Modelling Economic impact of public research

RISE Subgroup meeting 11 March, am, 2015

Summary

Introduction

The Chair, Luc Soete, opened the meeting, introducing the speakers. He pointed out that RISE is too big a group for in-depth content discussion. This should happen in ad-hoc thematic meetings such as this one. Modelling the economic impact of investments in R&D is based on a request of the Commissioner and is becoming an important element of the dialogue with the macro-economic services, in the Commission as well as in Member States. This is the case in the Netherlands, where the Dutch Central Planning Office is one of the major players assessing the value of research. In these models, investments in R&D figure as expenditure. Their very construction leads to a negative effect of R&D investments on economic growth, given a deviation effect on human resources. The work of RISE aims to revisit the construction of these models and shifts the emphasis from a short-term fiscal stand to a longer-term economic growth perspective. It is essential to find the most effective ways of assessing returns and to include them in existing models.

Presentation 1: Modelling the rate of return of R&D investment

The first presentation was made by Bart Verspagen, tracing the impact of R&D investments on total factor productivity. The focus is on the rate of return, or more precisely, the elasticity of R&D investment on total factor productivity. The research used OECD data going back to 1963. All available models have been tested on this data set (including ECM, Cobb-Douglas, etc.). Different input factors have been used: R&D stocks (which partly include lag effects), R&D intensity, and distinction public-private-foreign. Time lags of 4-5 years have been tested and several control variables have been used to differentiate between country structures. Two different output factors have been tested: total factor productivity and GDP. The research has also distinguished models which are scale dependent and models without scale (e.g. which divided the R&D stock by GDP). The results give broadly the picture that the economic returns to public investments in R&D are negative and the returns to private R&D are positive. The rate of return varies between countries depending on their economic structure (e.g. higher rate of return in countries which have a higher proportion of high-tech products in their export). There is also a positive scale effect. Countries with a higher stock of R&D investments (e.g. the USA, Germany) have a more positive rate of return. Scale matters. This is an interesting finding which provides economic evidence for a possible scaling of funding at EU level (i.e. the EU gets lower rate of return than the USA because of the fragmentation of its R&D funding into 28 smaller countries). However, more research is needed to verify and document such effects.

In the discussion, RISE experts proposed to test with longer time lags, up to 10 years. Other suggestions were to control for the shares of FDI, and to distinguish investments in basic and applied research. Structurally, the rate of return may also depend on the country's funding mix, e.g. Norway more applied and Switzerland with more focus on basic research. RISE members also suggested

reflecting on longer time series where the effects of disruptive innovations are more visible. Concerning the scale effects, particular attention should be made on the implications for cohesion countries. Finally, further research should also consider the outcomes of the recently finalised Simpatic project.

Presentation 2: Variables influencing returns of R&D investments

The second presentation was made by Pierre Mohnen. The research broke down the input into main variables through a principal factor analysis. The analysis identified three main variables: technological capacity (including indicators on R&D investments, publications, licensing, patents, etc.), infrastructures (including digital broadband infrastructure), and institutions (in the sense given in national innovation system theory). The research showed that investments in infrastructure gave the highest economic rate of return among the three variables. This finding and the possible positive effect of the combination of the three variables is interesting in the context of the current Juncker investment package (EFSI), envisaging investments in long-term and strategic infrastructures (e.g. energy, digitalisation) alongside R&I investments.

RISE members welcomed the research. There was a suggestion to reflect on the share of technology embedded in the variable of infrastructure, given that digital broadband has been counted as infrastructure and not technology. Perhaps a distinction between 'technological' and 'physical' infrastructure could be useful.

Presentation 3: Economic impact of tax credit schemes

The third presentation was made by Jonathan Haskel, focusing on the economic impact of tax incentive schemes. Tax credit for R&D is an instrument which lowers the price of R&D. Over the last ten years, there has been a progressive increase in the use of this instrument, costing currently € 1.5 billion a year to the UK, and almost four times as much in France. In a cross-country context, private R&D investment is volatile but also 'sticky'. The economic impact of a tax incentive scheme depends on the level of cross-country volatility of corporate R&D investments. This research came to the conclusion that overall, from an EU perspective, increasing tax incentives have triggered a 0-sum competition between countries where corporate R&D moves across countries to where R&D costs are cheapest. If this finding is confirmed, it has strong implications for a clearer EU-level policy on tax credit schemes, which could aim at optimising the use of 'reinstated' tax revenues.

RISE members present in the workshop welcomed the study. Suggestions were made to complement the macro-level analysis with micro-data from firms, also considering the different position of MNEs compared to SMEs (more space-bound). Another consideration is that there could be positive knowledge spill-overs across countries when corporate R&D activities move, although this would have to be verified empirically. A final consideration was that tax credit could be a defensive strategy to retain corporate R&D activity in the country, which may be the case in France and Spain. Further study would therefore need to consider if corporate R&D attracted by tax incentives also move to countries with more efficient R&I systems (whereby the overall rate of return at EU level would increase).

Presentation 4: Value of science as output from R&D investment

The last presentation was made by Luke Georghiou on the value of research. In the context of this workshop, it broadened the output from productivity to a broader societal impact. From a scientific point of view, research is becoming more productive (e.g. more publications per researcher). In an economic sense, evaluation studies have found a high rate of economic return on research (20-50% return rate). Better framework conditions (e.g. use of procurement, regulation) can further increase the return on R&D investments. The same holds for efforts to improve the absorptive capacity of firms, in particular in Eastern European countries. Another relevant question is if the value of science would grow with big data/open science and its links to open innovation.

The RISE members welcomed this work broadening the analysis of the value of research. It is very important for the construction of the conceptual framework to modelling. One suggestion was that the paper could reinforce the EU-level analysis, as most case studies referred to are at national level.

Conclusions

The research presented in the workshops confirms the positive effect of R&D investments on growth. This evidence has to be consolidated, backed up by an identification of the conditions under which returns on public R&D investments increase, including the new dynamics of open science. The findings also identify an EU value added, through the scale effect. The size of funding agencies appears to play a role with larger funding agencies associated with higher rates of return in quality and with lower risks. In particular smaller countries have difficulties to reach higher returns on their investments and may be pushed to close down faculties. However, more research is needed, taking up the comments made at the workshop. The final aim is provide Commissioner Moedas with strong evidence he can use in his dialogue with other Commissioners, in particular with VP Katainen and Commissioner Moscovici. And beyond the economic returns, what is the larger societal impact of R&D investments, also at the EU level? The Erasmus programme may have changed the culture of the younger generations, including through mixed marriages. What is the overall societal impact of the EU R&D funding programmes?

Main tentative findings of the workshop:

- The economic return on public investment in R&D is largely linked to its capacity to leverage business R&D expenditure
- There are also scale effects on the rate of return of R&D investment, with larger and more knowledge-oriented countries benefitting the most
- Investing in infrastrutures, including technological ones, offers the best economic return
- R&D tax incentives are a 'zero sum game': R&D tax competition among MS does not lead to an overall increase of R&D expenditure at EU level. The foregone tax revenues could be better used otherwise.
- The value of research goes beyond its economic impact and is largely determined by framework conditions, which need to be further investigated.