Capturing international R&D trade and financing flows: New insights from R&D survey data on the structure of knowledge-based global production

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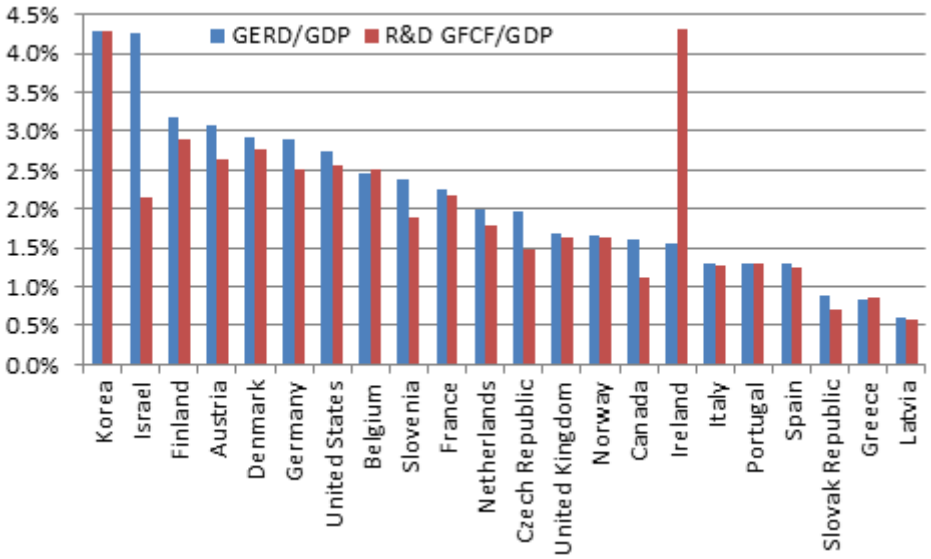
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Abstract
The capitalisation of Research and Development (R&D) in the 2008 System of National Accounts (SNA 2008) relied on detailed and systematic R&D data gathered under the OECD Frascati Manual framework. These record spending on inputs used for R&D within the economy and are thus used to indirectly estimate domestic production of R&D.

Translating domestic R&D output into R&D investment and capital stocks requires information on *where* the resulting R&D is owned and used in production – in the producing economy or elsewhere. This allocation is not trivial and can have important implications for productivity analysis. Gross domestic expenditure on R&D (GERD) – the expenditures underlying domestic R&D output (which were often used as a proxy for "R&D investment" prior to SNA 2008) - and R&D capital formation (GFCF) can be markedly different, with international flows of R&D being a key explanatory factor.

Comparison of GERD and R&D GFCF estimates

As a percentage of GDP, latest year in which both figures are available



1. 2015: Austria. 2014: Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Israel, Korea, Netherlands, Portugal, Slovak Republic, Slovenia, United Kingdom. 2013: Ireland, Italy, Latvia, Norway, United States. 2012: Spain
2. US GERD figures exclude most or all expenditure on capital inputs to R&D – to that extent the numerator will be understated; figures for 2014 (https://www.nsf.gov/statistics/2016/nsf16315/) indicate that the inclusion of business capital expenditure increases total Business Expenditure on R&D (BERD, the main component of GERD, accounting for around 70% of the total) by around 4.4%.
3. GERD includes R&D conducted in the course of developing software, R&D GFCF does not.

Source: OECD National Accounts Database (oe.cd/1Fb), OECD R&D Statistics (RDS) database (www.oecd.org/sti/rds), US Bureau of Economic Analysis, fixed assets accounts (http://www.bea.gov/iTable/iTable.cfm?ReqID=10&step=1#reqid=10&step=1&isuri=1). Retrieved November 2016.

Trade surveys are the natural source for information on imports and exports of R&D services. However, the intangible nature of R&D means that results and findings can easily be disseminated overseas without legal ownership changing hands or a specific export being registered. This is particularly likely between units within Multi-National Enterprises (MNEs) – for example where a head-office commissions and owns R&D but shares the results with other units in the group without specific financial compensation, which would imply R&D services flows being under-estimated in trade statistics. Furthermore, where financial transactions relating to R&D flows between units within a MNE are recorded, the transfer prices paid may be skewed in order to reduce the group's tax burden. This could imply over- or under- estimation of R&D flows in different countries' trade statistics.

This paper examines complementary information from R&D surveys on cross-border R&D funding and ownership streams. These identify funding for R&D coming from abroad and the nature of the funder (business, government, etc.). Furthermore, funding from, overseas businesses in the same group are separated out. Domestic business R&D expenditure by units within MNEs is also delineated. In addition, a new breakdown also allows funding payments requited with a compensatory flow of R&D services to be identified from those which go uncompensated; these include transfers from businesses in the same group as well as "standard" sales/purchases of R&D and can offer an additional "piece of the puzzle" where overseas affiliates are funding R&D and will receive the results in return but are not strictly purchasing it (so that the transfer of R&D services will not be captured in trade statistics).

These data on R&D transactions can offer a way to improve the allocation of R&D so that investment and stocks can be measured more robustly, and productivity can be better analysed and understood. Countries are currently in the process of implementing these changes and the first resulting data will be collated by the OECD Directorate for Science, Technology, and Innovation in 2017; this paper will present the progress delivered and early findings. National Science Foundation (NSF) data on MNE's global R&D spending will also provide further context and insights.

Nevertheless, areas for further work will continue to persist – particularly in relation to transactions relating not to "new" R&D output/assets but to those existing from previous periods (i.e. outright sales of intellectual property, licences, etc.). The paper will also set out the need for coordinated efforts by National Accounts, Trade, and R&D statistics practitioners to develop a framework for capturing all transfers of R&D assets.

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