



POLICY NOTE OF WORKING PAPER 4.21

NETWORKS, PROXIMITIES AND INTER-FIRM KNOWLEDGE EXCHANGES

Stefano Usai, Emanuela Marrocu, Raffaele Paci
University of Cagliari, CRENoS

OBJECTIVE

Building on previous literature providing extensive evidence on flows of knowledge generated by inter-firm agreements, in this paper we aim to analyse how the occurrence of such collaborations is driven by the multi-dimensional proximity among participants and by their position within firms' network. More specifically, the aim of this research is to analyse how the occurrence of inter-firm collaborations, and the consequent knowledge exchanges among partners, are driven by different dimensions of proximity among participants and by the features of the networks they are involved in. More specifically, we assess the likelihood that any two firms choose to activate a bilateral partnership (or take part in a multi-participant agreement) in relation to their reciprocal geographical, technological, organizational, institutional and social proximity. Moreover, on the basis of the past experience of each firm within networks, we assess whether the preferential attachment and the transitivity characteristics have an additional effect on the occurrence of inter-firm agreements.

SCIENTIFIC/RESEARCH METHODS

We base our empirical analysis on announced agreements over the period 2005-2012 in which at least one firm is localised in Italy, including both domestic and international collaborations. In total we examine 631 agreements that involved 1078 firms. An original feature of our study is that we consider agreements covering all economic activities and this allow us to offer a wide-ranging scenario with respect to previous contributions on the role of proximity based on individual data. To the best of our knowledge, previous studies limited the investigation to a single industry, while other studies give a global picture of the role of proximity with respect to the whole economy, but were conducted on data aggregated at a regional level (Marrocu et al., 2013; Maggioni et al., 2013). Our study represents a novel contribution in investigating five dimensions of proximity within a multi-sector framework and in testing whether they act as substitutes or complements in nowadays complex economic systems.

Given the large sample dimensionality difficulties that arise when analysing firm partnerships across different countries – because the network structure becomes virtually worldwide, reaching high degrees of complexity – we chose to restrict our sample to the set of agreements with at least one firm located in Italy. This allows us to end up with a manageable dataset and computationally less demanding proximity and network indicators for each pair of firms.

MAIN RESULTS

The econometric analysis, based on the logistic framework for rare events, yielded three main results. First, all the five dimensions of proximity jointly exert a positive and relevant effect in determining the probability of inter-firm knowledge exchanges, signalling that they are complementary rather than substitute channels. Second, technological proximity exhibits the higher impact on probability, followed by the geographical one, while the other proximities (social, institutional and organizational) have a limited effect. Third, firms network positioning, in terms of both preferential attachment and transitivity, significantly enhances the probability of inter-firm agreements.

Furthermore, unlike previous contributions in the literature on proximity, we take a step further in assessing how changes in proximity or network features affects the

likelihood that any two firms exchange knowledge thanks to inter-firm collaborations. Therefore, we measure the increase in the estimated conditional probability for a given change in each explanatory variable in turn. Unless otherwise stated such a change is considered with respect to the median value and it is equal to one standard deviation.

We start from a basic model which yields an estimated probability of an agreement, when median values are attributed to all variables, equal to 3.7%. With respect to this starting point we find that, as in Paci et al. (2013) and Montobbio and Sterzi (2013), the highest impact on probability is found when the technological proximity measured by the sharing of the same industry increases by one standard deviation with respect to the median. The probability goes up to around 7.4%, with an increase of 98% with respect to the baseline estimation. Increases of around 50% are also registered for all other measures of technological proximity.

Regarding the geographical proximity, one standard deviation change makes the estimated probability increase by 23% (from 3.7% to 4.7%), which is around one quarter of the effect produced by a change in the same-industry dummy. As a matter of fact, the same effect induced by an increase in the highest degree of technological relatedness would be obtained with a reduction in the geographical distance as remarkable as moving from the median value (1728 km) to just 100 kilometers.

As for the other proximities, the effect on the estimated probability is always positive but smaller: a change in the organizational proximity induces a change of 12.2%, while 9.3% and 0.8% are the increases in probability due to institutional proximity and social proximity, respectively. Despite the modest influence of social proximity, we find that firm's own social relations are much more effective. Considering the partners average effects, the preferential attachment raises the probability of observing an agreement by 31.1%, while 8.1% is the increase due to the transitivity property.

POLICY IMPLICATIONS

Our analysis offers some relevant and original empirical findings which allow for a better understanding of the processes of knowledge diffusion across Europe and ENC. Overall our findings offer further support to the composite role played by proximities and network features in driving the complex diffusion of knowledge. Although they

may have a reciprocal moderate effects, proximities and social links are by no means interchangeable, they supplement each other in contributing to favor the transmission of knowledge among firms. Such a transmission, as a matter of fact, is facilitated not only by spatial proximity, as argued by the traditional approach, but also by other dimensions of inter-firm closeness, like sharing a common cognitive base, have the same institutional background, being a part of the same organisation, belong to the same network. This highlights the importance of analysing inter-firm knowledge flows simultaneously accounting for the whole set of relevant proximities and network features within a comprehensive empirical specification.

Despite our analysis is devoted to the Italian case, this is unlikely to alter the general validity of the results because firms' propensity to start an agreement is much more influenced by sectoral heterogeneity than by country differences. This is confirmed by looking at the distribution of agreements by number of partners: in our sample, comprising agreements with at least one Italian participant, 90% of them involve only two partners; such proportion is very similar to the one (88%) reported by García-Canal et al. (2008) for 15 countries of the European Union.

This implies that as far as knowledge flows between EU and ENC countries are concerned, the most important factors are still given by technological and geographical proximities which are difficult to influence. The importance of the technological space, in particular, implies that regions and countries should focus on the creation and strengthening of relationships along common cognitive and technological trajectories. Policies should support the formation of specialised networks among firms which go beyond the geographical clusters.

Moreover, despite the modest influence of social proximity, the relative importance of network links is evidenced by the presence of preferential attachment and transitivity effects. More specifically, the significance of the other types of proximities, such as institutional and organizational, leaves some space for policy interventions which act directly on moderating the effect of such distances. In particular, financial and technical support for firms aiming at widening their spectrum of potential partners may be an good option to overcome high entrance costs in the international scenario. These policies, which help firms to start establishing some form of international links, are aimed at facilitating other potential agreements and exchanges in the future.

Finally, we should remember that firms' alliances and joint ventures are greatly influenced by the wider institutional and political state of affairs of each country. Consequently, we need policies which are aimed at reducing the global political-institutional distance between countries in EU and ENC. Only with a constant process of increasing civil and political stability we may hope to have a sustainable increasing dynamics of knowledge flows across countries thank to partnerships and agreements among firms.