Support for Private Research and Development in OECD Countries on the Rise but Increasingly Inefficient

By Heike Belitz

The majority of OECD member states promote companies' research and development (R&D) activities by providing project funding. Recently, in many countries, tax incentives have also begun to play an increasingly important role. The present study examines the level of R&D support in 18 OECD countries and explores how efficient the system of funding actually is. The main findings show that in the majority of the countries studied, the share of research and development expenditures funded by the government is on the increase. The system has become less efficient, however. Increasingly frequently, one euro of public funding fails to result in a corresponding increase in private R&D spending. In countries with high funding rates and substantial tax incentives (such as France and the UK), companies' spending relative to economic output has not increased any faster than in countries with considerably lower funding rates and no tax incentives at all (such as Germany).

In developed economies, research and development (R&D) is one of the key determinants of productivity performance, international competitiveness, and economic growth. For the most part, R&D is conducted by private companies—in Germany, as in many other countries, the private sector accounts for around two-thirds of total R&D investment. The government supports these companies' R&D activities by, for example, providing a research infrastructure comprising public education and research institutions as well as institutions for knowledge transfer, and by passing legislation to protect intellectual property rights. However, it also provides financial assistance for private R&D activities: on the one hand, directly, through grants and subsidies for selected R&D projects and through R&D contracts and, on the other hand, indirectly through tax breaks for R&D investment which is a mechanism that many countries have expanded considerably in recent years. The primary objective of incentives in this context is to reduce barriers to investment: for example, various forms of market failure can result in a situation where R&D development has a positive impact on innovation and growth from a macroeconomic perspective but where the companies actually conducting the research and development profit less.

Although, for purposes of international comparison, the OECD has already been providing national data on the level of direct R&D support, i.e., funding provided to subsidize R&D project costs and R&D contracts[1] for each OECD country for some time now, it has only just started to collate additional data on the level of tax incentives relative to GDP, most recently for 2013.[2] The resulting loss of tax revenue across all OECD countries is estimated at approx-

1 OECD Frascati Manual. See www.oecd.org/sti/inno/frascatimanualproposedstandardpracticeforsurveysonresearchandexperimentaldevelopment6thedition.htm.

2 OECD (2015): Science, Technology and Industry Scoreboard 2015. Paris. Even the OECD itself has described these data as still "experimental." One of the difficulties is that countries may estimate and present past tax revenue in different ways. See OECD (2011): Science, Technology and Industry Scoreboard 2011. Paris.

Table

Corporate R&D and its funding in selected OECD countries

	End year	Starting year	Share of funding in R&D	Share of tax incentives in total funding	Private R&D intensity (without funding)	Annual growth rate of R&D without funding (constant PPP)	Difference in funding rate of R&D	Difference in private R&D intensity	Change in the proportion of tax incentives
	End year					Period of time in total	End year compared to starting year		
			In percent				In percentage points		
Canada	2013	2006	26.1	84	0.63	−3.5	6.5	−0.26	−3
France	2013	2004	26.1	69	1.07	0.3	12.4	−0.06	52
Belgium	2012	2007	25.0	52	1.26	3.8	8.4	0.19	−14
Austria	2013	2006	18.4	32	1.71	3.5	4.6	0.27	2
Czech Republic	2013	2006	17.3	33	0.85	6.2	−3.1	0.27	13
UK	2013	2006	16.6	46	0.89	0.6	4.1	−0.00	7
Spain	2012	2006	15.6	19	0.57	1.0	−3.4	0.05	−5
Netherlands	2013	2007	15.6	87	0.92	1.9	4.7	0.12	8
USA	2012	2006	13.9	27	1.61	1.3	1.3	0.05	5
South Korea	2013	2007	12.9	57	2.84	8.9	0.6	0.83	7
Australia	2011	2006	12.4	85	1.08	2.8	4.5	0.01	33
Denmark	2013	2007	6.5	46	1.83	1.0	1.2	0.17	−7
Italy	2013	2006	6.5	1	0.67	3.4	−1.6	0.18	1
Sweden	2013	2005	6.1	0	2.14	0.2	1.6	−0.21	0
Japan	2013	2006	6.0	82	2.49	0.4	0.4	0.00	0
Germany	2013	2006	3.4	0	1.84	2.6	−1.2	0.19	0
Finland	2013	2006	3.2	14	2.20	−0.6	−0.5	−0.09	14
Schwitzerland	2012	2004	0.8	0	2.04	2.7	−0.7	0.09	0

Sources: OECD; calculations and estimates by DIW Berlin.

Germany's funding rate is one of the lowest in the OECD.

imately 50 billion US dollars for 2016[3]—around 6.5 percent of total business enterprise expenditure on R&D. Approximately the same sum was spent on direct support for R&D in 2013. Whereas the share of companies' R&D spending accounted for by direct support has remained approximately constant for the last ten years, in many countries, indirect support through tax policy has either been considerably expanded or, in some cases, only just introduced. Of the 34 OECD countries, 28 now have relevant legislation on this (see Box 1). Germany and Switzerland are among the few countries which do not provide tax incentives to promote research and development.

In an international comparison, countries with high funding rates ...

Among the OECD countries where data for both direct and indirect R&D support are available, France, Canada, and Belgium have the highest funding rates: in each case, the government funds around one-quarter of companies' R&D costs (see Table). In France, tax incentives account for a good two-thirds of all R&D funding, in Canada, the equivalent figure is as high as almost 84 percent, and in Belgium, it is still over half. In these three countries, the overall funding rate has increased dramatically in the last few years and the same applies to Austria, the Netherlands, Australia, and the UK. With the exception of Belgium and Canada where tax incentive levels were already very high, this form of support has been expanded particularly in countries where the overall funding rate increased most sharply. Along with Sweden, Switzerland, Finland, and Italy, Germany is one of the few countries which, up until 2013, either did not use tax incentives at all to promote R&D or only made marginal use of this mechanism. In these countries, the overall government funding rate is under seven percent and, with the exception of Sweden, this figure has even declined slightly in recent years.

3 OECD (2015): The generosity of R&D tax incentives. www.oecd.org/sti/rd-tax-incentive-indicators.htm.

Box 1

Tax incentives for R&D in different European countries

Tax incentives for research and development (R&D) are provided through income tax for natural persons and/or corporation tax.[1] They primarily consist of tax allowances that reduce the tax base, or tax credits that directly decrease the amount of tax payable. The tax credit may be offset against corporate taxes, or R&D personnel costs (income tax or social security payments). The subsidy is either based on volume, thus on the relevant R&D expenditure, or incremental, that is, related only to the growth of R&D expenditure compared to the previous period.

Tax incentives are not always granted to all companies but, for instance, restricted to companies of a particular size, specific age groups, regions, or fields of technology. The tax credit can be designed so that it would also be reimbursed in the event of companies operating at a loss ("negative tax"), in which case these companies would receive payments from the tax authorities.[2]

The attractiveness of R&D tax incentives for companies is heavily dependent on the specific tax system of that particular country, tax rates, and tax bases. Finally, how attractive the tax breaks are depends on how difficult it is to make use of them from an administrative perspective.

France

France switched from incremental to completely volume-based tax incentives in 2008. As part of the *Crédit d'Impôt Recherche* (CIR) program, the government reimburses 30 percent of R&D expenditure by means of an input tax deduction up to a total of 100 million euros and five percent of expenditure exceeding that amount.[3] In 2008, total government spending on R&D more than doubled compared to the previous year, increasing to 4.45 billion euros. Since 2010, annual expenditure has been over 5.2 billion euros and recently reached 5.5 billion euros. Young companies also receive support through a further tax measure called *Le régime de la jeune entreprise innovante* (J.E.I.).[4]

Netherlands

Since 1994, companies in the Netherlands have been able to reduce their R&D costs through the tax measure known as *Wet Bevordering Speur- en Ontwikkelingswerk* (WBSO). At present, 35 percent of the R&D personnel costs up to a total of 250,000 euros and 14 percent of any personnel costs over this amount are reimbursed. Another program, RDA, was introduced in 2012 to foster additional investment in R&D equipment. The Dutch government spent just over a billion euros on the two measures combined in 2013.

UK

Tax incentives for R&D have been gradually expanded in the UK since 2000, first for small and medium-sized enterprises (SMEs) and then, in 2002, for large companies, too. At present, the increased deductions amount to 230 percent for SMEs and 130 per-

1 See also Belitz, H., "Steuerliche Förderung von Forschung und Entwicklung – Erfahrungen aus dem Ausland," *DIW Roundup. Politik im Fokus*, no. 85 (Berlin: November 23, 2015).

2 OECD, "Tax Incentives for R&D and Innovation," *STI Outlook* (Paris: 2014): 161-173.

3 OECD, *Compendium of R&D Tax Incentives Schemes: OECD Countries and Selected Economies* (December 17, 2015), http://www.oecd.org/sti/rd-tax-stats.htm.

4 OECD, *Compendium.*

... do not necessarily have high private R&D intensity

The primary aim of government support for research and development is to increase business investment in this area—both in absolute terms and relative to GDP (private R&D intensity[4]). In 2013, private R&D intensity was even comparatively high in countries with relatively low funding rates—these included Switzerland, Finland, Germany, and Sweden (see Figure 1). Yet, in countries such as France, Canada, and Belgium which already had a high funding rate and at the same time attached particular significance to tax incentives, private R&D intensity was considerably lower. In the group of countries with moderate levels of R&D funding, South Korea stands out as having the highest private R&D intensity overall. In this group, the US and Austria also have relatively high R&D intensity but it is very low in countries such as the UK, the Netherlands, and Spain. When these countries are compared internationally, therefore, there is no dis-

4 Measured here as business enterprise expenditure on R&D minus government funding relative to GDP.

cent for large companies. In other words, the company's tax base is reduced by 230 pounds for 100 pounds sterling of allowable R&D expenditure for SMEs and by 130 pounds for large companies. In addition, the definition of SMEs has been changed so as to also include companies with up to 499 employees in this category.[5] Since 2013, large companies have been able to opt for an alternative tax reduction mechanism through which a new "above the line" R&D tax credit is granted, which is based directly on admissible R&D expenditure. This has improved the situation for companies operating at a loss. The tax credit amounts to ten percent of allowable R&D expenditure and is itself subject to taxation. The new system will become mandatory for large companies as of April 2016. Tax credits amounting to 1.37 billion pounds sterling were claimed in the 2012/2013 financial year.

Austria

The "research premium" was introduced in Austria in 2002 and initially amounted to only three percent of total research expenditure in a given financial year. It was gradually increased and has been 12 percent for large companies and SMEs since the beginning of 2016. The research premium is credited by the tax office and also benefits companies that have not reported any profits. It can also be claimed by companies commissioning external research worth a maximum of one million euros. The total amount paid out in research premiums in 2013 was 377 million euros (following just over 570 million in the previous year).

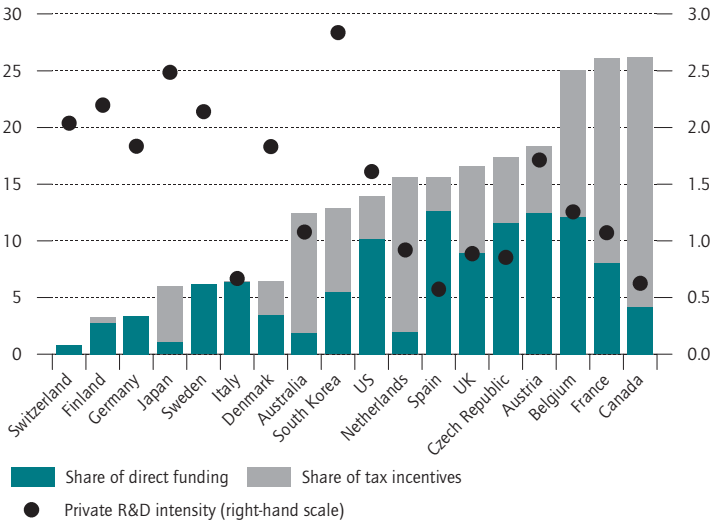
5 Guceri, I. (2015): Tax incentives and R&D: an evaluation of the 2002 UK reform using micro data. Working paper series (WP)15/11. Oxford University Centre for Business Taxation, August 2015.

cernible robust correlation between funding rate and private R&D intensity. Even increases in funding rates between 2006 and 2013 were not always accompanied by an increase in R&D intensity (see Figure 2).[5] Relatively large increases in funding rates in France, Belgium, and Canada coincided with levels of self-financed business R&D spending which, relative to GDP, had either stagnated or were even declining. Finally, the average annu-

5 The observation period differs slightly among the selected countries since data are not available for every year.

Figure 1

Funding rates and private R&D intensities of selected countries in 2013[1]
In percent



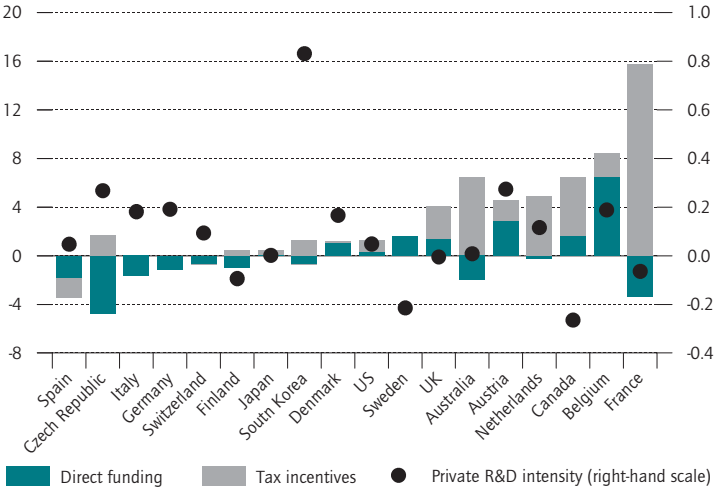
1 The relevant end year from the Table is shown.

Sources: OECD; calculations and estimates by DIW Berlin.

Private R&D intensity is relatively low in countries with high funding rates.

Figure 2

Changes in funding rates and in private R&D intensity in selected countries between 2006 and 2013[1]
In percentage points



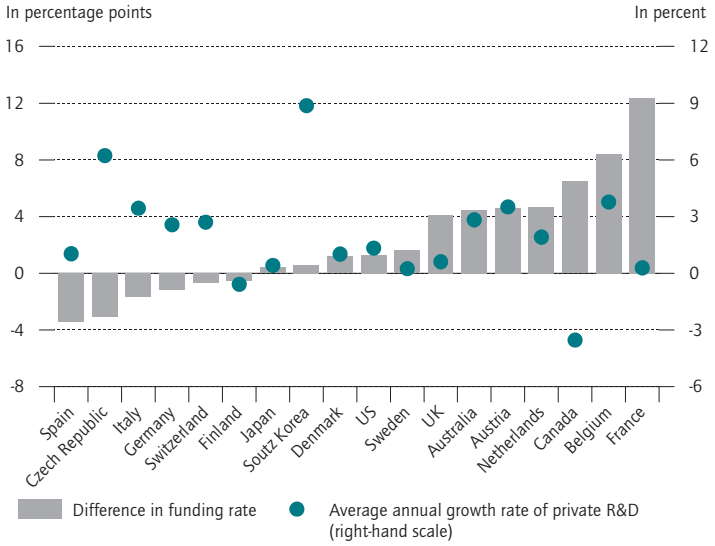
1 Changes in the relevant period from the Table are shown.

Sources: OECD; calculations and estimates by DIW Berlin.

Increases in funding rates were not always accompanied by an increase in R&D intensity.

Figure 3

Changes in funding rates and annual growth in companies' self-financed R&D expenditure between 2006 and 2013[1]



1 Changes in the relevant period from the Table are shown.

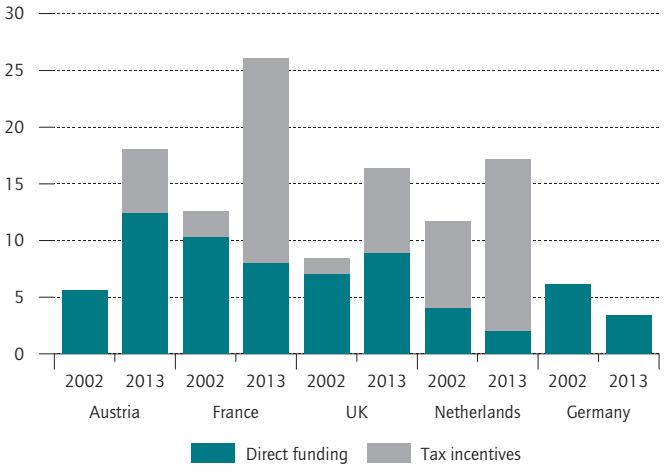
Sources: OECD; calculations and estimates by DIW Berlin.

The growth rates of private business R&D are independent of the changes in funding rates.

Figure 4

Shares of direct funding and tax incentives of total business enterprise expenditure on R&D in selected countries in 2002 and 2013

In percent



Sources: Statistik Austria; Verhoeven, van Stel, and Timmermans (2012), OECD Reviews of Innovation Policy Netherlands (2014); Ministère de l'Education nationale, de l'Enseignement supérieur et de la Recherche; HM Revenue and Customs; OECD; calculations by DIW Berlin.

France, the Netherlands, and Great Britain saw increases primarily in tax incentives for R&D.

al growth rates for business enterprise expenditure on R&D in countries experiencing strong growth in funding rates are actually no higher than in countries with stable or virtually unchanged funding rates (see Figure 3). Consequently, neither the rate of direct or indirect funding nor increases in this rate in the OECD countries studied has had a strong impact on the development of business research and development spending since the mid-2000s. Only in Austria did a relatively strong increase in the funding rate coincide with comparatively high growth in self-financed business R&D since 2006 and a substantial rise in private R&D intensity.[6]

Germany sees fall in share of private R&D investment funded by government ...

The following section will examine the efficiency of direct and indirect R&D support in Germany and in four other research-intensive European countries, France, the UK, the Netherlands, and Austria, in more detail. Unlike the data used above which were based on two points in time and a large group of countries, this part of the study uses annual data for the period from 2002 to 2013 for a small number of countries. The data on R&D tax incentives were taken from national data sources.[7] The annual data on the level of business enterprise expenditure on R&D and direct government support, i.e., grants or procurement, are provided by the OECD.[8] These data show the different trends in funding and R&D spending in the individual countries since 2002.

If we add up the shares of overall business R&D expenditure accounted for by direct and indirect funding, in 2002, France and the Netherlands had the highest funding rates, each with around 12 percent, followed by the UK with eight percent, and Germany and Austria with around six percent (see Figure 4). Whereas in the Netherlands, tax incentives already played a central role in 2002, the share accounted for by these incentives in France and the UK was still very low and Germany and Austria only provided direct support at this time.

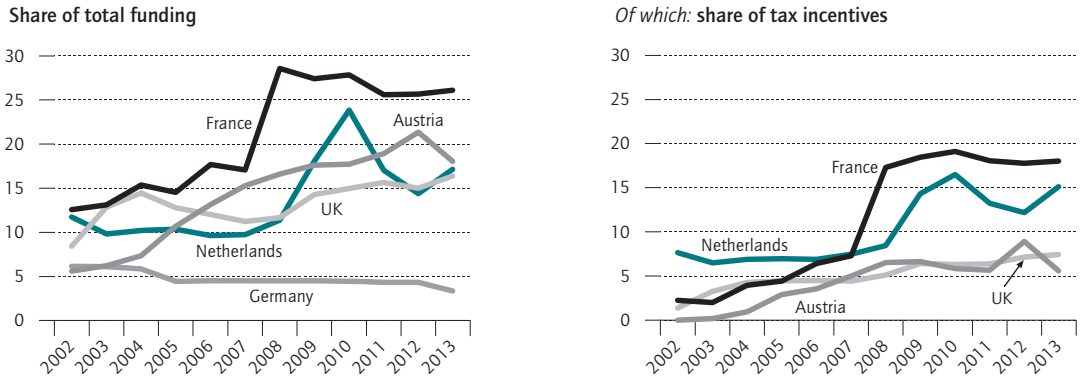
6 The evaluation of the "research premium" and also the entire funding system for companies in Austria, which was called for by the government, may explain why this is the case. This evaluation is still pending however. See, inter alia, Response from the Austrian Minister of Finance, Dr. Hans Jörg Schelling, to written parliamentary question no. 5063/J regarding the increase in the "research premium" of May 20, 2015 by the member of parliament Dipl.-Ing. Gerhard Deimek and colleagues (Vienna: July 16, 2015).

7 See Verhoeven, W. H. J. et al. (2014): Evaluatie WBSO 2006–2010. Zoetermeer, February; OECD (2014): Reviews of Innovation Policy Netherlands. Statistik Austria; HM Revenue and Customs, Ministère de l'Education nationale, de l'Enseignement supérieur et de la Recherche. In France, only expenditure for central tax measures for all companies, the CIR, was taken into consideration (see Box 1).

8 In Austria and the Netherlands, during the study period, data on R&D expenditure was not collected every year. For years with no original data on R&D expenditure and direct R&D support, the data were estimated based on linear interpolation.

Figure 5

Shares of direct funding and tax incentives of total business enterprise expenditure on R&D in selected countries between 2002 and 2013
In percent



Sources: Statistik Austria; Verhoeven, van Stel, Timmermans (2012), OECD Reviews of Innovation Policy Netherlands (2014); Ministère de l'Education nationale, de l'Enseignement supérieur et de la Recherche; HM Revenue and Customs; OECD; calculations by DIW Berlin.

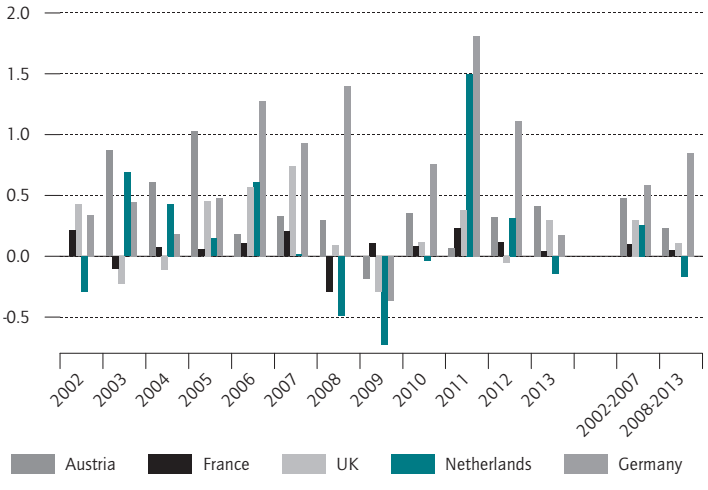
To address the consequences of the global economic crisis, France and the Netherlands relied primarily on the use of tax incentives for R&D.

Up until 2013, the share of business R&D expenditure which was funded by governments directly and indirectly increased in all the countries studied, with one exception. Germany was the only country where public subsidies fell to under four percent. France had the highest level of government funding with over 26 percent, followed by Austria with 18 percent, the Netherlands with 17 percent, and the UK with a good 16 percent. The discrepancy between government funding rates in Germany and in the other countries studied has therefore grown considerably since 2002 (see Figure 4). The expansion of tax incentives in France, Austria, and the UK (a mechanism which has not even been introduced in Germany) made a major contribution to this. In France, for example, as far back as 2013, 18 percent of business R&D expenditure was already funded through tax subsidies (see Box 1). However, the gap between Germany and Austria in terms of public funding did not only grow as a result of Austria introducing tax subsidies which already made up almost six percent of business R&D expenditure in 2013. An increase in direct funding that accounted for 12.5 percent of business R&D expenditure also contributed to the situation.

Whereas the share of R&D support contributed by public funding in Austria steadily increased from 2002 to 2013, the equivalent figure in France and the Netherlands rose sharply as both countries chose to address the consequences of the global financial and economic

Figure 6

Efficiency of R&D funding in selected countries between 2001 and 2013[1]



1 Austria excluding 2002, Netherlands excluding 2011.

Sources: Statistik Austria; Verhoeven, van Stel, Timmermans (2012), OECD Reviews of Innovation Policy Netherlands (2014); Ministère de l'Education nationale, de l'Enseignement supérieur et de la Recherche; HM Revenue and Customs; OECD; calculations by DIW Berlin.

In Germany, the efficiency of R&D funding is high.

Box 2

Firm-level studies on the efficiency of public funding

Numerous studies based on company data come to the conclusion that direct funding has a positive impact on companies' R&D expenditure. The possibility that private funds might be completely replaced by government funding can generally be ruled out.[1] However, only very few of the recent studies on companies in major EU countries conclude that R&D expenditure in companies (including public funding) grew more than the amount of the government subsidies received.[2] In other words, the government funding mostly replaced some of the funds for R&D provided by the companies themselves (partial crowding out), but the total amount of private and government funding for R&D is ultimately higher than it would have been without the direct funding.

For tax incentives, too, there are a number of empirical analyses from different countries that use corporate data. Although findings on the input additionality vary, most studies show that companies tend to respond to tax incentives by increasing their research expenditure. Studies using more sophisticated econometrics show that a loss in tax revenue amounting to one euro results in growth in R&D spending of less than one euro,[3] i.e., here, too, partial crowding out is normally observed. Recent meta-analyses attempt to verify and sum up the abundance of findings from econometric studies using statistical methods.[4] Although they establish a bias in the publications towards positive effects (publication bias), they ultimately confirm robust, albeit moderate, effects of R&D tax incentives on increasing private R&D spending. However, there are variations in the effects for different groups of companies, for instance, in low- and high-tech sectors, or for SMEs. Additionality is higher in countries with incremental public funding.[5] Moreover, recently published studies identify lower efficiency coefficients than older publications.[6]

1 See, for example, Aristei, D., Sterlacchini, A. and Venturini, F. (2015): The effects of public supports on business R&D: firm-level evidence across EU countries. MPRA Paper 64611, Munich; Correa, P., Andrés, L., and Borja-Vega, C. (2013): The Impact of Government Support on Firm R&D Investments. A Meta-Analysis. The World Bank, Entrepreneurship and Innovation Unit, July; Alonso-Borrego, C. et al. (2014): Assessing the Effect of Public Subsidies on Firm R&D Investment: A Survey. Journal of Economic Surveys, 28 (1), February, 36–67.

2 Aristei, Sterlacchini, and Venturini, Effects of public supports.

3 Straathof, B. et al. (2014): A study on R&D tax incentives. Working Paper no. 52-2014, a study conducted by a consortium led by Netherlands Bureau for Economic Policy Analysis CPB. The Hague: November 28.

4 Castellacci, F. and Lie, C. M. (2015): Do the effects of R&D tax credits vary across industries? A meta-regression analysis. Research Policy, 44 (4), 819–832; Gaillard-Ladinska, E., Non, M. and Straathof, S. (2015): More R&D with tax incentives? A meta-analysis. CPB Discussion Paper. CPB Netherlands Bureau for Economic Policy Analysis.

5 Castellacci and Lie, Effects of R&D.

6 Gaillard-Ladinska et al., R&D with tax incentives.

crisis by promoting R&D activities more proactively (see Figure 5).[9] Also in the UK, after a slight decline, the financial contribution of overall support increased again in 2008. Only in Germany has the funding rate been on a continuous downward trend since 2002, reaching 3.4 percent in 2013.

… but increase in efficiency of funding from macroeconomic perspective

From 2002 to 2013, private R&D intensity, i.e., the R&D expenditure funded by companies themselves, relative to GDP, experienced the strongest growth in Austria (0.41 percentage points). In Germany, private R&D intensity grew by 0.27 percentage points. The Netherlands recorded a smaller increase of 0.09 percentage points.[10] In the UK and France, private R&D intensity even declined slightly (by 0.13 percentage points in each case). If we examine the growth of business-funded R&D spending, a similar picture emerges: in Austria, this increased by 54 percent between 2002 and 2013, in Germany the increase was 31 percent during the same period, and in the Netherlands, the corresponding figure was 23 percent. In the UK and France, however, business-funded R&D expenditure remained at its 2002 level. Consequently, growth in companies' self-financed R&D spending was particularly low, both in absolute terms and relative to GDP, in countries where R&D tax incentives play a major and increasing role (see Figure 4).

9 In the Netherlands, the decline in the publicly funded share of overall funding in 2011 was largely the result of the break in the time series caused by the transition from a sample survey to a complete survey of companies' R&D expenditure. See OECD (2016): Main Science and Technology Indicators. http://stats.oecd.org/index.aspx?r=85052.

10 Here, the increase in the Netherlands is slightly overestimated due to the break in the time series in 2011.

Box 3

Measuring the efficiency of government funding from a macroeconomic perspective

Funding efficiency on the macroeconomic level can be measured by looking at the annual growth or decrease in the self-financed R&D expenditure of companies in a country (excluding public funding) relative to total government funding in a given year.[1] The funding efficiency (E) in year t is measured using the ratio between the change in R&D self-financed by companies (RS) compared to the previous year and the volume of the total direct (DF) and indirect (IF) funding in year t.

$$E_t = \frac{(RS_t - RS_{t-1})}{(DF_t + IF_t)}$$

In the above formula, the companies' self-financed R&D spending (RS) for a given year is calculated by subtracting the direct (DF) and indirect (IF) funding from their total internal R&D expenditure. An efficiency score of one or higher means that funding amounting to one euro results in an additional self-financed R&D expenditure of one or more than one euro in the same year. An efficiency factor between zero and one indicates that for each euro of funding provided, there is less than one euro of additional private R&D expenditure. A funding efficiency score of zero or below zero means that, despite public funding, the self-financed R&D expenditure has not increased or has even decreased (crowding out).[2]

1 A considerably more challenging approach is an estimation of the model to explain the annual changes in the self-financed R&D expenditure in companies where other factors are also taken into account in addition to public funding. This type of analysis was conducted for 17 OECD countries in the period between 1983 and 1996. See Guellec, D. and Van Pottelsberghe, B. (2003): The impact of public R&D expenditure on business R&D. Economics of Innovation and New Technologies, 12 (3), 225–244.

2 In the above-mentioned study by Guellec and Van Pottelsberghe, an additionality or, here, funding efficiency score of 0.7 for direct funding and 0.32 for indirect funding is estimated. Another finding is that an increase in one type of funding may have a negative impact on the other.

The efficiency of public spending on private R&D should primarily be measured on the basis of the direct effects of higher investment in business R&D (input additionality). Numerous studies have examined this at company level (see Box 2).

The following section examines the efficiency of funding at a macroeconomic level (see Box 3). For Germany, and the other four research-intensive countries, we were able to calculate funding efficiency, taking into account both direct and indirect funding for the period from 2002 to 2013.[11] In terms of how efficient the funding was, strong fluctuations can be observed both between the countries and over time (see Figure 6). Over three-quarters of the annual funding efficiency scores are higher than zero but of these, a good half are lower than 0.5. Generally, this means that for every "euro of funding," there is an increase in business-funded R&D spending of less than 50 euro cents. Only 22 percent of the efficiency scores are less than zero and these occur more frequently during the global financial crisis. The mean funding efficiency scores in the period preceding this crisis (2002 to 2007) are mainly higher than after it (2008 to 2013). This indicates declining funding efficiency coinciding with increased funding rates in the European countries compared in the present study. Germany is the exception since not only did this country achieve the highest funding efficiency from a macroeconomic perspective but also no decline was observed during the period following the crisis.

Conclusion

Using the most recent data available, the present study has not only examined the level of direct government support for research and development—for instance, in the form of project funding—but also indirect tax incentives. It was found that the overall funding rate in some OECD countries has increased dramatically in recent years and is now over ten percent in 11 out of 18 research-intensive countries studied. At the same time, tax incentives have become increasingly important in many places. There has been a decline in the efficiency of funding, however: in countries with high funding rates and a strong emphasis on tax incentives, private R&D intensity has not increased any faster than in countries with considerably lower funding rates and limited tax incentives—or no tax breaks at all. An increase in the funding rate, on the one hand, and changes in private R&D intensity and growth in business R&D expenditure in real terms, on the other hand, are not positively correlated in the OECD countries included in the study. Ger-

11 Due to data availability, the first funding efficiency score for Austria was calculated for 2003. The effecticiency score for the Netherlands for 2011 was excluded since the increase in R&D expenditure against the previous year was probably, for the most part, the result of the expansion of the R&D survey to include all companies conducting research from 2011 onward.

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