OECD ESTIMATES OF GOVERNMENT TAX RELIEF FOR BUSINESS R&D 2014

TAX4INNO Project 674888

Project partly funded under Horizon 2020 Programme of the European Commission

Deliverable 2.1: Summary report on Indicators of Tax Expenditures (Year 1)

Version 08 March 2017

Work package 2. **Measurement of tax expenditures for R&D**

Abstract

This report [D2.1] presents the latest tax expenditure based indicators of R&D tax support, based on the latest 2016 OECD-NESTI data collection on tax incentive support for R&D expenditures that was completed in July 2016. These new estimates of the cost of R&D tax incentives have been combined with data on direct R&D funding (i.e. comprising R&D grants and purchases), to provide a more complete picture of government efforts to promote business R&D up to 2014. These figures highlight the extent to which governments support R&D through tax incentives – over time and relative to other mechanisms, and provide new information on the structure and composition of such support. This report also provides some indicative new evidence on the aggregate relationship between government support for R&D and business R&D intensity.

1. Introduction

Governments in several countries seek to promote R&D investment in the economy by granting a preferential tax treatment to eligible R&D expenditures, especially those incurred by firms. R&D tax incentives have become a major tool for promoting business R&D in OECD and partner economies. As of December 2016, 29 of the 35 OECD members[1], 22 out of 28 EU member states, and a number of other major economies give preferential tax treatment to R&D expenditures.

Tax expenditures are complex objects of measurement, and not all statistical systems separately capture all types of tax relief measures. However, because government policy objectives for R&D tax relief are also achievable in principle through grants or other direct outlays such as through purchases of R&D services, there is widespread acknowledgement that reporting such tax support can facilitate transparency and more balanced international comparisons of public support for innovation. Providing evidence on the extent of efforts made by governments in OECD[2], EU[3] and other major economies is the objective of this OECD project and this report in particular.

This report focuses on indicators of the foregone revenues and additional costs incurred by government as a result of provisions for tax-based relief that is specifically targeted towards reducing the cost to firms of R&D efforts. These indicators reflect the result of tax support supply and demand decisions by governments and business across countries. This complements and enhances evidence on the design of R&D tax incentives and the notional level of subsidy per monetary unit of R&D, which are discussed in a separate report [D3.1]. The focus of this report is entirely descriptive, based on data provided by national authorities to the OECD through the OECD-NESTI data collection on tax incentive support for R&D expenditures. This data collection, now in its sixth edition, attempts to identify and address subtle differences in the tax treatment of R&D, the relevant tax benchmark and measurement approaches. National experts on science and technology indicators have collaborated with public finance and tax authorities to provide the most up-to-date and internationally comparable figures possible. The experiences accumulated over the past series of data collections have fed into the guidance contained in the 2015 OECD Frascati Manual which for the first time provides guidelines on the measurement of government tax relief for R&D (GTARD) (OECD, 2015).

Past collections carried out on a biennial basis from 2007 to 2015 have contributed to the OECD Innovation Strategy and a number of OECD flagship publications such as the 2015 STI Scoreboard and the 2014 STI Outlook. The outputs have been used in a number of OECD studies, policy and data briefs (OECD, 2016a; OECD, 2013) and country reviews carried out across the OECD.

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[1] The exceptions are Estonia, Finland, Germany, New Zealand, Switzerland and Mexico, the latter of which has recently announced it will reintroduce R&D tax support in 2017.

[2] The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities or third party. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

[3] Compared to previous OECD reports, this includes data for Latvia, as well as the following EU countries: Bulgaria, Croatia, Lithuania, Malta, Romania and Cyprus. Footnote by Turkey: The information in this document with reference to « Cyprus » relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Turkey shall preserve its position concerning the "Cyprus issue". Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

In this report, as in previous OECD work, estimates of the cost of R&D tax incentives have been combined with data on direct R&D funding, as compiled by National Statistical Offices based on reports from firms, in order to provide a more complete picture of government efforts to promote business R&D. The latest indicators and information on R&D tax incentives now also feature on the dedicated OECD website Measuring R&D tax incentives (http://oe.cd/rdtax).

This report is structured as follows:

- Section 2 provides an introduction to the measurement of government tax relief for R&D, highlighting the guidance under which data have been collected.
- Section 3 provides a snapshot view of levels of central (federal) government tax support for business R&D in 2014, based on data collected during Spring/Summer 2016.
- Section 4 documents recent trends of tax support vis a vis direct support for business R&D.
- Section 5 examines the structure of government tax support for R&D among countries for which data breakdowns are available and have been reported to OECD. This includes firm size, economic activity, and nature of support (e.g. foregone taxes or refunds).
- Section 6 examines in a purely descriptive fashion the link between support for R&D and R&D intensity.
- Section 7 concludes.

Descriptive evidence on the relative magnitude of these tax-based support measures and possible R&D, innovation and economic impacts are of vital importance. Improved evidence can help inform better policy decisions on the use of public funds and ensure that intended innovation outcomes are attained, not only at a national but also at a global level.

2. Measurement of tax expenditures for R&D

2.1. Background and scope

Measuring how much governments dedicate to R&D support schemes through R&D tax incentives involves a number of conceptual and practical challenges, especially when attempting to do so in an internationally comparable fashion. Measuring tax expenditures for R&D requires agreement on a common benchmark on what represents a baseline tax treatment of R&D expenditures. Tax expenditures are deviations from a benchmark tax system (OECD, 2010). Establishing a common scope is the first requirement for comparability.

Focus on R&D

Definitions of R&D or other types of expenditures eligible for tax relief differ across jurisdictions and with respect to the OECD Frascati Manual, although in a number of instances the manual's definitions are part of tax legislation. Definitions of R&D for tax purposes are under continuous evolution and reinterpretation by national tax authorities. For more information on R&D definitions used by countries, see the OECD compendium of R&D tax incentive schemes (www.oecd.org/sti/rd-tax-incentives-compendium.pdf).

Focus on business

This report is concerned with tax relief provided by government for R&D expenditures incurred by tax-paying units in the business sector. The business enterprise sector is usually the main intended

direct recipient of tax relief for R&D. However, provisions may allow relief for R&D expenditures subcontracted to third parties, in other domestic sectors such as higher education or located abroad. These are within the scope of this report. Outside the scope of the report are incentives provided outside the business sector, including firms other than incorporated companies. This may include in some cases self-employed individuals.[4]

Focus on central government

For practical reasons, only estimates of tax relief at central (or federal) level are included. Where additional information is available at subnational level, this will be discussed within country notes that are the subject of a separate deliverable.

Focus on relief for R&D inputs

Estimates reported in this report exclude income-based tax incentives – preferential treatment of incomes from licensing or disposal of assets attributable to R&D (e.g. patents) or other innovation activities – and incentives to taxpayers other than companies. Figures refer to expenditure-based R&D tax incentives applied at a national level through corporate income taxes, employer social security contributions and withholding taxes for R&D personnel. Personal and consumption tax incentives are not included. While typically non-discretionary, some countries require pre-approval of R&D projects or accreditation of R&D performers by government agencies or third parties.

2.2. Estimation of tax relief for R&D

The estimation of the value of tax relief provided for R&D falls under the responsibility of national governments which report to the OECD following as closely as possible the guidelines provided. These guidelines seek to find a common, meaningful perspective that is consistent with different national R&D tax relief and data source systems.

Choice of benchmark

The OECD information request focusses on the cost of provisions that imply a more favourable treatment of R&D relative to non-R&D expenditure. This approach is proposed in order to ensure comparability with countries that do not report dedicated R&D tax relief but allow for the deductibility of current R&D expenses. In the absence of enhanced incentives, companies have the ability to report the current expenditure components of R&D as the deductible costs of sales, without necessarily identifying the R&D nature of the activity.

Estimation

Most countries adopt an initial revenue loss approach, which yields the amount by which tax revenue is reduced as a consequence of the introduction (or extension) of R&D tax relief measures, based on the assumption of unchanged behaviour and unchanged revenues from other taxes.

[4] Individuals /self-employed are reported to be eligible to claim R&D tax relief in Belgium (R&D investment deduction), Canada (SR&ED tax credit), Denmark (R&D tax credit for deficit-related R&D expenditure), Hungary (SSC exemption), Japan (R&D tax credits), Netherlands (WBSO and RDA), Slovenia (R&D tax allowance), Turkey and the United States (R&D tax credits).

Net or gross basis reporting

The OECD R&D tax incentive survey collects information on the taxability of R&D tax benefits. In some countries, R&D tax incentives are taxable, i.e. tax benefits represent taxable income in the current or following income year, in others they are effectively taxable because in order to claim the headline tax credit rates the taxpayer has to renounce to the deductibility of the R&D expenses that are claimed. The tax expenditure metadata available to OECD at present do not provide any details on whether estimates are reported on a gross or net basis.

Recording

It is more difficult to ensure a common approach with respect to the recording of the provision of tax relief. In principle, this should occur when the R&D generating the basis for claiming tax relief has taken place; in practice, this may be possible only when the claim is recognised by government regardless of the time when it is paid in cash by government or used to decrease the tax liability of the firm. In many cases, tax authorities are only able to provide information based on payments, i.e. on a cash-based approach which more closely follows the actual flow of money between authorities and tax-paying units.

Two practical challenges arise:

- Accounting for the timing of the actual settlement of tax liabilities, which in some cases may only take place up to a year after the reference period when the R&D generating the basis for claiming tax relief took place. Most countries adapt the reference cycle of tax expenditure statistics to refer to the tax year to which the settlement applies.
- Accounting for the possibly of carry-forwards or carry-backwards, when the firm has insufficient profits to fully use earned tax credits or allowances. There are significant differences across countries in terms of how such surplus is effectively dealt with. In some jurisdictions, eligible enterprises will under certain circumstances be able to claim a direct payment from the authorities. Such provisions are known as payable or refundable tax incentives. [5]

Because of the variety of support mechanisms and administrative accounting practices, the questionnaire submitted to national official contacts provides the basis for reporting either total relief earned by taxpayers within the current year (accruals basis) and/or total relief provided in the current year (cash basis).

A-Relief earned and claimed in the current year - including refunds.
B-Relief earned in previous year(s), claimed in the current year
C-Relief earned in the current year, carried back
D-Relief earned in the current year, carried forward

Therefore, a measure of tax relief on an accruals basis would be based on A+C+D while for tax support on a cash basis, this would be based on the sum A+B+C. Ideally, authorities should strive to maintain comprehensive records systems that allow the production of estimates on both an accruals and cash expenditure basis. The amount of tax relief carried forward (item D) may not, or only

[5] Payroll withholding tax remissions and relief on employer taxes and social contributions are typically akin to refundable incentives because the relevant liability is rarely lower than the notional value of the relief.

partially, be claimed in the future due to insufficient tax liabilities, for example. Relief carried forward may be accumulated over time but there is uncertainty regarding when it will be used. The value of this component of relief may be expressed in nominal terms (thus overstating the true value to the firm) or as an estimate of its net present value based on past patterns.

3. Government tax support for business R&D in 2014

Based on the methodology presented in the previous section, this section lays out the most recently available evidence on the cost of central (federal) government support for R&D through tax incentives and direct funding measures. Data on R&D tax incentives corresponds to 2014 for 28 countries (including those providing no tax support), 2013 for 11 countries, 2012 for 3 countries and 2011 for 2 countries. Reliable data on R&D tax incentives is subject to timeliness problems because it needs to be based on tax returns for completed tax years. Budgetary data can be timelier but it is also subject to a greater degree or error.

3.1 Tax expenditures for business R&D compared to direct government funding

Based on estimates traditionally available of direct government support for business R&D, the Russian Federation, the United States, Korea and Hungary provided the most direct funding for business R&D as a percentage of GDP in 2014 (Figure 1a). The weighted average rate in the OECD area is close to 0.11%. Direct support accounts for 6.4% of BERD in the OECD area. In absolute terms, the United States, Russian Federation, the People's Republic of China and France provided the largest volumes of direct funding to firms.

The compilation of data on tax support for business R&D indicates levels of support which are not accounted for in the direct funding statistics that are on a very similar order of magnitude for a majority of countries that use this form of support. The average rate of tax support in the OECD area - including countries that do not provide this type of support - is close to 0.09% (Figure 1b). Tax support accounts for 5.3% of BERD in the OECD area.

As a percentage of GDP, tax relief for R&D expenditures is largest for Ireland, France, Belgium and Korea, followed by Australia. Data are not available for 2014 for five countries (Sweden, Israel, Poland, Croatia and Malta), while no such incentives were provided in 2014 in the case of 4 OECD countries (Germany, Mexico, New Zealand, Switzerland) and two other EU countries (Cyprus and Bulgaria). Sweden and Latvia introduced schemes for the first time in 2014. The budget proposals for Mexico for 2017 foresee the reintroduction of R&D tax support.

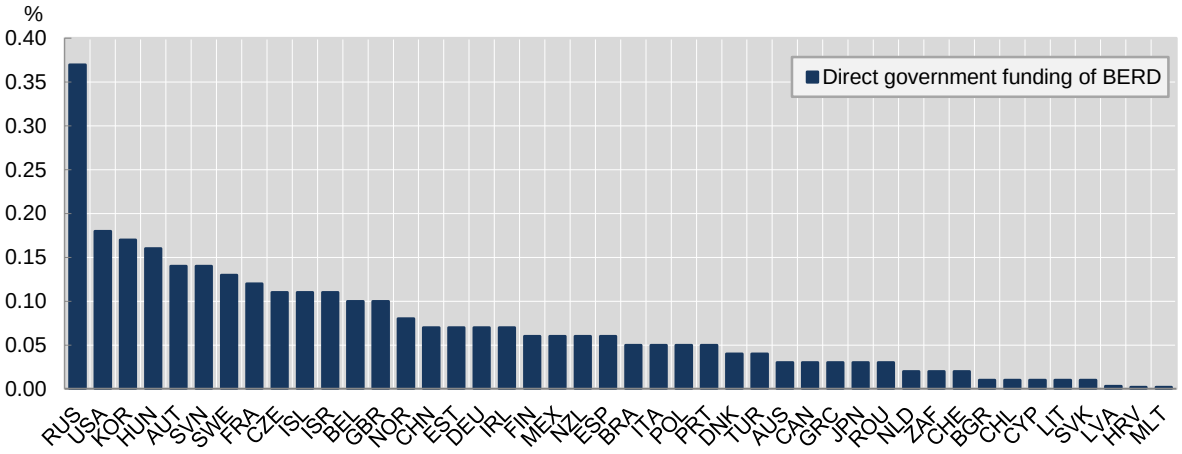
Combining both types of support (direct funding and tax relief), France, the Russian Federation[6], Korea, Ireland and Hungary provided the most combined support for business R&D as a percentage of GDP in 2014. By taking into account tax support, it is not only possible to get a better sense of the full extent of government support for R&D across OECD, EU and other major economies, but it is also possible to see how some countries, which appear to give little support on the sole basis of direct funding, are in fact providing significant assistance through the tax system. This is the case of countries such as Australia, Canada and the Netherlands.

[6] In the case of Russia, the country providing the largest direct support for business R&D, figures refer to 2011 instead of 2014. 2011 is the latest year for which both tax incentive and direct funding data are both available. The share of Russian BERD funded by government has increased from 59% in 2011 to 63% in 2014. In general, combined estimates reported are based on the most recent year for which both sources are available. for more details, see the Annex section.

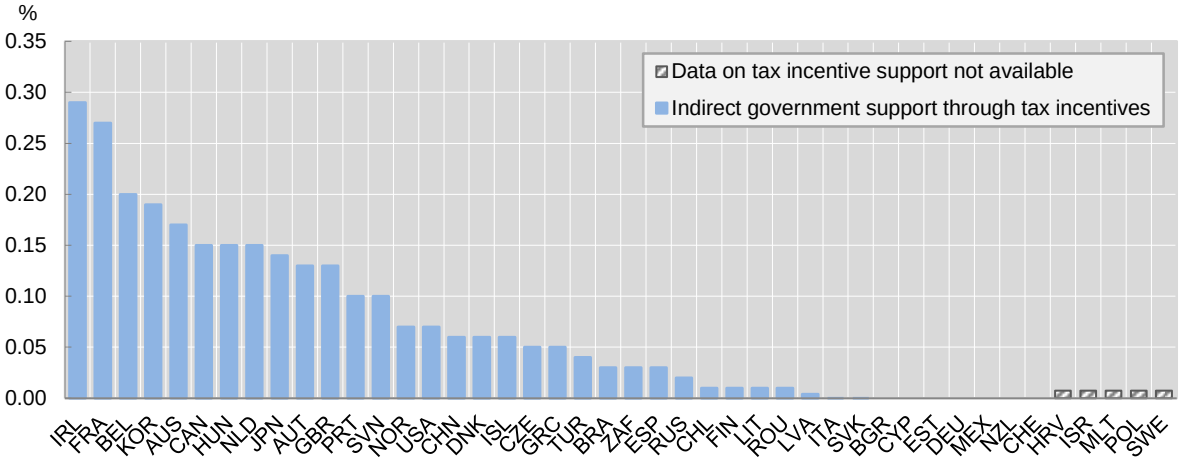
Figure 1. Direct government funding of business R&D and tax incentives for R&D, 2014 or latest year

As a percentage of GDP

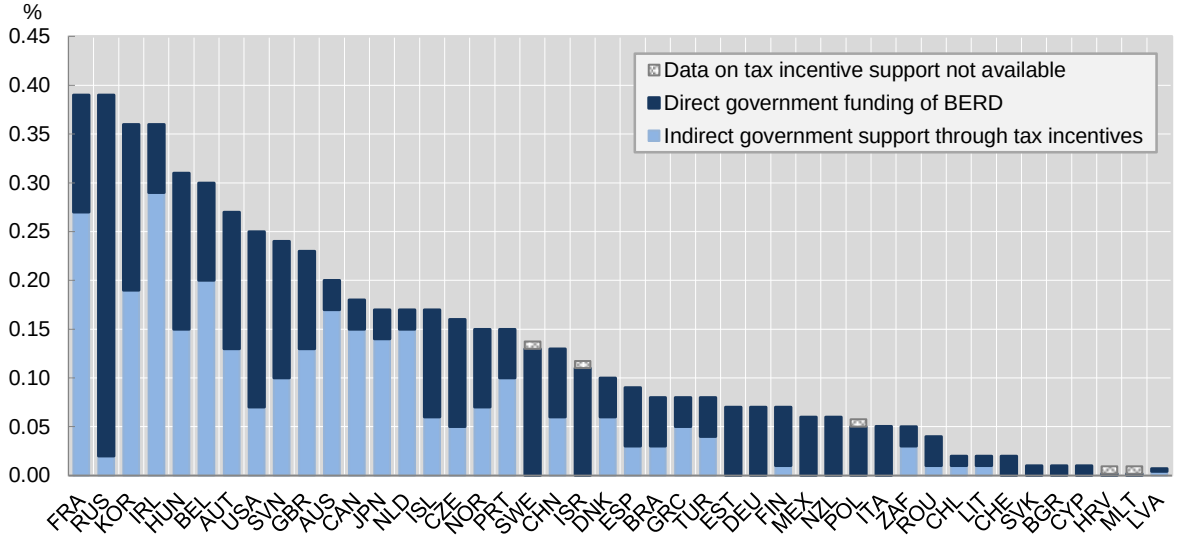
Panel 1a. Direct government funding of business R&D (GovFundBERD)



Panel 1b. Tax support for business R&D (GTARD)



Panel 1c. Combined GovFundBERD and GTARD



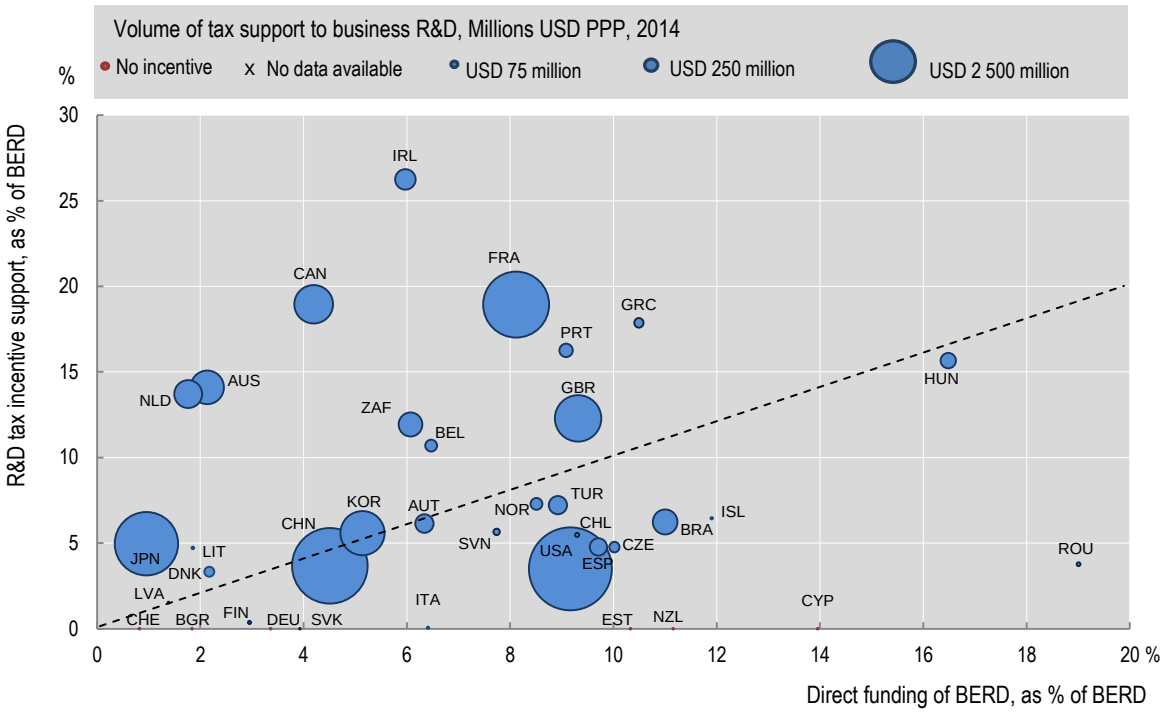
Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax, Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm and Eurostat R&D statistics http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database. See Annex for detailed notes.

It is worth examining in more detail how direct funding and tax support for business R&D compare across countries. **Figure 2** maps out the relationship between the share of BERD directly funded by governments (x axis) and the implied share of BERD that benefits from tax support (y axis), also for 2014. Countries on top of the notional 45 degree line dedicate comparatively larger effort to tax support compared to direct funding. 15 countries out of 38 for which data are available dedicate more resources to tax support than direct funding.

Countries relying more strongly on tax support compared to direct funding include Netherlands, Australia, Japan, Canada[7] and Ireland (which has the highest rate of GTARD to BERD at 26%), followed by Lithuania and France. At the opposite end we find the countries that do not provide R&D tax incentives, followed by Slovak Republic, Italy, the Russian Federation, Finland, Romania and the United States. Countries with an almost even split of support across direct funding and tax support include Korea, Austria and Hungary.

Figure 2. Direct government funding of business R&D and tax incentives for R&D, 2014 or latest year

As a percentage of BERD



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm, and Eurostat R&D statistics http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database. See Annex for detailed notes.

The size of the bubbles represents the volume of overall tax support provided. It is possible to note that the two largest providers of tax support in absolute terms (United States[8] and China[9]) make in

[7] Tax support for individuals through the federal SR&ED tax credits in Canada amounts to CAD 3-4 million (0.1% of the total cost of the SR&ED tax credit) per year over the 2010-2013 period. http://www.fin.gc.ca/taxexp-depfisc/2016/taxexp1602-eng.asp#_Toc442180632

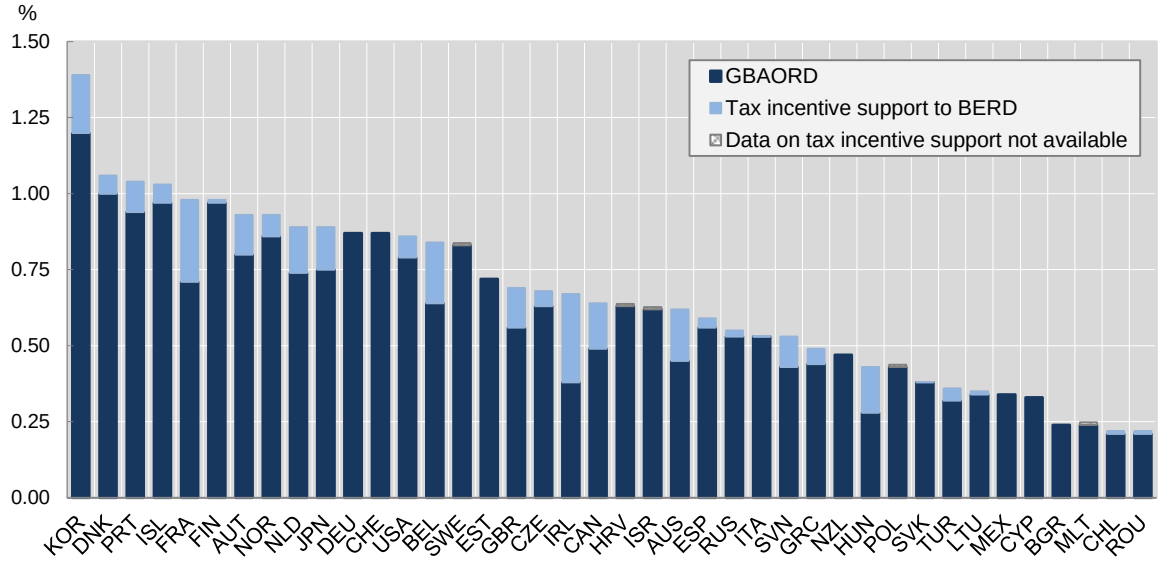
[8] According to IRS statistics for 2012, a total of USD 11.6 billion of current-year credit was reported on corporate and individual returns. Corporations accounted for USD 10.8 billion (93 percent) of the total, the amount that is reported in the chart. These estimates are however "not an accurate measure of the revenue loss for that year as a result of the credit. First, taxpayers must either reduce the amount of their deduction of research expenditures by the amount of the credit claimed, or elect to take the reduced credit. In recent years, more than 90 percent of corporate taxpayers chose the reduced credit. But for those who do not choose the reduced credit, an adjustment must be calculated to account for the

relative terms (as % of BERD) more use of direct than tax support measures in order to incentivise business R&D. In the case of the United States, most of the direct support for R&D is accounted for by government contracts.[10]

Countries located closer to the origin make a lower relative effort to support business R&D. This includes some highly R&D intensive economies, such as Switzerland, Japan and Finland. It is possible that this picture understates effective support in the form of subsidised loans or loan guarantees or procurement of innovative solutions that indirectly help firms finance R&D activities and are as result not captured as direct funding of business R&D.

Figure 3. Government budgets for R&D and tax incentive support for business R&D, 2014 or latest year

As a percentage of GDP



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm, and Eurostat R&D statistics http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database.

Figure 3 puts the information on the value of tax support for business R&D in the broader context of overall budgetary support for R&D activities undertaken by governments. This presentation has the advantage of relying on more directly comparable types of administrative data sources, as opposed to comparing reports by R&D performers with tax support data which may not fully align in time. Government budgets for R&D include direct funding provided to all sectors, including contributions to R&D programmes abroad. On average, tax support represents the equivalent of 10% of all reported support for R&D. In the case of countries with R&D tax incentives in place, this figure is closer to 13%. The relative importance of tax incentives in the overall financial effort incurred by governments for R&D is largest in the case of Ireland (43%), Hungary (35%)[11], France (28%), Australia

value of the lost deductions to equalize the value of the credit reported to those taxpayers who use the reduced credit. Second, many taxpayers do not have current-year tax liability for which to take advantage of the credit immediately." Source: https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/RE-Credit.pdf

[9] Data for China refer to 2013, with a reported total of PPP-USD 9.4 bn.

[10] Similar data are not available at present for a majority of countries so it is not possible to make a three way comparison between contracts, grants and tax incentives despite the policy relevance (see e.g. http://dx.doi.org/10.1787/5jlvc7sl1w7h-en). The 2015 Frascati Manual recommends the collection and reporting of such data.

[11] The relative importance of tax incentives in the overall budgetary support for R&D in Hungary, while one of the highest among OECD and partner countries in 2014, declined in recent years, during which Hungary rebalanced its policy mix towards direct support (Figure 9). One of its R&D tax incentive schemes - the innovation contribution allowance for own and subcontracted R&D - was abolished by Hungary with effect of 2012.

(27%) and Belgium (24%). In these countries, tax incentives are not only major policy instruments for supporting business R&D but also play a first order role in overall R&D policy.

3.2. Statistics on numbers of firms applying for and claiming R&D tax support

In addition to statistics on the cost of tax support for R&D, it is also relevant to assess how many firms within countries apply for and benefit from this type of tax relief. Only a limited group of countries have so far provided this information and as a result it has received a lower degree of scrutiny for international comparability. Such indicators have therefore never been part of the R&D tax incentives data publicly disseminated by the OECD. This section reports on the available data while calling for caution when interpreting the available figures. The intention is that, by drawing attention to the relevance and feasibility of this type of information, the concepts and data collection methods will be more easily reviewed and improved over time. Refining the information collection tool used by OECD and the concepts included therein is part of this ongoing process.

Different tax systems provide R&D tax support using different reporting systems and milestones for the administration process that impact on available indicators of taxpayer demand for and use of R&D tax support. **Table 1** proposes an indicative schema for understanding differences in reported figures. The schema accounts for the fact that some R&D tax incentive processes are based on individual projects which sometimes have to be put forward for pre-assessment and approval for eligibility. A single firm or enterprise group may in a given year put forward one or more of these. Different units of analysis (e.g. enterprise or enterprise group) may be adopted for reporting statistics on tax support claims. The term "claims" is used here to denote requests for support for eligible R&D, and is distinguished from the concept of claimants as referring to the unique firms behind one or more claims. Because there is a gap between claims and realised support, the concepts of tax support recipients is also important, based on realised claims. This difference has a direct translation in the expenditure figures provided on an accrual or cash basis.

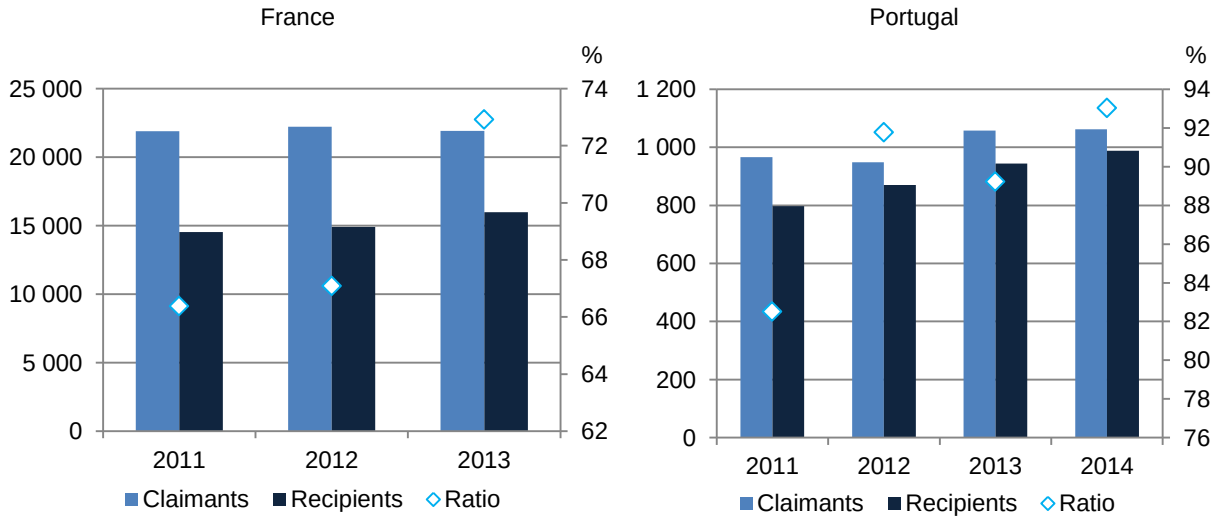
Table 1. Proposed schema for tax support claims and expenditure statistics for reference tax year

Status **Entity**	**Submission of request for R&D tax support**	**Entitled to R&D tax support**	**Realisation of R&D tax support**
Project/activity/schemes	**Applications** (Can be project or activity specific, or for separate types of incentives)	**Claims** (Can be part of tax returns, a company may submit more than one)	**Realised claims**
Firms (enterprises or groups)	**Applicants** (A company may submit more than one application within a year)	**Claimants** (Claims be kept separate or combined within a firm)	**Tax support recipients**
Link to tax expenditure measurement	N/A	Accruals basis	Cash basis (Yet in some cases the value will only be realised in future periods)

The 2016 questionnaire only asked for information on claims without providing an explicit definition. Three countries, Norway and Slovenia explicitly noted that the figures provided referred to tax support recipients, while France and Portugal provided data on both claimants and support recipients. The other relevant distinction, which can greatly matter for comparability, is between counts of claims versus counts of firms/enterprises. Some of the potential challenges for comparability relate for example to the need to account for potential reporting of multiple claims per firm. In Chile, Norway and the Netherlands a firm may submit more than one claim per year, for example as they may submit reports at different points throughout the year or relate different projects. In the case of the United Kingdom the reported figures reflects the total number of claims made under all R&D tax incentive schemes, excluding SME subcontractor and vaccines research relief claims that are included with existing SME, RDEC or large company claims. As the terminology was not fully specified in this experimental part of the OECD questionnaire, it is acknowledged that further work is still required to achieve a better understanding of the real uptake of R&D tax incentives across different countries.

Figure 4 provides the examples of France and Portugal that illustrate the difference between numbers of firms claiming and receiving tax support over a number of years. In the case of France, claimant and beneficiary figures relate to a different unit of analysis, claimants referring to the number of enterprises and beneficiaries to the number of enterprises groups. The number of claimants appears to have been fairly stable from 2011 to 2013, while the proportion of enterprise groups receiving support has increased from 66% to close to 73%. In the case of Portugal, the trends over a similar period point to a faster growth, in particular for the number of support recipients which stood in 2014 at close to 93%. The ratio between claimants and beneficiaries reflects the aggregation of tax relief in France from enterprise to group level. In Portugal, by contrast, this ratio reflects the rate at which firms claim and succed in receiving R&D tax support.

Figure 4. Number and ratio of R&D tax relief recipients vs claimants



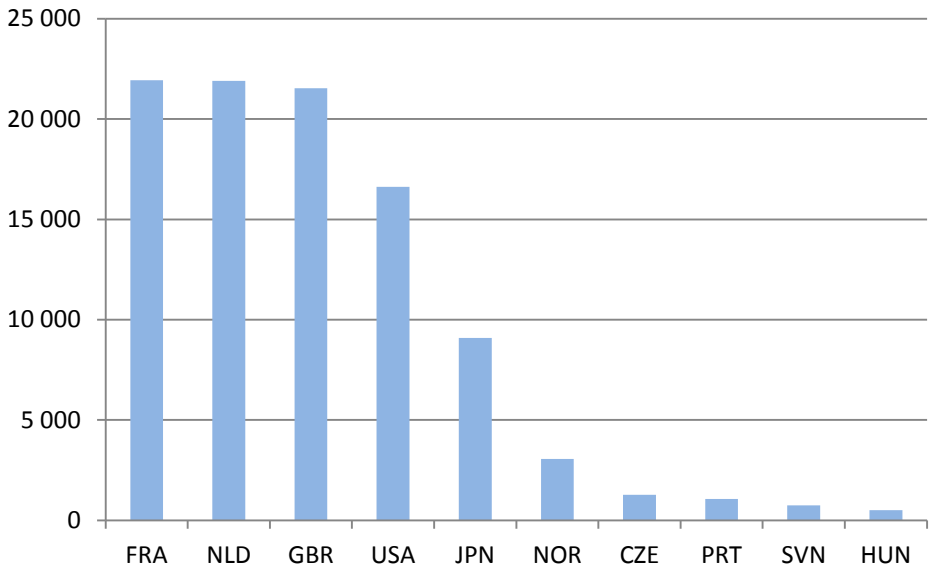
Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

Among those countries who have contributed information on the number of R&D tax support claimants (or recipients), it is possible to note that at face value, the Netherlands have the largest number of tax relief claimants after France at nearly 22 thousand, well above significantly larger

economies (**Figure 5**).[12] This appears to be only in part explained by the fact that figures include self-employed individuals and other non-business entities: 1 570 self-employed individuals are reported to have made use of the WBSO scheme for R&D labour cost in 2014 some of which also benefited from the RDA scheme for non-labour related expenditure (Netherlands Enterprise Agency 2015).

Another comparison shows the United States and Japan as having significantly lower numbers of claimants than France and the United Kingdom, suggesting lower levels of uptake, which in turn relate to higher levels of R&D concentration. In relation to the size of the economy and BERD estimates, the estimates for numbers of claimants appear to be larger in countries providing refundable or equivalent forms of tax relief, especially those favouring smaller firms.

Figure 5. Number of R&D tax incentive claimants, 2014 or closest year



Note: The figures for the Netherlands include self-employed tax support recipients. Figures reported refer to recipients rather than claimants in the case of Norway, the Netherlands and Slovenia. The figure for France excludes firms that declare exclusively innovation expenditure and no qualifying R&D or new fashion collection related expenditures. The figure for the United Kingdom reflects total claims made under all R&D tax incentive schemes, excluding SME subcontractor and vaccines research relief claims that are included with existing SME, RDEC or large company claims.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

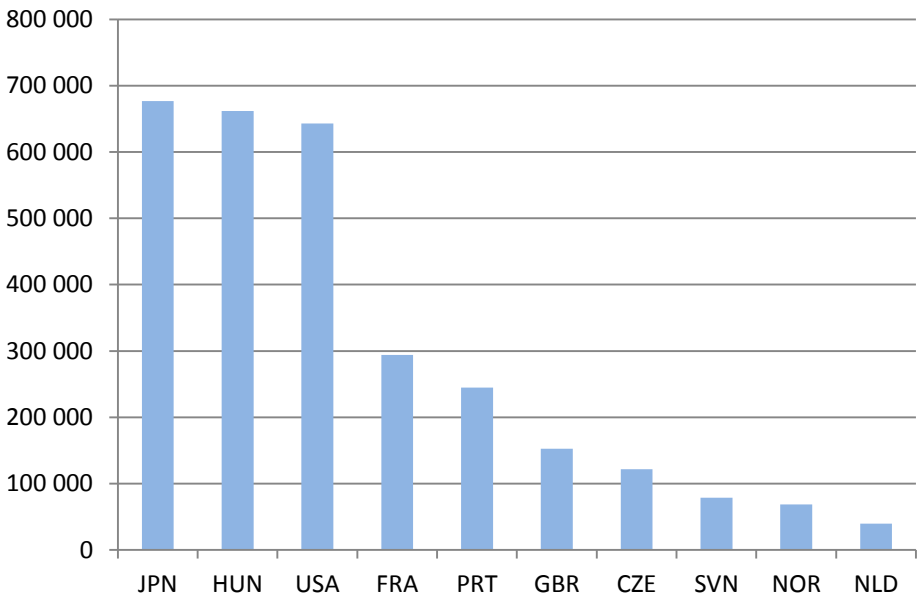
Unfortunately no statistics are widely available on the number of R&D performers in the business sector within OECD countries, and when these are available, they may not align with definitions of enterprises used for tax purposes. As a result, it is not possible to assess whether a small or large percentage of R&D performers are using tax support. This is something that the OECD is investigating as part of the microdata workstream - the microBERD project. The OECD is also trying to mainstream the provision of demographic information on R&D performers as a part of its international data collection.

[12] This compares with a total of 38 420 applications (for WBSO and RDA combined) in 2014. In the Netherlands it is possible to submit applications several times a year for the WBSO and the RDA. It is estimated that 66% of companies submits applications two or three times within a year. This reflects the possibility to submit requests for support for upcoming R&D projects throughout the year. Until 2014, non-for-profit knowledge institutions could also receive tax support through the WBSO for contract research commissioned by companies (this provision exists no longer for knowledge institutes from 2015 onwards). In 2015, at most 50 knowledge institutions reportedly benefitted from the WBSO - this figure is not included in the reported estimates above.

Figure 6 presents the ratio of R&D tax expenditures to the number of tax support claimants in order to provide an indication of the average amount of support provided on a per firm basis. The results broadly suggest an inversion in the order according to number of recipients, with some exceptions. This indicator of "average support" should ideally be complemented by information on the full distribution of support, as the average value can be potentially misleading in particular as a representation of the median firm given the likely high degree of skew. Thresholds and ceilings on eligible R&D expenditure or the value of R&D tax benefits apply in a number of countries, and may influence the average support figure to a large extent as well.

Figure 6. Ratio of R&D tax expenditures to number of claimants*, 2014 or closest year

Average amount per claimant in constant USD2010



Note: Figures reported refer to recipients instead of claimants in the case of Norway, the Netherlands and Slovenia. The figures for the Netherlands include self-employed tax support recipients. The figure for France excludes firms that declare exclusively innovation expenditure and no qualifying R&D or new fashion collection related expenditures. On a recipient basis, the figure for France would be approximately 37% larger. The figure for the United Kingdom reflects total claims made under all R&D tax incentive schemes, excluding SME subcontractor and vaccines research relief claims that are included with existing SME, RDEC or large company claims.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

Japan, Hungary and the United States exhibit the largest average values of support. This could be a potential indication of high degree of concentration in R&D tax support and possibly also R&D performance. In Hungary, tax support is not capped (only relief for collaboration R&D is capped), while different types of caps apply in the case of Japan and the United States.

They are followed by France, which on a recipient basis, would be close to a value of USD 300 000. The low value for Norway appears to be related to the existence of tax support caps while in the case of the Netherlands, the lowest ratio among the countries for which some data are available, the inclusion of self-employed and accessibility of the scheme with a set overall budget to small firms may contribute to the observed low average.

All these differences, as noted earlier, call for additional discussion and analysis.

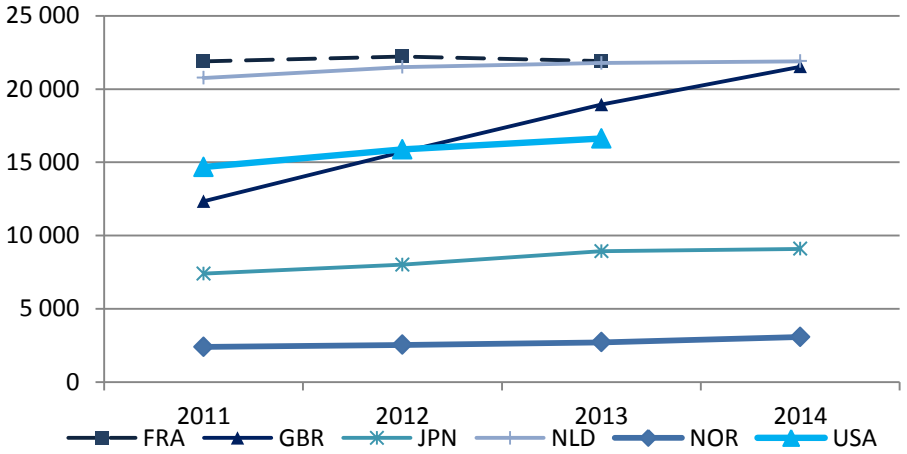
4. Trends in government support for business R&D

4.1. Changes in the number of tax support claimants

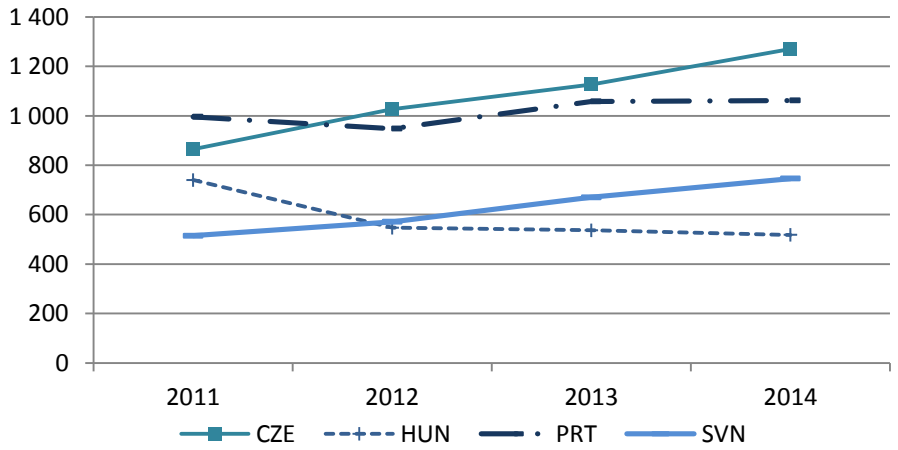
Available statistics indicate a tendency over the period 2011-2014 for countries that provide R&D tax incentives to witness a significant increase in the number of firms applying for or effectively claiming tax relief (**Figure 7**). Growth is particularly pronounced in the case of the United Kingdom (Panel A) where the number of claims almost doubled. This may be related to increases in scheme generosity over this period.[13] Significant growth is also observed in the cases of the Czech Republic and Slovenia (Panel B). Hungary is the only country to have witnessed a reduction in claimant numbers.

Figure 7. Number of R&D tax incentive claimants, 2011-2014 (or closest years)

Panel A. Countries with more than 2 000 R&D tax incentive claimants per year



Panel B. Countries with less than 2 000 R&D tax incentive claimants per year



Note: Figures reported refer to recipients rather than claimants in the case of Norway, the Netherlands and Slovenia. The figures for the Netherlands include self-employed tax support recipients. The figure for France excludes firms that declare exclusively innovation expenditure and no qualifying R&D or new fashion collection related expenditures. The figure for the United Kingdom reflects total claims made under all R&D tax incentive schemes, excluding SME subcontractor and vaccines research relief claims that are included with existing SME, RDEC or large company claims.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm.

[13] In the case of the United Kingdom, the enhanced allowance rate for SMEs increased from 75% to 100% in 2011 and further rose from 100% to 125% in 2012; a 10% reimbursable tax credit for large firms was introduced in April 2013 (http://www.oecd.org/sti/OECD-STI-RDTaxIncentives-CountryProfile_GBR.pdf).

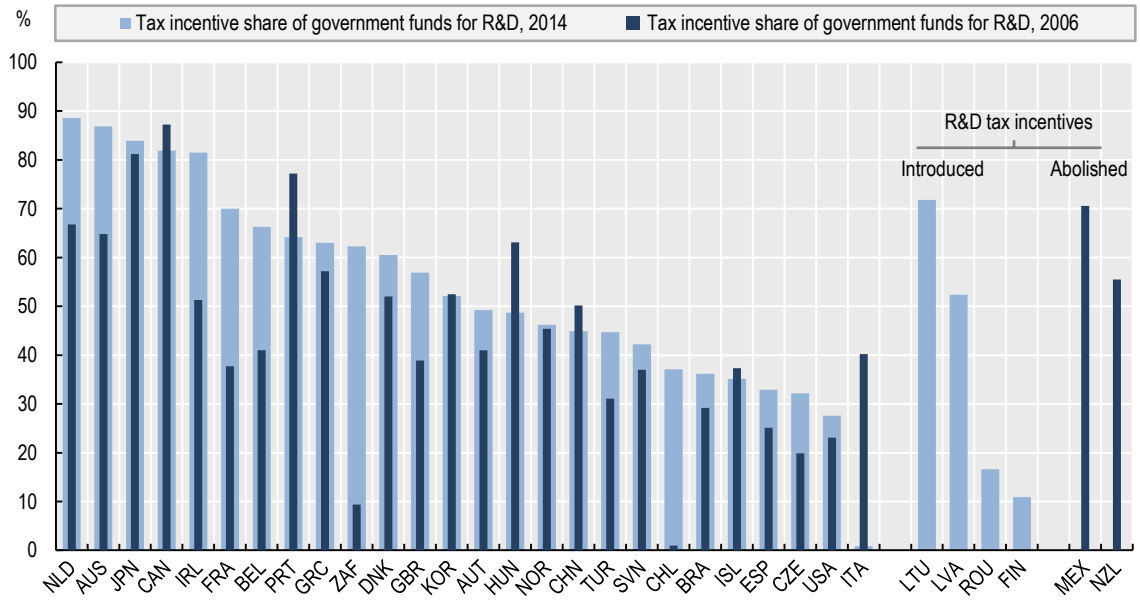
4.2. Changes in the volume of R&D tax support provided compared to direct funding

One of the key defining features of the landscape of government support for business R&D in the last couple of decades is the progressive move towards less discretionary instruments among which tax incentives stands out as the pre-eminent type of instrument.[14] This is clearly reflected in the available indicators on the distribution of government support for business R&D that are discussed below.

Figure 8 provides a comparison of two snapshots of the structure of public support for business R&D provided in 2014 and 2006 (or closest available years). This shows an increase in the relative importance of tax incentives among 23 out of 32 countries for which data are available. Italy, Portugal and Hungary, starting from a high share of tax support, moved towards rebalancing their support mix, increasing their reliance on direct funding.

Figure 8. Change in public support for business R&D through direct funding and tax incentives, 2006-14

As a percentage of total government support



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax, Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm, and Eurostat R&D statistics http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database.

Overall tax support increased across most countries, with the exception of Italy, which significantly reduced its level of support to marginal levels, and Mexico and New Zealand which abolished their schemes. Finland introduced a scheme on a temporary basis over the 2013-14 biennium and has now been phased out. Three other EU countries, Latvia, Lithuania and Romania also introduced tax incentives for R&D.

A more detailed analysis of the time series data on tax support for R&D is now possible. **Figure 9** provides a basis for identifying among other things the onset of different provisions and the role of factors impacting on the demand for tax support by firms and their ability to claim it. Among the largest users of R&D tax incentives in **Panel 9A** stand out the declining importance of this instrument within the initial largest user, Canada, and the very fast growth from low levels in Ireland (from

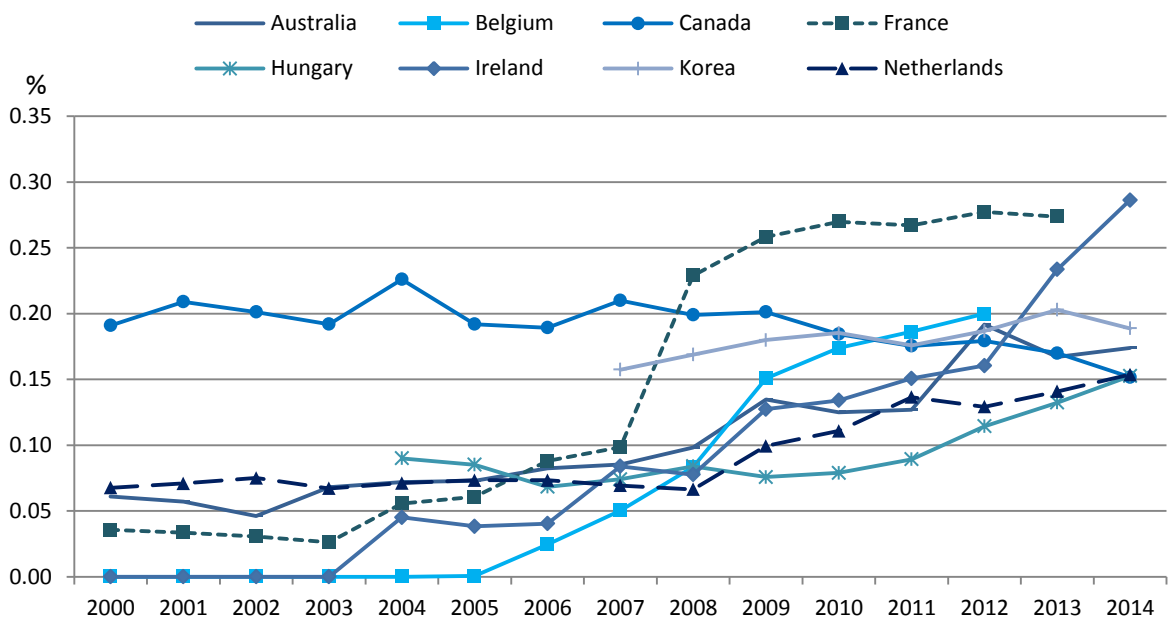
[14] After abolishing its R&D tax incentive provisions, New Zealand introduced recently a direct grant support with significant non-discretionary features.

0.045% of GDP in 2004 to nearly 0.3% of GDP in 2014), France and Belgium. Overall, and across the different panels, it is possible to note that the global financial and economic crisis had a temporary depressing impact on the use of R&D tax incentives when governments did not adopt measures to increase the generosity of the existing relief measures. As a temporary measure, France offered an immediate refund of all unused credit to all firms (instead of 3 years waiting period) in 2009.

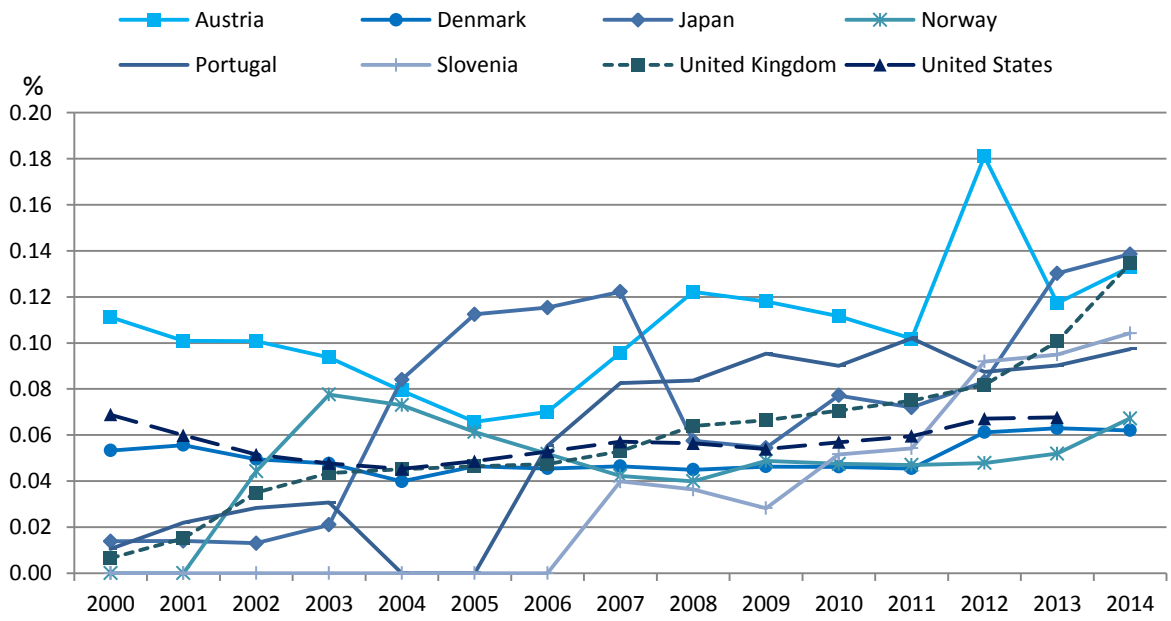
Figure 9. Trends in government tax incentive support for business R&D, 2000-14

Tax support as a percentage of GDP, selected countries

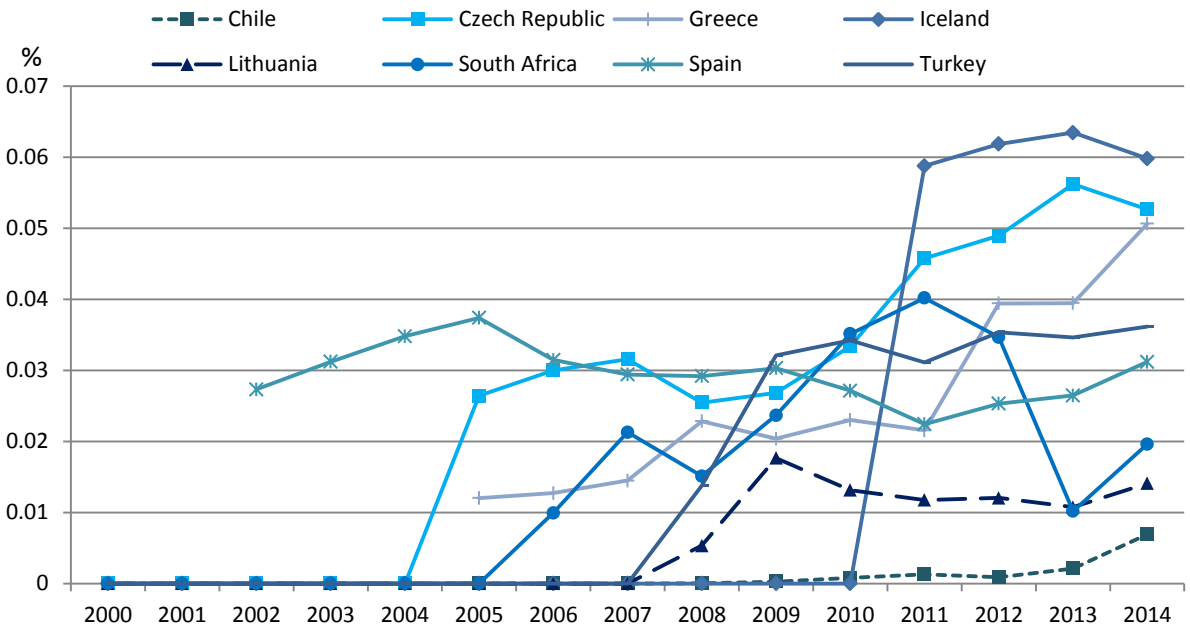
Panel 9A



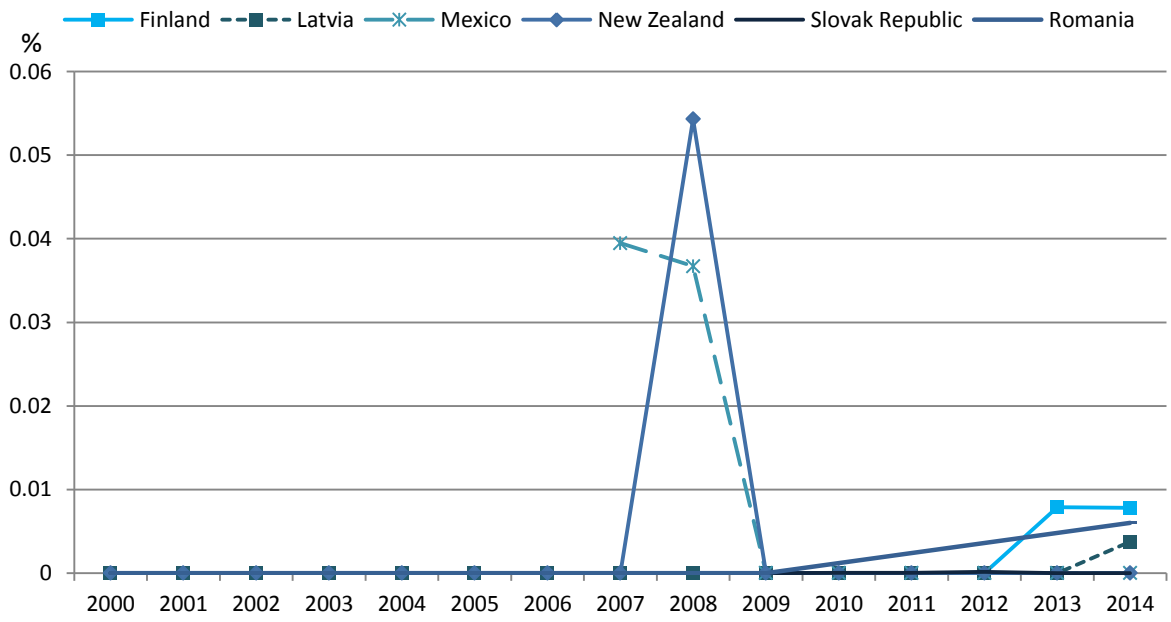
Panel 9B



Panel 9C



Panel 9D



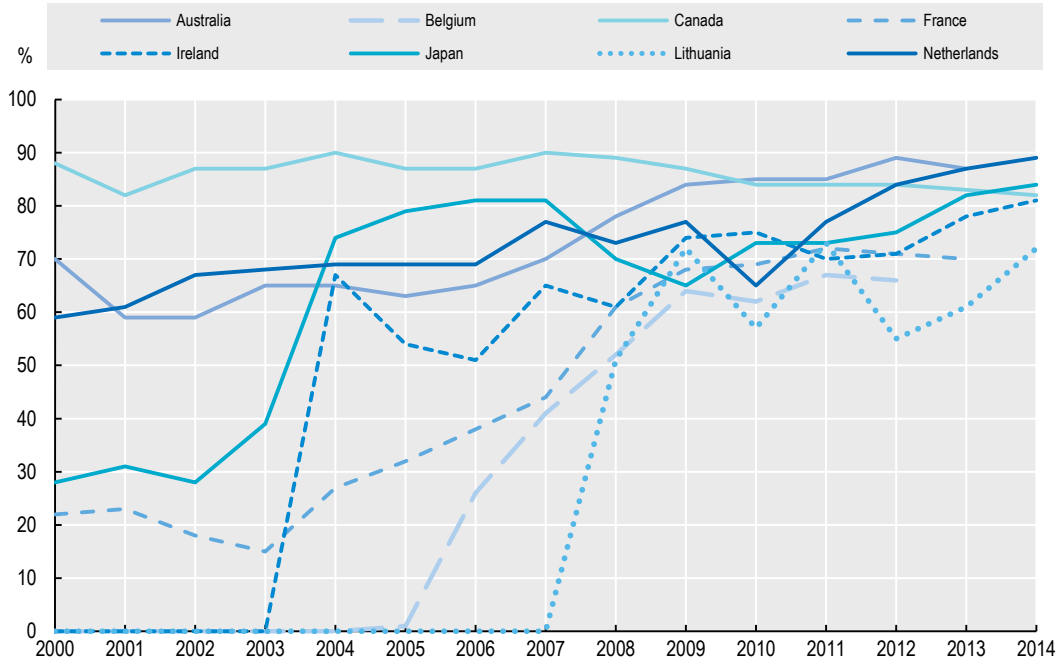
Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm.

Combining the trends on R&D tax support with direct funding estimates, it is possible to examine the changes in relative importance of tax incentives as a policy instrument (**Figure 10**). It is important to note that data on direct funding are subject to methodological changes driven by modifications to the way business are asked to report R&D performance and the support received from governments to that effect. More detailed information on those trends and breaks in series is provided in the **annex** section. Panel 10A shows the fast introduction of R&D tax incentives in Belgium (2005), Ireland (2004) and Lithuania (2008), alongside the sustained growth in importance in Australia, France, Japan and the Netherlands. In Canada, R&D tax support declined from a peak in 2007.

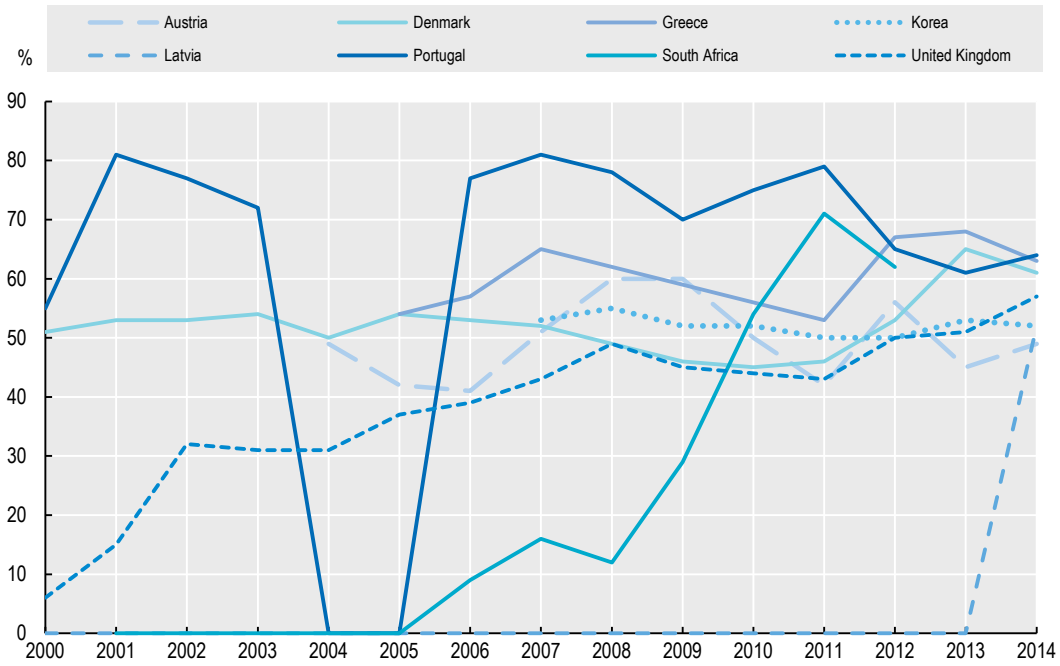
Figure 10. Trends in government tax incentive and direct support for business R&D, 2000-14

Tax support as a percentage of total (direct and tax) government support for business R&D, selected countries

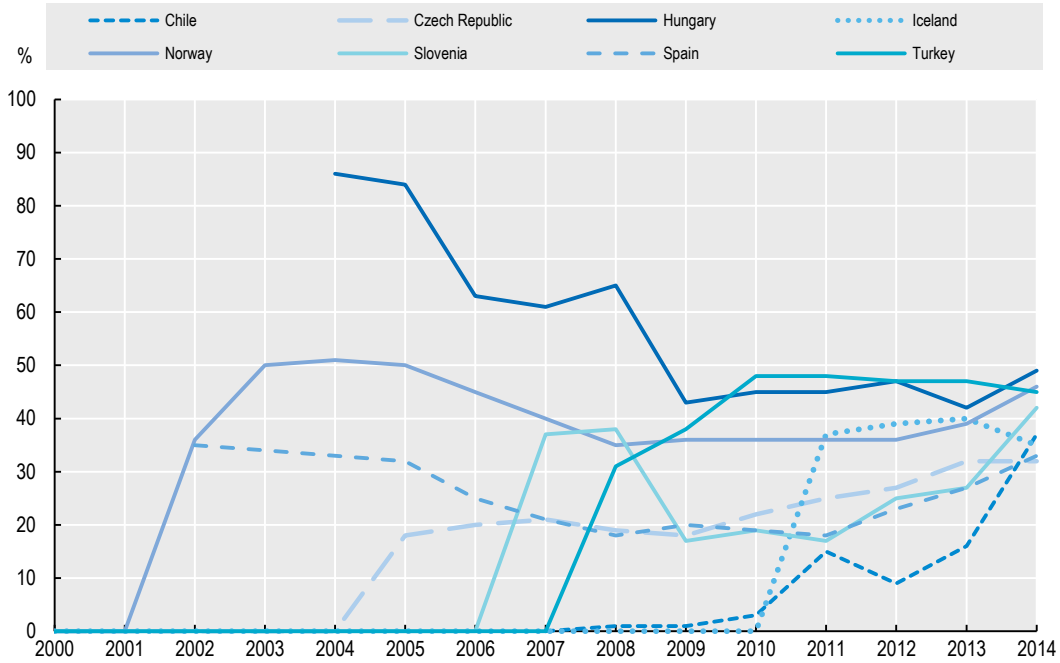
Panel 10A



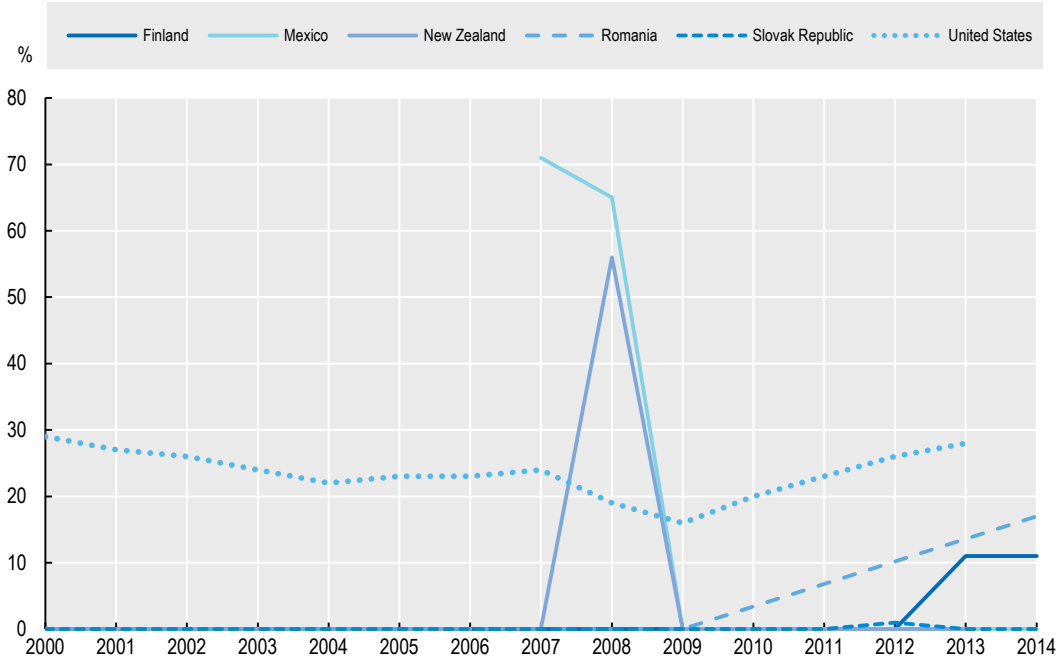
Panel 10B



Panel 10C



Panel 10D



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm.

Panel 10B depicts the introduction of R&D tax support in South Africa (2006) and Latvia (2014), the temporary suspension of the Portuguese tax credit from 2004 to 2005, and the continuously increasing reliance on R&D tax support in the United Kingdom where an R&D tax allowance was first introduced for SMEs in 2000 and extended to large companies in 2002. The decline in the relative importance of R&D tax support observed for Austria and Greece, for instance, can be related to the global financial and economic crisis. In Denmark and Korea the share of R&D tax relief as a

percentage of total government support to business R&D remained fairly stable over the 2000-2014 period.

Panel 10C displays the increased adoption of R&D tax incentives in OECD economies among countries with mid to low levels of reliance on tax support. It shows the introduction of R&D tax support in Chile (2008), the Czech Republic (2005), Iceland (2011), Norway (2002), Slovenia (2007) and Turkey (2008). A decline in the reliance on tax incenitves and rebalancing of the policy mix towards direct support can be observed for Hungary, whereas the relative importance of R&D tax incentives remained fairly stable in Spain over the 2000-2014 period.. The reliance on R&D tax support increased in most of these countries following their introduction. Due to the demand-lead nature of tax incentives, the reduction in the relative magnitude of tax support is noticeable when terms for tax relief remain unchanged. The decrease in the relative importance of tax support is particularly pronounced for Slovenia. Panel D focuses on the countries with the lowest levels of reliance on R&D tax incentives. In the case of the United States it is possible to note how the boost to direct funding throughout the crisis and temporary drop in demand for tax support resulted in a further decline in business reliance on R&D tax support. This figure displays the repeal of R&D tax incentives in Mexico, where an R&D tax credit was available from 2001-2009 (cost estimates are only available for 2007-08) and converted into direct assistance in 2009. Finland introduced R&D tax support on a temporary basis during 2013 and 2014. New Zealand temporarily experimented with tax incentives in 2008 and re-introduced an R&D tax credit for deficit-related R&D expenditure in 2015. Mexico announced the reintroduction of an R&D tax credit, this time incremental in nature, with effect from 2017.[15]

5. The distribution of public support for business R&D

This section presents for the first time a range of indicators that aim to identify how the distribution of tax support for R&D within countries compares to the distribution of R&D performance and government direct funding and R&D performance in general. This is relevant for understanding what types of firms benefit more and less from tax support.

5.1. Distribution of R&D tax support by firm size

Firm size is one of the main business attributes that shape the provision of tax relief and it is foreseen in several international and national rules that provisions may favour small and medium sized enterprises (SMEs). These may be entitled to more generous conditions for direct funding or tax support in order to compensate for other potential barriers to innovation. The available evidence indicates that R&D is a highly concentrated activity and OECD R&D statistics show that most R&D is accounted for in most countries by large firms. The share of SMEs in total BERD ranges from more than two thirds in Iceland and New Zealand to less than 15% in the United States and Germany and below 5% in Japan.[16]

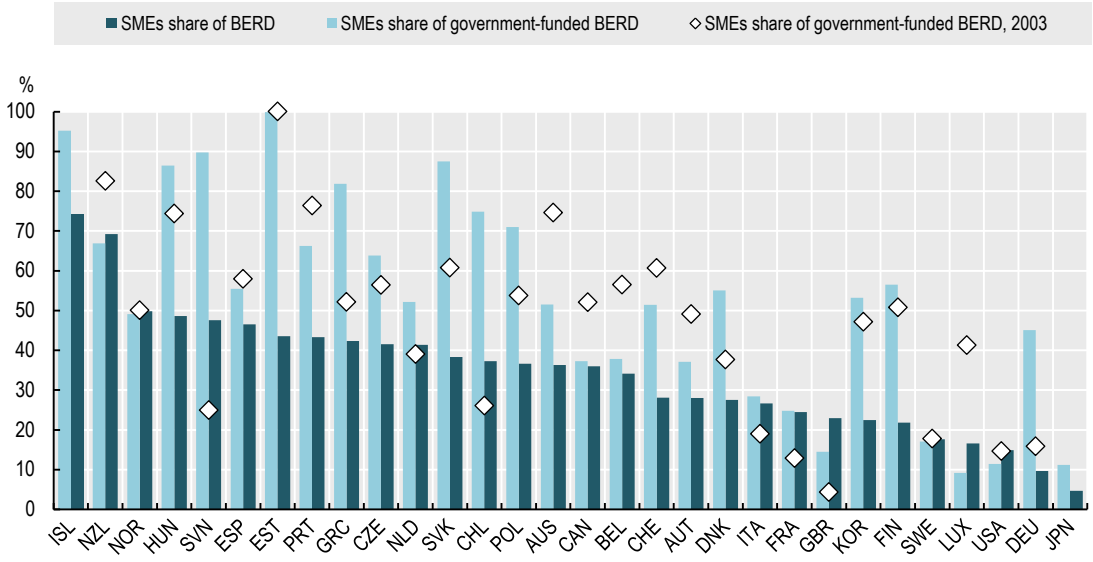
[15] See: http://dof.gob.mx/nota_detalle.php?codigo=5463187&fecha=30/11/2016

[16] This phenomenon may be partly overstated in some countries as the low likelihood of identifying R&D expenditures in small firms leads many statistical offices to avoid sampling very small firms for which there is no external evidence of R&D performance. Evidence on the use of R&D tax incentives has been used in some cases to reassess the relevant population of R&D performers, with some appreciable changes to total aggregates but no changes to the overall qualitative picture of most R&D performance being highly concentrated relative to other economic activities.

SMEs receive a relatively large share of direct funding (**Figure 11;** excluding tax support) in several countries including Estonia, the Slovak Republic, Korea and Finland. In the case of the United Kingdom and the United States, SMEs receive a smaller share of funds for R&D compared to their overall contribution to BERD.

Figure 11. Business R&D and direct government support for business R&D, by size, 2013

Share corresponding to SMEs, as a percentage of the relevant category



Source: OECD, Research and Development Statistics Database, www.oecd.org/sti/rds, October 2016.

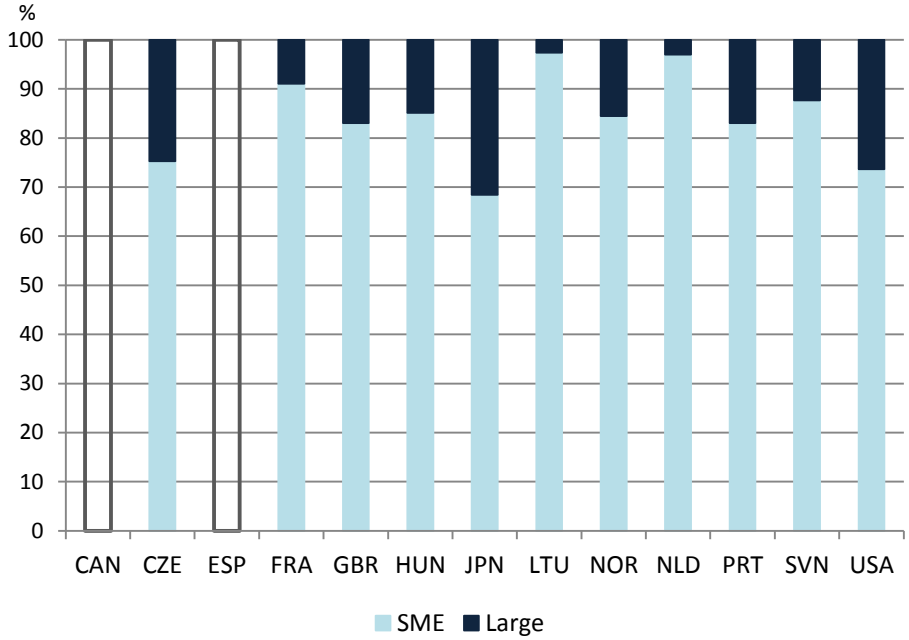
Figure 12 provides evidence of the generalised tax support concentration phenomenon. For example, in France, 32% of tax support goes to SMEs while these account for 91% of the total number of tax incentive beneficiaries. This tax support figure is somewhat lower than the 75% of BERD and direct government funding that is accounted for by large firms. This may indicate that a) R&D tax support is concentrated in larger firms because BERD is concentrated, and b) when more favourable terms offered to SMEs to benefit from tax support this can somewhat contribute to rebalance the distribution of support but only to some limited extent.

With its strong similarity in the breakdown by expenditures and number of claimants, the case of Norway is a notable exception. This appears to be explained by the capping of tax support at a relatively low level compared to other countries.

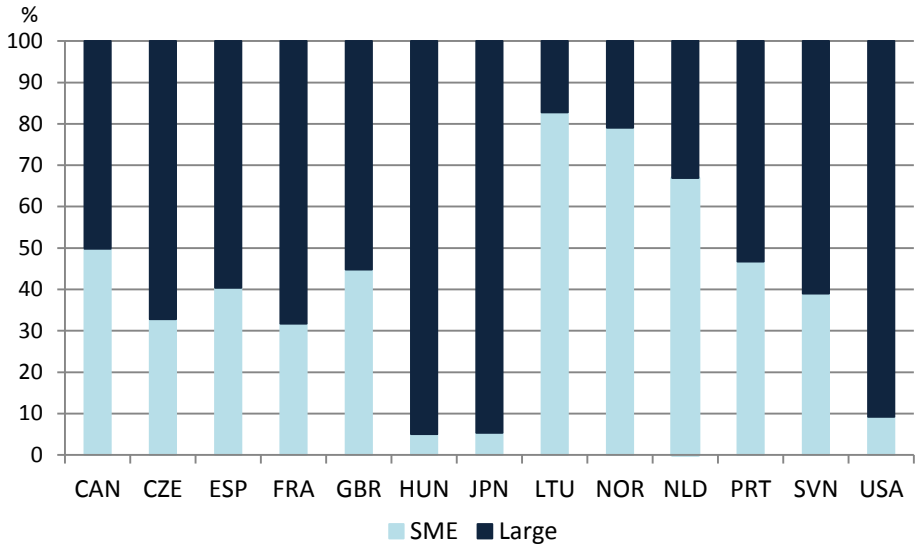
In the United Kingdom, 45% of tax support appears to be accounted for by SMEs. This is well in excess of the corresponding 23% of BERD and the 14% of direct government funding. Here and in other cases it is important to take into account the scope for different definitions of SMEs for the purposes of general R&D statistics and tax purposes and the coverage. For example, in the case of the United Kingdom, a small or medium sized enterprise (SME) is a company with less than 500 employees with either an annual turnover under EUR 100 million or a balance sheet under EUR 86 million. A company that is part of a larger enterprise that, when taken as a whole, fail these tests, is not considered to be an SME.

Figure 12. Distribution of R&D tax incentive claimants and support by firm size, 2014 or latest year

Panel 12A. R&D tax incentive claimants



Panel 12B. R&D tax incentive support



Note: Figures reported (Panel 12A) refer to recipients rather than claimants in the case of France, Norway, and Slovenia. The figures for the Netherlands include self-employed tax support recipients. The figure for the United Kingdom reflects the number of claims made under the SME R&D scheme vs. schemes for large companies (including RDEC). The figure for France is based on consolidated, group level information and excludes firms that declare exclusively innovation expenditure and no qualifying R&D or new fashion collection related expenditures.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm. See Annex for detailed notes.

In contrast, R&D statistics take into account in some cases whether enterprises are part of larger firms and tend, by and large, to adopt a firm size criterion based on the number of persons employed. This approach is however not universal. Furthermore, R&D statistics in some countries do not always cover the population of firms with less than 10 employees.

These indicative estimates for a small group of countries point at the importance of examining in more detail the government support statistics by size as well as examining the methodological

differences by source and use of independence and aggregation rules - in the case of R&D tax incentives in order to ensure that more beneficial terms are targeted to the intended group of firms and in the case of R&D statistics to ensure a consistent interpretation of the concepts.

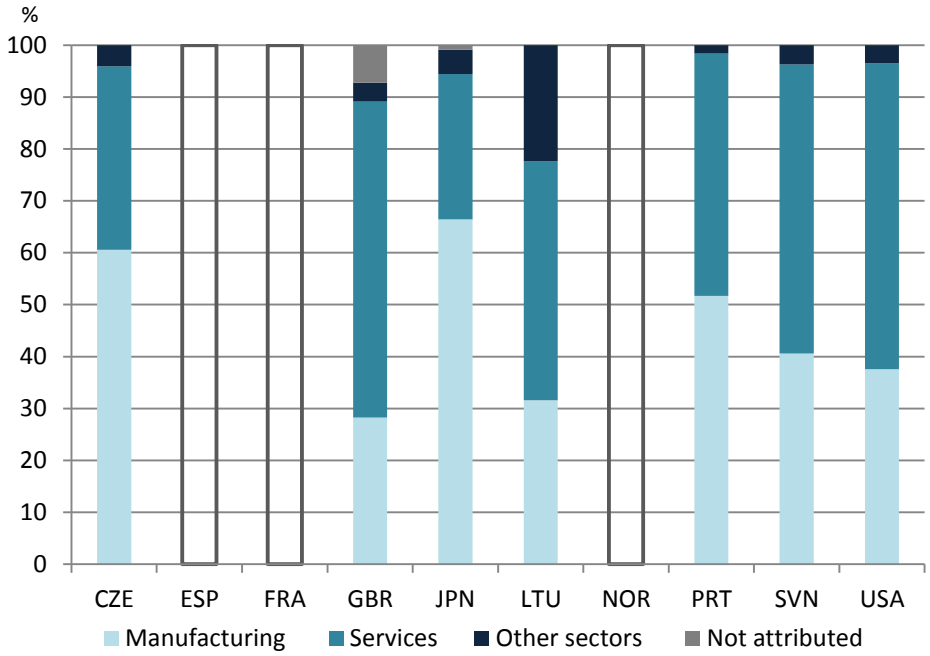
5.2. R&D tax support by economic activity

Economic activity is another dimension for which the distribution of R&D tax incentive support can be of particular interest is. There is a widespread concern that overall government support for industry may be flowing mainly to sectors that carry out manufacturing-based R&D. For example, in the United Kingdom, the proportion of government funded BERD going to businesses with manufacturing as their main activity in the United Kingdom stands at 58% compared with their 39% share of BERD (OECD 2016b). In France, the figure is 78% of funds relative to 50% of R&D performance and in the United States, the figure is also 78% of Federal Funds[17] compared with 68% of BERD. In Germany, the Czech Republic and Korea, on the contrary, services account for a proportionately higher share of support than overall R&D performance.

In the case of R&D tax incentives, **Figure 13** shows that the distribution of support resembles more closely the domestic distribution of R&D performance by main activity, but still falls short from replicating it completely, with the exception of the United States. It can be also noted that the proportion of claimants from service sectors tend to be relative higher than the proportion of tax support provided to firms in this activity group, suggesting that average claimants in the manufacturing sector tend to perform more R&D and thus also receive higher levels of tax support.

Figure 13. Distribution of R&D tax incentive claimants and benefits by broad industry group, 2014 or latest year

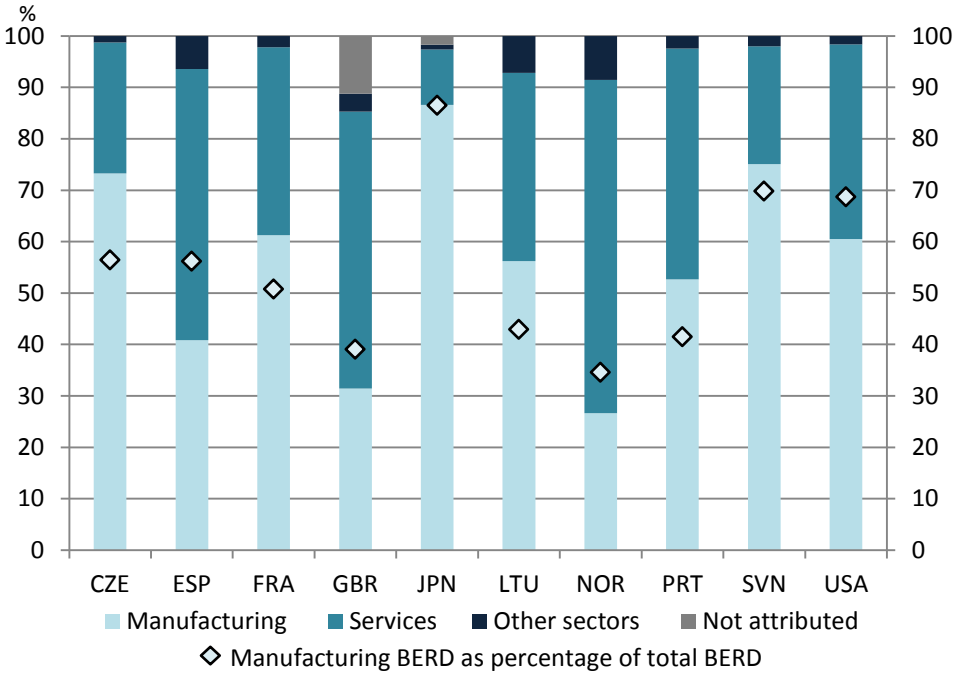
Panel 13A. R&D tax incentive claimants



[17] US National Science Foundation, National Center for Science and Engineering Statistics, Business R&D and Innovation Survey, 2013. See: https://www.nsf.gov/statistics/2016/nsb20161/#/data

Panel 13B. R&D tax support

Manufacturing BERD as a percentage of Total BERD (right-hand scale)



Note: Figures reported refer to recipients rather than claimants in the case of France, Norway and Slovenia. The figure for the United Kingdom reflects the number of claims made under all R&D tax incentive schemes. The figure for France excludes firms that declare exclusively innovation expenditure and no qualifying R&D or new fashion collection related expenditures. Please see Annex for details on the assignment to industry groups.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm. See Annex for detailed notes.

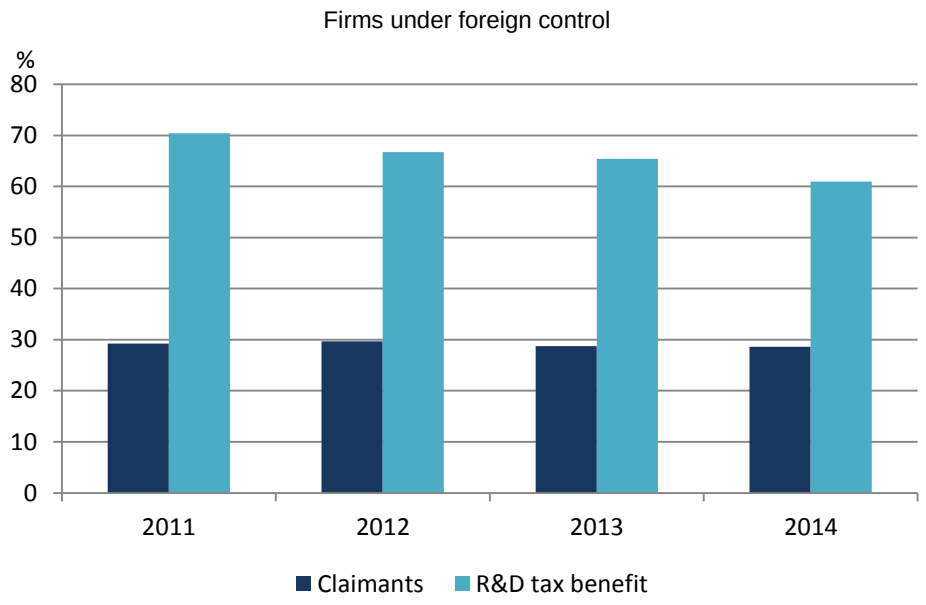
When interpreting these figures, it should be noted that a misalignment between different sources of data on support may occur not only as a result of differences in the unit of analysis (e.g. group, enterprise, establishment) and sector allocation criteria, but also due to the fact that R&D tax incentive statistics are principally derived on the basis of eligible expenses incurred by the firm rather than R&D performed within the firm. R&D performers may be directly funded by client firms who in turn benefit from tax support for such external expenses. Estimates of R&D by served/destiny economic activity are not yet available in order to support such in-depth analysis.

One area for future development is the analysis of direct and tax support at a more detailed industry level. Few countries report to OECD at present at a level of disaggregation that enables the study of the link between government support and key domestic industries contributing to the overall R&D effort.

Ownership structure

Another dimension of significant policy interest but currently underserved by available statistics is the extent to which R&D support is distributed across firms by multinational and control status. BERD statistics generally allow distinguishing between domestic and foreign owned firms. However, few countries are at present linking to data on foreign investment registers to identify which domestic firms are multinational enterprises (MNEs). MNEs are of particular interest because they have a greater ability to optimise their tax obligations and the location of their innovative activities and assets across different jurisdictions.

Figure 14. Distribution of R&D tax incentive claimants and benefits by ownership, Czech Republic



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax. See Annex for detailed notes.

The example in **Figure 14** for the Czech Republic shows that the percentage of tax support provided for foreign owned companies is on a similar order of magnitude to the proportion of BERD accounted by such firms, at close to 60%.[18] In this particular case, the share of tax support accounted for these firms appears to be declining. On the basis of this example, and in the absence of specific provisions that impact differentially on foreign-owned companies (directly or indirectly), it is possible to hypothesise that the share of support will closely resemble the structure of BERD in the domestic economy but this will also depend on the extent to which companies locate a sufficiently large profit base in the economy under study. These hypotheses should become testable as soon as data for other countries becomes available and complementary information can be linked. It should also be noted that in some jurisdictions, tax incentives may be provided for R&D incurred in different countries.

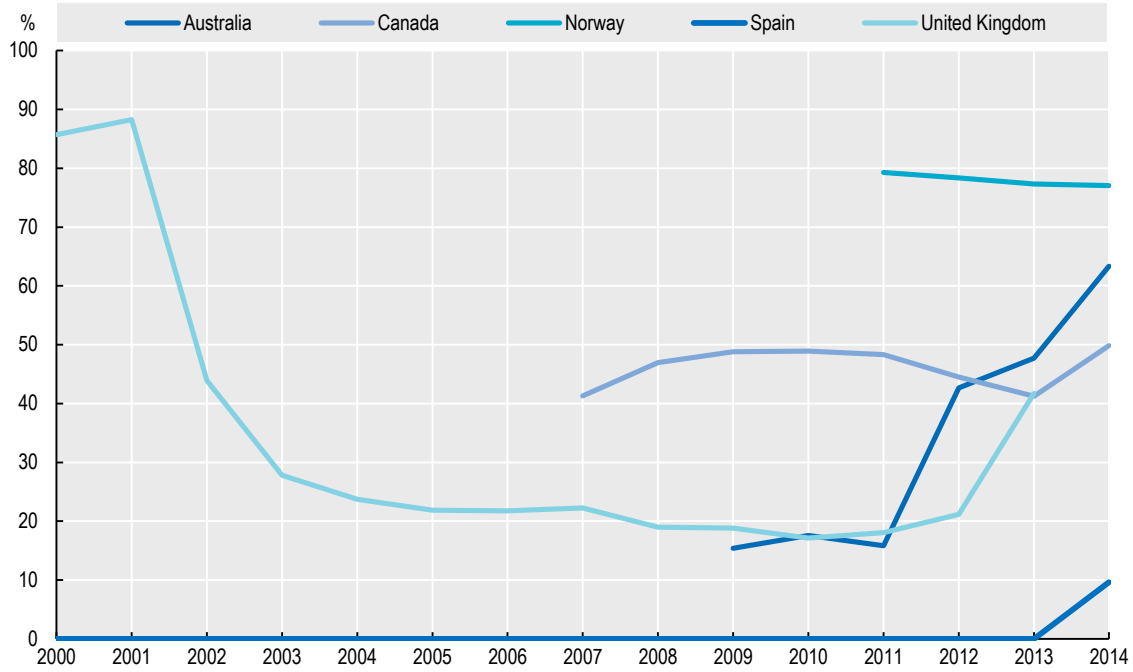
5.3. Foregone tax versus payable credits

From the perspective of firms, tax support for R&D comprises both taxes that are foregone by authorities that the company is in a position to use to reduce its current tax liability, and the amounts that a firm can expect to reduce its future liability or receive a compensating direct payment if provisions allow for that. All these categories represent tax expenditures and impact on the government's fiscal balances compared to the counterfactual of no tax support for R&D.

One specific breakdown of interest is the component of tax support which results from payable credits. A detailed breakdown is not available for a majority of countries that report estimates of the cost of R&D tax support to governments. **Figure 15** reports on the status of four countries that allow for payable credits under some conditions.

[18] For reference, please refer to data from the OECD, Activity of Multinational Enterprises Database, www.oecd.org/sti/ind/amne.htm; and Eurostat, Inward FATS Database, Database as reported in the STI Scoreboard 2015. http://dx.doi.org/10.1787/888933273939

Figure 15. Percentage of payable R&D tax benefits



Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

It is possible to note that Norway has the largest refundable component at close to 80%. This is explained by the existence of upper limits that constrain the extent to which larger, profitable firms with high levels of R&D can benefit from support, and the existence of provisions that make the level of support fairly predictable regardless of the profit situation of the firm. Recent trends point to an increasing use of refundable credits in recent years for Australia, Canada and the United Kingdom. In the case of the United Kingdom, data for the past 15 years show how the share of payable credits initially declined from a very high base of nearly 10%. This initial decline can be accounted for by the extension of the R&D tax credit to large firms. In Canada, figures reflect the value of the enhanced, refundable SR&ED tax credit for qualifying Canadian Controlled Private Corporations (CCPCs) and thus an upper bound on the actual amount of refundable credits. The refundable portion includes all refundable tax credits independently of whether these credits have been used to offset tax payable or have actually been refunded.

In the case of the United States, the Office of Tax Analysis at the US Treasury estimates that on a present value basis, 82 percent of the credit will eventually be used assuming a 5 percent discount rate. Reports indicate there is a stock of USD 27.3 billion of R&D tax credit carry-forwards for corporations (plus USD 0.8 billion in R&E credit carry-forwards reported on individual returns).

It is also relevant to assess what proportion of tax support provided in any given year is accounted for tax support that is accrued and can be claimed in that same year. As **Table 2** shows for the case of Canada, this represents a very small proportion (one fifth) of measured support, pointing at the importance of carry forward and carry back provisions. At present, very few countries appear to have reporting systems that keep track of these multiple components of their tax expenditures, which can hamper the effective management of tax expenditures and by implication the overall budget impact of tax incentives. A similar concern applies to the generalised lack of data on the gap between accruals-based and cash-based estimates.

Table 2. Cash-based estimates of R&D tax support in Canada (CAD million)

	Estimates				Projections			
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Earned and claimed in current year	710	805	795	675	580	585	610	640
Claimed in current year but earned in prior years	675	745	955	995	820	825	860	900
Earned in current year but carried back to prior years	180	55	65	225	110	115	115	125
Total (non-refundable portion)	1,565	1,605	1,815	1,895	1,510	1,525	1,585	1,665
Refundable portion	1,500	1,500	1,455	1,330	1,500	1,515	1,575	1,645
Total (Corporate income tax, cash basis)	**3,065**	**3,105**	**3,270**	**3,225**	**3,010**	**3,040**	**3,160**	**3,310**

Note: The federal credit is applied to eligible spending (net of federal direct assistance and provincial direct and indirect assistance).

Source: Department of Finance Canada, Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2016, http://www.fin.gc.ca/taxexp-depfisc/2016/taxexp1607-eng.asp#_Toc442180571

5.4. Tax support at subnational level

In addition to tax support provided at the national (federal) government level, several regional and local governments in OECD and other countries make use of tax instruments at their control to support R&D and related activities within firms. For example, a majority of U.S. states (39) provide some form of R&D tax incentive to firms. No comprehensive estimates of the cost of such support are currently available. Finance Canada estimates that Canadian provincial governments are estimated to provide tax relief for R&D expenditures worth in excess of CAD 1.4 billion for 2013. This represents the equivalent of an additional 50% of tax support on top of Federal tax relief.

There is not much information available on the design and cost of tax support for R&D at a subnational level for other countries. Throughout the course of this project, an attempt will be made to identify available statistics where national authorities deem such type of support to be significant and assess their basic features and overall comparability.

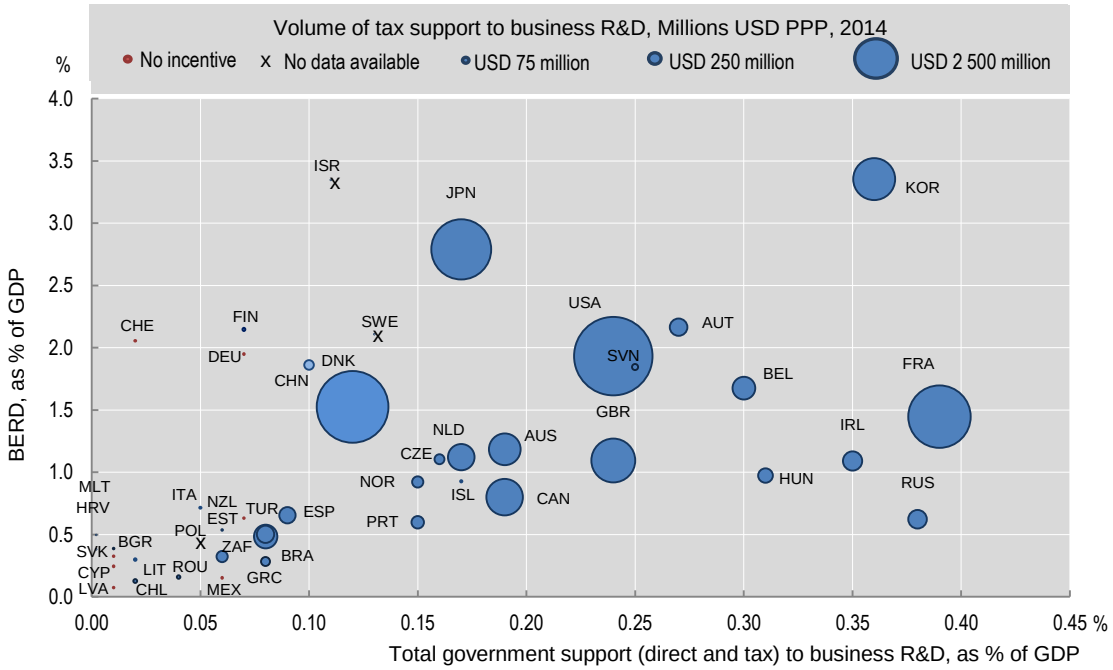
6. Government support for R&D and R&D intensity

Across countries, R&D intensity in the business sector has a positive correlation (0.45) with the level of government funding of business R&D (**Figure 16**). It should be noted that correlations do not necessarily imply the existence of a causal relationship between R&D support and performance.

Furthermore, it is possible to observe that there are several outliers to the observed relationship between government support and R&D performance, the reasons for which can relate to several factors, including differences in sector composition, the presence of other indirect mechanisms of government support, etc… For example, Germany and Korea present relatively high levels of business R&D intensity compared to their degree of measured government support, while France, Ireland and the Russian Federation have high rates of support relative to countries with similar business R&D-to-GDP ratios.

Figure 16. Business R&D intensity and government support to business R&D, 2014

As a percentage of GDP



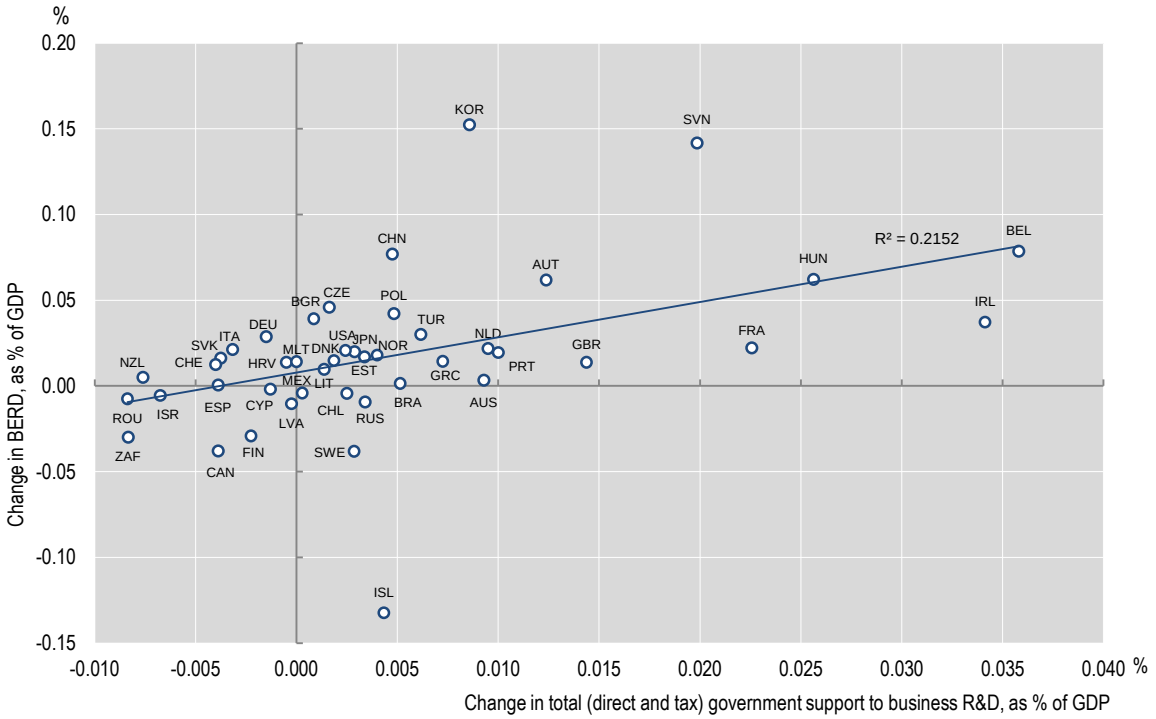
Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax, Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm and Eurostat R&D database, http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database.

Bubble sizes in **Figure 16** represent the volume of tax support provided within countries. In 2014, Germany and Switzerland did not offer tax incentives and levels of direct funding for business R&D were also small in relative terms. In spite of this, their business sectors are highly R&D-intensive. Israel provides a limited form of R&D tax relief but no estimates are available. In 2013, Finland temporarily introduced a tax allowance although its volume was rather modest.

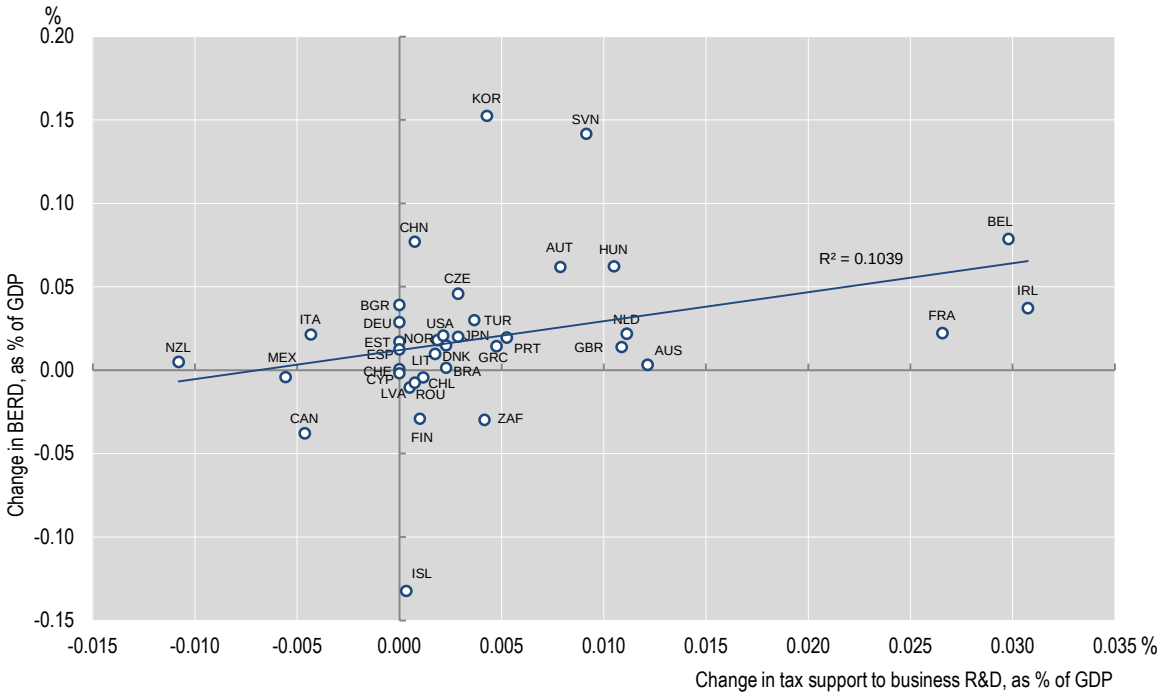
A complementary and potentially more insightful indicator of the relationship between government support for R&D and business R&D performance is the analysis of the correlation in changes over time. The annualised change figures are mapped out in **Figure 17**. On average, as **Panel 17A** shows, an increase of 1 basis point of GDP is associated with a 2 basis point increase in the R&D intensity of the economy per year. Changes in government support appear to account for one quarter of the observed variation in business R&D intensity.

Figure 17. Change in BERD intensity and government support to business R&D, 2006-14 (or closest year)

Panel17A. Change in total (direct and tax) government support per year (in percentage points)



Panel17B. Change in R&D tax support per year (in percentage points)



Note: Reported figures are annualised changes (differences). Panel 17B is restricted to OECD, EU and partner economies that offer R&D tax support in 2014 or 2006 (or closest years), including those that for the first time introduce R&D tax incentives and those that abolish them over this period.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax, Main Science and Technology Indicators 2016/2, www.oecd.org/sti/msti.htm and Eurostat R&D database, http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database.

Panel 17B suggests that changes in R&D tax expenditures alone explain nearly 10% of the observed variation in the data. As a result, direct support appears to account for a significant degree of variation in BERD intensity, especially over a period marked by the global financial and economic crisis. In such conditions, tax support is likely to have a less important incentive effect unless provisions are in place helping unbundle business profitability from tax relief.

The results presented in **Figure 17** provide a first illustration of the aggregate data patterns which will also be investigated at the micro level. Future OECD work will examine these correlations in more detail and assess their robustness to competing explanations for the observed changes, including country specific economic and policy changes as well as discontinuities in the statistical methodologies underpinning the R&D data. The potential relationship between the provision of government support and the reporting of R&D data to national statistical offices over and above actual changes in R&D performance is also an important priority in order to assess the true impact of government support and the international comparability of business R&D statistics.

7. Conclusions and next steps

This report contains the main findings arising from the 2016 OECD data collection on the cost of R&D tax incentives provided in OECD and EU countries and other major economies. The measurement of tax expenditures associated to the provision of relief for R&D efforts incurred by firms is a necessary complement to other available statistics on direct government funding of R&D and information on the design and notional tax subsidy rates.

The analysis of government support would be severely impaired by neglecting what is a major policy instrument for supporting business R&D. Indicators of tax expenditures, while still relatively new and often difficult to compare internationally, provide the most reliable source of evidence on the combined outcome of supply and demand for tax relief for R&D.

This report has confirmed existing evidence concerning trends towards increasing reliance on R&D tax incentives, extending coverage to a number of countries that were not previously the object of OECD analysis. It has also provided new evidence on the dynamics of such trends, providing time series evidence of the change role of tax incentives that can be linked to policy and economic developments. The report also contains for the first time, on an experimental basis, indicators on the uptake, concentration and distribution of tax support compared to R&D performance and direct funding for R&D. The evidence appears to confirm some of the intended properties of R&D tax incentives that make them less discretionary instruments.

The report also raises a number of questions for further investigation of methodological differences across countries and the overall comparability of the data. This evidence provides with a resource for further analysis of the extent and impact of R&D tax incentives, in connection with other indicators and data sources. This will be the object of other work conducted in the framework of this project, including future distributed microdata analysis and annual updates to this report.

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ANNEX

Annex 1. Links to other recent OECD work related to R&D tax incentives

OECD R&D tax incentives database

- Overview of schemes used by countries to provide tax support for R&D, 2015. http://www.oecd.org/sti/rd-tax-incentives-provisions.pdf [To be subject to update by end 2016]
- Compendium of information on the design and scope of R&D tax incentive schemes in OECD member states and partner economies, 2015 http://www.oecd.org/sti/rd-tax-incentives-compendium.pdf [To be subject to update by end 2016]
- Eligibility of current and capital expenditure for R&D tax relief in selected OECD and non OECD countries, 2015 http://www.oecd.org/sti/rd-tax-incentives-expenditures.pdf [To be subject to update by end 2016]
- R&D tax incentive country profiles (2015) (Available for Canada, France, Japan, United Kingdom, United States): http://www.oecd.org/sti/rd-tax-stats.htm#CountryProfiles Updated country profiles for 2016 to be released in early 2017.

Related work at the Centre for Tax Policy and Administration

- OECD Corporate and capital income taxes. http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCaptial
- OECD (2016), *Tax Policy Reforms in the OECD 2016*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264260399-en
- Taxation of Knowledge-Based Capital by Alessandro Modica, Thomas Neubig www.oecd-ilibrary.org/taxation/taxation-of-knowledge-based-capital_5jm2f6sfz244-en
- Neubig, T. et al. (2016), "Fiscal incentives for R&D and innovation in a diverse world", OECD Taxation Working. Papers, No. 27, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/5jlr9stckfs0-en.

Annex 2.

Stylised examples proposed for tax relief calculations for different types R&D tax incentive schemes

A. R&D tax allowance

Consider a tax allowance A on R&D of 150%. Assume all RD is current expenditure and otherwise eligible for standard deduction.

Tax liability with no tax incentive: TL(0) = t * (R-OC-RD)

Tax liability with tax incentive: TL(I) = t * (R-OC-RD*A)

Value to the taxpayer: V=TL(0)-TL(1)= t*(A-100)*RD

The enhanced allowance rate: EA= 150-100=50%

B. R&D tax credit

Under a tax credit system with rate c, assuming R&D expenses are deductible:

Tax liability with tax incentive: TL(1) = t*(R-OC-RD)-c*RD

Value to the taxpayer: V=c*RD

The tax credit equivalent to the gross allowance of 150% is such that c=t*50%.

For example, with t=30%, the enhanced (net) tax credit is c=15%.

Case of a "Gross" tax credit:

If the tax system does not foresee standard deductibility of R&D expenditures when a tax credit is claimed and the headline tax credit rate is c', then TL(I)= t* (R-OC)-c'*RD and the value of the incentive is V'=(c'-t)*RD.

For these systems to be equivalent, in our numerical example, c'=15%+30%=45%.

C. Payroll withholding tax remissions

Consider a payroll withholding tax credit r for R&D wages of 60% which is applied to the employer's and employee's share of withheld payroll taxes and social security contributions. Assume all R&D labour costs are current expenditures and otherwise eligible for standard deduction. Other variations may apply.

Tax liability with no tax incentive: WH(0)= (SEM+SEE)*WRD

Tax liability with tax incentive: WH(I)= (1-r)*(SEM+SEE)*WRD

Value to the taxpayer is: r*(SEM+SEE)*WRD

For example, with SEM = SEM =20%, V=24%*WRD

D. Accelerated depreciation for R&D capital assets

Assume all R&D is capital expenditure and that the R&D capital expenditures incurred can be fully written off in the first year instead of over a standard three-year time period. Other variations may apply. With an interest rate i and straight-line depreciation method:

Tax offset without tax incentive: TO(0)=t*RD*(1/3*(1+1/(1+i)+1/(1+i)2))

Tax offset with tax incentive (year 1): TO(1)=t*RD

Value to the taxpayer: V=t*RD*(1-1/3*(1+1/(1+i)+1/(1+i)2)))

For example, with t=30%, RD=$100000, i=10%: V=$2645

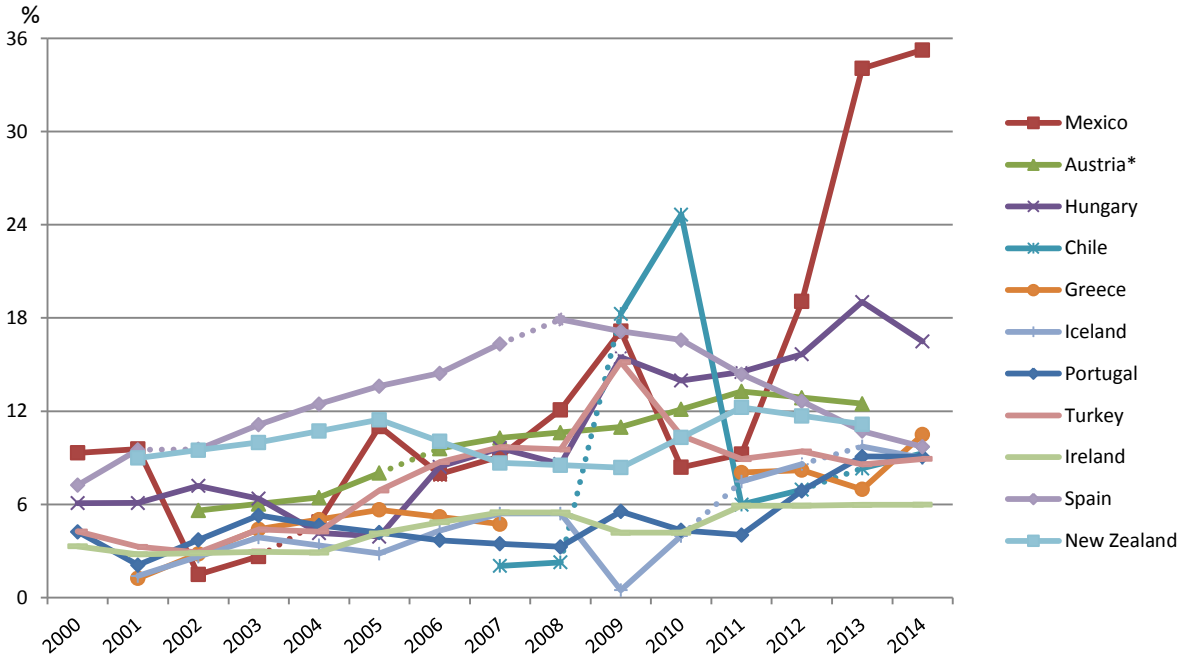
Abbreviations used:

- c=tax credit,
- r=payroll withholding tax credit,
- RD= eligible R&D expenditure,
- SEE / SEM =employee's / employer's share of withheld payroll taxes and social security contributions,
- t=tax rate;
- R=revenue;
- TO=tax offset;
- OC=other costs;
- V= value of the R&D tax incentive to the taxpayer;
- WH=withheld payroll taxes and social security contributions;
- WRD=Total gross R&D wages paid by employer,
- y=year.

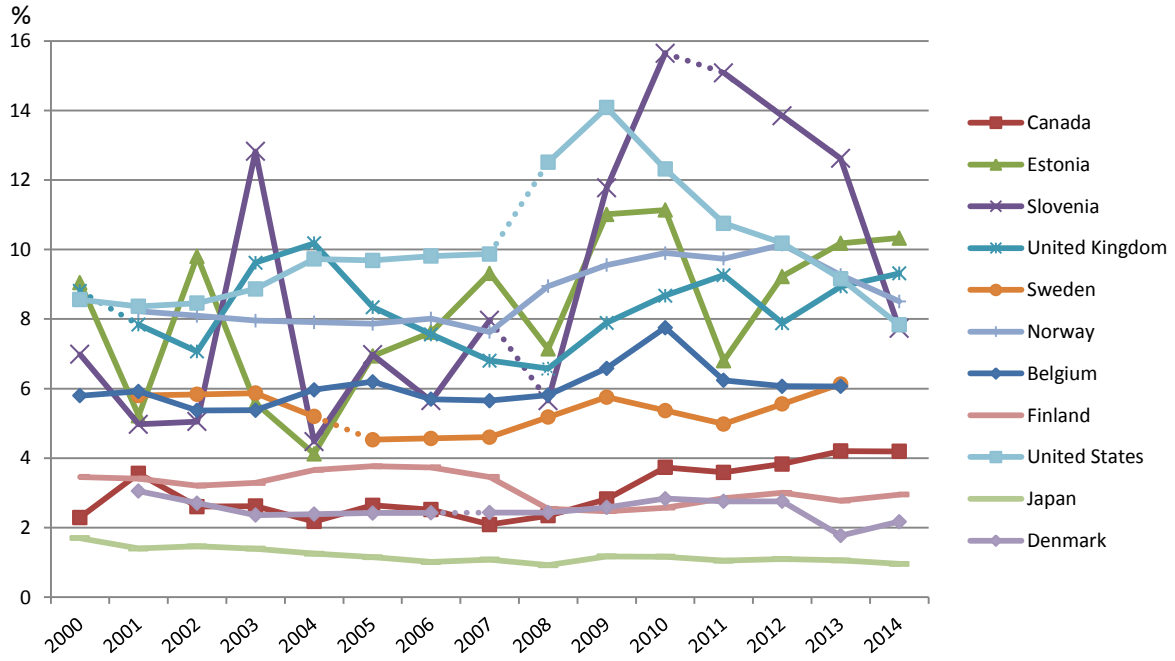
Annex 3. Detailed trends for share of BERD directly financed by Government in OECD countries

Figure A3.1. Percentage of BERD financed by government, 2000-2014

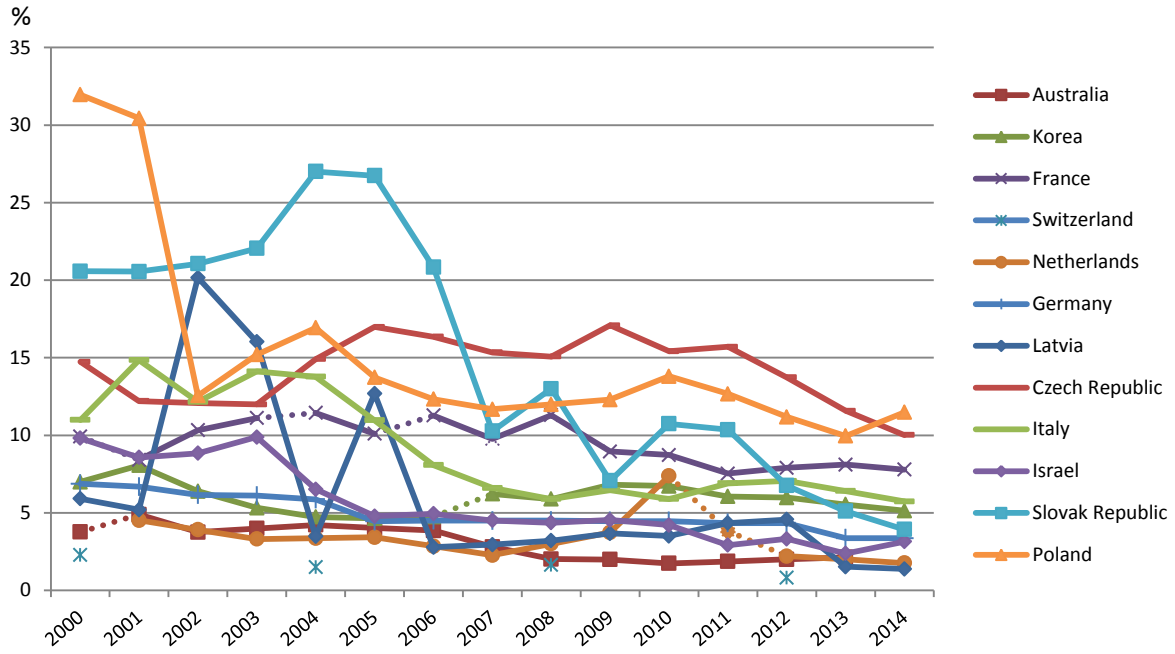
Panel A. Countries with largest growth



Panel B. Countries with medium-level growth



Panel C. Countries with lowest growth



Note: Data on direct government funding for Austria include Research Premium tax relief support.

Source: OECD, Main Science and Technology Indicators, www.oecd.org/sti/msti.htm, February 2017.

Annex 4. SME definitions adopted for tax purposes (Figure 12)

Country	Description
Czech Republic	Firm size-class categories are based on the number of employees from the Business Register. They do not reflect the annual turnover and balance sheet. This category includes also micro firms with less than 10 employees.
Canada	An SME is defined in this context as a CCPC which qualified for the refundable and enhanced investment tax credit of the SR&ED program. A breakdown using other definitions of SMEs is not publicly available. A corporation is a CCPC if it meets all of the following requirements at the end of the tax year: • it is a private corporation; • it is a corporation that was resident in Canada and was either incorporated in Canada or resident in Canada from June 18, 1971, to the end of the tax year; • it is not controlled directly or indirectly by one or more non-resident persons; • it is not controlled directly or indirectly by one or more public corporations (other than a prescribed venture capital corporation, as defined in Regulation 6700); • it is not controlled by a Canadian resident corporation that lists its shares on a designated stock exchanges outside of Canada; • it is not controlled directly or indirectly by any combination of persons described in the three previous conditions; • if all of its shares that are owned by a non-resident person, by a public corporation (other than a prescribed venture capital corporation), or by a corporation with a class of shares listed on a designated stock exchanges, were owned by one person, that person would not own sufficient shares to control the corporation; and • no class of its shares of capital stock is listed on a designated stock exchange http://www.cra-arc.gc.ca/txcrdt/sred-rsde/clmng/glssry-eng.html#cndn
France	SMEs here only mean that the number of employees does not exceed 250. Total = SMEs (< 250) + Large (> 250) + not attributed (346 in 2011; 377 in 2012; 178 in 2013) # Firms receiving the R&D tax credit ("entreprises bénéficiaires"). Data updated in nov 2015 for 2013, June 2014 for 2012, may 2013 for 2011
Hungary	The SME definition for R&D tax incentives purposes complies with the EU SME definition (The enterprise employs less than 250 employees and (i) its annual turnover does not exceed EUR 50 million or (ii) its annual balance sheet does not exceed EUR 43 million). http://net.jogtar.hu/jr/gen/hjegy_doc.cgi?docid=A0400034.TV
Japan	SMEs are defined to be corporations whose stated capital does not exceed JPY 100 million. This excludes SMEs held by large corporation/corporations, whose stated capital exceeds JPY 100 million. http://www.chusho.meti.go.jp/sme_english/outline/04/20131007.pdf
Lithuania	Firms with less than 250 employees and meeting at least one of these requirements: (i) annual income below EUR 40 million or (ii) book value of assets below EUR 27 million. https://ukmin.lrv.lt/en/sector-activities/business-environment/small-and-medium-sized-business
Netherlands	Firms with <250 employees. The SME definition for R&D tax incentives purposes complies with the EU SME definition (The enterprise employs less than 250 employees and (i) its annual turnover does not exceed EUR 50 million or (ii) its annual balance sheet does not exceed EUR 43 million). https://www.rvo.nl/sites/default/files/MKB-definitiegids.pdf
Norway	[0-49 employees]. Number of firms receiving R&D tax credit
Portugal	The SME definition for R&D tax incentives purposes complies with the EU SME definition (The enterprise employs less than 250 employees and (i) its annual turnover does not exceed EUR 50 million or (ii) its annual balance sheet does not exceed EUR 43 million). http://www.eicpme.iapmei.pt/eicpme_faq_02.php?tema=7
Slovenia	A SME company shall meet two of the following criteria on the annual balance sheet cut-off date: - it has less than an average of 250 employees in a financial year; - it has an annual turnover of less than EUR 35 000 000; and - the value of its assets is less than EUR 17 500 000. http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4291
United Kingdom	A small or medium sized enterprise (SME) is a company with less than 500 employees with either an annual turnover under EUR 100 million or a balance sheet under EUR 86 million. A company that is part a larger enterprise that, when taken as a whole, fail these tests, is not considered to be an SME. www.gov.uk/corporation-tax-research-and-development-rd-relief
United States	For the purposes of this exercise, OECD calculations are based on IRS SOI 2013 corporate tax return data and comprises companies with gross receipts of less than USD 50 million. Under 2016 provisions, firms below this threshold can claim the R&E credit against Alternative Minimum Tax liability.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

Annex 5. Industry sector classification (Figure 13)

Country	Description
France	Data updated in June 2016 using the shares of the official notes (May 2013, June 2014, Nov 2015)
Lithuania	Manufacturing: NACE rev. 2 section C taxpayers. Services: NACE rev. 2 H, I, J, N, M, S, K section taxpayers. Other sectors: taxpayers in other NACE rev. 2 sections, not covered in manufacturing or services categories.
Japan	Manufacturing: Corporations with non-consolidated tax declaration only Includes Textile, Chemical, Steel and metals, Machinery, Food, Publishing and printing, Other manufacturing (until 2011); Services / other sectors: Corporations with non-consolidated tax declaration only (until 2011). "Not attributed" includes corporations with approval of consolidated tax declaration and medical corporations (until 2011).
Norway	Sums by economic activity differs slightly from totals in 6.1
United Kingdom	OECD calculation based on 2016 HMRC report "Research and Development Tax Credits Statistics", September 2016. Services includes industry sector G-S (SIC 2007). Manufacturing covers sector C. The "Other sectors" category includes industry codes A, B, D, E and F. In the case of claims, "Non attributable" is calculated as difference between total claims made under the SME and large company R&D Schemes (RD1) and total number of claims made by firms for which Industry sector information is available (RD6). In the case of R&D tax benefits, "Non attributable" is calculated as the difference between the cost of support claimed for all R&D schemes on an accounting period basis (RD2) and the total amount of R&D tax benefits claimed by firms for which Industry sector information is available (RD6).
United States	OECD calculation based on IRS SOI 2013 corporate tax return data. Services includes wholesale and retail trade, transportation and warehousing, information, finance and insurance, real estate, rental and leasing, professional scientific and technical services, management of (holding) companies, administrative support and waste management services and various services. The "Other sectors" category includes agriculture, forestry, fishing and hunting, mining, utilities and construction.

Source: OECD, R&D Tax Incentive Indicators, http://oe.cd/rdtax.

Annex 6. General and country-specific notes for main reference Figure

General notes

For Canada, France, Korea, Latvia, Lithuania, Norway, Portugal and the United Kingdom, preliminary R&D tax incentive estimates are reported for 2014 (or closest year). Figures are rounded to the second decimal unless rounding would result in a value of zero.

For Australia, Brazil, Bulgaria, China, Cyprus, France, Italy, New Zealand and the United States, figures refer to 2013. For Belgium, South Africa, Switzerland, figures refer to 2012. For the Russian Federation, figures refer to 2011.

Estimates of direct funding for Austria and Sweden are based on imputing the share of direct government-funded BERD in the previous year to the current ratio of BERD to GDP. For Brazil, the 2011 share is used for 2013.

In Austria and South Africa, R&D tax incentive support is included in official estimates of direct government funding of business R&D. It is removed from direct funding estimates to avoid double counting. In the case of South Africa, where the overlap of estimates cannot be identified based on available budget data, this transformation was not undertaken.

In 2014, Bulgaria, Cyprus, Estonia, Germany, Luxembourg, Mexico, New Zealand and Switzerland did not provide expenditure-based R&D tax incentives. For Israel, the R&D component of incentives cannot be identified separately at present. No data on the cost of expenditure-based R&D tax incentive support are currently available for Croatia, Malta, Poland and Sweden.

Estimates do not cover sub-national and income-based R&D tax incentives and are limited to the business sector. Data refer to estimated initial revenue loss (foregone revenues and refunds) unless otherwise specified.

Estimates refer to the cost of incentives for business expenditures on R&D, both intramural and extramural, unless otherwise specified. Direct support figures refer only to intramural R&D expenditures, except for Brazil.

Country-specific notes

Country name	ISO3 code	Details
Australia	AUS	Estimates, on an accruals basis, refer to the R&D tax concession and the R&D refundable tax offset, as published in the Taxation Expenditures Statement.
Austria	AUT	Estimates, on a cash basis, refer to the refundable research premium. 2006 also includes an R&D allowance, which was abolished in 2011.
Belgium	BEL	Estimates, on an accrual basis, include the R&D tax credit (for R&D capital) and payroll withholding tax credit for young innovative companies, private companies and partnership agreements with universities. They exclude the investment deduction for environmental projects as the R&D component cannot be identified. Break in BERD data series in 2012.
Brazil	BRA	Estimates, on a cash basis, refer to the R&D tax allowance. No further details available. Direct funding estimates for Brazil based on national sources.
Bulgaria	BGR	No R&D tax incentives in 2014.
Canada	CAN	Estimates, on a cash basis, refer to the scientific research and experimental development tax credit for current R&D expenditures. They do not reflect the cost of provincial governments' R&D tax incentives provided by many Canadian provinces in order to ensure the comparability of R&D tax incentive estimates across countries. Estimates for the cost of accelerated depreciation provisions are not available.

Country name	ISO3 code	Details
Chile	CHL	Estimates, on a cash basis, refer to the tax credit for intramural and extramural R&D, which partially include baseline tax deductions taking a 100% deduction of current R&D expenditure as benchmark (a 65% allowance applies Chile).
China	CHN	Estimates are based on responses by firms to the 2013 national R&D survey. No further details were provided.
Croatia	HRV	Estimates for the cost of the R&D tax allowance (state aid for research and development), available in Croatia from 2007 to 2014, are not available.
Cyprus	CYP	No R&D tax incentives in 2014.
Czech Republic	CZE	Estimates are on a cash basis.
Denmark	DNK	Estimates refer to the cost of accelerated depreciation of R&D capital and the R&D tax credit for deficit-related R&D expenditure, and exclude personal income incentives for research and key personnel.
Estonia	EST	No R&D tax incentives in 2014.
Finland	FIN	Estimates refer to the R&D tax allowance for R&D labour costs, provided on an experimental basis over the tax years 2013 and 2014.
France	FRA	Estimates, on an accrual basis, refer to the crédit d'impôt recherche and special provisions for social security contributions by young and innovative firms (JEIs) and young university enterprises (JEU), but exclude the cost of accelerated depreciation incentives for capital R&D.
Germany	DEU	No R&D tax incentives in 2014.
Greece	GRC	Estimates, on an accrual basis, refer to the R&D tax allowance.
Hungary	HUN	Estimates refer to the R&D tax allowance and the special provision for social security and vocational training contributions for researchers (including Ph.D. students and doctoral candidates) but exclude the local business tax allowance. No figures are available for the R&D component of the tax incentive for capital development.
Iceland	ISL	Estimates refer to the R&D tax credit providing a deduction of eligible R&D expenses from the income tax at an enhanced rate of 20 percent. No further details were provided.
Ireland	IRL	Estimates, on a cash basis, refer to the R&D tax credit on current, machinery and buildings expenditures.
Israel	ISR	The R&D component of incentives cannot be identified separately at present.
Italy	ITA	The cash-based estimate, referring to fiscal year 2013, is based on corporate tax return data. The estimate refers to the R&D tax credit for SMEs providing a fixed payment for newly hired, qualified researchers and a volume-based credit for R&D collaborations with universities and public research consortia (Law 449/1997).
Japan	JPN	Estimates are on a cash and final revenue loss basis.
Korea	KOR	No details available on cost estimates.
Latvia	LVA	Estimates refer to the R&D tax allowance on current R&D expenditures introduced in 2014. No further details available on cost estimates.
Lithuania	LTU	Estimates, on an accruals basis, refer to the R&D tax allowance on current R&D expenditures, available since 2008. Estimates for the cost of accelerated depreciation provisions are not available.
Luxembourg	LUX	No R&D tax incentives in 2014.
Malta	MLT	Estimates for the cost of the R&D tax incentive introduced in Malta in 2009, are not available.
Mexico	MEX	No R&D tax incentives in 2014.
Netherlands	NLD	Estimates, on a cash basis, refer to the WBSO payroll tax credit for R&D labour and the R&D tax allowance (RDA) for non-labour related R&D expenditures.
New Zealand	NZL	No R&D tax incentives in 2014.
Norway	NOR	Estimates for the fully refundable SKATTEFUNN R&D tax incentive cover current and machinery costs.
Poland	POL	Estimates for the cost of accelerated depreciation provisions and tax

Country name	ISO3 code	Details
		deductions for R&D Centres are not available. New Technology Tax Relief scheme for the acquisition of intangible assets is excluded as it does not necessarily apply to R&D.
Portugal	PRT	Estimates, on an accrual basis, for the SIFIDE-II R&D tax credit which includes current and R&D-related capital expenditures.
Romania	ROU	Estimates refer to the R&D tax allowance on current and depreciation related R&D expenditures. Estimates for the cost of accelerated depreciation provisions are not available.
Russian Federation	RUS	Estimates refer to the R&D tax allowance on current expenditures, the accelerated depreciation incentive for R&D capital and the R&D tax credit, worth RUB 3 726.1 million in 2011 (0.007% of GDP), which covers value-added tax exemptions on R&D and property tax credits for national R&D centres and organisations implementing state-approved R&D projects. No estimates are available for the cost of reductions in social security contributions.
Slovak Republic	SVK	Estimates, on an accrual basis, refer to the R&D tax allowance scheme, which is restricted to grant recipients (Tax relief for subsidy recipients: Income Tax Act §30b).
Slovenia	SVN	Estimates, on an accrual basis, refer to the R&D tax allowance scheme.
South Africa	ZAF	Figures, on a cash basis, refer to the R&D tax allowance.
Spain	ESP	Figures, based on published data by the Spanish Tax Agency, refer to the R&D and innovation tax credit. Estimates include support for technological innovation. According to data from a non-random subset of firms (Informes Motivados), this accounts for more than 45% of all qualifying expenditures and nearly 20% of all deductions. Estimates do not include the cost of the accelerated depreciation provision for R&D capital and allowances for employers' social security contributions which was less than EUR 1 million when introduced in 2007.
Sweden	SWE	Estimates for the cost of the partial exemption of social security contributions for R&D employees introduced in Sweden in 2014 are not yet available.
Switzerland	CHE	No R&D tax incentives in 2014.
Turkey	TUR	Estimates, on a cash basis, refer to deductions for current R&D and machinery expenditures in eligible R&D centres and companies (Law 5746) and to partial relief on social security contributions both in these and in firms based in Technoparks. Figures may include the cost of standard deductions for current R&D expenditures and may therefore overstate tax support in relation to other countries. Estimates for the cost of accelerated depreciation provisions are not available.
United Kingdom	GBR	Estimates for fiscal year 2014, on an accrual basis, refer to the Research & Development Relief for Corporation Tax and the Research and Development Expenditure Credit (RDEC) Scheme for large companies, introduced for expenditure incurred on or after 1 April 2013. Estimates for the cost of accelerated depreciation provisions are not available. Cost estimates of R&D tax incentive support in the United Kingdom are based on HMRC Research and Development Tax Credits Statistics, September 2015.
United States	USA	Estimates refer to the federal research and experimentation tax credit (only corporations), based on SOI corporate tax return data. For international comparability, the cost of allowing for the expensing of research and experimentation expenditures is not included. Cost estimates of R&D tax incentive support in the United States are based on data from Statistics of the Income Division (SOI) of the IRS, November 2016.