



The effect of patent grant on the geographic reach of patent trade



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ABSTRACT

This paper examines whether patents increase the geographic reach of the market for ideas. By employing a dataset of 25,127 US patents traded between US located firms, we find that patents sold during application phase are less likely to be traded outside the seller's state than patents that have been issued. To tackle the endogeneity issues we employ coarsened exact matching techniques. We find that patent grant increases the likelihood of a patent to be traded across boundaries of the state. This evidence is stronger for patents originating from the less innovative US states.

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1. Introduction

Innovative activity is at the heart of economic growth and the knowledge-based economy. A key driver of innovative activity is the exchange of ideas (Audretsch & Feldman, 1996). Scholars have shown that knowledge flows increase the speed of innovative activity and subsequently the rate of economic growth (Coe & Helpman, 1995; Grossman & Helpman, 1991). As a result, a great deal of attention has been paid to channels that can embody knowledge flows; namely, Foreign Direct Investments (FDI), trade of physical goods, inventor mobility and patent citations.¹

Recently, the market for patents has received considerable attention as a mechanism through which ideas are exchanged and, therefore, a conduit of knowledge flows. As Ouellette (2012) shows, researchers receive information from studying patent documents in addition to scientific papers, while Bessen (2005) argues that the patent system should operate as a means for the diffusion of technical information disclosed in inventions. Johnson and Liu (2011) show, for the case of Chinese, that technology markets enhance knowledge spillovers and innovation.

Geographic distance has been recognized as one of the most important obstacles for all the aforementioned channels of knowledge diffusion, including patent transactions.² Burhop and Wolf (2013) found that geographic distance mitigates patent transactions and

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¹ Branstetter (2006) tested and verified that FDI embodies knowledge flows between Japanese and US firms. Keller (2002) found that accessible R&D from other industries through trade increases the own industry's productivity. Kim & Marschke (2005) showed that hiring high skilled workers increases the knowledge stock resulting in larger innovation output for a given firm. Finally, in the seminal paper Jaffe, Trajtenberg, and Henderson (1993) approximated knowledge flows via patent citations; the large literature stemming from this study has shown that citations approximate knowledge flows with a significant effect on production of innovation (for a recent review consult Autant-Bernard, Fadaïro, & Massard, 2013).

² For instance Peri (2005) found significant negative effects of distance in the reach of patent citations. For the large literature of the negative effect of distance on trade see Disdier and Head (2008).

Drivas and Economidou (2014) came to similar conclusions as regards to patent citations and patent trade. Given the significant role of patents in technology transfer and the importance of geographic distance as a mitigating factor, a key question that emerges is to what extent patents themselves weaken the localization of technology transfer.

In this paper we investigate whether patent applications are less likely to be sold outside the state compared to issued patents. Our focus, therefore, lies on the patent grant, the event in which a patent application is awarded a patent, and on whether it increases the likelihood of a patent to be sold outside a state.

We utilize the recently compiled dataset by the Office of Chief Economist at the United States Patent and Trademark Office (USPTO). From this dataset we isolate a large sample of patents that were traded between US located firms. We compare whether patents traded before patent grant (i.e. during the application phase) are less likely to be sold outside the state than patents traded after patent grant. There is however an inherent endogeneity problem. Patent applications could simply be traded within state borders because they are introduced for a short period of time and, therefore, known only locally. That is, the patent grant could be merely confounded with an aging effect and it could mistakenly be interpreted as the cause of the reach of the transfer.

To tackle this endogeneity issue we perform a coarsened exact matching of patents traded based on the lag of sale since filing date. By matching patents on this lag, we avoid endogeneity issues associated with the age of the patent application or patent. We also match patents based on their citations and the state's patent profile to capture patent quality, and the market opportunity for the patent. We follow the procedure proposed by Iacus, King, and Porro (2012) to match patents based on these characteristics.

Results show that patents originating from similar states in terms of patenting profile with similar trade lags and patent citations are more likely to be traded outside the state compared to patent applications. This indicates that patent grant plays a role in the reach of the market for ideas. Furthermore, we find that the patent grant effect varies across technology fields. Finally, for patents that originate from the forty less innovative states in the US, patent grant has a greater impact than for patents that originate from the top ten innovative states. This finding implies that, the publicity associated with the patent grant is more important in shaping the geographic reach of patent transfers when patents originate from less innovative states.

Our paper relates closely to two streams of literature. The first is the market for patents. This topic was first studied in the economic history literature. Lamoreaux and Sokoloff (1999, 2001) investigated how the patent system contributed to the development of a formal market of trading intangible assets in the US during the 19th century. Burhop and Wolf (2013) examined the market of patents in Germany between 1884 and 1913 and focused primarily on the geographic determinants of patent assignments.³ While this literature is concerned with the geographic aspect of patent transactions, it has not examined the role of patent grants. Serrano (2010) was the first to use modern day data from USPTO to analyze the determinants of patent trades and focused on the gains from such trades.

The second stream examines the impact of patent grant on licensing. Two recent studies by Elfenbein (2007) and Gans, Hsu, and Stern (2008) concluded that patent grant increases the hazard rate of licensing.⁴ However, they did not offer any insights on the geography of the licensing activity and whether this is influenced by the event of patent grant. The only study which examines the impact of patents on the geography of innovative activity is by Moser (2011) which found that an exogenous shift towards patenting chemical inventions enhanced the geographic diffusion of such innovations. However, she did not explicitly examine the market for patents.

We contribute to the aforementioned literature by examining the role of patent grant in the geography for the market of ideas. Geography is one of the most important obstacles of accessing other regions' R&D (Keller, 2002). Therefore, examining whether patents alleviate part of the geographic boundaries in the market of ideas can play a role in our understanding of how patents moderate the role of geography.

The next section describes the data and the empirical setup. In Section 3 we present the results and in Section 4 the paper concludes. Technical details of the coarsened exacting matching are included in Appendix 1.

2. Data description and empirical setup

2.1. Data construction

Data on patent trades have graciously been supplied to us by the Office of Chief Economist at the USPTO.⁵ The Office has compiled a dataset which discloses patent assignments (transactions) between entities which are registered at the USPTO.⁶ This dataset is called "Patent Assignment Dataset". A typical assignment is characterized by a unique identifier (i.e. reel frame), the names of the buyer (i.e. assignee) and seller (i.e. assignor), the date that the transaction agreement was signed (execution date) and the patent numbers or patent applications that are traded per assignment. For detailed information on the dataset see Graham and Marco (2014).

While compiling our sample we faced two main challenges. The first one relates to the fact that entities are not required to report transactions to the USPTO. Hence, it is likely that a number of transactions have not been disclosed to the USPTO either due to negligence, or to strategic behavior of firms. Nevertheless, for legal and perhaps accounting reasons, they have incentives to do so.⁷ However, given the question in our paper, as long as this missing information is random for patents sold before (during application) and after grant, it is not likely to bias our results.

³ See Burhop and Wolf (2013) and the references therein for more references concerning the market of patents in a historical context.

⁴ This finding has also been supported by the theoretical literature (Hellman 2007; Hellmann & Perotti, 2011).

⁵ As of recently, the data are publicly available at Google bulk downloads: <http://www.google.com/googlebooks/uspto-patents-assignments.html>.

⁶ In the US, when entities transfer US issued patents to other entities, they disclose such transactions to the USPTO. The latter are called assignments.

⁷ For instance, in a potential litigation the courts will need to know clearly which firm or organization holds the intellectual property in question. Thus, parties that are involved in such transactions have incentives to disclose such information to the USPTO.

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