R&D support, innovation and regional performance

Pei-Yu Yuan[1], Raquel Ortega-Argiles[1] and Gloria Cicerone[3]

MIOIR Institute, The Productivity Institute, Alliance Manchester Business School, The University of Manchester, UK

[3] Gran Sasso Science Institute (GSSI), Italy.

Extended abstract

Motivation
Public funding schemes for research and innovation (R&I) and collaboration in R&D have been found to be crucial for promoting regional development. However, translating R&D into regional development is a complex process, as it involves more than just a linear connection between business R&D, public support for R&D, and regional development in the UK. Our analysis builds upon recent research by Ortega-Argiles and Yuan (2022) to investigate the various pathways involved in the R&D-regional development process, with a focus on the role of innovation activity and technological relatedness as pathways for performance. Our analysis adds to the current agenda on regional inequalities (UK Levelling Agenda) in the UK, which intends to make more balanced the redistribution of R&D public funded supporting schemes outside the GSE (Greater South East) extended capital region, with the aim to rebalance the UK economy by more evenly distributing the potential positive returns from R&D, innovation, and technology across the country.

Theoretical background
Drawing on the CDM framework (Crepon, Duguet, and Mairesse, 1998) and its regional/spatial adaptations.

The CDM model, developed by Crepon, Duguet, and Mairesse in 1998, is a framework used to analyze the relationship between research and development (R&D), innovation, and productivity. The model is structured in three stages:

1. R&D Investment: This stage examines the factors that influence a firm's decision to invest in R&D. It considers the role of public funding, firm size, and market conditions in determining the level of R&D investment.

2. Innovation Output: The second stage focuses on the output of R&D activities, which is typically measured by the number of patents or new products developed. This stage analyzes how R&D investment translates into innovation, considering factors such as the efficiency of R&D processes and the firm's ability to absorb new knowledge.

3. Productivity: The final stage of the model looks at the impact of innovation on firm productivity. It assesses how the innovations generated from R&D activities contribute to improvements in productivity and overall firm performance.

The CDM model has been widely used and adapted in various studies to understand the dynamics of R&D, innovation, and productivity across different regions and industries.

Data and Sample

In order to illustrate the potential of using public funding as a promotor of levelling-up in the UK, this paper analysed the UK Research and Innovation (UKRI) funded projects repository between 2004 and May 2021. This information is complemented with data from ONS and scrapping individual information data from Company House website. Our dataset contains 25,122 projects and 44,406 participants. In particular, we use all collaborative research and development (R&D), feasibility, smart and innovation voucher grants, and Knowledge Transfer Partnerships in 42 UK NUTS2 regions. We use social network analysis techniques to analyse the distribution of partnerships and categorise and measure the strength of R&I relationships. The quality of our dataset allows us to identify different types of R&I partnership collaboration (by project type, university-industry, public-private) as well as determine different characteristics of their "quality" and "quantity" (partnership composition, partnership leadership). With the post-code information of the participants, the data allows us to geolocate the distribution of projects and participant involvement and identify the spatial patterns of spending distribution over time as well as the changes in the spatial distribution of R&I partnership collaboration.

We construct a series of indicators that summarize the regions' innovation performance in terms of R&D, patents, and technologies. These indicators will act as mediators between R&D investment regional productivity and economic cohesion.

Methodology

In this paper we use Multilevel (mediation) Structural Equation Modeling (MLSEM). MLSEM is a statistical technique used to analyze data that has a hierarchical structure. In the context of regional development and R&D, MLSEM can be employed to understand the potential mediator role of regional private R&D, innovation, and technology adoption in regional output. This approach considers the hierarchical structure of the data, where one level is nested within the region (within and between regions). By using MLSEM, we can analyse the direct and indirect effects of policy interventions on regional development, providing a comprehensive understanding of the dynamics involved

Preliminary Results

Our analysis shows that around 80 per cent of the funding recipients are from the private sector, and they constitute the top lead organisation in multiparticipant projects. At the NUTS1 level, London and the South-East of England are the primary recipients, having received around 46% of UKRI grants between 2014 and 2021. Inner London West and Inner London East appear as the top NUTS2 recipients. Among the project types, UKRI collaborative R&D funding covers nearly half of the funded projects between 2014 and 2021. The top cross-regional combination of recipients was constituted by London and the South East, indicating that overall collaborative R&D funding has not contributed to a more balanced distribution of R&I public funds. Over time, UKRI has failed to contribute to the levelling-up of R&I funds; London and the South East of England, apart from being the top recipients, have seen a continuous increase of UKRI projects over time at the expense of other regions.

Our econometric analysis shows that UKRI funding (as intended) has contributed to the increase of Business R&D (BERD) in the UK. This contribution has varied within and between regions. While BERD has contributed to UK economic prosperity in the short and medium term, we can only find an indirect effect on the short—to medium-term economic growth of UKRI projects and funds when looking at the comparison within the regions.

The effect of UKRI on levelling up and economic convergence has been very weak or non-existent. When looking at the UKRI projects, we can only find an indirect contribution to levelling up as moving from the average (between regions).

These results are more interesting when the role of R&D interregional and intraregional collaboration is also taking into consideration indicating the positive effects of redistribution of funds.

Preliminary Conclusions

In this paper we analyse the effects of UK public support for R&D collaboration within and between regions during the last decades. Our analysis shows that the R&D public support has been mainly deployed in the Great South East contributing to the widening of the (already) severe UK interregional disparities.

In the UK, the geographical transmission mechanisms and outcomes of industrial or innovation policies and funding have never before been considered in national policy discussions.

Recent increasing awareness of the role played by policy interventions (public funding boost or infrastructure deployment) in potentially widening interregional disparities has led to a new focus on how these interventions may help to rebalance—to Level Up—the country.

Considering the combination of the direct and indirect effects of policy interventions and implementation and the importance of interlinkages <u>within and between places and industries</u> is crucial for achieving levelling up.

Keywords: public support to R&D, patents, R&D collaboration, regional development