

The use of indicators for strategic decisions of policy makers: which characteristics of subsidy recipients can positively impact on increasing return to public R&D subsidies

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Introduction

The probability that firms' R&D be financially subsidized is generally affected by legal requirements and these eligibility criteria can evolve over time. Public selection is based on some main "efficiency" indicators, which largely reflect the justification of the public intervention, traditionally rooted in "market" and "system" failures. The literature reviewing these R&D failures has concentrated the attention on two main aspects: externalities, deriving from the semi-public nature of knowledge, which is the main result of R&D activity, and financial aspects, mainly the financial constraints and credit rationing, deriving from information asymmetries (see Hall, 2002). Other system failures can also be taken into consideration, such as sectoral or geographical weakness. Policy makers have answered to the first problem mainly by the design of the public intervention and specifically by internalising externalities within R&D collaborative projects and they have answered to the third aspects through targeted measures (Structural Funds intervention can be considered as such). The financial aspect is taken into consideration through some "eligibility" criteria, which are widespread adopted, in different types of "bottom up" intervention. As Wallsten (2000, p. 84) wrote: "the problem of the government is to finance the best projects among those that cannot receive adequate funds from other sources" or, differently phrased, to finance projects that in absence of the public subsidy should have not been realised. So, financial indicators have a central role among the eligibility criteria. They can indicate the level of the firm financial burden (for example the ratio between the firm net yearly financial charges and its net sales), as it is foreseen by the Law 297/1999 regulating in Italy the eligibility criteria of the Ministry of Research financial aid to industrial R&D. Or they can indicate the rate of bank indebtedness of a firm, or its capacity of self financing or the firm investment profitability and so on.

The background assumption is that a firm with a relatively high indebtedness rate¹ or a low equity rate, can better react to the public subsidy, i.e. doing additional investment in R&D, compared to the case in which the subsidy are not present. Nevertheless the "additionality" behaviour (i.e. the fact that a subsidized firm has an incentive to invest in R&D more than its normal or pre-grant equilibrium level) cannot be equal for all firms, given their heterogeneity and it can be useful to understand under which conditions the incentive works.

Moreover, the purpose of government is larger than the firm one's: it is that of increasing the social return from private R&D activity and therefore that of putting in action a "triggering" mechanism, that is to produce increasing return from the subsidy. Which characteristics must have projects or firms to give a result in terms of increasing return to public subsidy? Which indicators can help policy makers in selecting the right recipients? In what these increasing return are rooted? They can be rooted in local or network spillover mechanisms, but more in general successful innovation attract new innovation through feedback mechanisms (Baumol, 2004), for example the creation of complementary innovations. At firm level increasing return to R&D can be justified by aspects such as learning, internal spillover or scale and scope economies.

Starting from these considerations, we have developed an empirical analysis to check if the indicators used in the selection process are necessary and sufficient or which other, complementary indicators can orient policy makers in their selection behaviour, i.e. which indicators, for a same financial quality of firms and project, can bring better welfare results.

¹ The Law 297/1999 in Italy gives a threshold, over which the indebtedness rate assume the negative meaning of non sustainability

Methodology

First of all we did an evaluation of the “aggregated” effect (in terms of industrial R&D additionality) of a Ministry of Research intervention in the first half of 2000s in Italy².

We used a panel dataset where the unit of analysis is the “firm per year”. Moreover, since a project generally lasts more than one year, we consider a firm as “treated” along all the duration of the project and, once this spreading procedure was done, the number of treated units was 1.845 while non-supported observations were 9.760, for a total of 11.605 observations.

The evaluation of the R&D additionality has been done with a counterfactual approach, by comparing the firm’s “own R&D expenditure” (that excludes from the total R&D expenditure all the subsidy received by year) in the treated and untreated companies³. We provided results for the pooled regression for detecting, at an aggregated level, if there exists a “crowding-out” or an “additionality” average effect on firm own R&D investment. We found out a 40% of R&D additionality for the average firm (about 800 thousand Euros of additional “own R&D investment”).

Then, since going beyond an aggregated average value seems of a great importance for a more in-depth understanding of the policy effect, we looked at the distributional characteristics of the “additionality”: this is a firm-specific investigation of the causal effect of the policy intervention on firm R&D performance. We found that half of our sample performs a crowding-out, whereas the other half an R&D additionality result and, given the existence of a strong right asymmetry of the distribution, positive values are significantly higher than negative value in absolute terms.

Then we looked for evidence upon the differences in term of economic and structural characteristics between the group of firms performing additionality and the group of firm performing crowding-out, for identifying the leading factors which characterize the policy’s success and their relations with the public agency’s selection criteria.

We looked at three types of variables according to three theoretical perspectives: “corporate financing”, “industrial organization” and “innovative capacity” variables. In short, it resulted that there aren’t differences related to the industrial structure (market power) nor to the structure of firm costs, neither to corporate financing components (leverage, equity, cash-flow) or to a strict knowledge input capacity (R&D intensity), which can justify the different firm behaviour (performing additionality or crowding out). In particular, it resulted that from a financial point of view, the two groups of firms are quite indistinguishable, so that no differential financial constrains are able to justify different additionality performance. Also no differences arise among firms as to the public efficiency in implementing the measures (time delay between the project application and its final positive acceptance).

The most important differences between the two groups of firms resulted to be size (scale dimension), the propensity to patent and the rate of growth of fixed capital accumulation. It is quite clear that the additionality performance concerns a specific group of firms, particularly oriented towards growth, with a high propensity to reinvest and with a very different performance in terms of patenting activity. What seems to emerge is a greater ability of the “additionality” group in transforming their inventive inputs (mainly, the R&D intensity) in innovative outputs (in our case, the number of patent applications): this identifies a different “innovation production function” between the two groups.

To be successful the R&D policies should pay more attention to these aspects. For a given level of size, the message seems to state that firm “strategies” really matter. Where to find this kind of indicators? New requirements for the ex-ante assessment in case of state aid are now foreseen for high costly R&D projects by the EC Framework for State Aid for R&D (2006): information from the “medium term” plan of investment of firms participating to the selection for financial subsidy are now requested. Our empirical analysis shows that they can help policy makers in selecting firms which put in action a “triggering” mechanism.

² The analysis presented here is part of a larger project of evaluation of the intervention of the Italian Ministry of Research in support of the applied industrial R&D (see the national strategic project Firb (2005-2008), “Modelli e metodologie per la valutazione dell’impatto dei finanziamenti pubblici per la ricerca industriale”).

³ In what follows we use the term “treated” and “untreated” firms as synonymous of “supported” and “non-supported” firms.

Discussion

The idea of introducing in the ex ante selection mechanism some indicators related to the medium term firm investment (in fixed capital and in innovation) is easy to realize and bring with it more than a simple “promise” of increasing employment or innovation.

In the past Antonelli (1989) suggested to introduce in the selection mechanism the disclosure of some information on the “additionality” character of the subsidized industrial R&D. The definition of “additionality” is a complex one, since it concerns the elasticity of the firm R&D cost and the relation between firm’s R&D marginal cost and return, i.e. something difficult to summarise in indicators⁴. Neither financial indicators are sufficient to disclose this effect.

The recent change in the EC Framework for State Aid for R&D (2006), to which country have to adapt their legislation, moves in another direction: to have disclosed information on the firm medium term investment plan. Firm orientation to growth is an indicator of its capacity of multiplying the effect of the public investment.

Our analysis included both small and large projects (with a budget higher than 7,5 Meuro), only these last following the new procedure: a pre-selection step in which the three years plan of investment are disclosed. We found out that the better impact (additionality) concerned this last group of subsidy recipients. We looked only at the short term impact, and surely a check on medium term post- treatment effects could add more information.

The new procedure is used only in case of large projects. A policy maker, of course, can choose to finance small and medium sized firms, with a scarce or non continuative R&D activity. In this case he can face specific, national constraints, which ask for a “tailored” design of intervention. For instance in the Italian system of innovation, SMEs seem to be historically more projected towards short-term returns (profits) than long-term objectives, such as growth. Many previous researchers, indeed, have emphasized how Italian SMEs are reluctant to strategies pointed at enlarging the scale of production (through, for example, an active financing on stock markets), in so remaining, essentially, under-capitalized. This is due, among other things, to the Italian traditional family ownership of firms and on its connected “fear” to lose power and strategic control when growing. This asks for specific incentive and institutional intervention (i.e. related to the national financial market).

In the case of firms which do R&D in a continuative and formalised way, the introduction of new indicators related to their growth strategies, more than industrial structure (market power), corporate financing components (leverage, equity, cash-flow), or a strict knowledge input capacity (R&D intensity), seems to give good results. This kind of indicators help also answering to the traditional question: does a policy which picks the winners drives to a waste of public resources, crowding out effects and more inequalities? Assured that a specific policy for SMEs R&D is pursued, large firms/projects exploit higher “scale economies” through greater internal division of labour (specialization), access to wider internal and external networks, ability in generating and absorbing spillovers, market/political power, easier access to credit and equity⁵. Of course not all large firms follow similar paths and indicators on firms orientation towards a growth strategy are useful to discriminate between crowding out and increasing return effect.

Finally, only ex-post impact analysis can give an answer to the question if qualitative behavioural change (different content of R&D activity, different time, different risky level) have been induced by public financial subsidy policy, but this is out of the present paper concern.

⁴ See Jaffe (1998) cited in Wallsten (2000, p. 85):“government technological programs have never been designed to include comprehensive economic evaluation, making it almost impossible to identify marginal effects”.

⁵ In another work the authors found out that, when studying the impact of R&D activity on firm productivity or competitiveness, it is worth to distinguish among different kinds of innovation strategy and it appears quite clear that competition mechanism awards more complex innovation strategies than simple R&D intramuros activity.

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