Research Policy 42 (2013) 465–480

Contents lists available at SciVerse ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

We need to talk – or do we? Geographic distance and the commercialization of technologies from public research

Guido Buenstorf[a,*], Alexander Schacht[b,1]

[a] Institute of Economics and International Center for Higher Education Research (INCHER-Kassel), University of Kassel, Germany
[b] Graduate College "The Economics of Innovative Change", Friedrich Schiller University Jena, Germany

ARTICLE INFO

Article history:
Received 21 September 2011
Received in revised form 30 April 2012
Accepted 29 June 2012
Available online 9 August 2012

JEL classification:
L24
L26
O34
R30

Keywords:
Academic inventions
Licensing
Spin-off entrepreneurship
Geographic distance

ABSTRACT

Using a new dataset with detailed geographic information about licensing activities of the German Max Planck Society, we analyze how the probability and magnitude of commercial success are affected by geographic distance between licensors and licensees. Our evidence suggests that proximity does not generally lead to superior commercialization outcomes. A significantly negative association between distance and commercialization success is identified only for foreign licensees within the subsample of inventions licensed to more than one firm. Positive associations between distance and performance indicators are not robust to controlling for invention quality or selection into licensing.

1. Introduction

Creation of new knowledge through research and development (R&D) is the main engine of technological change, and technological change is the main engine of growth and employment in modern economies. Universities and non-university public research organizations (PROs for short) are important generators of new knowledge (Salter and Martin, 2001). It is therefore not surprising that policy makers have undertaken considerable efforts to strengthen the links between public research and the private sector. Driven by the motivation to improve the utilization of new knowledge in the economy, the Bayh-Dole Act of 1980 in the U.S. and similar legislative changes elsewhere advanced technology transfer as one of the main objectives – a "third mission" (Etzkowitz and Leydesdorff, 2000) – of public research. Even though multiple relevant channels of knowledge transfer exist, including publications, conferences, consulting, and scientist migration to the private sector (Agrawal and Henderson, 2002; Cohen et al., 2002), recent legislative activities have often focused on university patenting and licensing as instruments to commercialize scientific results (Bozeman, 2000; Mowery et al., 2001; Shane, 2002; Sampat, 2006; Kenney and Patton, 2009; Della Malva et al., forthcoming; Von Proff et al., 2012).

Commercialization of academic inventions by private-sector firms is fraught with a variety of challenges. Similar to other "markets for technology" (Arora et al., 2001) the market for academic inventions is characterized by substantial information asymmetry between the inventor and the potential licensee (Shane, 2002; Siegel et al., 2003; Lowe, 2006). In addition, licensed academic inventions are usually far from being readily marketable (Jensen and Thursby, 2001) and the underlying knowledge possessed by the original academic inventors – which is often critical for success – is not fully codified (Agrawal, 2006).

This paper focuses on the role of geography in the commercialization of academic inventions. Geographic distance and licensing across national borders may aggravate problems of information asymmetry and complicate inventor engagement. This may lead to inferior commercialization outcomes, which in turn might provide an economic rationale for preferential licensing of academic inventions to regional firms. To assess the relevance of such concerns, we utilize the fact that license-based commercialization is a sequential process, and not all licenses of academic inventions

* Corresponding author. Tel.: +49 0561 804 2506.
E-mail addresses: buenstorf@uni-kassel.de (G. Buenstorf), alexander.schacht@uni-jena.de (A. Schacht).
[1] Tel.: +49 03641 9 43277.

0048-7333/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.respol.2012.06.010

lead to commercial success stories. Specifically, we relate observable differences in outcomes of the commercialization stage to the geographic distance between licensor and licensee.

Empirical research on license-based commercialization of academic inventions is limited by the lack of universities and PROs having sufficient numbers of successfully commercialized inventions. Existing findings are largely restricted to a few leading U.S. universities. Shane (2002, for the MIT) and Lowe and Ziedonis (2006, for the University of California system) compare commercialization outcomes of startup licensees with those of established firms. Also using data on licensed MIT inventions, Dechenaux et al. (2008) analyze how appropriability conditions affect termination likelihood and commercialization success. Elfenbein (2004, 2007) explores the significance of contractual provisions and inventor seniority for commercialization outcomes in the empirical context of Harvard University. Given the traditionally different ownership model for academic inventions in Europe (Lissoni et al., 2008) and the ensuing lack of licensing data, very little prior evidence at the level of individual inventions exists for Europe. Buenstorf and Geissler (2012) use data for the German Max Planck Society to compare the commercialization outcomes of spin-offs and other licensees. Similar to Shane (2002) and Lowe and Ziedonis (2006) they find limited evidence of systematic differences between both types of licensees.

The contribution of public research to the *regional* innovation and growth performance has been explored in a long line of prior research. Results have been mixed. Several authors (e.g. Jaffe, 1989; Acs et al., 1992; Anselin et al., 1997; Fritsch and Slavtchev, 2007) suggest that proximity to public research yields substantial benefits to firms' innovativeness. Mansfield and Lee (1996) likewise find that firms prefer to work with university researchers who are located less than 100 miles away from their laboratories. Based on a survey of R&D laboratories in the U.S., Adams (2002) concludes that geographic proximity is more important in university-firm interactions than in firm-firm interactions. Adopting the methodology pioneered by Jaffe et al. (1993), Belenzon and Schankerman (forthcoming) find that citation rates of both publications and university patents decline sharply with distance.

Other work suggests a lesser role for geographic proximity. Audretsch and Stephan (1996) show that the majority of links between university scientists and U.S. biotechnology firms are non-local. Even about 40 percent of all spin-off founders among the studied researchers established firms outside the region of their university. Similar results have been obtained for Germany (e.g. Grotz and Braun, 1997). In a survey of 2300 German companies, Beise and Stahl (1999) do not detect a higher likelihood to innovate for firms that are located close to universities or polytechnics. They conclude that geographic proximity to public research does not influence the probability of public research-based innovations. However, as pointed out by Salter and Martin (2001), this result might be influenced by specificities of Germany's geography.

Very little prior work has studied the role of geography in the commercialization of licensed university inventions. Mowery and Ziedonis (2001) compare the geographic reach of patent citations and licenses. They conclude that licenses of academic inventions are more localized than patent citations. Survey-based work by Santoro and Gopalakrishnan (2001) suggests that geographic proximity favorably affects technology transfer activities between universities and firms. In contrast, controlling for inventor involvement in licensees' commercialization efforts, Agrawal (2006) finds no effects of co-location on commercialization outcomes.

In the present paper we contribute to this latter line of research at the intersection of academic inventions and geography. We use and extend a dataset with detailed information about licensing activities of the Max Planck Society, Germany's largest non-university public research organization focused on basic research (Buenstorf and Geissler, 2012). In contrast to the faculty of German universities, Max Planck researchers have never enjoyed the professors' privilege but have consistently been subject to a Bayh-Dole-like IPR regime since the 1970s. This circumstance provides us with a rare opportunity to study license-based commercialization of academic inventions in the European context. Our dataset encompasses more than 2300 inventions for the time period 1980–2004, of which 773 have been licensed. It also includes detailed information about payments to the Max Planck Society indicating whether or not an invention has been commercialized successfully, as well as the magnitude of the returns.

Most importantly for the present study, the available information includes the locations of the originating Max Planck institute and the private-sector licensee. While a considerable fraction of license agreements is with regional firms, there is substantial variation in distances, and international licensing accounts for almost a third of all licenses in our analysis. We exploit this variation to analyze whether and how probability and magnitude of commercial success are affected by geographic distance between inventors and licensees. Our findings suggest that geographic distance is generally not a relevant obstacle to successful commercialization of academic inventions. A significantly negative association between distance and commercialization success is identified only for foreign licensees of inventions licensed to more than one firm. In some models, more distant licensees have superior commercialization outcomes. However, these positive associations between distance and performance indicators are not robust to controlling for invention quality or selection into licensing.

The remainder of the paper is organized as follows: The next section develops theoretical considerations about the potential importance of geographic proximity for commercialization success. Section 3 provides information about the technology transfer process of the Max Planck Society. Section 4 describes our data and research design, whereas results are presented in Section 5. We discuss implications and limitations of our analysis in Section 6.

2. Geographic proximity and the commercialization of academic inventions

2.1. Why are licensees of academic inventions localized?

Belenzon and Schankerman (forthcoming) show that citations to U.S. university patents are concentrated around the location of the patenting university. Mowery and Ziedonis (2001) find for a sample of leading U.S. universities that licensees are even more localized than citations. A variety of factors could help explain these patterns.[2]

Non-codified knowledge is frequently invoked to account for geographic concentration of economic activities. Non-codified or "tacit" (Polanyi, 1966) knowledge is not expressed in patents, publications or blueprints and can only be learned through direct face-to-face contact. As a consequence, it tends to be geographically "sticky" (Von Hippel, 1994). In the context of license-based commercialization of academic inventions, non-codified knowledge related to the invention may contribute to localization in several ways.

[2] Co-location of licensors and licensees might be spurious in that it might only reflect a concentration of potential licensees in the proximity of the licensing university. Previous work based on patent citations has accordingly sought to control for geographic concentration by finding suitable control groups. Jaffe et al. (1993; see also Thompson and Fox-Kean, 2005) find that knowledge flows as measured by patent citations are more localized than the overall population of patents in the respective technology field.