Assessing the policy mix of public support to business R & D

Michel Dumont

Federal Planning Bureau and Ghent University, Belgium

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ABSTRACT

This paper investigates whether the effectiveness of public support to business R & D increases or decreases when firms benefit from different support schemes. Data on the amount received by individual firms in the available support schemes in Belgium, over the period 2003–2011, are matched with other firm-level data. Estimations of this panel of firms permit to account for the time dimension and selection mechanism in public support as well as for observed and unobserved firm heterogeneity. Results on the impact of public support appear to depend on the econometric specification and estimation procedure that is considered. Robust results indicate that the effectiveness of R & D support decreases when firms benefit from different schemes at the same time, especially when firms combine subsidies with several tax benefits.

1. Introduction

Public financial support to business R & D increased in most OECD countries over the last decade. Government expenditures for R & D shifted from public towards private research, especially through the introduction, or the increase in the generosity, of tax incentives. Despite the apparent general popularity of tax benefits, there are still substantial differences in the extent to which countries opt between direct and indirect financial support to business R & D.[1] Whereas countries such as Belgium, Canada, France and the Netherlands increasingly favour tax incentives, countries such as Estonia, Germany, Mexico, Sweden and Switzerland only provide direct support. Even in times of austerity policies, the budgetary cost of government support to business R & D has risen in most OECD countries (OECD, 2016).

Fig. 1 shows total public support to business R & D as a percentage of GDP in 2014, or the latest year available, for OECD countries, with a breakdown between direct and indirect support (on the left-hand side Y-axis) and Gross domestic Expenditure on R & D (GERD), also as a percentage of GDP on the right-hand side Y-axis.

Although public support and GERD are positively correlated,[2] some of the most R & D intensive countries spend relatively little on public support and tend to rely mostly − or only − on direct support, such as Finland, Germany, Sweden and Switzerland.

The differences in the generosity and the policy mix of public support to business R & D suggest disagreement among policy-makers as to

the effectiveness of public support in general and individual policy instruments more specifically. Dimos and Pugh (2016) argue that there are indeed no definitive guidelines, theoretically or empirically, on the effectiveness of public subsidies in stimulating business R & D. Their meta-regression analysis of 52 micro-level studies indicates that subsidies do seem to stimulate R & D efforts of private firms but the effect is only limited. Two other recent meta-regression analyses, by Castellacci and Lie (2015) and Gaillard-Ladinska et al. (2015), also indicate a statistically significant but modest impact of tax incentives on R & D efforts of private firms. In their conclusions, Castellacci and Lie (2015) point out that most studies assess the impact of tax credits and subsidies separately and advocate that future studies should assess the effectiveness of the combination of policy instruments. Busom et al. (2015) and Guerzoni and Raiteri (2015) point out that most studies on public support to R & D assess the impact of individual support schemes although in most countries firms can receive subsidies as well as tax benefits.

This paper assesses the effectiveness of public support to business R & D in Belgium by considering jointly all available policy instruments. As shown in Fig. 1, Belgium is by now the most generous OECD country in terms of public support to business R & D. In 2012, public support in Belgium was evenly split between direct and indirect support. Moreover, indirect support to business R & D in Belgium also consists in different types of tax benefits.

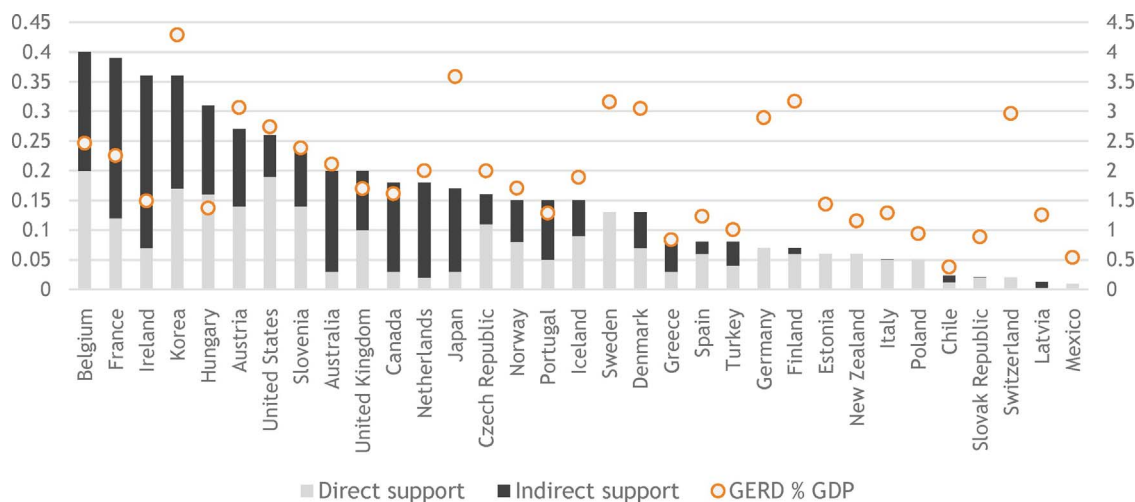The number of studies that have considered the combination of

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Fig. 1. Direct and indirect public support to business R & D and GERD in% GDP in 2014.

Note: Public support in% of GDP on left-hand side Y-axis and GERD in% GDP on right-hand side Y-axis. Only OECD countries with data available for all variables are considered. Direct public support: grants, loans and public procurement, indirect public support: tax incentives.

Source: OECD, R & D Tax Incentive Indicators, http://oe.cd/rdtax and Main Science and Technology Indicators, www.oecd.org/sti/msti.htm, July 2016. All observations apply to 2014 or the latest available year (see source for details).

different R & D support schemes is rather limited. In contrast with most of these studies, this paper considers a continuous variable for public support instead of a binary or categorical variable and uses panel estimation to account for the time dimension of R & D expenditures and support as well as unobserved firm heterogeneity whereas the potential selection bias in public support is acknowledged through the estimation of a selection model.

The paper is organized as follows. Section 2 discusses the role of the policy mix of public support to business R & D. Section 3 proposes the econometric procedure to assess the additionality of individual policy instruments and their combination. The data used for estimation are discussed in section 4. Estimation results are reported in Section 5 and Section 6 summarizes and concludes.

2. The policy mix of public support to business R & D[3]

The diversity in the relative use of direct and indirect support but also in the mix of policy instruments used by countries to support R & D performed by firms is indicative of the lack of consensus as to which instruments are most effective in raising business R & D. As mentioned in the introduction, recent meta-regression analyses confirm that subsidies and tax incentives appear to stimulate R & D efforts by private firms but only to a limited extent. Whereas recent studies that assess the effectiveness of public support tend to acknowledge unobserved firm heterogeneity and selection mechanisms in public support, some issues have clearly not received sufficient attention. As mentioned in the introduction, Busom et al. (2015) and Guerzoni and Raiteri (2015) recently argued that the estimation of single policy instruments, without controlling for other available instruments, may result in a hidden treatment bias.

Guellec and van Pottelsberghe de La Potterie (2003) provide evidence, for 17 OECD countries over the period 1981–1996, that direct funding as well as tax incentives are effective in increasing business-financed R & D but that increasing one form of support reduces the effectiveness of the other form of support. Only few firm-level studies

followed up on this early cross-country aggregate level indication that direct and indirect public support to business R & D could be substitutes.

Hægeland and Møen (2007a) were among the first to use firm-level data to assess the interaction between subsidies and the R & D tax credit in Norway. Their results suggest that direct and indirect support are complements. More recently, Czarnitzki and Lopes-Bento (2014) also find indications of complementarity between R & D subsidies granted by the German government and research support by the European Commission. The estimation on French data by Guerzoni and Raiteri (2015) suggests that different R & D policy instruments are most effective when they interact. Marino et al. (2016), also using French data, on the other hand conclude that the combination of the French tax credit with R & D subsidies reduces the additionality of public support. All recent studies that assess the policy mix of policy instruments in support of R & D consider a binary or categorical treatment variable. Dimos and Pugh (2016) point out that the use of this type of variable precludes a full assessment of the additionality of public support. The use of binary treatment variables is often due to the lack of data on the amount of support. For this study data are used from the Belgian Policy Mix R & D database, which contains information on the amount received by individual firms, in all existing schemes of public support to R & D (subsidies and different types of tax benefits). The database contains additional firm-level data that permits to construct a panel of firms and account for the time dimension (including years before the introduction of the tax benefits) as well as observed and unobserved firm heterogeneity. Given the 50/50 share of direct and indirect support but also the different types of tax benefits for R & D that can be combined, Belgium seems an appropriate country to assess the effectiveness of different individual instruments but also to investigate whether the different support schemes tend to reinforce or weaken one another.

As a result of state reforms in the 1980s and the 1990s, most competencies in science and technology in Belgium now reside at the level of the three regions: Brussels-Capital Region, Flanders and the Walloon Region. The regions provide substantial direct support to R & D and innovation by firms, mainly through subsidies. To fulfil its commitment to a 3% target for R & D intensity, the Belgian federal government introduced several tax incentives in support of business R & D. Following the recommendations of Van Pottelsberghe et al. (2003), who evaluated the rather unsuccessful tax allowance for additional employees in scientific research in Belgium − which was abolished as

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[3] In the categorization of the policy mix for innovation of Borrás and Edquist (2013), this paper only considers the second category of three categories of instruments (financial instruments) that aim at increasing the first of four innovation activities (the provision of knowledge inputs).