

How Can We Attract and Retain More Internationally-mobile R&D?

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As the world becomes ‘flatter’ and firms have more locations available in which to site their activities, more and more locations are chasing the ‘holy grail’ of attracting high-tech activity, and particularly R&D. This is, however, often in the absence of a clear strategy of how to retain this investment once it has landed, and how to best encourage interactions between internationally mobile capital to maximise the benefits of that investment for a region. This review explores the empirical literature on the location of R&D and other high-tech or innovation-intensive activities and explores the main findings of this in the context of local economic development or inward investment strategies.

It is important to consider the nature of local labour markets in this context. Attracting high-tech investments often requires a degree of migration into a region. Firms recognise that in these activities they are engaged in a ‘war for talent’ such that earnings growth in these sectors far outstrip more general wage increases. As such, firms need to be convinced that in addition to the pool of labour already in a given location, more can be attracted from elsewhere. This issue is however somewhat at odds with the existing evidence, which focuses on financial incentives or tax policy as the means to attract such investments.

Background

Both policy and academic inquiry has developed an understanding of the benefits of attracting internationally mobile investment. This has moved from the straightforward strategy of seeking to attract inward investment to generate jobs, to an understanding of the wider benefits of attracting high-tech activity, generating productivity and innovation externalities, and fostering technological intensity in related sectors and along supply chains.

The approach that is used to explore the issue of the location of innovation intensive activity is to employ a relatively standard location model, and apply it to the question of R&D. Thus, the focus of this analysis is typically on the location, in terms of its characteristics, including factors such as infrastructure, local availability of labour,

technological competences locally, etc. It is necessary therefore to think of this in a 'multi-level' setting, with a combination of local (or regional) factors, as well as national ones, being the determining factors. So, for example, national government policies, such as the support for innovation or tax policy, interact with the availability of local labour. Based on the identified relationships, the literature then makes assumptions about the drivers of a given firm's location decisions. For example, if low labour costs are found to be important, then one may infer the desire to find low cost locations, while if local R&D expenditure is important, one may infer a desire to foster agglomeration economies as a driver.

However, this literature is rather divorced from that which considers the benefits of attracting such investment (or retaining it). The large, but still empirically rather limited literature on 'spillovers' essentially focusses on the extent to which attracting (high-tech) internationally mobile investments can generate knowledge transfer into other sectors, with an emphasis on the identification and measurement of these phenomena, rather than an explanation of why they may occur. Theoretically, attracting international R&D activities to a region *should* generate significant spillover effects into related sectors or along supply chains. These effects are in practice limited by a number of factors, such as the absorptive capacity of the local sector, and not least the efforts that R&D intensive firms go to in order to prevent knowledge leaking out of the firm. Typically, one finds that a key driver of such effects is labour mobility, as employees of the multinational move into other (local) firms then some knowledge transfer occurs with them.

What does the evidence suggest about the drivers of R&D location decisions?

Evidence

Studies tend therefore to adopt one of two approaches to exploring the determinants of R&D. The first is to focus on the firm, and its response to fiscal stimuli such as tax credits. There is a set of studies that seeks to model firms' location decisions. Typically, these focus on either the specific nature of the location, in terms for example of likely sources of agglomeration economies, links to universities, or the history of R&D or innovation in particular sectors, or they focus on fiscal issues. There is a well-developed, and convincing literature for example that argues that tax credits, or other forms of tax-based incentives boost R&D, but this typically focusses on firms that are already in a given location, rather than seeking to establish whether such policies will attract new investment in R&D.

Taken together, the evidence is compelling on two particular aspects. Firstly, R&D credits, or other tax-based approaches to stimulating R&D have been effective. However, whether this is still the case as the focus on tax shifts from the overall tax rate to the allowances for the treatment of licenses etc. remains to be seen. The evidence suggests though that this approach will remain effective. Locations now seek to offer an 'overall tax package' to attract new investors, including tax credits, and agreed treatment of license payments to the parent for example, in addition to bespoke agreements on tax breaks for investment.

Secondly, that factors which may be considered jointly as sources of 'agglomeration economies' are positively associated to R&D location drivers, with locations offering qualified labour, a vibrant local sector, or a 'history of R&D' likely to attract new R&D. All of these are also shown, in a related literature to be influenced by local industry-university linkages.

These findings then suggest that R&D tax incentives need for example to carefully consider where firms have cross-border tax planning opportunities, such that the effectiveness of R&D tax incentives requires stability of policy to build up credibility.

Overall, the literature on the determinants of the location of R&D mirrors closely the related literature on the determinants of high-tech activity more generally, with an emphasis on high-tech locations fostering virtuous cycles of development. Such a perspective is confirmed by the smaller, but equally compelling literature on co-location of production and R&D. While this literature focuses on similar issues as the main determinants of location, it is perhaps not surprising that more evidence of this is found for what may be considered medium-high tech sectors, and for second tier cities, rather than the most technological intensive sectors or locations, where production costs prohibit this degree of co-location.

Table 1: Drivers of R&D location

Study	Data	Locations considered	Variables included	Principal empirical results:
Belderbos, et al (2014)	location of 394 multinational R&D projects	NUTS 1 EU	Local universities research strength Local patent intensity Local Industry establishments Unemployment rate Geographic distance Language similarity Wage cost R&D tax incentives	R&D tax incentives, local universities and agglomeration all important
Hines (1994)	R&D locations of US firms	Country level locations of US R&D	Firm size, location	US firms R&D location extremely tax sensitive
Cantwell and Mudambi (2000)	Survey / interviews of foreign R&D plants in UK	UK regions	Incentives, export intensity, sector / activity	Tax allowances dominate all other inward investment incentives
Crescenzi et al (2014)	FDI markets data, EU locations. Location of different types of activity, one of which is R&D	EU NUTS 2	Patent intensity, unemployment, GDP/ head, Other investments in the region	Patent intensity and agglomeration drives R&D location
Castellani et al (2013)	FDI market	Location by country	Geographic and cultural distance, investment treaty, trade agreement	Trade agreements and R&D intensity of the firm

Castellani and LAVORATORI (2017)	FDI markets	Co-location of R&D and production	Technological intensity, distance, city locations	Co-location more likely in less high tech sectors, and in secondary rather than primary cities
Bloom et al (2000)	OECD ANBERD data	OECD	Firm size, user cost of capital, lagged R&D	Fiscal incentives boost R&D
Castellani (2017)	OECD regional innovation	OECD	Regional concentration, clustering	Spatial concentration and agglomeration drive R&D location decisions
Yang et al 2012	Firm level data	Taiwan	Fiscal incentives	Fiscal incentives boost R&D
Hall, B., & Van Reenen, J. (2000).	Review paper			Countries use tax policy rather than incentives to attract R&D

Summary and evidence gaps

The essential gap in this literature is that which exists between the focus on firms who are already in a given location and how to boost their R&D, and how to attract new R&D into a location. There is for example a well-developed literature which focuses on the location of high-tech activity, see for example Driffield and Menghinello (2009) which explores the importance of multilevel conditions, including local, regional and national, though this approach is seldom applied to the location of R&D. In contrast, the literature that seeks to link national policy on attempts to boost R&D has focussed on a set of firms in a given location, and then sought to model their responses. While this is compelling, for example Bloom et al. (2000) show that incentives boost R&D, the impact is very much at the firm level, so does not capture relation of activity.

This literature is however too divorced from literature on innovation more generally, which often sees R&D as an input into an overall production function.

Perhaps therefore the most appealing approach to this problem is offered by Devereux and Griffith (2009), who link tax incentives to firms' location decisions, showing that a key driver, irrespective of activity, is the user cost of capital, for which of course tax policy can be important. They also show that agglomeration economies, and proximity to other firms with high R&D spend drives location. In this context one also has to consider the motive for firms to be considering location. Efficiency seeking is now a consideration in R&D, with cost inflation well ahead of price inflation in many sectors, just as some firms engage in R&D in order to connect to external sources of innovation. This appears however to be ignored in the literature on the location of R&D.

However, while the literature does occasionally focus on labour costs, it essentially ignores the nature of labour markets in such sectors. In R&D and indeed in R&D intensive sectors, wage inflation globally is well ahead of other sectors, and it is common for people to be head hunted at short notice. The literature on firm location often ignores this, often with a focus on employment creation. In activities such as R&D, many of the jobs created involve firms competing in already over-heated labour markets, or seeking to encourage migration to the region.

This highlights then the final gap in this literature. If firms are going to be competing either for already scarce labour, or encouraging migration, then this offers two challenges for local policy makers. The first centres around skills, and ensuring the pipeline of skills, through apprenticeships as well as through universities (with action on retention of graduates) to meet demand. The second is more general, including issues around housing, schools and other factors that may be considered 'quality of life'. If locations are going to seek to attract key workers in, then these basics also need to be on offer as part of the regions value proposition.

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