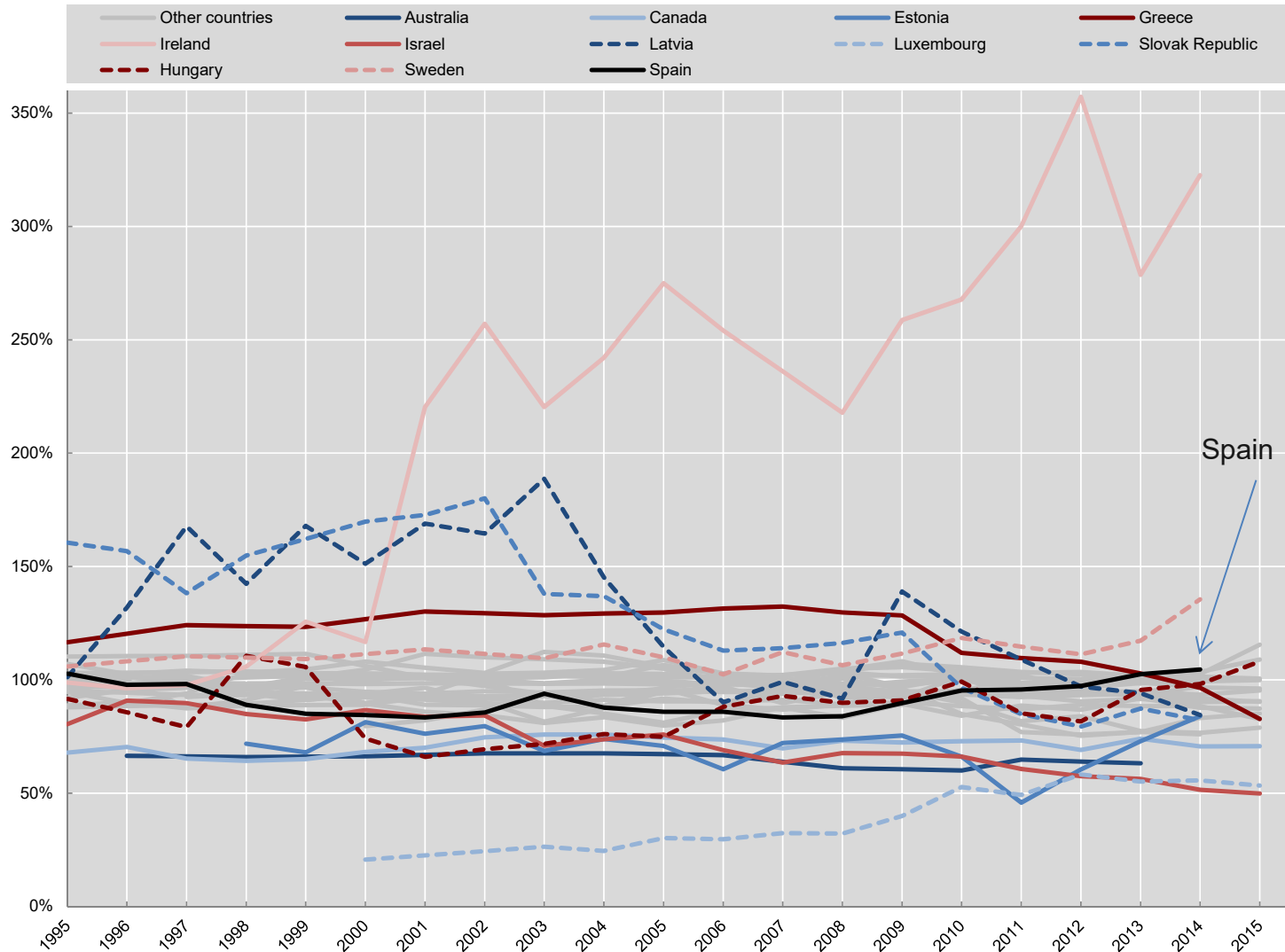
- R&D GFCF (investment) now included in National Accounts (+OECD database)
- “Built-in” for productivity analysis
 - Important to understand what is measured and how
 - important to identify the right units/ industries/ firms/ countries owning and using knowledge



Expenditure vs capital formation (GFCF/GERD)

- GERD has been main proxy for R&D investment
- Now we have R&D GFCF from National Accounts

→ includes imports, excludes exports





Interpretation

Most often $GERD > R\&D\ GFCF$

= most countries are R&D exporters?

1. GERD includes *R&D in the course of software development*, this is treated as software GFCF (not R&D)
 - Reduces R&D by $> 20\%$ in some cases
 - Impacts countries with widespread software development more
2. GERD includes total expenditure on capital inputs to R&D, most R&D GFCF is valued based on the *notional cost of using* that capital in each period (plus other costs)
3. countries do import and export R&D, but typically these are measured using separate sources (trade surveys) \rightarrow compatibility issues

Differences in the data, methods, and parameters used can generate international variation in R&D GFCF \rightarrow OECD stocktake



For more...

OECD publishing

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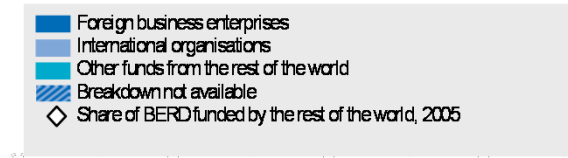
Frascati Manual R&D and the System of National Accounts

Daniel Ker, Fernando Galindo-Rueda

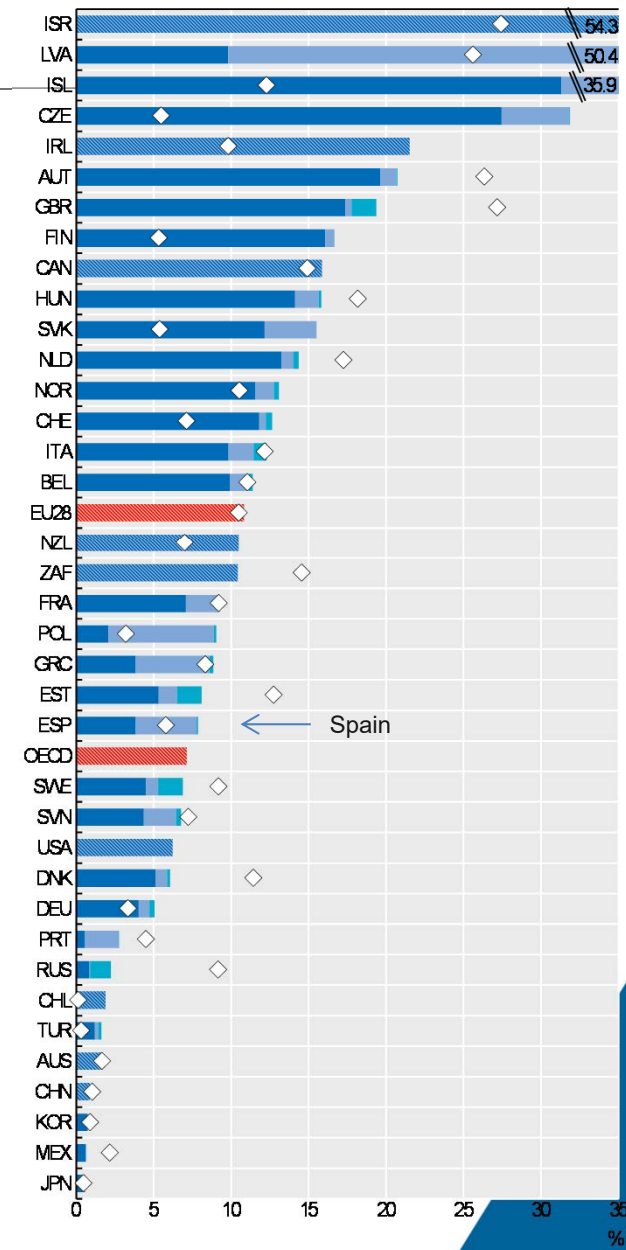
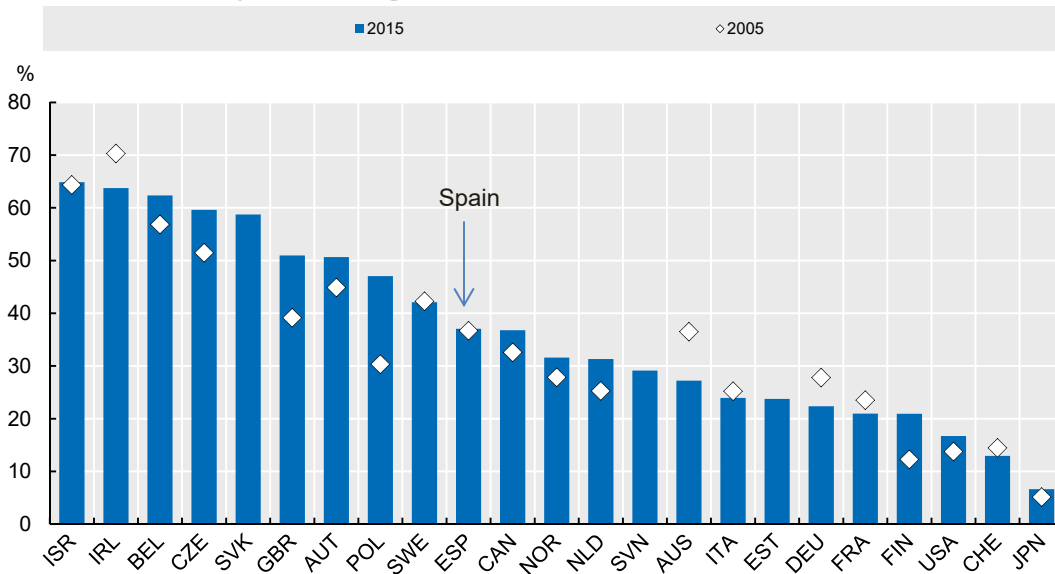
- New working paper / FM annex
- Interrelation of FM and SNA
- Many developments in FM2015 incl.:
 - R&D by source *and nature* of funds
 - Value of R&D sales
 - Ch. on Globalisation



% BERD funded from overseas



% BERD by Foreign-Controlled Affiliates (FCAs)



- Gap can be large:
 - e.g. in Belgium 64% of BERD by FCAs but only 10% of BERD is funded by overseas businesses
 - Are FCAs really funding most of their R&D domestically?
- Work to better understand how FCAs/MNEs account for different funding flows.



New data

- New/improved ways to estimate who owns R&D assets
- Improved “mark-ups”
- Improved basis for country and sector productivity analysis



So what's missing?

- Ongoing implementation – challenges
 - Countries in the process of implementing the new FM
 - changes require clear user demand
- Topics not covered in FM
 - R&D outputs and related transactions (patent sales, licencing, etc.)
 - Issues cover in the current revision of the Oslo Manual on Innovation



Oslo Manual (OM) revision

- OM: framework for identifying and measuring innovation inputs, activities, and outputs

- Revised definition:

A business innovation is a new or improved product, business process, or combination thereof that differs significantly from the firm's previous products or business processes and which has been implemented on the market or within the firm.

→ **R&D on its own is not innovation**

→ Invention/patenting on its own is not innovation

...only occurs if a new product or process has been *implemented*

- Measurement focus remains on *business* innovation
- BUT new chapter introduces the concept of innovation in other sectors



Oslo Manual (OM) revision

Covered in
OM 2005

New in OM
2018

Innovation as a concept /purpose

General concepts – all sectors (ch2)

Business innovation concepts (ch3)

Business innovation objectives and outcomes (ch8)

Innovation activities

Business innovation activities (ch4)

Innovation and knowledge flows (ch6)

Innovation draws upon/creates KBC:

- **Computerised info**
 - *incl. innovative software, uses of data*
- **Innovative property**
 - *incl. patents, designs, etc.*
- **Economic competences**
 - *incl. organisational capital*

Factors influencing innovation

Business innovation capabilities (ch5)

External factors (ch7)

OM4 → improved understanding of drivers and links

Measuring innovation

Business innovation survey methodology (ch9)

Object-based approaches to measurement (ch10)

Data use: indicators and analysis (ch11)

Improved guidance → more and better data



Key developments in OM2018 (more)

- Modified typology of innovation activities to improve alignment with KBC-creating activities:

- R&D activities
 - Design and other creative work activities
 - Marketing and brand equity activities
 - Intellectual property (IP) related activities
 - Employee training activities
 - Software dev. and database activities
 - Investment in tangible assets
 - Innovation management activities
-

- Types of innovation:

- Product innovations:
 - Process innovations
 - Services
 - Process innovations:
 - Production of goods or services
 - Distribution and logistics
 - Marketing, sales, after-sales
 - ICT services
 - Administration and management
 - Product and business process dev.
-

- Proposed data collection (key features):

- Presence of each activity - for innovation or other purposes
- Innovation expenditure - product/process innovation
- Degree of novelty (new to firm, new to market, new to world)
- Use of design in product innovations
- Role of 3rd parties in developing and implementing innovations
- *Cover “innovative” and “non-innovative” firms – to understand differences*



Closing remarks

- Improved understanding of productivity relies on conceptual and data developments
 - R&D: concepts proved, now need more countries to implement the new variables
- Innovation: OM2018: aims to deliver more, better data. Linked to KBC framework.
 - open consultation on new framework planned
- “Frascati Manual R&D and the System of National Accounts” paper [oe.cd/FMSNA](https://www.oecd.org/FMSNA)
- STI Scoreboard 2017 [oe.cd/Scoreboard](https://www.oecd.org/Scoreboard)