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Policy Brief

Innovation, job creation and productivity: implications for public policy

Mehmet Ugur, University of Greenwich
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GREENWICH POLITICAL ECONOMY RESEARCH CENTRE (GPERC)

Abstract

Direct and indirect public support (subsidies and tax relief) for business R&D in the UK is higher than most other OECD countries. Nevertheless, total business R&D expenditure as percentage of GDP in the UK (1.7%) is relatively low compared to OECD countries (2.43%). This policy brief summarizes the findings from an ESRC-funded research project on productivity and employment effects of R&D investment; and on whether direct public support has had additionality effects in terms of increasing the funded firms' R&D investment. The findings suggest that the bot the effects of R&D on productivity and employment and the effect of subsidies on private R&D effort are heterogeneous and non-linear. Therefore, we call for well-targeted R&D subsidies, new conditionality clauses taking account of past performance, and industry-specific targets for R&D investment.

Keywords: *Innovation, R&D, Employment, Productivity, Public Policy*

JEL codes: *030, 032, 038, J23, D24*

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Corresponding authors: Mehmet Ugur

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Policy Brief

Mehmet Ugur - Greenwich Political Economy Research Centre, University of Greenwich
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Policy Issues

Direct and indirect public support (subsidies and tax relief) for business R&D in the UK is higher than most other OECD countries, excluding the US, Korea, Canada and France. Also, the UK support regime relies on both direct grants and indirect support via tax credits with equal measures (National Audit office, 2013).

Nevertheless, total R&D expenditure as percentage of GDP in the UK (1.7%) is relatively low compared to OECD countries (2.43%). Also, R&D activity tends to be concentrated by firm type (large R&D spenders) and location (London) (National Audit Office, 2013; Hughes and Mina, 2012).

Focusing on direct grants for business R&D, the sources of funding include UK government departments, their agencies and non-departmental public bodies (e.g. Technology Strategy Board or its successor, Innovate UK). The multiplicity of funding bodies and changes in priorities over time have led to different selection criteria and a relatively generous coverage ratio (usually more than 80% of R&D-active firms have received public support).

Given this background, a range of policy-relevant questions arise: (i) what are the effects of R&D investment on job creation and productivity? (ii) Does R&D investment reduce the risk of firm exit due to bankruptcies or liquidations? (iii) Does public support lead to additionality effects in terms of private R&D effort or R&D personnel employment? (iv) How do the additionality effects compare between UK and EU funding?

Analysis

We have used a rich firm-level dataset obtained by merging three Office for National Statistics (ONS) databases: (1) The Business Research and Development Database (BERD); (2) the Business Structure Database (BSD); and (3) the Annual Respondents Database (ARD) and its successor, the Annual Business Survey (ABS). The number of firms in the estimation samples vary between 40,000 and 45,000. Our findings (as reported in Ugur et al, 2016a, 2016b, 2016c; Solomon et al., 2015; Ugur et al., 2015) can be summarised as follows:

1. Higher R&D intensity is associated with non-linear (inverted-U shape) effects on employment, productivity and survival. Firm performance in terms job creation, productivity and survival first increases with increased R&D intensity and then decreases as R&D intensity increases beyond an optimum threshold.

2. The effect of R&D intensity on job creation is positive and stronger at two ends of the labour market: R&D personnel and part-time male/female employment. In these market segments and in the case of total employment, there appears to be decreasing scale effects: the effect of R&D intensity on job creation decelerates and eventually becomes negative as we move towards the top end of the R&D intensity distribution.

3. Unlike existing evidence, different pair-wise R&D types (e.g., publicly and privately funded R&D; intramural and extramural R&D; and basic research versus applied research) tend to be substitutes rather than complements. In other words, a simultaneous increase in the components of the R&D type pairs tends to decrease the productivity effect of either type.

4. Over the period 1998-2013, UK public support for R&D investment creates additionality in privately-funded business R&D but the additionality effect is small compared to that of EU support. Also, the effect of UK public support on privately-funded business R&D is heterogeneous. Specifically, direct public support is associated with:
    a. Larger additionality effects among small firms and start-up firms;
    b. Larger additionality effects among R&D intensive firms;
    c. Negative (substitution) effects among large firms; and
    d. Negative (substitution) effects during recession years after 2009.

3. Implications for public policy

Our findings have two implications for public policy.

First: There is evidence to suggest that public support for R&D investment should be linked to past firm performance in terms of additionality effects. This is in contrast to what is envisaged in the latest spending review of December 2015. In that review, the government proposed to make R&D grants increasingly repayable. Under the review, £165 million out of a total of £600 million of Innovate UK funding will be repayable by 2019-2020. This policy choice will reduce the scope for securing additionality effects: funded firms will be more likely to substitute public R&D funding for privately-funded R&D expenditures as the firm will have to repay at least part of the received public funds. In addition, the repayment conditionality will not address the lack of (or small magnitudes of) the additionality effects as these effects are firm-specific and closely related to the business cycle. Our research suggests that direct public support for R&D investment should not be repayable because it has been associated with additionality effects overall. Furthermore, our research indicates that the relatively small additionality effects can be increased and the firm-specific and business-cycle-related substitution effects can be reversed by rewarding past performance with respect to privately-funded R&D effort of all firms.

Second: the government can encourage the selection of optimal levels of R&D intensity in general and by industry in particular. This can be estimated for the effects of R&D on job creation, type of jobs created, firm productivity, and firm survival.

The encouragement for choosing the optimal level of R&D intensity can be exercised through two channels. On the one hand, the government can influence the research funding councils to prioritise research projects that would pay attention to heterogeneity in the relationship between R&D investment and firm performance. Through this channel, the government can help increasing the quality of existing evidence and supporting evidence-based firm decisions. On the other, the government can introduce new funding criteria into both Innovate UK funding and the HMRC-run Tax Credit Scheme. The new criteria can reward firm with good past performance records in terms of job creation, type of jobs created, and the level of productivity. The combination of these performance criteria will ensure that public support for R&D addresses: (a) the quasi-public good nature (incomplete appropriability of the returns to) private R&D; and (b) conflict between maximising social and private welfare effects of R&D investment.

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