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Innovation, Jobs & Productivity: Supporting Business R&D

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Policy Issue

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[1]

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).[2]

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.

The following policy-relevant questions arise:

1. **What are the effects of R&D investment on job creation and productivity?**
2. **Does R&D investment reduce the risk of firm bankruptcies and liquidations?**
3. **Would public support for R&D encourage additional private effort in terms of private R&D investment or R&D personnel employment?**
4. **How do the effects of public support compare between the UK and EU funding regimes?**

Analysis

Our findings from a comprehensive study of UK firms can be summarised as follows:

1. Higher R&D intensity is associated with non-linear (inverted-U shape) effects: firm performance in terms of 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 job creation first increases with increased R&D intensity and then decreases as R&D intensity is above the turning point.

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[1] National Audit office, 2013.
[2] National Audit Office, 2013; Hughes and Mina, 2012.

3. The effect of R&D intensity of non-R&D full-time employment follows a U-shaped pattern: full-time employment of non-R&D personnel first decreases with increased R&D intensity and then increases as R&D intensity above the turning point.

4. Unlike existing evidence elsewhere, 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, an increase in any component of the R&D type pairs tends to decrease the productivity effect of either type.

5. Over the period 1998-2012, UK public support for R&D has a positive but small effect on privately-funded business R&D. However, the extra private R&D investment induced by a £1 of public support (the additionality effect) is small compared to the effect of EU support. Also, the additionality effect of the public support on privately-funded business R&D in the UK is heterogeneous. The effect is:

(a) Positive and larger than average among small firms and start-up firms;
(b) Positive and larger than average among R&D intensive firms;
(c) Negative (substitution effect) among large firms; and
(d) Negative (substitution effect) during recession years after 2009.

3. Policy Framework

Empirical evidence lead to two major guidelines for public policy.

First, public funding for R&D investment should be linked to past firm performance in terms of additionality effects.

This is in contrast to the policy in the spending review of December 2015. In that review, the government proposed to make R&D grants increasingly repayable. This policy choice will reduce the scope for securing additionality effects. Firms will be 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. 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 firms to achieve the level of R&D intensity that is optimal for their industries.

The public policy objective and the appropriate levels of incentives can be defined for different industries and for different levels of importance assigned to policy objectives such as job creation, type of jobs created, firm productivity, and firm survival. Encouraging the choice of the optimal R&D intensity can be exercised through two channels. On the one hand, the government can influence funding councils to prioritise research projects that would pay attention to heterogeneity in the relationship between R&D investment and a wide range of firm/industry performance indicators. Through this channel, the government enhances the

knowledge and evidence base that would shape the decisions of both policy and business decision makers.

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 firms with desirable past performance records in terms of job creation, type of jobs created, and the level of productivity.

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This policy brief is based on a 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 varies between 40,000 and 45,000.

References are available here from GALA *(the Greenwich Academic Literature Archive) or can be requested from the author via PEG, please write to jeremy.smith @ primeeconomics.org.*