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R&D tax incentives: rationale, design, evaluation

Governments can choose among various tools to leverage business research and development (R&D). They can offer direct support via grants or procurement or they can use fiscal incentives, such as R&D tax incentives. More countries are now using tax incentives than a decade ago and the schemes are more generous than ever. As of today more than 20 OECD governments provide fiscal incentives to sustain business R&D, up from 12 in 1995 and 18 in 2004. Of the countries that do not have R&D tax incentives, Germany and Finland are currently discussing their introduction. This note sets out key considerations for the rationale, design and evaluation of such measures.

Why do governments support business R&D?

- **R&D is seen as a crucial investment for the long-run growth of economies.** Increases in multifactor productivity in OECD countries have been a major determinant of economic growth. These are linked strongly to increases in public and private R&D. R&D intensity of countries and their growth performance is correlated with the share of research financed by the business sector.

- **Maintaining jobs, especially in times of crisis.** Governments can make the difference between business success and business failure. For example, to help firms facing the financial crisis, some countries have provided more generous but temporary R&D fiscal incentives such as enlarging the eligible base for the credit (*e.g.* in Japan and the Netherlands), allowing a longer carry-forward of unused credits to the following years (Japan), or shortening the time for credit refunds (France).

- **Contribute to national competitiveness.** In a world where multinational enterprises are increasingly internationalising their R&D activities governments also compete in attracting R&D activities of these corporations. Generous incentives through R&D tax incentives can make a country a relatively more attractive location for R&D investments than its competitors.

- **R&D investment is risky.** Few R&D projects are likely to end-up as a marketable new products or processes, and often only after long and uncertain payback periods. Moreover, it is very difficult for financial institutions to judge the quality of the R&D investment because of its uncertain outcome and firms' reluctance to disclose all of the relevant information. As a result, firms, and particularly small firms and start-ups, will be more likely to be credit constrained when investing in R&D.

- **R&D activity generates "public" goods.** Knowledge spills over to other firms and organisations which did not bear the costs of this investment. Since investing firms will not be able to capture all the benefits of their own investment, they will perform less R&D than what would be "socially" optimal (or in other terms, the private rate of return of R&D would be lower than the social rate of return). These risks contribute to gaps in R&D spending and the bringing on stream of desirable innovations.

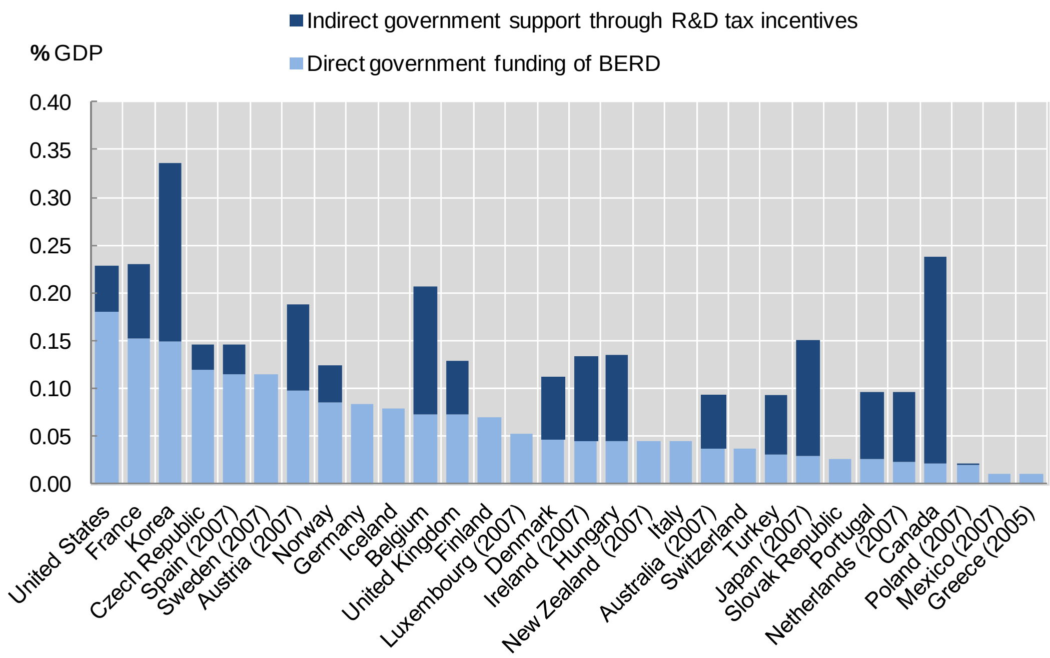
The policy mix: direct versus indirect funding of R&D

Governments can choose among various tools to leverage business R&D. They can offer direct support via grants or procurement or they can use fiscal incentives, such as R&D tax incentives. Direct R&D grants/subsidies can target specific projects with high potential social returns while tax credits reduce the marginal cost of R&D spending and allow private firms to choose which projects to fund.

Countries differ in their use of direct and indirect support (Figure 1). The United States (through competitive R&D contracts) and Spain rely more on direct support, while Canada and Japan mostly use indirect support to foster industrial R&D. The optimal balance of direct and indirect R&D support varies from country to country, as each tool addresses different market failures and stimulates different types of R&D. On the one hand, R&D tax credits are not targeted to a specific group of firms or projects, but rather to all (potential) R&D performers. They are therefore industry, region and firm-neutral. Grants, on the other hand, can be directed to specific projects that the government/innovation agencies consider to have high social returns and are more dependent on discretionary decisions by governments. In general, tax credits are used mostly to encourage short-term applied research, while direct subsidies are directed more to long-term research.

Figure 1. Direct and indirect government funding of business R&D and tax incentives for R&D, 2008

As a percentage of GDP



Note: The estimates of R&D tax expenditures do not cover sub-national R&D tax incentives. The Austrian estimate covers only the refundable research premium. The estimate for the United States covers the research tax credit but excludes the expensing of R&D. Italy and Greece offered R&D tax incentives in 2008, but estimates of the foregone tax revenues are not yet available.

Source: OECD (2010), *Measuring Innovation : A New Perspective*, based on OECD, R&D tax incentives questionnaire, January 2010; and OECD, Main Science and Technology Indicators Database, September 2010.
http://dx.doi.org/10.1787/835805814452

The first internationally comparable "quantitative" estimates of R&D-related tax expenditures

Estimates of R&D-related tax expenditures by central government have been compiled by the OECD. While international comparisons are not perfect due to the heterogeneity of tax incentives covered and methods used in estimating them, this new indicator gives a rather different picture of international comparisons of public support to R&D than has previously been understood.

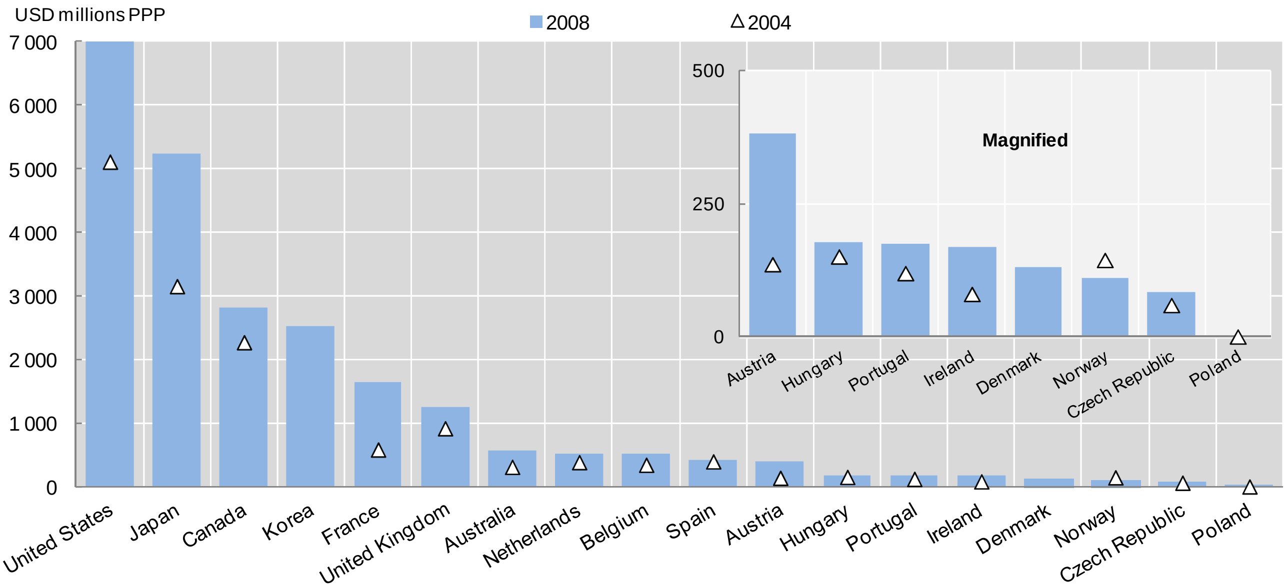
This new indicator on R&D tax incentives – which measures forgone tax revenue - sheds new light on country support for business R&D. For instance, in each of the United States, Japan, Canada and Korea, forgone tax revenues amount to more than USD 2 billion (Figure 2). In France and the United Kingdom forgone tax revenues are in the range of USD 1-2 billion. In France, the amount for 2009 will jump up to USD 6 billion, due to the introduction of a new scheme, as well as a temporary additional incentive for R&D introduced as part of the stimulus package.

R&D tax incentives on the rise

More countries are now using tax incentives than a decade ago and the schemes are more generous than ever. As of today more than 20 OECD governments provide fiscal incentives to sustain business R&D, up from 12 in 1995 and 18 in 2004. Of the countries that do not have R&D tax incentives, Germany and Finland are currently discussing their introduction.

Non-OECD countries such as Brazil, China, India, Singapore and South Africa also provide a generous and competitive tax environment for investment in R&D. China provides generous (general) tax reductions for R&D firms located in certain new technology zones or investing in key areas such as biotech, ICT and other high tech fields.

Figure 2. Indirect government funding of business R&D through tax incentives for R&D, 2004 and 2008



Note: The estimates of R&D tax expenditures do not cover sub-national R&D tax incentives. The Austrian estimate covers only the refundable research premium. The estimate for the United States covers the research tax credit but excludes the expensing of R&D. The starting period is 2005 in Australia, Czech Republic, and the United States; 2006 for Portugal and Poland. The ending period covered in 2007 for Ireland Japan, and Spain.

Source: OECD (2010), based on OECD, R&D tax incentives questionnaire, January 2010; and OECD, Main Science and Technology Indicators Database, September 2010.

The design of tax incentives

Most countries provide fiscal incentives through tax credits or enhanced allowances.[1] Tax credits allow a direct deduction from the tax payable, while enhanced allowances represent a deduction (above the normal deduction rate of 100%) from the corporate taxable income. The main difference between the two mechanisms is that the former directly reduces the tax liability, while in the latter the reduction in tax liability depends on corporate income tax rates.

Incremental *versus* volume based tax credits

R&D tax incentives may apply to all qualified R&D expenditures (volume-based credits) or only to the additional amount of R&D expenditure above a certain base amount (incremental credits).

Several issues have to be considered when designing R&D tax incentives. The general fiscal environment plays a role in deciding whether to use fiscal measures at all, as fiscal incentives are less effective in a country with a low rate of corporate income tax. In addition, target groups need to be selected, eligible expenses must be defined and a choice must be made between a tax credit that applies on all R&D outlays (volume) and a credit based on additional spending on R&D (incremental) (see Box 1).

Box 1. Design considerations - fiscal support for business R&D

The target group: Governments can make fiscal support accessible to all companies, or make support more generous for target groups of firms (*e.g.* SMEs). This can be done by:

- Placing upper limits on the amount of tax credit that can be claimed (upper limits are more likely to be attained by larger companies than by SMEs).
- Giving higher tax credit rates for SMEs, and/or greater flexibility *e.g.* cash refunds or unused credits.

Minimum thresholds can increase the efficiency of policy as administrative costs can be high for small applications.

Labeling of activities and claiming the tax credit: The definition of R&D is typically based on the *Frascati Manual (*OECD, 2002). However, most countries have produced their own lists of types of R&D that qualify.

Qualified R&D expenditure: Three types of expenditure can qualify for fiscal incentives:

- Expenditure on wages related to R&D. This reduces social security and wage taxes and gives an incentive for investment in human capital.
- Current R&D expenditure. This includes wages and all consumables used in the R&D process.
- Current and capital R&D expenditure. This enlarges the incentive for companies, but increases the public cost of the policy.

The base amount of incremental tax credit: can take two forms:

- Rolling average base. The base amount is computed as the average R&D expenditure of the previous x years.
- Fixed base. The base amount equals the average R&D expenditures during a fixed reference period. This average can then be indexed to sales or inflation to stay relevant.

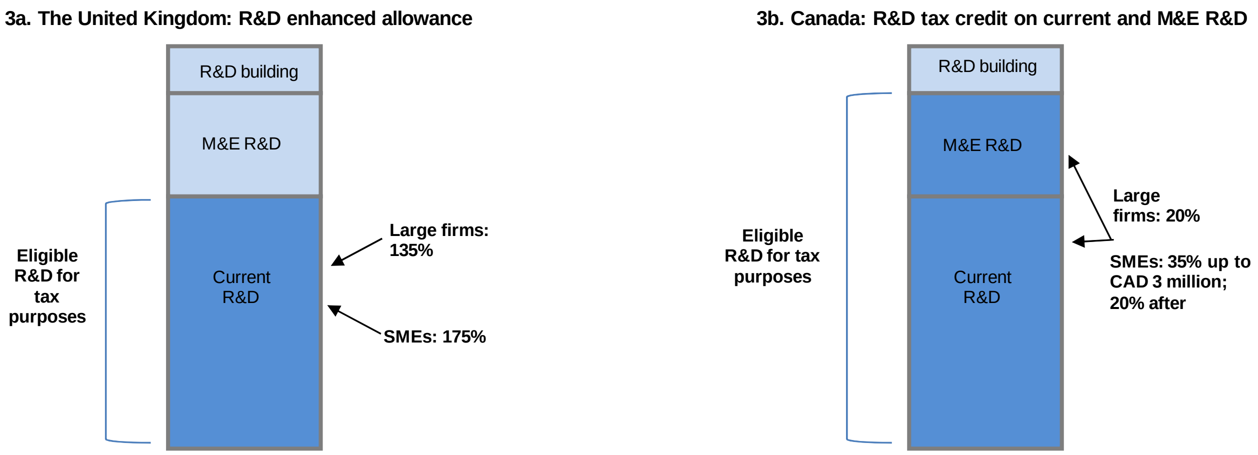
Carry-over provisions and cash refunds: These provisions allow unused portions of the credit to be carried forward or backward to previous fiscal years. Carry forward provisions are particularly important for SMEs, as these tend to have limited current corporate income against which the credit can be applied, while many younger firms are carrying losses from previous periods. Cash refunds can also replace carry forward provisions. The time value of funds should be taken into account when calculating refunds. Delays in effecting cash refunds need to be avoided in order to making this tool efficient.

Source: Van Pottelsberghe *et al.* (2003).

1. Other mechanisms used by countries are full deduction of current R&D expenditures (treating all current R&D as current expenses and deducting them from taxable income) and accelerated depreciation (capital depreciation at a higher rate than the usual accounting practice). Given they are used almost uniformly by all countries and provide only weak stimuli, these two mechanisms are not considered important measures relative to countries' R&D tax incentive schemes.

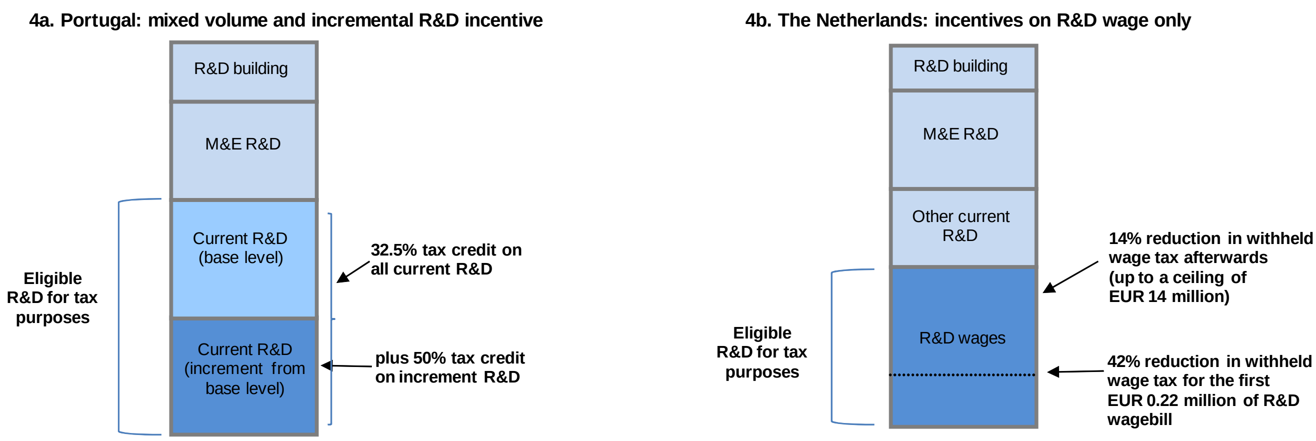
The most common scheme used by countries is a *volume-based* tax incentive with *current R&D* (*e.g.* United Kingdom (Figure 3a), Czech Republic, Norway, Denmark) or *current and machinery and equipment (M&E) R&D* as eligible expenditures (*e.g.* Canada (Figure 3b), Australia, Austria, France and Italy). These countries usually also provide more generous support to SMEs through higher tax exemption rates. Referring to the examples in Figure 3a and 3b, it can be calculated that a small British firm would reduce its corporate tax liability by 0.16 for each unit of eligible R&D, while in Canada, the tax credit of 35% would reduce the corporate tax liability of a small firm by 0.35 for each unit of eligible R&D (up to a limit of CAD 3 million), and 0.20 unit thereafter.[2]

Figure 3. Examples of simple R&D tax incentive schemes



Other approaches also exist. For example, some countries consider only incremental current R&D as eligible R&D for tax purposes (*e.g.* The United States and Ireland) or to use a hybrid scheme considering both volume and incremental R&D as eligible expenditures (*e.g.* Portugal (Figure 4a), Japan, Spain). Alternatively, and somewhat more different still from the schemes in Figure 3, some countries consider only R&D wages as eligible R&D and deductions would apply to the "corporate wage and social contribution" tax instead of the general corporate income tax (*e.g.* Belgium and Netherlands, see Figure 4b).

Figure 4. Example of main deviations from simple R&D tax incentive schemes



2. For enhanced allowance, corporate income tax rate must be taken into account to estimate the tax liability reduction. For a small UK firm with a corporate income tax rate of 21%: [175% -100% (normal deduction rate)]*21% = 0.16 unit in reduction of income tax liability.

A fuller picture: multi-faced schemes, sub-national tax incentives, and innovation tax incentives.

In fact, countries can use *several different schemes at the same time*. For instance Belgium offers a tax credit on R&D capital assets and fiscal incentives in the form of a reduction in taxes and social security contributions for R&D employees. The Netherlands, in addition to fiscal incentives on labour costs, also offers R&D tax allowances for self-employed workers spending at least 500 hours per year on R&D.

In addition to national R&D tax incentives (provided by central governments), some *sub-national governments also provide their own R&D tax incentives* that are usually combined with the national ones. For instance, in Canada, most provinces provide R&D tax credits for R&D performed in their provinces. Likewise, in the United States forty states currently have some type of R&D tax incentives, up from 35 in 1996 (Miller and Richard, 2010).

Some countries have introduced fiscal measures to stimulate innovation more broadly by extending the eligible base to expenses in advanced technology solutions (such as “green” technology in Belgium) and acquisition of intangibles such as patents, licences, know-how and design (*e.g.* Spain, Poland). China also apply lower income taxes to high-technology enterprises and software development enterprises located in certain new technology zones. Finally, some countries also provide tax incentives on the outcomes of innovative activities by reducing the tax burden on income generated from patents (Belgium, Ireland) or income generated from all qualified R&D projects (the Netherlands).

Recent changes in R&D tax incentive schemes

The general trend among OECD countries has been to adjust their R&D tax incentive to make them more generous and simpler to use. For instance, France (in 2008) and Australia (in 2010) replaced their more complex hybrid volume and incremental-based schemes with simpler and more generous volume-based schemes. Belgium, Ireland, Korea, Norway, Portugal and the United Kingdom have increased and sustained their tax credit rates or the ceilings of eligible R&D in recent years. Canada has introduced new administrative rules to facilitate access to their R&D tax credit programme, improve its consistency and predictability, and enhance the quality of the claims process.

Contrary to the general trend, Mexico and New Zealand have repealed their R&D tax credit recently. Mexico converted its R&D tax credit to direct assistance in 2009. New Zealand had introduced a R&D tax credit in 2008 but has since repealed it with effect from the 2009-10 fiscal year.

To help firms facing the financial crisis, some countries have provided more generous but temporary R&D fiscal incentives. For instance Japan and the Netherlands increased temporarily the ceilings of eligible R&D. Japan also allowed a longer carry-forward of unused R&D credits recognising that several firms would not be in position to claim the totality of their R&D tax credit in the next few years because of the likely fall in profits for Japanese firms. Finally, France will refund, in 2009, all pending claims from the previous years. Before 2009, firms would have had to wait up to three years before getting the refund of their unused credit. With the 2009 scheme, firms will be able to get a refund from their unused credit earned in the last three years. This measure is expected to increase forgone tax revenue to USD 6 billiion in 2009 (0.29 per cent of GDP).

Efficiency of R&D tax incentives

Incremental vs. level-based schemes

- Incremental tax credits are more efficient for the government (they minimise the amount of "subsidised" R&D that would have been undertaken even in the absence of support), however, they are also more complex to implement.
- Volume-based schemes are more straightforward, less subject to fluctuations but costlier and tend to finance larger firms.
- The design of schemes (incremental or volume) depends on policy objectives but also the tax base and capacity constraints (number of R&D staff).
- Generally, most countries are moving to volume-based incentives.

Using a volume-based scheme has the advantage, for firms claiming incentives, to be simple and generous. However, from the government perspective, this approach might be costly as it subsidises a portion of all R&D performed, even the amount that would have been performed without any R&D tax incentives. In addition, a strict volume-based approach does not provide a strong incentive to perform additional R&D.

The main advantage of using only incremental R&D as the eligible base is that it ensures that the cost incurred by government is compensated by an increase in R&D. As such, it minimises the amount of "subsidised" R&D that would have been undertaken even in the absence of support. However, the use of incremental-based schemes is more complex to design and to use. The complexity issue should not be underestimated as it can significantly increase the cost of applying the tax credit and even deter some firms to apply if application costs are, or are perceived to be, higher than the uncertain benefits.

From a policy point of view, a volume-based scheme would be more appropriate if the objective is to increase the overall level of R&D in the country, while an incremental-based scheme may be considered if the objective instead is to support firms with high R&D growth. A combination of volume and incremental tax incentives (hybrid schemes) may be considered when the objective is to maintain the level of, and reward high growth of, R&D (Criscuolo *et al.*, 2009).

Tax credit for R&D wages

- It reduces the tax wedge, *e.g.* the difference between what it costs to pay workers (wages, social security/withholding taxes) and wages of workers.
- It acts as a subsidy to early stage costs whereas tax credits for R&D expenditures generally subsidise later-stage profits, which can be seen as a reward for successful innovation.
- It may be easier to control and may be less subject to accounting manipulation than company profits.
- It is well suited for small firms.
- It helps build/retain human talent.

A recent trend in OECD countries has been to employ fiscal R&D incentives for labour social charges (*e.g.* social security and other social taxes on labour). The rationale is that by reducing social charges, companies can reduce monthly operating costs and therefore increase cash flow. This is particularly important since wages typically make up a large part of total R&D costs. Increasing cash flow is particularly important for small, research-intensive firms with little revenue but high investment in intellectual and human capital. Furthermore, by subsiding human capital, the incentives may contribute to retaining human talent.

However, if the number of scientists and engineers workers is stable over time (or "inelastic"), an increase in R&D due to the tax incentive would be captured by higher wages for R&D workers, instead of higher quantity of inventive activities. While this "wage effect" can also arise with the more traditional R&D tax scheme, the effect might be acerbated when the only R&D eligible activity is R&D wages. Econometric studies seem to corroborate the assumption of a "wage effect".[3] It should be noted however that, for most of those studies, it could not be ruled out that the increase in R&D wages could correspond to a change in *quality* of researchers (*e.g.* more experienced scientists; higher skilled composition of scientists), in which case the increased in cost would be related to a real increase in innovative activities. More empirical studies are needed to analyse this impact.

Finally, the question of level or incremental eligible expenditures can also apply to R&D wage bill incentives. Governments can choose between providing tax incentives for the employment of all R&D workers or only for newly hired researchers (at a given time). The trade-off between simplifying the scheme and minimising the amount of "subsidised" R&D would still need to be taken into account.

Temporary vs. permanent programmes

Efficiency of tax incentive programmes can also be affected by whether it is a temporary or a permanent programme. While the generosity of a tax incentive is believed to have an impact on the amount and location of R&D performed, another important aspect in firms' R&D decisions is for how long the tax incentive will continue. Some projects might just be undertaken to benefit from temporary tax incentives, while other potentially more promising R&D projects might be delayed or performed abroad if the planning horizon for those projects extends beyond the scheduled end of the tax incentive programme. However, not all R&D firms would be affected in the same way by a temporary programme. Firms undertaking R&D projects to be completed within a year (or a few years) would be less likely affected than those with R&D projects covering several years (Guenther, 2008).

Presence of sub-national R&D tax incentive programmes

The presence of sub-national R&D tax incentive programmes increases the overall generosity of the tax relief provided to the firm. While these additional tax reliefs provided by sub-national governments are believed to increase R&D performed by local firms, the overall effect is not clear, in particular whether the net effect would still be positive if one takes into account the (supposedly decreasing) R&D performance in neighbouring regions.

The few (mostly American) studies looking at this issue seem to conclude that while the introduction of state-level RD tax incentives do increase R&D within the state, this increase would mostly come from drawing away R&D in neighboring states rather than increasing the national level of R&D.[4] This would lead to a nearly zero sum game (gain in one state would be off-set in another state). While the net national effect of combining national and sub-national R&D incentives need further study, the same issue also arises at the country level where international competition for attracting R&D from MNEs is increasing.

3. See for instance Goolsbee (1998), Haegeland and Moen (2007); Lokshin and Mohnen (2009).

4. See for instance Wilson (2009); Gittell and Tebaldi (2008) and Miller and Richard (2010).

Evaluation of R&D tax credits

Evaluations are essential in monitoring effectiveness of R&D tax incentives. New tools are available but evaluations should not only consider goals but also full monetary and societal costs (distortion, trade-offs, compliance).

R&D tax credits have been evaluated in many countries using diverse methods. For the purpose of policy assessment, firms cannot legally be excluded from a tax incentive to which they are entitled. This removes the possibility of evaluating R&D tax credits by constructing a control group using randomisation techniques. Evaluations have therefore been based on the following four approaches: Surveys; Quasi-natural experiments; Techniques using statistically constructed control groups; Structural econometric modelling.

Surveys

The evaluations using surveys suffer from a number of weaknesses. Entrepreneurs or managers might be unable accurately to assess the genuine impacts of the scheme, distinguishing these from many other possible determinants of R&D spending. Long-run effects might be ignored, especially if the survey is administered shortly after the commencement of the policy. And respondents could also have strategic reasons for overstating or understating programme impacts. Surveys, moreover, have typically been based on small sample sizes.

Quasi-natural experiments

Another set of evaluations of R&D tax credits uses econometric techniques that exploit discontinuities in the process of administrative selection of target firms. If for instance there is a ceiling on the application or rate of the tax credit, then firms operating above that ceiling could be used as a control group. A comparison over time can be made between the change in R&D spending among firms below the ceiling – following introduction of the scheme - and the change in R&D spending over the same period among firms above the ceiling (the so-called 'difference in differences' method). An evaluation of Norway's R&D tax credit followed this approach (Haegeland and Moen, 2007). That evaluation concluded that the scheme, introduced in 2002, increases private spending on R&D.

Techniques using statistically constructed control groups

The third evaluation approach statistically constructs a control group. Analysts have recorded observable characteristics of firms that have used the tax credit, and then identified firms that match those characteristics but did not use the tax credit. The difference in R&D spending in the two groups is attributed to the tax credit. However, even using a comprehensive set of matching criteria – such as firm turnover, age, sector of operation, geographic location, etc. - perfect comparability between the two groups is not possible. There may always be some unobserved differences between beneficiaries and non-beneficiaries that also affect the policy outcome. For instance, in all observable respects two firms may have the same probability of receiving a tax credit, but the abilities of their respective managements may differ. This might lead the managerially able firm to use the tax credit, and the managerially less able firm not to. The managerial abilities in question might also be associated with a higher propensity to innovate. Evaluations that use matching-methods also require that there be a sufficient number of firms that qualify for the tax credit but fail to apply.

Structural econometric modelling

A fourth approach to evaluating R&D tax credits has been structural econometric modelling. Developed by the United States' Government Accounting Office, this approach uses models of R&D investment behaviour and assumes that R&D spending is a function of the cost to the firm of the capital used. The modelling first seeks to estimate the sensitivity of the cost of capital used to the R&D tax credit. In a second step, estimates are made of the sensitivity of firms' R&D spending to changes in the user cost of capital. Lokshin and Mohnen (2009) use structural econometric modelling to assess the R&D tax credit in the Netherlands (WBSO). Their results indicate that for SMEs, each euro of the tax credit generates 0.2 of a euro in additional R&D. The figure is considerably lower in large firms, at around 0.07 of a euro.

R&D tax credits also produce outcomes other than increased R&D. These include: decisions to begin investing in R&D for the first time; changes in the productivity of R&D; changes in the wages of researchers; and social welfare improvements (taking into consideration all direct and indirect economic effects of the policy). However, these outcomes are rarely assessed in policy evaluations. Nevertheless, Mairesse and Lentile (2009) identify a number of evaluations that do consider the less-frequently assessed outcomes: in Norway, Hoegaland and Moen (2007) found that after the introduction of the R&D tax credit, firms that had not previously invested in R&D experienced a 7% increase in their probability of doing so. In Canada, Czarnitzki *et al* (2005) found evidence both for and against the proposition that R&D tax credits generate increased productivity or profitability. And in both Norway and the Netherlands, evaluations found a positive but small effect on the wages of research workers.

Very little research exists assessing the full costs and benefits of an R&D tax credit. An exception is a study of the scheme in Canada by Parsons and Phillips (2007). This evaluation sought to separately quantify and then combine five effects of policy. The study indicates a median increase in social welfare of 11 cents for each dollar of tax credit. However, the authors observe that variations in assumptions underlying the estimates of each policy effect can lead to net outcomes that are either positive or negative, leading to the conditional conclusion that the "tax credit likely generates positive net economic benefits under a reasonable range of assumptions."

Despite the large number of evaluations, comparability across studies is hazardous. In part this reflects variations in method. Problems of comparability also arise because of variation in the design of tax incentive schemes. This diversity of designs and goals underscores the importance of establishing the right evaluation metrics.

What Next

The OECD will continue to compile evidence and improve the international comparison of R&D tax schemes used by countries and assess factors that affect the overall cost (inclusion of sub-national R&D tax credits, differences in firm eligibility, etc.).

Work is also ongoing at the OECD to improve the international comparability of countries' R&D tax subsidy rates. A first measure, the B-index (present value of before-tax income needed to cover initial cost of R&D investment and to pay corporate income tax), has been used extensively to compare the generosity of the tax treatment of R&D in different countries (see Warda, 2001). A second measure, using the marginal effective tax rate (METR) framework, has been developed recently to refine the analysis. This METR framework takes into account the relative generosity (tax wedge) of the treatment of R&D assets compared to the treatment of other assets.

Finally, the OECD will continue working on analytical aspects by launching econometric work aiming at better assessing the impact of these support measures on firms' innovation activities and economic performance.

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Table A1: R&D tax incentives for G7 countries and other selected countries, 2009

Country/ MainTax Incentive	Description of Tax Incentive			Forgone tax revenue
	Rates	**Expense base**	**Deducted from/Ceiling**	
CANADA				
SR&ED Tax Credit (permanent program)	35% on volume for small Canadian-owned firms for first $3M R&D and 20% afterward. 20% for large firms.	Current and machinery and equipment (M&E)	Tax payable (benefit is taxable). No ceiling on R&D eligible (at lower rate).	2002: CAD 2.3B (0.21% GDP) 2008: CAD 3.2B (0.22% GDP)
	Other characteristics of the main tax incentive: Cash refund for small Canadian-owned firms. Carry-back (3 years) and carry-forward (20 years) available for all firms. Complete write-off of all current expenditures.			
	Recent significant changes: in 2008: Tax ceiling to benefit the 35% rate has been increased from $2M to $3M; enlarged SMEs definition to claim the 35% rate. Up to 10% of R&D carried out outside of Canada is now eligible for the credit.			
France				
Research tax credit (CIR) (permanent program with temporary measures)	30% on volume for first EUR 100 million and 5% afterward. The 30% rate is increased to 50% (1st year) and 40% (2nd year) for firms claiming tax credit for the first time.	Current cost and depreciation of all capital assets. Note that **salaries and social security contribution of new Ph.D researchers is counted twice** (for 24 months after hiring) to estimate eligible R&D .	Tax payable (benefit non-taxable). No ceiling on R&D eligible (at lower rate).	2004: EUR 547M (0.03% GDP) 2008: EUR 1.5B (0.08% GDP) **2009: EUR 5.6B (0.29% GDP)**
	Other characteristics of the main tax incentive: Complete write-off of all current expenditures.			
	Recent significant changes: 2008: Tax credit calculated on volume-base only (instead of the hybrid scheme). The tax ceiling to benefit the 35% increased from EUR16M to EUR100M. **2009:** immediate refund of all unused credit for all firms (instead of 3 years waiting period) as a temporary measure.			
GERMANY	No R&D tax incentives at the moment			EUR 0
	Recent significant changes: The new German Federal Government has agreed to introduce R&D tax credit before 2012.			
ITALY	10% on volume; 40% if carried out with universities or public research organisations.	Current cost and M&E	Tax payable. Ceiling of EUR 50M of eligible R&D.	n.a
R&D tax credit	**Other characteristics of the main tax incentive:** No refund and no carry-over. Complete write-off of all current expenditures.			
	Recent significant changes: This scheme (10% credit) has been implemented in 2007.			
JAPAN				
R&D tax credit (permanent program with	12% on volume for SMEs and 8-10% for large firms (depending of their R&D intensity) and; 5% on incremental R&D (average R&D of the previous 3 years as baseline)	Current cost and M&E depreciation.	Tax payable. Maximum credit value of 30% of tax liability (20% on level plus 10% on increment).	2003: JPY 105B (0.02% GDP) 2007: JPY 629.9B (0.12% GDP)
	Other characteristics of the main tax incentive: No refund but carry forward for 1 year available only if R&D expenditures are higher than the prior year. For 2009 to 2010, carry-forward available until 2011. Alternative incremental-based scheme available for SMEs (20% credit applied on the difference between R&D expenditures and one-tenth of the average sales from the last 3 years)			
	Recent significant changes: 2009 (and for FY 2009 and 2010): maximum credit value increased from 30% to 40% and carry-forward possible until FY2012;			
UNITED KINGDOM				
R&D tax allowance (permanent program)	175% on volume for SMEs and 130% for large firms.	current cost.	Taxable income. No ceiling on R&D eligible.	2002: GBR 390M (0.04% GDP) 2008: GBR 820M (0.06% GDP)
	Other characteristics of the main tax incentive: Refund available for SMEs (refund of GBR 24 by GBR 100 of eligible R&D). Cary-forward (infinite) available for all firms. Complete write-off of all current expenditures			
	Recent significant changes: 2008: **rates increased** (from 125% to 130% (large firms); from 150% to 175% (SMEs)). **Enlarged definition of SMEs** (from 250 employees and GBR 50M of turnover to 500 employees and GBR 100M of turnover);			
UNITED STATES				
R&D tax credit (temporary program)	-20% incremental credit for eligible expenditures above a calculated base amount (regular research credit); or - Different rates apply for the alternative incremental research credit (AIRC) and the alternative simplified credit (ASIC). (firm must choose between the 3 schemes)	current cost.	Tax payable. (benefit is taxable). Ceiling of 50% of R&D eligible to the regular research credit rate of 20%. Maximum credit value of 25% of tax liability .	2005: USD 5.1B (0.17% GDP) 2008: USD 7.1B (0.18% GDP)
	Other characteristics of the main tax incentive: Refund not available but carry-forward for 20 years available for all firms. The calculated base amount (to estimate the amount of increment research expenses) is different for established firms and start-ups. Introduced an Energy tax credit (20% (volume based) on 100% expenditures contracted out to public research organization and some small firms). Complete write-off of all current expenditures.			
	Recent significant changes: 2009: **Increased the research credit for energy research** and allowed to claim **a refundable credit for certain unused research credits in lieu of depreciation allowance** for eligible qualified property			

Table A1: R&D tax incentives for G7 countries and other selected countries, 2009 (cont)

Country/ MainTax Incentive	Description of Tax Incentive			Forgone tax revenue
	Rates	**Expense base**	**Deducted from/Ceiling**	
Belgium				
Payroll withholding tax credit for R&D wages	75% reduction of R&D wage bill.	Research wages and social contributions (includes in-house resesarchers as well as those contracted-out from universities or some public research organizations)	Reduction of withholding tax on wages. No ceiling on eligible R&D wage bill.	2004: EUR 307M (0.11% GDP) 2008: EUR 460M (0.14% GDP)
R&D tax credit/allowance	allowance rate at 115.5% or conversely a tax credit of 5.9% (firms can choose between tax credit or allowances). At a corporate tax rate of 33.99, both schemes are cost-equivalent for the government.	Capital assets (could also include green technology (broader than FM R&D)	Tax income (R&D allowance) or Tax payable (tax credit)	
Deduction for patent income (broader than R&D incentives)	80% deduction (decrease the effective income tax rare to 6.8% level)	gross patent income (licences, royalties as well as patent remuneration embedded in the sales prices of goods and services)	Taxable income	
	Other characteristics of the main tax incentive: The payroll withhodling tax credit works like refund (through wage tax system), while unused credit (from the tax credit scheme) can be refunded after 5 years.			
	Recent significant changes: in 2009, **increased payroll withholding tax credit** rate (from 65% to 75%); in 2010, increased **allowance rate** (from 113.5% to 115%); **Simplified the shceme** by applying a single rate (75%) for all category of researchers (in-house researchers; those affiliated to eligibles universities or public research organisations; and those affiliated to young innovative companies (small firms with at least 15% of R&D intensity)). In 2007, introduction of the **patent income deduction** scheme.			
Netherland				
Payroll withholding tax credit for R&D wages (permanent program with temporary measures)	2009: 50% (64% for start-ups) reduction on the first EUR 150,000 of R&D wage bill; 18% afterward. 2010: 50% (64% for start-ups) reduction on the first EUR 220,000 of R&D wage bill; 18% afterward.	Research wages and social contributions	Reduction of withholding tax on wages. Ceiling of EUR 14M for eligible R&D wage bill.	2003: EUR 329M (0.07% GDP) 2008: EUR 445M (0.07% GDP) 2009: n.a.
	2009: For self-employed (with at least 500 hours on R&D), income tax deduction of EUR 11,806 (with additional EUR 5,904 for start-ups).		Tax payable	
Innovation income box (broader than R&D ncentives)	2010: decrease the effective income tax rate to 5% level	income from qualified R&D projects (broader than FM R&D)	Tax income	
	Other characteristics of the main tax incentive: The payroll withhodling tax credit works like refund (through wage tax system), while unused credit (from the innovation income box) can be carried-forward up to 5 years.			
	Recent significant changes: Rates and ceilings have been gradually increased in 2009 and 2010 (where rate was of 42% for the first EUR 110,000 of R&D wage costs and 14% for the remaining (up to a ceiling of EUR 8M) . In 2009, the **R&D definition was extended** to include development of services based on software. **Extended the eligible income** from patents to income from all eligible R&D projects with more generous conditions (from effective tax rate of 10% to 5% and removal of the maximun amount of eligible income)			
Brazil				
R&D tax allowances	160% on volume	Current cost	Taxable income.	n.a.
China				
R&D tax allowances	150% on volume	Current cost	Taxable income. No ceiling on R&D eligible.	n.a.
	Other tax incentive programs: General tax reduction (from 25% to 15% income tax rate) for R&D firms located in certain new technology zones or investing in key areas such as biotech, ICT and other high tech fields. This lower income tax rate is also **available to high-technology enterprises** and software development enterprises located in certain new technology zones.			
	Recent significant changes: Before 2008: The 150% R&D allowances was available only for R&D firms located to new technology zones, it has now been extended to all R&D firms working in key areas (biotech, ICT and other high tech fields).			
India				
R&D tax allowances	150% on volume	Current cost and Machinery and Equipment	Taxable income.	n.a.

Source: OECD NESTI R&D tax incentive questionnaire, 2010 and national administrative documents. Preliminary information.