POLICY NOTE OF THE WORKING PAPER 4/06

Business-funded r&d intensity: impact and complementarity of public financial supports

Benjamin Montmartin
UJM-GATE

1. OBJECTIVES

The aim of this research is to study the capacity of different financial support for private R&D to generate a leverage effect upon the private sector's investment level in R&D at the macroeconomic level. More specifically, we distinguish direct support (grants, subsidies, loans) from indirect support (fiscal incentives) and we study their effectiveness to stimulate business R&D in three ways: their individual effect, their internal complementarity and their external complementarity. In this work, the concept of internal complementarity refers to the fact that different support policies implemented within a country do not conflict each other for stimulating private R&D. The concept of external complementarity or jurisdiction's complementarity refers to the fact that different support policies implemented by different jurisdictions (here different countries) do not conflict each other for stimulating private R&D.

Even if available data on this subject concerns OECD countries, we still think that econometric studies can be useful for other countries and especially for NC countries that currently implement such policies. Moreover, the study of the jurisdiction's complementarity could be indicative for future cooperation between NC and EU countries in terms of R&D and innovation policies.

The added value of our work holds in the specific way by which we address the research questions. More precisely, contrary to the majority of the empirical literature that use microeconomic data on one specific support policy for R&D: (1) we use macroeconomic data on 25 OECD countries over the period 1990-2007; (2) we include data concerning two kind of support for R&D: direct and indirect; (3) we not only study the individual effect of direct and indirect aids upon private R&D investment but also investigate their internal (between instruments within a country) and external (between support implemented by different countries) complementarity.

www.ub.edu/searchproject

2. SCIENTIFIC METHOD

Our empirical methodology includes 4 main steps:

1) We identify in the literature the methods used, their advantages and their weaknesses in order to construct adapted empirical models. This work allows us to highlight the need to use a partial adjustment process for the private investment in R&D in order to take into account the strong irreversibility of such investments. Indeed, past investment in R&D is one of the main determinants of current investment in R&D. We also show the importance of accounting for the potential price-effect that direct and indirect support could have on R&D inputs by using relative measurements for these policy variables. Finally, the possibility that both direct and indirect support could be endogenous has been taken into account in this work.

2) We use OECD and IMF data for 25 OECD countries. We use the amount of direct support received by firms expressed as a percentage of GDP for the direct support variable and the B-index for the indirect support variable. The B-index represents the extent of the tax system's generosity for R&D, given the various tax incentives (tax credits, tax allowances, depreciation rates ...). This indicator, which was developed by McFetridge and Warda (1983), measures the present value of the pre-tax income required to cover the initial cost of R&D investment and corporate income.

3) To test the jurisdiction's complementarity, we use three different spatial weight matrices. The first is based on bilateral trade intensity between two countries using OECD's STAN database. The second is based on scientific collaboration intensity between countries using data on PCT patent applications from the OECD's REGPAT database. The last spatial matrix is based on the geographical proximity between two countries using the EuroBoundryMap database provided by Eurogeographics.

4) Concerning the estimation strategy, we first identify potential efficient estimators of dynamic panel data model. After that, we implement numerous econometric tests in order to identify the best estimator for our model. It appears that given our dataset size (25*18) and our subject (private investment in R&D), a Least Square Dummy Variable Corrected (LSDVC) estimator is the most efficient one.

3. MAIN RESULTS

Our results reveal a distinct difference in the impact of R&D support between direct vs. indirect activities. The first does not seem to produce sufficient incentives to generate leverage effect on the private investment in R&D whereas the second seems to have such a capacity.

This difference in impact makes even more sense when one considers the question of complementarity between the different types of instruments. Indeed, our results show that direct support is a substitute for indirect support (and vice-versa) when increasing the intensity of private R&D. This means that setting up additional direct (indirect) support will increase the "windfall" effect of the indirect (direct) measures which are already in place and will diminish their effectiveness.

Concerning the jurisdiction's complementarity, our results have not really brought to light any highly significant influence of external financial support. This result upholds the idea of a jurisdiction's complementarity of financial support for R&D implemented at the national level in

the sense that, this means that the effectiveness of internal measures is not affected by external measures.

4. POLICY VALUE-ADDED

We should be careful with the interpretation of our results for policy making. They are the preliminaries of a more global research program on the efficiency of public support for private R&D. Indeed, if macroeconomic studies are useful to give an idea of the global effect of such policies, they do not allow us to distinguish microeconomic effects at the origin of the macroeconomic effects. Moreover, we need to continue the investigation around the notion of complementary at lower scale level (regions for example) in order to obtain more intuition about the best public organization for the implementation of such policies.

Even if these results need to be interpreted with cautions, we still think they bring some general interesting information for policy-makers (whatever the country concerned). Indeed, our study confirms the better capacity of indirect support to generate a leverage effect upon the private investment in R&D compared to direct support. Nevertheless, this difference should be related with the fact that states cannot control which R&D projects will be financed with these measures (and consequently their social returns). This highlights a kind of tradeoff between quantitative and qualitative objectives. This idea is reinforced by the substitutability effect highlighted between direct and indirect support. Indeed, this result confirms the necessity for policy-makers to understand that the relative intensity of each kind of support will have an impact on the leverage and welfare effect of their policy-mix. Finally, the jurisdiction's complementarity highlighted at the national scale is also a first interesting result for the understanding of the organization of public authorities. Indeed, this result seems to show that effectiveness of national-scale R&D policies is not reduce by foreign national-scale policies. We need to continue to investigate the jurisdiction's complementary for lower and upper territorial levels (regions and European policies in particular) to bring new insights.