

Public Investment in R&D: Does public investment in R&D in lagging regions of the European Union have an impact on GDP growth? If so, is it the most efficient mechanism to foster economic growth in these regions?

Beñat Bilbao Osorio
London School of Economics

I. Theory/ Model

1. Question to be researched: What is my empirical question?

My research is aimed at answering whether **public investment** in R&D in lagging regions of the European Union **does pay off** and if so, if the **public sector** is the **most suitable agent**, in terms of *effectiveness and efficiency*, to undertake these R&D initiatives.

The definition of the two **benchmark measures** that I shall use are defined as it follows:

- *Effectiveness*: To have a positive impact on GDP growth
- *Efficiency*: To be more profitable in terms of GDP growth than private investment, both in the short and the long run.

2. Why this question is relevant?

Since the achievement of the internal market **regional disparities** have grown within the EU. Although national disparities have decreased among countries, these disparities have increased within the states, so that the overall effect is an increase in the interregional disparities.

In order to compensate these growing disparities many **peripheral regional governments**¹ have **increased their investment in R&D** as a mean to reduce these disparities. However, the question which remains unanswered is whether this effort pays off or not.

3. Theoretical Relevance

It is widely accepted that **technology**, and technological advances become the main driver to enhance **innovation**. But how can a region or a firm achieve these technological advances which would lead us to a greater level of innovation, and therefore, economic growth? Traditionally, investment **in Research and Development** has been considered as a the suitable instrument.

However, in an increasingly open economy, it is sound to believe that technological advances would **spill over** to other agents within an area and towards other areas. Thus, the attraction to free- ride becomes very appealing.

Moreover, the attractiveness of free riding increases whether we take into account many studies on the field (Audretsch and Feldman –96-, De Bondt –96-, Engelbrecht –97-) which have argued that the relationship between expenditure on R&D and economic growth is not linear. The requirement of a **minimum**

¹ See Rodriguez-Pose, A (1999) “Innovative prone and innovative averse societies: Economic performance in Europe”, *Growth and Change*, 75-105.

threshold, an appropriate structure (quality of labour force working on R&D, local human capital...) to actually obtain any positive impact on technological advances, and the **increasing returns of scale** factor (the more you invest the more than proportional effect you get) could seem to call for the agglomeration² of the R&D activities in some core regions.

However, Audretsch and Feldman (96) and Rodriguez-Pose (99) have already put this model at stake by pointing out the existence of increasing costs according to distance for the “**transmission of tacit knowledge**” and the existence of “**innovative averse societies**”. Equally, another benefit of R&D is the fact that it enhances the capacity to absorb technological advances (spillovers) from other regions and/ or agents. These facts would difficult technological spillovers to occur (if R&D is neglected), and therefore it could create a model of chronically technological dependent regions in Europe which would not be able to embrace innovation and subsequently associated economic growth.

However, little research has been carried out about the efficiency of the public investment in R&D in lagging regions in relation to some other policy alternatives.

4. Proposed alternative

In order to analyse the public efficiency of direct investment in R&D, it would be necessary to calculate the impact of this investment, not only on innovation activities (i.e. number of new patents), but also on the final objective, which is economic growth (i.e. GDP)

The results of this analysis should be compared with other **alternative initiatives** (i.e. private efficiency of R&D investment), which do also try to foster economic growth, in order to point out the main benefits and pitfalls of this sort of public intervention. It should also take into account the **nature of the investment** and the difference between **short and long term effects** of investments on economic growth.

5. Theoretical significance of the model

This model would provide a tool to determinate whether the public sector is the most suitable agent to undertake R&D initiative and the fields of investment which seem to be more profitable in terms of long and short term returns.

6. Policy implications of my research

Depending on the results of the analysis, some policy guidelines should be provided about the nature and role of public investment in R&D. In that sense, questions such as whether the public sector should invest in R&D, or to incentive private R&D or to create the enabling structures to absorb technological spillovers, etc... should be determined.

² See Scherer, F.M. (1982) “Inter.-industry technology flows in the United States”, Research policy 11 and Dosi G. (1988) “Sources, procedures and microeconomic effects of innovation”, Journal of Economic Literature, 26

II. Methodology

1. Methodology

I intent to use both quantitative and qualitative methods in order to draw some general and more specific conclusions about my research question.

1.A. Quantitative Analysis

In fact, the first part of the analysis would be based on a *multivariate analysis*, where regional economic growth (measured by the GDP) would be regressed against a set of variables, which would measure the impact of private and public R&D. An approximate model would be the following one:

$$\begin{aligned} \text{GDP} = & \alpha + \beta_1 \text{R\&D}_{\text{pub}} + \beta_2 \text{R\&D}_{\text{priv}} + \beta_3 \text{R\&D}_{\text{pub}} * \text{Technological Gap} + \beta_4 \\ & \text{R\&D}_{\text{priv}} * \text{Technological gap} + \beta_5 \text{R\&D}_{\text{pub}} * \text{Level of skills} + \beta_6 * \text{R\&D}_{\text{priv}} \\ & \text{Level of skills} + \beta_7 \text{R\&D}_{\text{pub}} * \text{Demographics} + \beta_8 \text{R\&D}_{\text{priv}} * \text{Demographics} + \beta_9 \\ & \text{R\&D}_{\text{pub}} * \text{Economic structure} + \beta_{10} \text{R\&D}_{\text{priv}} * \text{economic structure} + \beta_{11} * \text{R\&D}_{\text{pub}} \\ & \text{Institutional development} + \beta_{12} \text{R\&D}_{\text{priv}} * \text{Institutional development} \end{aligned}$$

For each of the variables, I shall use proxies depending on the availability of data.

The aim of these regressions would be to analyse the **effectiveness** (sign of the coefficients) and **efficiency** (significance of the difference between public and private coefficients) of public R&D in terms of GDP growth. In this analysis, we would assess some of the variables which have been highlighted in the theoretical model³ and especially, it take into account both the **direct** impact and the **indirect** impact (absorptive capacity⁴) of R&D on GDP.

Equally, this analysis would consider the ability of a region to benefit from R&D depending on its structural features (level of skills, level of institutional development, demographics, economic structure, etc...)

From this previous analysis, I intent to achieve some general conclusion about the influence, significance and differences in the impact on GDP from public and private R&D activities.

Nevertheless, GDP can be influenced by many other factors apart from the nature of the R&D (i.e. type of investment –basic v. applied-, sectors where investment has been allocated, structure of the industry –size and number of SMEs, etc-), which would be difficult to capture in a quantitative analysis. Thus, a second type of methods would be appropriate to provide us some further lights.

³ See point 3

⁴ Absorptive capacity can be defined as the ability of a region or an agent to benefit from technological spillovers.

1.B Qualitative Analysis

A set of *comparative case studies* where a description of the context, the process, the content and the outcome of the different R&D policies carried out by some regions –and the economic and social agents interacting within that framework– would be analysed.

The selected regions for this comparative case study would be: The Basque Country (Sp), Dublin County (Irl) and the Basilicata Region (It). The reason for this selection is due to the different approach the three regions have adopted in terms of investment in R&D. In fact, the Basque Country has developed an intensive public R&D, while in the case of Dublin, it has been the private initiative (mainly, multinational companies) which has emphasised the investment in R&D. Basilicata, on the other hand, remains at low rate of both public and private investment levels in R&D.

The case studies will be **on cascade**. First, a comparative analysis will be carried out between the Regione Basilicata (peripheral region with very little investment in R&D) and the Basque Country and Dublin County (peripheral regions with relatively high levels of R&D investment)

Secondly, there will be an analysis comparing the Basque Country (Peripheral region with relative high levels of public investment) and Dublin County (Peripheral region with relative high levels of private investment)

2. Data and data sources

The main sources of information will be:

- Existing Literature on the topic
- Statistical Data bases: Eurostat, National (i.e. INE) and Regional (i.e. EUSTAT, OECD) statistic offices
- Public and published information carried out on the topic by Regional Development Agencies, Regional Governments, Business Innovation Centres, Chambers of Commerce or previous studies about the topic carried out by other institutions such as the European Commission (DG Regional Policy), or the OECD
- Interviews with key representatives of regions' main agents

3. Foreseen problems.

Some of the problems which may be encountered whilst carrying out the research could be:

- *Lack of consistent information* at the regional level of the different levels of private and public R&D investment
- *Accessibility of information.* Some of the relevant information may be difficult to obtain, especially for the case studies, where a set of open interviews is established.

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