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R&D Interdisciplinarity and the Organisation of R&D Activity: Evidence from the UK

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Arts, Humanities and Social Sciences R&D, Interdisciplinarity and the Organisation of R&D Activity: Evidence from the UK

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1. Introduction

There is increasing awareness of the importance of interdisciplinarity in organisational contexts, for instance at the team (Hundscheil et al 2021) and organisation (Grillitsch et al 2018; Brunow et al 2020; Siepel et al 2021) levels. In the context of R&D, a growing literature points to the importance of diversity in expertise as a driver in innovation performance (Kim and Song 2021; Zaggl and Pottbacker 2021), while innovation outputs themselves also increasingly draw from broad bases of knowledge and technology (Porter and Rafols 2009; Whalen 2018), and these outputs drawing from broad areas have disproportionate effect (Shi et al 2009).

Moreover, our understanding of interdisciplinarity itself is also changing – while it is widely proxied in the literature through patents that span multiple technology classes, this is also increasing awareness that R&D, as a phenomenon, often draws upon disciplines that vary widely beyond traditional science and technology fields.

For example, skills and knowledge from the arts, humanities and social sciences (AHSS) play an important complementary role in innovation and firm performance (cf. Sapsed et al 2013; Siepel 2021; Bakhshi 2022).

One challenge in capturing the role of AHSS in R&D is because the inputs of non-science and technology disciplines are difficult to measure. Although AHSS is recognised by the OECD Frascati Manual as a valid part of R&D, AHSS inputs are not easily traced to prior art

in patents, and other registered forms of IP such as trademarks or design rights are not easily attributable to specific types of inputs that would facilitate measurement.

Another issue with capturing the role of AHSS relates to the structure and organisation of R&D activities. Dating back to Schumpeter, there is a large body of literature on the structure and organisation of R&D departments, and recently there has been a prominent debate about the benefits of centralisation versus decentralisation in R&D departments across multinational corporations and other corporate groups (see for instance Becker et al 2014; Arora et al 2014; Argyres et al 2020; Eklund 2022). But given the importance of multiple disciplines within teams for innovation outcomes (Kim and Song 2021), it remains unclear whether companies with higher levels of interdisciplinarity are more likely to use different means of organising R&D activities. Building upon these developments in the organisation of R&D as well as other recent work around the nature of project based organisations (cf. Hadida et al 2018), the paper proposes a conceptual framework explaining how organisations executing interdisciplinary R&D may be more suitably organised around the integration of freelancers and other temporary workers.

2. Methods

As discussed above, identifying and measuring AHSS R&D is intrinsically challenging, as both the intermediate and final R&D outputs are necessarily intangible and difficult to count (cf. Hopkins and Siepel 2013). Rather than rely on R&D outputs, our approach in this paper is to measure AHSS R&D activities in terms of inputs. We do this by using a novel operationalisation of the OECD Fields of R&D (FoRD) classification (OECD 2015). This classification is typically used in official statistics to disaggregate national R&D spending, and includes a number of standardised disciplines. For our purposes we take the FoRD definition and then introduce a finer gradation again, allowing us to unpick various elements of broad field of AHSS.

With the aim of capturing these types of R&D, we used this FoRD-based framework in a survey of 303 UK businesses. Our sample frame was all businesses that had received public innovation funding from the UK government (either through receiving innovation grants from Innovate UK, or through receiving research funding from UK research councils), and which operated in either creative industries or technology sectors.

Our data is based on a survey of 303 UK businesses that had received innovation funding from the UK government (either innovation grants from Innovate UK or funding from research councils). The companies in the sample were selected for participation by their identification of R&D activities as a significant part of their UK business activities, as well as by their investment of financial or staff resources into R&D, using the OECD definition of R&D. Companies in the survey were asked about the disciplines that their R&D activities drew upon, as well as the level and nature of their R&D funding activities. They were also

asked about the organisation and nature of their R&D spending, including their use of freelancers. We construct a measure of freelancer intensity (in our case relating solely to R&D workers), following the Burke and Cowling (2020) ratio of freelance R&D workers to staff R&D workers. We model the relationship between R&D freelancer intensity and interdisciplinarity, among other controls, using OLS models.

3. Results

Beginning with interdisciplinarity, we find high levels of interdisciplinary R&D in our sample, with 23% of firms in our sample drawing upon three or more distinct disciplines in their R&D activity. In particular, arts, humanities and social science topics are found in R&D activity of 25% of firms in the sample. Notably, while this figure made up 36% of creative industries firms (as might be expected), 17% of non-creative industries firms used these disciplines in their R&D activities, virtually all in addition to conventional science and technology disciplines. This suggests that interdisciplinary R&D is a more common phenomenon than might otherwise possibly be expected.

Our econometric analysis shows that companies using AHSS R&D disciplines are more likely to use freelancers in their R&D activities in any case, and are associated with higher levels of freelancer intensity. Companies that combine more disciplines in their R&D activities are more likely still to have higher levels of freelancer intensity.

4. Discussion and Conclusions

This paper explores the extent to which interdisciplinary, and particularly non-science and technology R&D, is associated with divergent models of organisation for R&D activity. We find that a substantial minority of firms in our sample work across disciplines, and that these interdisciplinary firms are more likely to draw upon the skills of freelancers to achieve their R&D activities than those companies focusing across single disciplines. We find our conceptual framework regarding interdisciplinarity and the role of freelancers to be largely supported. We argue that this has meaningful implications for our understanding of R&D and R&D policy.

Our paper points to the importance of R&D interdisciplinarity, and in particular foregrounds the role of non-science/technology disciplines for their contribution to R&D. By highlighting the prevalence of (for instance) AHSS in R&D activities across tech companies – within but also beyond the creative and cultural industries – it points to the need to recalibrate our understanding of the nature of R&D. Our research suggests that measures to support R&D, for instance tax credits, should recognise the importance of AHSS. But our findings also point to the need to recognise shifting organisational forms associated with these changes to R&D activities beyond the more traditional notions of R&D activity, and to recognise these as equally valid to the conventional forms of R&D organisation that have been seen elsewhere in the economy.

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