Technological Forecasting & Social Change 108 (2016) 83–94

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

The impact of relational spillovers from joint research projects on knowledge creation across European regions

Daniela Di Cagno [a], Andrea Fabrizi [b,1], Valentina Meliciani [a,*], Iris Wanzenböck [c]

[a] University LUISS Guido Carli, Rome, Italy
[b] Ministry of Economic Development, Rome, Italy
[c] Austrian Institute of Technology, Austria

ARTICLE INFO

Article history:
Received 3 November 2014
Received in revised form 18 April 2016
Accepted 19 April 2016
Available online 12 May 2016

JEL classification:
O31
R12
C23

Keywords:
Relational spillovers
R&D collaboration
Knowledge
EU Framework Programmes
Spatial correlation
Patents

ABSTRACT

This paper investigates the impact of "relational" spillovers, arising from participation in European research networks, on knowledge creation across European regions. We use links in the EU Framework Programmes (from the Fourth to the Seventh) to weigh foreign R&D in order to construct a relational distance matrix across 257 European regions over the period 1995–2010. We then assess the impact of relational spillovers on regional patent applications controlling for local spatial spillovers. We find that relational spillovers matter for knowledge creation although spatial contiguity remains a crucial factor. We also find that spillovers are higher when regions with different levels of R&D participate in European networks.

1. Introduction

The European Union in both the Lisbon Strategy and, more recently, in the Strategy Europe 2020 strongly emphasizes the crucial role of innovation for Europe's long run growth. Among the different instruments used to foster innovation, the EU has devoted a relevant and increasing amount of resources to finance Framework Programmes (FP) encouraging collaboration across different EU regions/countries. Behind the implementation of such policies is the idea that international knowledge flows are a major factor in world growth. This view has been supported by a large body of literature showing the importance of technology spillovers[2] for growth and productivity (for a review see Cincera and Van Pottelsberghe de la Potterie (2001); Hall et al. (2010)).

However, most of the studies find that knowledge spillovers are geographically concentrated (see, among others, Jaffe et al. (1993), Jaffe et al. (1999), Maurseth and Verspagen (2002)). This is consistent with the fact that knowledge is imperfectly codified, linked to the experience of the scientists or "attached" to people, so that it diffuses mostly via personal contacts and face-to-face interactions that are facilitated by geographical proximity.

Recently, some authors (Boschma, 2005; Maggioni and Uberti, 2011) have argued that the importance of geographical proximity cannot be assessed in isolation, but should always be examined in relation to other dimensions of proximity that may provide alternative solutions to the problem of coordination (Boschma, 2005). The different role of geographical and relational proximity in the creation and diffusion of knowledge bears important consequences for the geographical distribution of innovation activities in Europe and for policies devoted to support the creation and dispersion of knowledge among European countries/regions. In fact, the geographical concentration of knowledge spillovers can lead to an uneven distribution of innovation activities exacerbating income disparities between the core and the periphery (Bottazzi and Peri, 2003; Crescenzi and Rodriguez-Pose, 2011). In this perspective, in order to be consistent with its Cohesion policy, the European Union should evaluate what kind of knowledge transfers/

* Corresponding author.
E-mail address: vmeliciani@luiss.it (V. Meliciani).

[1] Responsibility for the information and views set out in this article lies entirely with the author.

[2] Spillovers differ from technology transfers since the former refer to an unintended transfer of knowledge (externality) while the latter occur when there is a voluntary exchange of knowledge and eventually a price is attached to the transaction of knowledge. Empirically distinguishing between spillovers and knowledge transfers is not an easy task, in this paper we will, therefore, use the two terms interchangeably.

http://dx.doi.org/10.1016/j.techfore.2016.04.021
0040-1625/

spillovers occur within EU research networks and to what extent the decrease in "relational" distance brought about by research networks could overcome the possibly diverging impact of geographically clustered spillovers.

Framework Programmes have special characteristics that make them particularly interesting for evaluating the role of relational spillovers. In fact, participation in EU funded projects creates supranational networks potentially able to give rise to international knowledge transfers based on "relational" distance, going beyond geographical proximity. If geographical proximity is important for exchanging knowledge, participation in international research programmes can be a way of reconciling the need for "face to face" contacts (through the mobility of researchers during and after the project) with knowledge exchange via interactions over long distances. But, what kind of networks are favoured by the EU initiative and what kind of networks are more effective in fostering knowledge transfers/spillovers?

On the one hand, regions at the technological frontier have an incentive to collaborate with partners from other research intensive regions in order to create networks of excellence; on the other hand the European Union encourages participation of scientifically lagging regions to FP networks.[3] For these regions, participation in FP can be a means to partly close their scientific and technological gap with the more advanced partners.

The aim of this paper is to assess the role of relational R&D spillovers arising from participation in EU Framework Programmes for knowledge generation (patents) across European regions. In contrast to previous studies (reviewed in the next section) our focus is on the additional effect of relational spillovers with respect to spatial spillovers and on assessing which kind of collaborations, if any, are more effective in generating spillovers. For that purpose, in our empirical analysis we allow for the extent of spillovers to vary between regions cooperating with other similar or dissimilar (in terms of R&D intensity) regions.

The paper is organized as follows: the next section discusses other papers dealing with the estimation of relational spillovers at the regional level and introduces our research hypotheses and econometric methodology; Section 3 describes the data and presents descriptive statistics on EU regional innovation networks based on collaborations in FP; Section 4 presents the results of the econometric estimations, while Section 5 concludes and draws policy implications.

2. Measuring relational spillovers

2.1. Previous literature

The role of R&D spillovers for regional growth has been deeply investigated recently by many authors showing that the relevance of such spillovers is very localized.[4] This result is supported by other studies in the field of the geography of innovation stating that proximity matters since it enhances interpersonal relationships and face-to-face contacts, thus making it easier to transfer tacit knowledge.[5]

However, the special role of geographical distance with respect to other types of distances has been questioned by Boschma (2005) and Autant-Bernard et al. (2007a) claiming that geographical proximity per sé is neither a necessary nor a sufficient condition for learning to take place: other types of proximity such as cognitive, organizational, social and institutional distances may be equally relevant, although they could be enhanced by geographical proximity. In this context, Singh (2005) finds that geographical proximity (being in the same region or firm) has little additional effect on the probability of knowledge flows between inventors who already have close network ties (past collaborations). Further, Breschi and Lissoni (2009) show that after controlling for inventor mobility and for the resulting co-invention network, the residual effect of spatial proximity on knowledge diffusion is strongly reduced.[6] More recently, using co-patenting between UK inventors, Crescenzi et al. (2014) show that while physical proximity is crucial in starting a collaboration, once a relationship has been established other forms of proximity (organizational, social and ethnic links) become more relevant and, in the case of serial inventors, geography no longer matters.

These, and other similar findings, suggest that quantifying the role of "relational" distance, with respect to "geographical" distance, as a source of knowledge flows is an interesting research topic deserving deeper investigation. With this aim Marrocu et al. (2013) analyse the role of different types of proximity on regional innovation for a sample of European regions, finding that technological proximity outperforms geographic proximity, whilst a limited role is played by social and organizational networks.

European Framework Programmes provide data that fit especially well when measuring relational proximity: they are in fact specifically designed to encourage the creation of linkages among researchers of different and often geographically distant regions. However, this data has been analysed so far mainly with the purpose of looking at the structure of research networks and aimed at investigating the factors that facilitate their formation,[7] while only a few papers have looked at the impact of participation in EU Framework Programmes on knowledge transfers (Maggioni et al., 2007; Hoekman et al., 2013; Di Cagno et al., 2013).

To the best of our knowledge, the only studies that use the data extracted from EU Framework Programmes to estimate the impact of relational distance on knowledge creation at the regional level, as done in this paper, are those of Maggioni et al. (2007) and Hoekman et al. (2013). In particular, Maggioni et al. (2007) investigate the role of both geographical and relational distance, finding that spatial proximity and geographical centrality are always significant in determining the co-patenting activity, whereas joint collaborations also appear as another important factor. They also estimate a knowledge production function using two spatial error models based respectively on geographical and relational (co-participation to EU projects) distance matrices. They find that relational networks influence the behaviour of regional innovation systems, but that spatial proximity plays a more relevant role in determining their performance.

Using a regionalized dataset of joint FP participations and joint co-publication activities, Hoekman et al. (2013) study whether the acquisition and effect of FP funding is disproportionally concentrated in the leading research regions. They show that the returns to FP funding are highest when involving scientifically lagging regions, concluding that the current FP policy is in line with the EU Cohesion policy.

Our contribution builds on these two studies: similarly to Maggioni et al. (2007), it aims at investigating the respective role of geographical and relational proximity for knowledge creation while, in line with Hoekman et al. (2013), it asks whether the effect of FP funding varies across regions. However, differently from Maggioni et al. (2007), it contributes to the literature by disentangling the additional effect of R&D relational spillovers and geographical spillovers by adopting a spatial lag of X (R&D) model (SLX) (Lesage, 2014) of the knowledge production function including, at the same time, R&D weighted by two different distance matrices; one based on geographical distance across regions and the second based on relational distance. At the same time, in contrast to Hoekman et al. (2013), it formally tests whether relational R&D

[3] Although there is no explicit reference to this criterion, the chance of obtaining EU funding increases when the network includes regions with different levels of R&D capabilities and in particular regions from countries recently joining the EU.

[4] Peri (2004), Bottazzi and Peri (2003), Moreno et al. (2005) and Rodriguez-Pose and Crescenzi (2008 and 2011).

[5] Zucker et al. (1998), Almeida and Kogut (1999), Singh (2005), Balconi et al. (2004), Breschi and Lissoni (2006) and Mairesse and Turner (2006).

[6] An analogous effect is found by Ponds et al. (2007), using data on co-publications in the Netherlands and by D'Este et al. (2013) in which the role of geographical proximity in the formation of new partnerships between universities and firms is weakened when firms are located in dense and technologically related clusters.

[7] Breschi and Cusmano (2004), Maggioni et al. (2007), (2011), Autant-Bernard et al. (2007b), Scherngell and Barber (2009), Ortega and Aguillo (2010), Scherngell and Barber (2011), Hoekman et al. (2013) and Wanzenböck et al. (2014).