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United States Senate Committee on Finance

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Tax Reform Options: Incentives for Innovation

The International Experience with R&D Tax Incentives

Chairman Baucus, Ranking Member Hatch, Members of the Committee: Thank you for inviting the OECD to appear today to testify on the international experience with tax incentives for R&D.

The OECD was founded 50 years ago to foster economic prosperity and development by supporting policy makers around the world with advice on "better policies for better lives." In that context, we collect the best possible data from countries on their investments in research and development (R&D) and innovation, and analyze the factors and policies that drive innovation and growth. Our testimony will primarily focus on the international experience with tax incentives for R&D investment.

The policy rationale for public support for R&D

Innovation is well known to be an important driver of economic growth and investments in R&D are among the factors that drive innovation. Many governments encourage business investment in R&D, often with the aim of correcting or alleviating two main market failures:

- **Difficulties by firms to fully appropriate the returns to their investment.** Returns on investments in R&D are difficult to appropriate by firms as some of the resulting knowledge will leak out or "spill over" to other firms, to the benefit of society. This leads firms to 'underinvest' in innovation. Policy instruments such as intellectual property rights, grants, and R&D tax incentives can help address this problem.
- **Difficulties in finding external finance, in particular for small start-up firms.** Innovation is a highly uncertain activity with large differences in the information available to inventors compared to investors. This may imply that external capital for innovation will only be available at a high cost.

In recent years, several governments have also started to use innovation policies to attract R&D activities of multinational corporations. The reason is that in a context of growing internationalization of R&D activities, government support might make a country a relatively more attractive location for R&D investments than its competitors. However, the available evidence suggests that government support is often only of minor importance for the decisions of multinationals to locate their R&D facilities in a particular country; other factors such as access to markets and to a country's knowledge base, or the availability of researchers tend to be more important.

Tax incentives for R&D are often considered to have some advantages over direct support for R&D, including procurement of R&D or grants. They are a market based tool that aims at reducing the marginal cost to firms of R&D activities, leaving firms to decide on which R&D projects to fund.

Tax incentives for R&D are expected to lead to an increase in private investment in R&D, which in turn should lead to an increase in innovation outcomes and ultimately to an increase in long run growth. The policy might also have indirect effects, *e.g.* on raising the wage level of researchers as more R&D increases demand for their skills, on the (re)location of R&D activities and on R&D start-up decisions.

Tax incentives, as other forms of direct funding, entail potential deadweight losses, since they might support R&D activities that would have taken place even in the absence of support. The design of the support schemes should therefore aim at minimizing these deadweight losses (OECD, 2006a).

This testimony will first look at the use of tax incentives for R&D investment in the OECD area and a few emerging economies and then examine the international evidence on the impacts of R&D tax incentives.

Use of R&D tax incentives across countries

R&D tax incentives are now widely used in OECD and non-OECD countries. Today, 26 out of the 34 OECD member countries offer R&D tax incentives to business. Amongst non-OECD countries, Brazil, China, India, the Russian Federation, Singapore and South Africa also provide tax incentives for R&D.

In Finland, Switzerland and Germany, all countries that currently do not provide tax incentives for R&D, there has been some debate about their future introduction. On the other hand, New Zealand and Mexico have withdrawn their R&D tax incentives schemes.

The existing R&D tax incentives schemes differ significantly across countries in terms of their generosity; their design and how they explicitly target different firms or specific areas.

Tax incentives for R&D include expenditure-based tax incentives – most importantly R&D tax credits, R&D tax allowances and payroll withholding tax credit for R&D wages – and income-based tax incentives – most importantly regimes that tax royalty income and other income from knowledge capital at a preferential rate.

Most OECD and emerging economies apply a system where an R&D tax credit is provided on the volume of R&D expenditure undertaken (*e.g.* Canada, Japan, United Kingdom, France, Norway, Brazil, China and India) while others target R&D tax credits to incremental R&D expenditure (*i.e.* expenditure in excess of some baseline amount). R&D tax allowances are available in Denmark, Czech Republic, Austria, Hungary, and the United Kingdom. Payroll withholding tax credit for R&D wages, which are deduction from payroll taxes and social security contributions, are also being used in Belgium, Hungary, the Netherlands and Spain.

Some countries target firms that conduct basic research; and many provide more generous incentives for small and medium-sized enterprises (SMEs). Some countries also differentiate according to the age of a firm. France, for example, has a scheme for young companies, while others encourage industry-science collaboration. The US recently introduced a more generous credit for R&D in energy. Finally, some countries have regimes that tax royalty income and other income from knowledge capital at a preferential rate (*e.g.* partial inclusion or reduced statutory tax rate) such as the patent/innovation box regimes in the Netherlands and Belgium, or a preferential regime for profits arising from patents, which was recently announced in the United Kingdom. Some of these differences are illustrated in Table 1 and discussed in Appendix 1. Appendix 2 reports details on the design of R&D tax incentives in the G7 countries and in other selected OECD countries in 2009.

Table 1. Details of differences in R&D tax incentives schemes across selected OECD countries, 2009

Design of the R&D tax incentive scheme	*Volume base R&D tax credit*	Australia, Canada, France, Norway, Brazil, China, India
	Incremental R&D tax credit	United States
	Hybrid system of a volume and an incremental credit	Japan, Korea, Portugal, Spain
	R&D tax allowance	Denmark, Czech Republic, Austria, Hungary, UK
Payroll withholding tax credit for R&D wages		Belgium, Hungary, Netherlands, Spain
More generous R&D tax incentives for SMEs		Canada, Australia, Japan, United Kingdom, Hungary, Korea, Norway
Targeting	*Special for energy*	United States
	Special for collaboration	Italy, Hungary, Japan, Norway
	Special for new claimants	France
	Special for young firms and start-ups	France, Netherlands, Korea
Ceilings on amounts that can be claimed		Italy, Japan, United States, Austria, Netherlands
Income based R&D tax incentives		Belgium, Netherlands, Spain
No R&D tax incentives		Estonia, Finland, Germany, Luxembourg, Mexico, New Zealand, Sweden, Switzerland

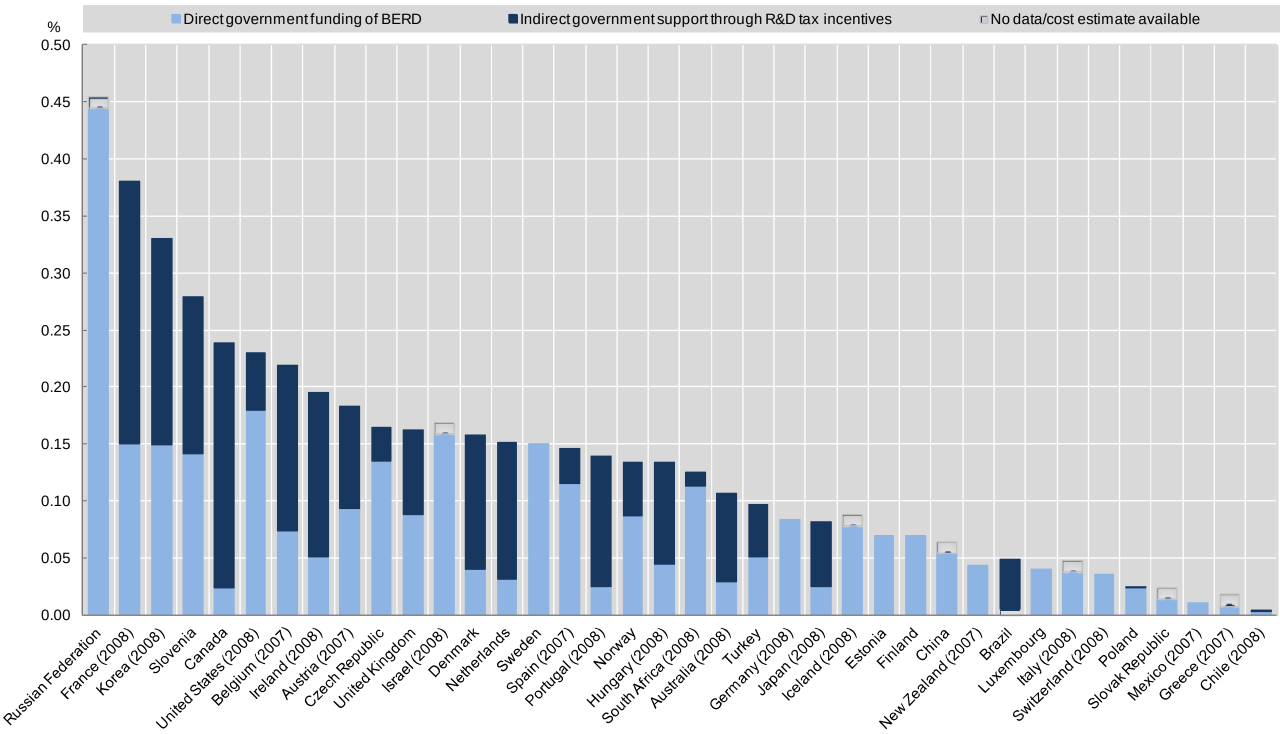
Note: R&D tax allowances are tax concessions up to a certain percentage of the R&D expenditure and can be used to offset taxable income; R&D tax credits reduce the actual amount of tax that must be paid.

Source: OECD (2010a).

Support for business R&D through the tax system is typically part of a broader set of policies to support investment in R&D, which also includes direct support, such as grants, loans or procurement contracts. Estimates of the costs of tax incentives and direct support for business R&D relative to GDP, based on an OECD survey, are shown in Figure 1. Significant cross-country differences exist in the policy mix: some OECD countries do not offer R&D tax incentives at all (*e.g.* Estonia, Finland, Germany, Luxembourg, Mexico, New Zealand, Sweden and Switzerland), others like the United States and Spain rely more on direct support and a final group of countries that includes Canada and Japan mainly relies on R&D tax incentives to support R&D investment. Some countries offer R&D tax incentives, but an estimate of their costs is not available (China, Greece, Iceland, Israel, Italy, the Slovak Republic and the Russian Federation).

Figure 1. Direct government funding of business R&D (BERD) and tax incentives for R&D, 2009

As a percentage of GDP



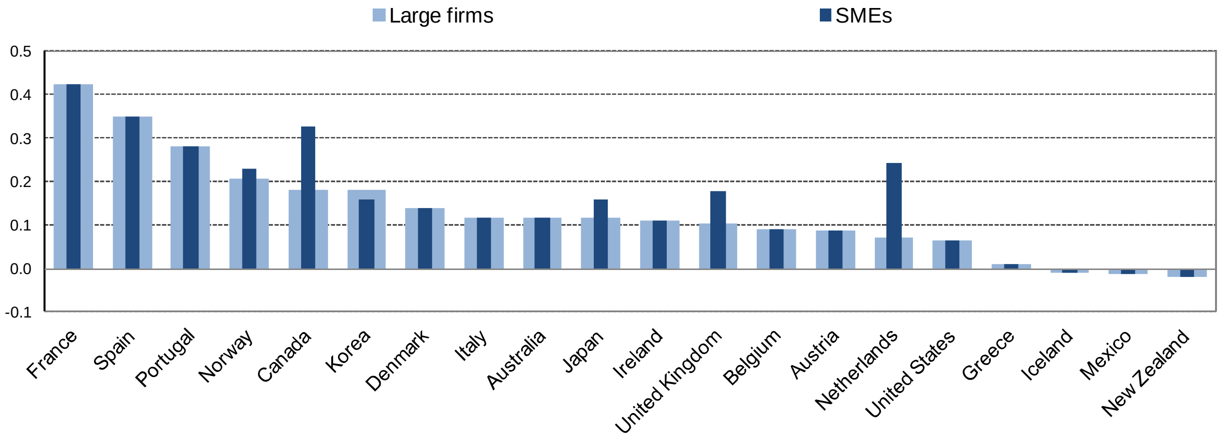
Statistical data for Israel: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms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

Source: OECD (2011), *OECD Science, Technology and Industry Scoreboard 2011*, based on OECD R&D tax incentives questionnaires, January 2010 and June 2011; and OECD, Main Science and Technology Indicators Database, June 2011.

The overall costs associated with the R&D tax incentives schemes depend both on the uptake of the scheme by firms and on the design of the tax incentives in a country. Significant differences exist in the generosity of R&D tax incentives across countries and within countries between small and large firms (Table 1 and Figure 2). Notable changes have occurred over the past few years (Figure 3).

The general trend among OECD countries has been to adjust their R&D tax incentives to make them more generous and simpler to use. The increasing generosity of the scheme is outlined in Figure 3 with the majority of countries offering a higher tax subsidy in 2008 relative to the one offered in 1999 both for large and small firms. Exceptions are Denmark, Mexico and Italy. In order to compare the generosity of tax incentives in a country, Figure 2 and Figure 3 compare “tax subsidy rates” across countries; this rate estimates the tax subsidy (if positive) or tax burden (if negative) on an additional dollar of R&D.

Figure 2. Tax treatment of R&D: Tax subsidy rate for USD 1 of R&D, large firms and SMEs, 2008

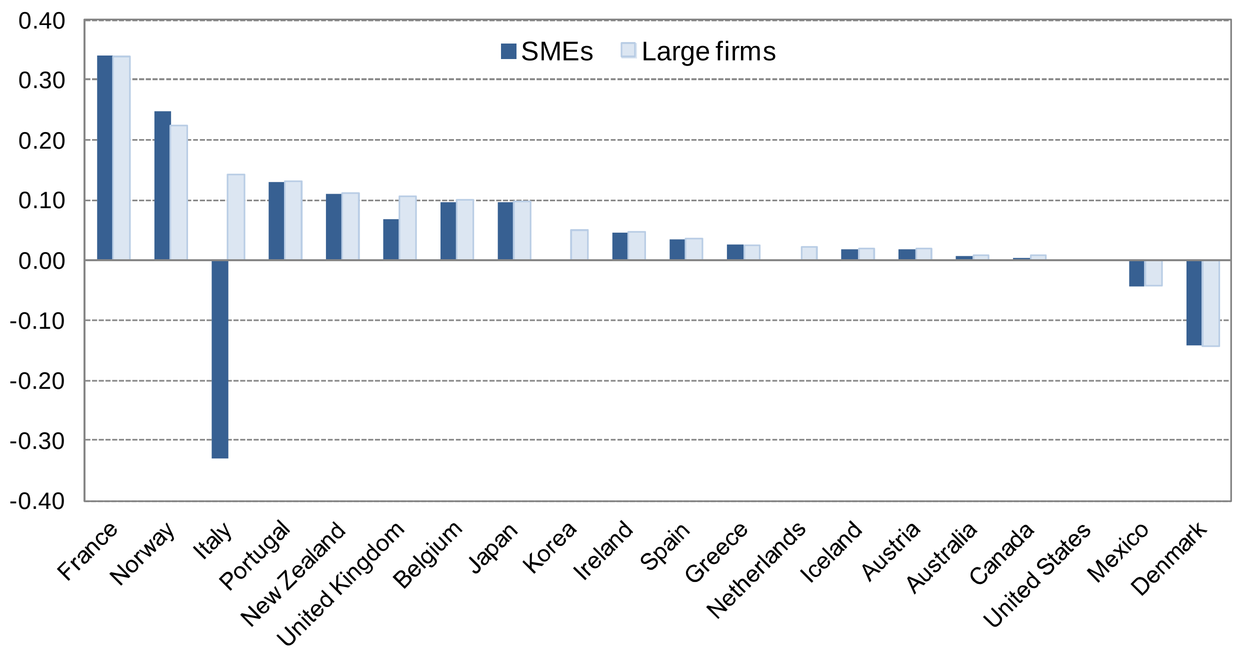


Note: The tax subsidy rate is calculated as 1 minus the B-index. The B-index measures the before-tax income needed to break even on one dollar of R&D outlays and is calculated for representative small and large corporations in a country. The tax subsidy rate is reported for a profitable firm able to claim tax credits/allowances. The subsidy rate calculations only include expenditure-based tax incentives and does not account for income-based tax incentives.

Source and further detail: *OECD Science, Technology and Industry Scoreboard 2009.*

Figure 3. Tax treatment of R&D: Change in the tax subsidy rate for USD 1 of R&D between 1999 and 2008

Large firms and SMEs



Note: see notes to Figure 2.

Source and further detail: *OECD Science, Technology and Industry Scoreboard 2009.*

The general trend has been to increase the availability, simplicity of use and generosity of R&D tax incentives. France (in 2008) and Australia (in 2010) replaced their relatively 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 their tax credit rates or the ceilings of eligible R&D in recent years. Canada introduced new administrative rules to facilitate access to its R&D tax credit program, improve consistency and predictability, and enhance the quality of the claims process. China extended its R&D tax credit to all firms working in key areas of technology (biotech, ICT, and other high tech fields) even if these firms are located outside the specially designated “new technology zones”.

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

Recently, R&D tax incentives have also been used to help firms cope with the financial crisis, although usually on a temporary basis. Japan and the Netherlands, for example, temporarily increased the ceilings of eligible R&D. Japan also allowed a longer carry-forward of unused R&D credits, recognizing that several firms would not be in position to claim the totality of their R&D tax credit because of their likely fall in profits following the economic downturn. In 2009, France offered to refund 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. Following the introduction of this scheme in 2009, firms were able to get a refund from their unused credits earned over the last three years. This measure is expected to have increased forgone tax revenue to USD 6 billion in 2009 (0.29% of GDP).

Effectiveness of R&D tax incentives

The effectiveness of R&D tax incentives is typically not only evaluated on how much R&D investment is spurred by the R&D tax incentive, but also on whether this increased expenditure translates into an increase in innovation output and to a long-run increase in economic growth and productivity. More generally, R&D tax incentives are expected to contribute to higher welfare in a country.

Evaluations of R&D tax incentives also often seek to understand the channels underlying a possible increase in the amount of R&D caused by the policy. For example, by how much do R&D tax incentives increase investment for firms that are already investing in R&D; how many firms that were not yet investing in R&D are induced to invest in R&D due to the tax incentives; and how does the presence of R&D tax incentives across countries affect the decision of firms to locate their R&D investment in different tax jurisdictions (*e.g.* countries, but also US federal states).

Evidence on the impact of R&D tax incentives on R&D investment

The effectiveness of R&D tax incentives on increasing R&D investment can be evaluated by estimating the private “R&D price elasticity”, which measures the percentage change in R&D investment resulting from tax relief for every percentage change in its after-tax price (also called the user cost of R&D), or the incrementality ratio, which measures the change in R&D investment per dollar of foregone tax revenue that is spent on R&D fiscal incentives.

Evidence from econometric estimates suggest that the responsiveness of investment in R&D to its price (measured as the R&D price elasticity) is greater in the long run than in the short run (Hall and van Reenen, 2000; Parsons and Phillips, 2007; Lokshin and Mohnen, 2009; Ientile and Mairesse, 2009 and references therein). This is likely due to the adjustment costs that firms have to incur when increasing their investment in R&D (*e.g.* the hiring of scientists and engineers).[1]

Evidence also suggests a different impact on small relative to large firms. Smaller firms seem to be more responsive to R&D tax incentives (*e.g.* Lokshin and Mohnen, 2007; Hægeland and Moen, 2007 and Baghana and Mohnen, 2009). This is consistent with small firms being more credit constrained than large firms, since they are less likely to have collateral.

The evidence also suggests that the incrementality ratio is affected by policy design with estimates for incremental R&D tax credits generally above 1, and below 1 for volume-based R&D tax credits (Parsons and Phillips, 2007 and; Lokshin and Mohnen, 2009).

The incremental credit is meant to target tax relief to R&D expenditure that would not have occurred in the absence of the credit. In tax planning, to maximize the amount of tax relief, incremental credits may have the unintended effect of distorting the timing of R&D expenditure (Hollander, Haurie and L'ecuyer, 1987 and Lemaire, 1996).

On the other hand, volume tax credits do not provide additional incentives to increase R&D investment from previous years since, conditional on their current level of R&D, firms will receive a tax credit regardless of their past investment.

An incremental scheme supports more firms with high R&D growth relative to a volume-based scheme which supports equally all R&D performing firms. A combination of volume and incremental tax incentives (hybrid schemes) maintains the level of R&D investment, and simultaneously rewards high growth in R&D investment (Criscuolo *et al.*, 2009).

The stability of the R&D tax incentive over time may also play a role: expectations that R&D incentives are permanent, proxied by their stability over time, seem to strengthen the impact of the policy on R&D investment (Guellec and van Pottelsberghe de la Potterie, 2003).

R&D tax incentives may also affect the overall level of R&D investment in a country by encouraging R&D by firms that have not previously invested in R&D. As noted above, R&D tax incentives schemes can provide special provisions for new claimants (*e.g.* France) or start-ups (*e.g.* France, Netherlands and Korea). At the same time, fiscal incentives might not be sufficient to spur a firm's decision to invest in R&D. However, the scarce empirical evidence on this issue suggests that the presence of an R&D tax incentive is associated with a higher probability of firms becoming R&D performers (Corchuelo, 2009 and Hægeland and Moen, 2007).

Evaluations of the impacts of R&D tax incentives on R&D expenditure are faced with several difficulties.[2]

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1. Using estimates across a broad range of studies between 1990-2006 in the US, Canada and other OECD countries Parsons and Phillips (2007) find an estimated median long-run elasticity of -1.09: a 10% reduction in the price of R&D would lead to a 10.9% increase in the long run. OECD work (2005) shows that a 1 standard deviation rise in the ratio to GDP of public subsidies for private R&D (worth 0.04 percentage points of GDP in the average country) is estimated to raise business R&D by ¼%. A 1 standard deviation increase in the generosity of the tax system for R&D (measured by the 'B-index', where [1 – B-index] is the tax subsidy per unit of R&D) is estimated to raise business R&D by 1¾%. The direct budgetary cost would be around 0.055 percentage points of GDP in the average country.

2. These include difficulties in measuring effective tax rates on R&D, data availability, and estimation problems (including endogeneity, time lags, as well as indirect effects on firms that did not receive the fiscal incentives).

Evidence on the impact of R&D tax incentives on innovation output

R&D tax incentives are expected to lead not only to higher R&D expenditure but also to higher innovative outcomes, proxied by more product and process innovations, higher sales from innovative products or more patents, and increased productivity in the long run. However, a measured increase in R&D expenditure might not necessarily translate into an increase in innovation output and therefore might not lead to a long-run increase in productivity growth. Mitigating factors include:

- Firms might "relabel" their outlays: following the introduction of a tax incentive firms might relabel some of their existing non R&D activities as R&D investment. This would lead to a spurious increase in measured R&D. The available evidence suggests that the incidence of this factor is relatively small, particularly in the long term (see for example Hall, 1995 for the US, and Mansfield, 1986 for Canada, the US and Sweden).
- The introduction of an R&D tax incentive would likely cause an increase in the wages of scientists and engineers, due to the inelastic supply of such workers, at least in the short run. Part of the potential benefits of the R&D tax incentives are therefore "eroded" by an increase in the cost of R&D, rather than inducing only an increase in the volume R&D performed.
- Finally, projects financed through R&D tax incentives might be those with the lowest marginal productivity. If there are decreasing marginal returns to R&D, the additional R&D induced by an R&D tax incentive might be less productive.

Thus far, the evidence on the impact of R&D tax incentives on innovation output remains scattered.

Evaluation of these impacts are difficult both because of imperfect measure of innovation output – *e.g.* patents and available measures of product and process innovations – and the variable time lags between R&D investments in various types of R&D (research versus development, projects, technology areas, etc.) and the resulting innovation output.

The available evidence suggests a positive effect of R&D tax incentives on innovative sales or the number of new products (*e.g.* Czarnitzki, Hanel and Rosa, 2005; de Jong and Verhoeven, 2007). However, innovations brought about by R&D tax incentives schemes might not have the same features as innovations funded privately by the firm or by government grants.

For example, the Norwegian R&D tax incentive scheme has been found to increase innovation outcomes (both product and process innovations) that are new to the firm but not innovations that are new to the market or innovations that are patented. This outcome may also be linked to particular features of the Norwegian scheme, however, *e.g.* most subsidized firms are SMEs, and the scheme includes a cap on the total level of support available. Both of these features might hamper the effectiveness of the policy in stimulating innovations with high social returns (Cappelen, Raknerud and Rybalka, 2008).

The assessment of the impact of R&D tax incentives on innovation outcomes is difficult. In particular, the benefits of the incentives might spillovers to firms that did not directly receive the incentives, including those that are not located within the boundary of a country, especially if these firms are linked to recipients on the value chains (as suppliers or customers), or within larger (multinational) groups or even because they are competitors. Therefore the benefits of R&D tax incentives might not be limited to the host country where R&D is carried out, but also in foreign countries where knowledge capital is employed. This cross-border aspect makes it difficult to assess innovation outcomes.

Evidence on the impact on productivity growth and welfare

Ultimately, tax incentives should also lead to higher productivity growth and increased welfare.

The evidence on the effectiveness of R&D tax incentives on productivity growth is scarce, but points to a positive correlation between R&D tax incentives and productivity (Brouwer *et al.*, 2005 and Lokshin and Mohnen, 2007).

Estimates of the effectiveness of R&D fiscal incentives on welfare require a full cost-benefit analysis. This must take into account the full direct and indirect effects of the policy, the implementation and compliance costs, and the impact of distortionary taxes needed to finance the incentives.

Although some studies have attempted to provide such estimates (Parsons and Phillips, 2007 and Lokshin and Mohnen, 2009), they depend heavily on the assumptions made. Keeping this caveat in mind, available cost-benefit analysis (Russo, 2004) and simulations suggest a positive net welfare gain from R&D tax incentives.

Evidence on the effect on wages

Fiscal incentives for R&D aim at increasing the volume of R&D investment. However, part of these incentives might lead to an increase in the wages of - or the cost to firms of hiring - R&D scientists and engineers. This might be due to inelastic supply of scientists or search costs for scientists and engineers, between firms and R&D workers and incentive schemes for R&D workers (Goolsbee, 1999). Studies that have looked at this issue remain scarce and are strongly constrained by the availability of suitable data. The available studies tend to find that the increase in R&D wages does not correspond to a change in quality of researchers (*e.g.* more experienced scientists; or a change in the mix of scientists towards the higher skilled), which would imply an improvement in the quality of the inputs into the innovation process (see for example Hægeland and Moen, 2007 and Lokshin and Mohnen, 2008).

Evidence on the impact of R&D tax incentives versus direct support (grants)

Governments face the question of which policy tools are best suited to incentivize innovation. R&D tax incentives are non-discretionary, and available to all (potential) R&D performers and therefore are industry, region and firm neutral, even if, as shown in Table 1, some countries provide preferential treatment to specific groups of firms or types of R&D investments.

Grants, on the other hand, can be directed to specific projects and missions that the government considers to have high social returns, *e.g.* in areas such as defence, health or energy.

The nature of the R&D projects funded through grants and those funded by R&D tax incentives is also likely to differ (David at al., 2000). Firms are likely to use R&D tax incentives to fund projects with expected (after-tax) positive private rate of return, not necessarily those that have the highest social returns but that are not funded by firms because they have low private returns. Thus, R&D tax incentives might not be the most efficient tool to address private R&D investment decisions that ignore knowledge spillovers. Direct R&D grants might be better suited to bridge the spillover gap between the private and social returns to innovation, since they target projects with the highest expected social returns. However, grants are subject to the discretion of government agencies that award such grants, not to the firms that undertake the R&D.

A study for Norway (Hægeland and Moen, 2007) provides a ranking of different policy tools according to their impact on R&D investment and the private returns to R&D. The study found that the policy with the largest impact on R&D investment were R&D tax incentives, followed by grants from Norway's research council, government agencies and the European Union. It also found that the returns to R&D projects financed by a firm's own funds are on average higher than those of projects financed by R&D tax incentives, which in turn are higher than those projects financed by grants. However, the study did not provide a ranking of policy tools according to their social returns. Furthermore, caution should be exercised in applying the results of Norway to other countries.

Evidence also suggests an additional effect of direct support relative to R&D tax incentives. For small and young firms in particular, direct support might help to certify the "good quality" of firms and projects, and reduce problems associated with information asymmetry (*e.g.* Lerner, 1999; Blanes and Busom, 2004). This in turn would lower the cost of capital of firms receiving grants when applying for external sources of financing. In addition, grants, loans and loan guarantees may provide more assistance to young and small firms, relative to tax incentives if the latter do not allow for carry-over provisions or cash refunds. Since young/small firms are typically in a loss position in early years of an R&D project, they have no taxable income and thus no tax payable that tax incentives can be deducted against.

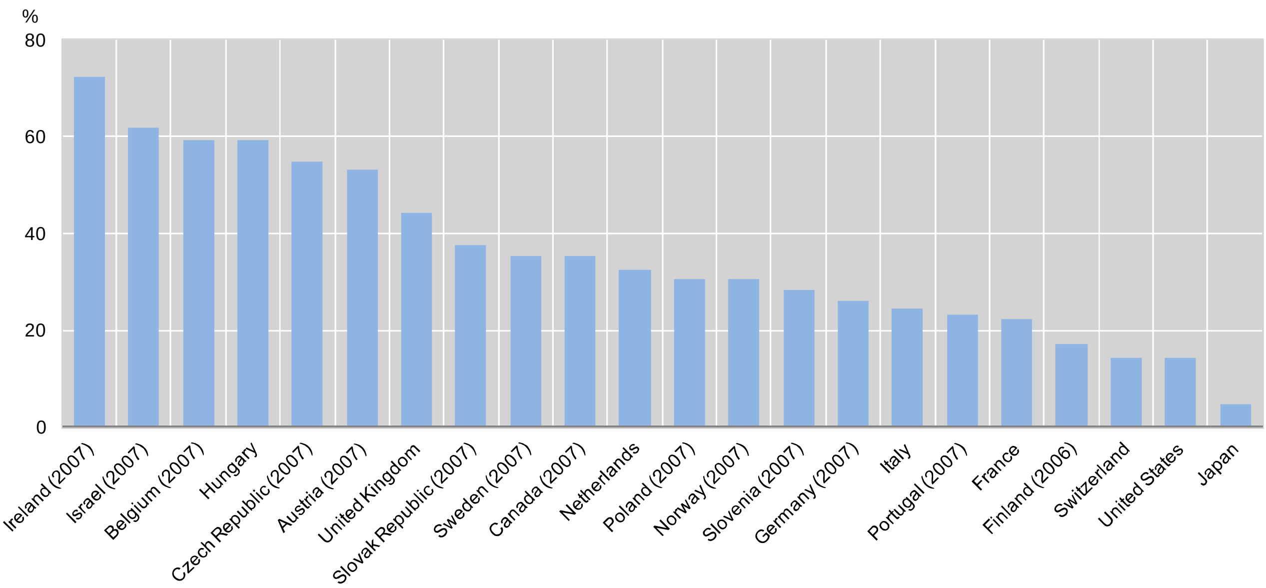
R&D fiscal incentives and the location of innovative activities

Multinational firms account for a substantial share of R&D expenditure: in small open economies, such as Ireland, Israel, Belgium, Hungary, the Czech Republic and Austria, the R&D expenditure of affiliates of foreign multinationals accounts for more than half of total business R&D expenditure of all resident firms (Figure 4). National and local governments may use R&D tax incentives to attract multinationals' R&D investment. Some recent support programs explicitly include a focus on increasing the "attractiveness" of a country as a host location for R&D (*e.g.* in France).

The effects of R&D tax incentives on the location choice of R&D investment by MNEs remains a relatively unexplored issue.

Figure 4. R&D expenditures of foreign-controlled affiliates, 2008

as a percentage of business expenditure on R&D



Source: *OECD Science, Technology and Industry Scoreboard 2011*, based on OECD, AFA, FATS and AMNE Databases, May 2011.

Estimation of the impact of R&D tax incentives on the location of R&D investment are particularly difficult due to the scarcity of relevant data and the complex interaction of tax regimes across and within countries. A limited number of studies have analyzed this issue across countries (Hines, 1994; Hines and Jaffe, 2000; Bloom and Griffith, 2001 and Billings, 2003) or across states within countries (Wilson, 2008).

The available evidence suggests that the volume of R&D conducted in one country responds to changes in the cost of doing R&D in competitor countries (Bloom and Griffith, 2001). A similar conclusion was reached in a study within the US of R&D tax (incentives) competition across states (Wilson, 2008). This study found that the availability of R&D fiscal incentives in (neighbouring) US states is associated with the relocation of firms conducting R&D towards states with more generous R&D fiscal incentives, leading to an estimated net effect of these state-level incentives at the national level that is near to zero. Analysis of data on the R&D activities of multinational enterprises (MNEs) suggests that the growth rate of R&D by affiliates of resident MNEs is higher in countries providing R&D tax incentives than in those countries that do not offer such schemes (Billings, 2003), again suggesting that the MNE's decisions of conducting R&D in a particular country is correlated with the availability of tax incentives in that country and other potential destination countries.

However, evidence from surveys on multinational enterprises and econometric evidence suggest that even if tax incentives might affect the location of MNEs R&D investment, there are other factors that are more important. These factors include access to local science and technology, proximity to university frontier research and centres of excellence, availability of a skilled workforce, engineers and scientists, and strong intellectual property rights. These factors are particularly important for MNEs laboratories aimed at doing basic research (the "R" in R&D) (*e.g.* Thursby and Thursby, 2006; Belderbos *et al.* 2007; Alcacer and Chung, 2007; Branstetter *et al.*, 2006). Other factors, such as access to local markets and proximity to other corporate activities, such as production sites, and proximity to local customers influence the location of R&D labs engaged in development (the "D" in R&D) and in the transfer and commercialization of knowledge from the MNE R&D centre to the host country lab (Defever, 2006 and von Zedwitz and Gassman, 2001).

Location-based incentives (including R&D tax incentives) seem to play some role especially in the final stages of the decision making process, particularly when different countries are 'bidding' for the same investment (OECD, 2011a) What typically happens is that MNEs first draw up a short list of preferred sites on the basis of economic fundamentals, while in a later stage they consider and/or actually seek for government support in the shortlisted locations. It is clear that when having two or more relatively similar location alternatives (especially when such competition occurs within a region), government incentives can tilt the investment decision. At the same time, the existence of such incentives, often provided in a selective and non-transparent way, creates scope for rent-seeking behaviour.

Tax incentives as part of a broader innovation strategy

While OECD work (Jaumotte and Pain, 2005a and 2005b) has found evidence that tax incentives are effective in increasing R&D expenditures, tax incentives are typically part of a broader strategy to foster innovation. Elements of such a strategy include a strong business environment for innovation and entrepreneurship, investment in education and research, a well-functioning system of intellectual property rights, etc.

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Appendix 1. The design of tax incentives

Most OECD countries provide fiscal incentives through tax credits or enhanced allowances. Tax credits allow a direct deduction from the tax payable, while enhanced allowances provide an additional tax deduction (above the normal deduction rate of 100% for wages, and standard depreciation for capital costs) from corporate taxable income. The main difference between the two mechanisms is that the former directly reduces the tax liability, while in the latter approach the reduction in tax liability depends on corporate income tax rates. 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. Firstly, the tax liability position of targeted firms needs to be considered: at the extreme, firms that are not tax liable would not benefit from tax allowances nor tax credits in the absence of carry forward/backward rules or refundable credits. This would make unincorporated businesses undertaking R&D ineligible. Secondly, the general fiscal environment affects the generosity of some fiscal measures - the effective value of an R&D tax allowance is lower the lower the rate of corporate income tax - while the value of others, such as R&D tax credits, are independent of the corporate income tax.

R&D tax credits and allowances are often targeted at corporations and are therefore deducted against corporate income tax. Some countries do not provide refunds for credits that cannot be claimed where the firm is in a loss making position (*e.g.* as firms often are in their early stage). This is an important distinction between tax credits/allowances and cash subsidies.

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

The target group. Governments can make fiscal support for R&D accessible to all companies, or target support (possibly more generous support) to particular 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 and/or greater flexibility for SMEs *e.g.* cash refunds or unused credits.

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

Labelling 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 lower the corporate tax base or corporate tax payable. This reduces employer social security contribution and payroll taxes and gives an incentive for hiring scientists and engineers to work on R&D projects,
- 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).

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 to all R&D outlays (volume) or a credit based on additional spending on R&D (incremental) (see Box 1).

The most common scheme used by countries is a volume-based tax incentive with current R&D (*e.g.* United Kingdom (Figure 5a), Czech Republic, Norway, Denmark) or current and machinery and equipment (M&E) R&D as eligible expenditures (*e.g.* Canada (Figure 5b), 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 5a and 5b, 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 per unit thereafter.[3]

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 use a hybrid scheme considering both volume and incremental R&D as eligible expenditures (*e.g.* Portugal (Figure 6a), Japan and Spain). Alternatively, moving away from the schemes set out in Figure 5, some countries consider only R&D personnel wages as eligible R&D and deductions would in such case apply to the "corporate wage and social contribution" tax instead of the general corporate income tax (*e.g.* Belgium and Netherlands, see Figure 6b).

Figure 5. Examples of simple R&D tax incentive schemes by type of spending

Current R&D; capital R&D, *i.e.* machinery and equipment – M&E – and building

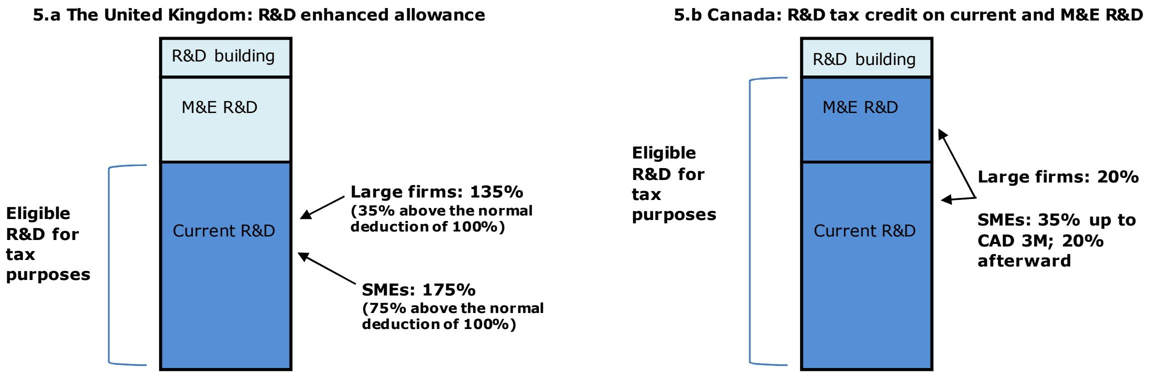
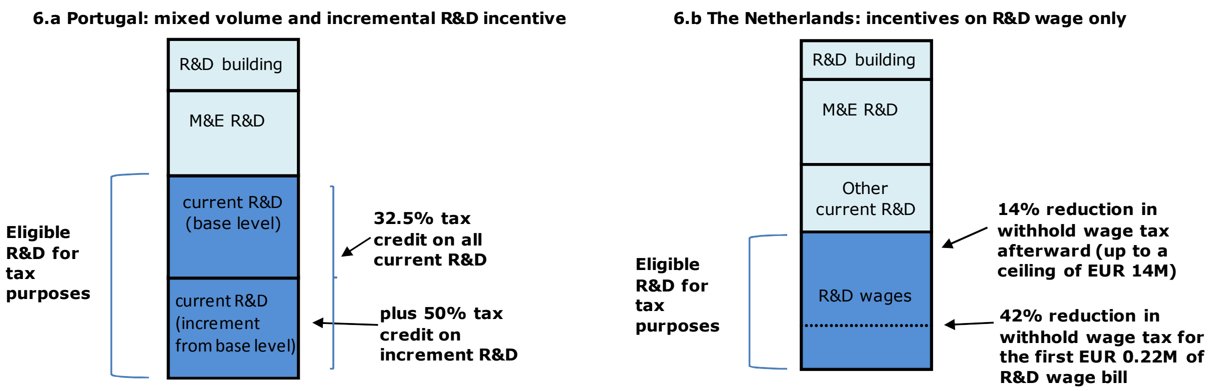


Figure 6. Example of main deviations from simple R&D tax incentive schemes



3. 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.

Incremental vs. level-based schemes

- Incremental tax credits are more efficient for the government (they minimise the amount of "subsidized" R&D that would have been undertaken even in the absence of support, *i.e.* the level of deadweight loss), 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.
- Generally, most countries are moving to volume-based incentives.

Using a volume-based scheme has the advantage, for firms claiming incentives, of being simple and generous. However, this approach might be costly as it also subsidises R&D expenditure that would have been performed in the absence of R&D tax incentives.

The main advantage of using only incremental R&D as the eligible base is that it ensures that the cost to the government is incurred only where there is an increase in R&D. As such, it minimises the amount of "subsidized" R&D that would have been undertaken even in the absence of support. However, incremental-based schemes are more complex to design and to implement. Complex systems can significantly increase the cost of applying the tax credit and even deter some firms from applying if application costs are, or are perceived to be, higher than the uncertain benefits.

Tax credit for R&D wages

- A tax credit for R&D wages 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 wage costs whereas tax credits for current and capital R&D expenditures generally subsidise later-stage capital expenditures.
- It may be easier to control and may be less influenced by company accounting than company profits.
- It is relatively well suited for small firms that might not be in a profit making position and therefore would not benefit from tax credits or allowances.
- It can help build/retain human talent.

A recent trend in OECD countries has been to target R&D tax incentives to offset employer social security contributions and other taxes on labour income. The rationale is that by reducing social charges, companies can reduce their 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, although this ratio can vary depending on the nature of the R&D activity. 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, since the supply of scientists and engineers workers cannot increase quickly and therefore cannot respond to an increase in demand in the short run (*i.e.* it is "inelastic"), an increase in R&D investment due to the tax incentive would lead to higher wages for R&D workers (given the scarce supply relative to demand), instead of a higher quantity of inventive activity. 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.

Finally, the choice between the level or incremental eligible expenditures can also apply to R&D incentives applying to wage bills. Governments can choose between providing tax incentives for the employment of all R&D workers or only for newly hired researchers[4]. The trade-off between simplifying the scheme and minimizing the amount of "subsidized" R&D would still need to be taken into account.

4. This scheme, however, might have the unintended effect of giving firms the incentives of artificially increasing churning amongst R&D staff where previously hired researchers are let go and either rehired, or replaced with less experienced staff.

Temporary vs. permanent programs

The efficiency of a tax incentive program can also be affected by whether it is a temporary or a permanent program, since the temporary nature of a scheme increases the uncertainty of the incentives for firms. 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 R&D projects might be delayed, advanced or performed abroad if the planning horizon for those projects extends beyond the scheduled end of the tax incentive program. However, not all R&D firms would be affected in the same way by a temporary program. 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).

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

In fact, some countries 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 providing 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, 40 states currently have some type of R&D tax incentive, up from 35 in 1996 (Miller and Richard, 2010).

The presence of sub-national R&D tax incentive programs increases the overall generosity of the tax relief provided to firms. While these additional tax reliefs provided by sub-national governments are believed to increase R&D performed by local firms, the overall effect on national R&D investment is not clear, in particular as increases in one region might coincide with decreases in neighbouring regions.

Some countries have also 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 to the acquisition of intangible assets such as patents, licences, know-how and design (*e.g.* Spain, Poland). China also applies 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).

More details on some of the characteristics of R&D tax incentive schemes in selected OECD countries and in some non-OECD countries are included in Appendix 2.

Appendix 2. R&D tax incentives for G7 countries and other selected countries, 2009

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

Country/ MainTax Incentive	**Description of Tax Incentive: Rates**	**Expense base**	**Deducted from/Ceiling**	**Forgone tax revenue**
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 cost and machinery and equipment (M&E)	Tax payable (benefit is taxable). No ceiling on R&D eligible.	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 and capital (other than buildings) R&D 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 temporary measures)	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. 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.	No ceiling but firms must spend at least GBR 10K to be eligible for the credit	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). Carry-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			

R&D tax incentives for G7 countries and other selected countries, 2009 *(cont'd)*

Country/ MainTax Incentive	Description of Tax Incentive			Forgone tax revenue
	Rates	**Expense base**	**Deducted from/Ceiling**	
AUSTRALIA				
R&D Tax Credit (2010) (program to be reviewed in 2014)	45% on volume for small firms and 40% for other firms.	Current and machinery and equipment (M&E)	Tax payable. No ceiling but firms must spend at least AUD20K to be eligible for the credit.	2004: AUD 485M (0.04% GDP) 2008: AUD 820M (0.07% GDP) 2010: n.a.
	Other characteristics of the main tax incentive: Small firms (aggregate turnover of less than AUD 20M) can claim refund instead of carry-forward. No ceiling on R&D expenditure amount refunded. Carry-over available for all firms. Complete write-off of all current expenditures.			
	Recent significant changes: 2010: Australia moved from a mixed "volume and incremental-based" R&D tax allowance scheme (125% on level + 175% on increment) to a simpler volume-based tax credit (described above); Enlarged small firm definition (from less than AUD 5M of turnover to less than AUD 20M), and removal of the ceiling (AUD 2M of R&D) eligible for refundable credit.			
AUSTRIA				
R&D Tax Credit (Research premium) R&D allowance (not included in forgone tax revenue)	8% on volume or; 125% on volume (firm can choose between the tax credit and research premium.)	All R&D as covered by Frascati (currents + M&E + Capital)	Tax income (R&D allowance) or Tax payable (tax credit). Ceiling of EUR 100K for contracted-R&D, no celing on in-house R&D	2005: EUR 121M (0.04% GDP) 2008: EUR 340M (0.12% GDP)
	Other characteristics of the main tax incentive: Refund available for all firms within the year the expenses are incurred. Another scheme (R&D allowance for economically viable inventions) is available for activities resulting in a patents but eligible expenditures are narrowingly defined (narrower than FM R&D).			
	Recent significant changes: While firms can choose between a tax credit and a tax allowance, the decrease in the corporate income tax rate in the previous years (without changing the R&D allowance rate) makes the R&D tax credit financially more interesting than the R&D allowance.			
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 and 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 114.5% or conversely a tax credit of 5%. 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. Complete write-off of all current expenditures.			
	Recent significant changes: Increased payroll withholding tax credit rate (from 65% to 75% in 2009) and allowance rate (from 114.5.to 115.5% in 2010). 2009: Simplified the scheme 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)). 2007: introduction of the patent income deduction scheme.			
CZECH REPUBLIC				
R&D tax allowance	200% on volume	current cost.	Taxable income. No ceiling on R&D eligible.	2005: CZK 861M (0.03% GDP) 2007: CZK 1.12B (0.03% GDP)
	Other characteristics of the main tax incentive: Refund not available but carry-forward for 3 years available for all firms.Complete write-off of current expenditures available.			
	Recent significant changes: No significant change in the last years.			
DENMARK				
R&D tax allowance	200% on volume	Current costs	Tax income. No ceiling applied to eligible R&D.	2008: DKK 1.15B (0.06% GDP)
	Other characteristics of the main tax incentive: Refund not available. Note that Denamrk also provides tax incentive for foreign R&D researchers and key staff through lower personnal wage tax for the three (25% instead of 31%) to five years (31% instead of 38.4%). Complete write-off of all current expenditures.			
	Recent significant changes: Removal of the 2007 pilot tax incentive scheme on collaborative R&D tax credit (150% allowance if R&D performed jointly with eligible university). 2010: Companies and individuals can get a deduction in the taxable income for donations given to non-for profit R&D organizations.			

R&D tax incentives for G7 countries and other selected countries, 2009 *(cont'd)*

Country/ MainTax Incentive	Description of Tax Incentive			Forgone tax revenue
	Rates	**Expense base**	**Deducted from/Ceiling**	
HUNGARY				
R&D tax credit on large projects (over HUF 100M)	Different rates by regions (25-50%) + size (additional 10-20%)	All R&D as covered by Frascati (currents + M&E + Capital)	Tax payable. Maximum credit value of 80% of tax liability (all incentives taken into account).	2004: EUR 19B (0.09% GDP) 2008: EUR 24B (0.09% GDP)
R&D wage tax credit	15% for small firms, 10% otherwise.	wage and contributions of R&D workers and software developers		
R&D allowance	300% if joint project with university or public research organisation	current costs (with a ceiling of HUF 50M)		
	Other characteristics of the main tax incentive: Refund not available but carry-forward up to 5 years. In addition to the above tax incentives, Hungary also provides a accelerated depreciation for R&D capital (50%) and allows a R&D reserve (50% of pre-tax profit retained and if the amount is used for R&D purpose in the next 6 years, the amount is tax exempted).			
	Recent significant changes: 2008: limit of the R&D reserve increased from 25% to 50%.			
IRELAND				
R&D tax credit	25% on incremental current R&D (with baseline set as R&D level in 2003); and 25% on volume for R&D building	current cost and machinery and equipment (incremental scheme) and R&D building (volume scheme).	Tax payable. No ceiling on eligible R&D.	2004: EUR 81M (0.05% GDP) 2007: EUR 165M (0.09% GDP)
	Other characteristics of the main tax incentive: Refunds available for all firms to be paid over a period of 33 months (starting in 2010). Carry-back (1 year) also available. Complete write-off of all current expenditures.			
	Recent significant changes: 2009: increased credit rate (from 20% to 25% on incremental R&D); unused credit can now be refunded (with 3 installments) over a period of 33 months. Increased credit rate of R&D building (from 20% to 25%) and allow a shorter period to claim the credit for R&D building (from 4 years on strait-line (25% per year) depreciation basis to full amount the year the expenditures is incurred (100%))			
KOREA				
R&HRD tax credit (permanent program since 2009)	25% volume-based tax credit for small firms; 3% to 6% for large firm (depending of firm R&D intensity) or; 50% on incremental R&D for small firms (with average R&D expenditures of the previous 4 years as baseline); 40% for large firms.	current costs	Tax payable. No ceiling on eligible R&D.	2008: KRW 1911B (0.19% GDP)
Facilities R&HRD tax credit (temporary pgm.)	10% on volume	M&E	Tax payable. No ceiling on eligible R&D.	
	Other characteristics of the main tax incentive: No refund available but carry-forward available (M&E) up to 5 years. Korea also provides tax incentive for foreign R&D researchers through exemption (100%) of personnal wage tax for the first 5 years (to be validated by Korea). Complete write-off of all current expenditures.			
	Recent significant changes: in 2008, increased credit rates (from 15% to 25% for small firms on current cost and from 7% to 10% for all firms on M&E); in 2010, new R&D tax incentives are expected for pre-designated strategic growth industries (30% for small firms, 20% for other firms) and original-sourcing-technology R&D (35% for small firms, 25% for other firms).			
NETHERLANDS				
Payroll withholding tax credit for R&D wages (permanent program with temporary measures)	50% (64% for start-ups) reduction on the first EUR 150,000 (EUR 220,000 in 2010) 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.
	For self-employed with at least 500 hours on R&D, income tax deduction of EUR 11,806 (EUR 12,031 in 2010). Additional EUR 5,904 (EUR 6,017 in 2010) 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. Projects must be pre-approved with detailed information on cost. Complete write-off of all current expenditures.			
	Recent significant changes: 2009 and 2010:Rates and ceilings have been gradually increased (2008 rates were 42% for the first EUR 110,000 of R&D wage costs and 14% for the remaining (up to a ceiling of EUR 8M). 2009: 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)			

R&D tax incentives for G7 countries and other selected countries, 2009 *(cont'd)*

Country/ MainTax Incentive	Description of Tax Incentive			Forgone tax revenue
	Rates	Expense base	Deducted from/Ceiling	
NORWAY				
R&D Tax credit (permanent program)	18% on volume for small firms and 20% of for other firms.	current costs	Tax payable. Ceiling of NOK 5.5M for in-house R&D and NOK 5.5M for contracted-out R&D to eligible public research organizations.	2003: NOK 1.3B (0.08% GDP) 2008: NOK 1B (0.07% GDP)
	Other characteristics of the main tax incentive: Refund available for all firms within the year the expenses are incurred. Note that project must be pre-approved by the government agency. Complete write-off of all current expenditures.			
	Recent significant changes: In 2009, ceilings were increased (from total NOK 8M (NOK 4M for both in-house and contracted R&D) to NOK 11M).			
POLAND				
Technology purchase tax credit (permanent program)	150% on volume-based (to check with Poland --they said tax credit)	M&E, patents and intangible assets. Note the eligible expenditures are not based on R&D (borader than Frascati R&D definition).	Tax income. No ceiling on eligible R&D.	2006: PLN 1.9M (0.00% GDP) 2008: PLN 1.5M (0.00% GDP)
	Other characteristics of the main tax incentive: Refund not available but carry-forward for 5 years available for all firms. Complete write-off of all current expenditures.			
	Recent significant changes: 2010: the government intents to introduce an additional R&D tax incentive (accelerated depreciation) for the enterepreneurs granted with the status of R&D Centre (firms with R&D intensity of at least 20% with turnover higher than PLN 5M (EUR 1.2M).			
PORTUGAL				
R&D tax credit (temporary program)	32.5% volume-based tax credit and 50% on incremental R&D (with average R&D expenditures of the previous 2 years as baseline)	current cost	Tax payable. Ceiling of EUR 1.5M for incremental R&D, and max total credit at 35% of tax liability.	2005: EUR 81M (0.05% GDP) 2009: EUR 142M (0.09% GDP)
	Other characteristics of the main tax incentive: Refund not available but carry-forward up to 15 years. Complete write-off of all current expenditures.			
	Recent significant changes: The former R&D tax incentive scheme establishment in 1997 was suspended in 2004 and 2005, restaured in 2006 (under severe budget countraints) and reinforced in 2009. 2009: increased rate (from 20% to 32%) and ceiling for eligible incremental R&D (from EUR 0.75M to EUR 1.5M)			
SPAIN				
R&D tax credit (permanent pgm. since 2009)	25% volume-based tax credit and 42% on incremental R&D (with average R&D expenditures of the previous 2 years as baseline) and:	current costs	Tax payable. Maximum credit value of 35% of tax liability.	2002: EUR 205M (0.02% GDP) 2008: EUR 262M (0.02% GDP)
	8% on volume	M&E		
Payroll withholding tax credit	17% reduction on R&D wage bill or 40% reduction of social contribution of newly hired researchers.	Research wages and social contributions for new researchers	Reduction of withholding tax on wages.	
Innovation Tax credit (not included in the forgone tax revenue)	8% on volume	advanced technology solutions and acquisition of intangibles such as patents, licences, know-how and	Tax payable. Ceiling of EUR 1M of eligible expenditures	
	Other characteristics of the main tax incentive: no refund available but carry-forward up to 5 years (R&D tax credit). Complete write-off of all current expenditures.			
	Recent significant changes: From 2007 to 2009, R&D tax credit rates decreased (they were at 50% incremental and 25% volume in 2007) to compensate for the overal decrease of the corporate income tax. Note the R&D tax credit were scheduled to be phased-out completely in 2011 but a new decree ensure continuity of the tax credit in 2009.			
Selected non-OECD countries				
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 questionnaire, January 2010; OECD (2010a); Warda (2009); and national sources.