



Institute of Economic Research Working Papers

No. 32/2017

International activity of the innovative enterprises – experience and recommendations

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Article prepared and submitted for:

9th International Conference on Applied Economics Contemporary Issues in Economy, Institute of Economic Research, Polish Economic Society Branch in Toruń, Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Toruń, Poland, 22-23 June 2017

Toruń, Poland 2017

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JEL Classification: *O14; O11*

Keywords: *technology, support, cooperation, innovation, management*

Abstract

Research background:

In the international literature we can find great examples of research in the field of innovation and technological cooperation boosting between companies. Confrontation of theory and empirical research shows that meaning of cooperation and geographical closeness for innovative activity as well as the quality and effectiveness of public support are still ambiguous. Public support of technological cooperation is connected with different components of innovative network, that shows the need of horizontal cooperation, what is legitimate in developed countries. Great example of that kind of international network is Enterprise Europe Network (EEN).

Innovative cooperation and technology transfer infiltration always have been a subject of research, but still there are issues to investigate. Because of that reason, there was a research hypothesis created: international technology transfer performed among companies and other economic entities accelerates innovative processes and gives profits for both players.

Purpose of the article:

The purpose of this article is to show different aspects among cooperation and technology transfer and try to evaluate its synergical impact on international innovative activity of companies.

Methodology/methods:

This paper illustrates theoretical and empirical research in the scope of many aspects of innovative cooperation and technology transfer. The empirical analysis focused on data from the Enterprise Europe Network in 2009-2015 and interviews with offices

supporting companies in starting and performing of international technological cooperation. The presentation of spatial connections of technological cooperation was illustrated by the Gastner Newman's amorphous (eumorphous) choropleth, created in the ArcMap 10.4.1 programme with the use of the quantile method.

Findings:

The article discusses the role of cooperation among network in the international technology transfer. A special analytical emphasis was put on the public networks supporting such cooperation. Specific knowledge and technology is very often out of reach for companies (especially SMEs) because of costs or limited access, and cooperation provides the opportunity to create new relations which can integrate ideas and knowledge, and in effect, lead to new ground-breaking innovations. There is also the significant element like public support for companies in the whole technology transfer process.

Introduction

Conceptualization of the international activity of companies in the area of technological cooperation is one of the most important areas of research undertaken in the literature (Kuemmerle, 1999, pp. 1-24; Boutellier *et al.*, 2008, pp. 372-391, & Szarucki Knežević, 2012, pp. 392 -397). Careful observation of the behaviour of enterprises in recent years indicates a rapid increase in the number of technological cooperation agreements between both national and international parties (Narula, 2003, pp. 45-60). This trend is particularly evident in the industries where consumption patterns are more uniform in all countries, i.e. those with a high level of capital, as well as intensive knowledge in the field of investment in innovation and technology (Duysters & Narula, 2003, pp. 199-218).

Cooperation in the field of innovation does not necessarily mean that technology transfer is its main aim, but it may be a consequence of the activity undertaken. The reason for businesses to engage in the international technology transfer includes, e.g. access to knowledge and markets and, consequently, the potential size of the economy. Transfer of knowledge should also be regarded as a predictor of creating technological links of cooperation.

The last three decades have seen a significant increase in the number of cooperation agreements (Narula & Martinez-Noya, 2014 pp. 5) in terms of undertaking knowledge-based activities, such as those related to R&D, technologies and commercialization of solutions. It turns out that the growing complexity and the multidisciplinary nature of the process of innovation implies a greater need for businesses. They are trying to be flexible and adaptable to external partners in order to gain access to complementary resources, and to take advantage of more business opportunities, lower the costs, and shorten time-to-market (Duysters & de Man, 2003, pp. 49-58; Hagedoorn 1993, pp. 371-385;

-Noya Martínez *et al.*, 2012, pp. 18-37). As a result, technological changes and global competition oblige companies to seek external sources of knowledge and technology through a wide variety of alliances and cooperation (Hagedoorn & Osborn, 2002, pp. 517-142). Thanks to the international technological cooperation, companies have not only found a way to a more efficient and flexible cooperation, but also gained access to the use of a variety of specialized partners located around the world (Chen, 2004, pp. 337-349; Mudambi & Graf, 2005 pp. 253-268), even from emerging countries.

Empirical research on the motivation behind the international technology transfer can be viewed in two dimensions. The first is the observation unit, namely the relation enterprise-country. The second is the geographical and spatial range. In studies of Flemish enterprises, Belderbos *et al.* (2013, pp. 1-32) show that technology transfer is carried out by companies that are struggling with limited resources. In their company level research aimed at the efficiency of technological cooperation Song & Shin (2008, pp. 291-303) and Penner-Hahn & Shaver (2005, pp. 121-140) pay attention to the element of "absorption capacity" of companies to use foreign expertise and the results of R&D. Considering the issue of technological complementarity, Chen *et al.*, (2011, pp. 121 - 148.) showed how the life cycle of technology and expertise affect the effectiveness of cooperation.

In summary, the determinants of international technology transfer can be divided into two blocks. First is the economic capacity and creativity of the enterprises engaged in the exchange of technology. The second block includes the instruments of support for innovative cooperation (Picci, 2010, pp. 1070-1081; Patel & Pavitt, 1991, pp. 141- 156; Dachs & Pyka 2010, pp. 71-86; Guellec *et al.*, 2001, pp.1253-1266).

The analysis of literature does not provide a comprehensive theoretical model explaining the formation of technology transfer between countries. Moreover, as explained above, there are various motives that drive companies from one country to seek complementary technological resources outside their own country. The closest concept, which is theoretically suitable for empirical analysis of technology transfer (exploration and transmission) across borders is the gravity model. It is commonly used for the analysis of international trade between countries (De Benedictis & Tajoli, 2011, pp. 55-89). Such an approach has already been used to study the issue of internationalization of technology (Thomson, 2011; De Prato & Nepelski 2014, pp. 358-375).

Technological cooperation, especially on the international level, is associated with additional expenses for the enterprises. Hence, it is necessary to provide systemic support instruments at national and transnational levels. One of the tools for initiating, implementing and diffusion of the effects of international technology transfers is the Enterprise Europe Network (Nesterak & Gródek-Szostak, 2016, pp. 134-143). Public instruments of the systemic sup-

port of technological cooperation are linked in parallel with the various components of the innovation network, acknowledging the primacy of horizontal cooperation, which is valid in the developed countries. The problem of infiltration of the innovative cooperation and technology transfer has been taken up in the literature, but research gaps still remain. Based on the above, a research hypothesis has been defined, which is the claim that the international technology transfer implemented in the course of cooperation between enterprises and other economic entities accelerates innovation processes and contributes to achieving the benefits of two-way transfer of knowledge between organizations. The aim of the study is to analyse the multi-faceted relationship between the phenomena of cooperation and technology transfer, and their combined effect on the international activity of innovative enterprises.

The publication was financed from the funds allocated to the Faculty of Management of the University of Economics in Krakow as part of a grant to maintain the research potential.

Research methodology

The publication brings the theoretical and empirical oeuvre related to cooperation and transfer of innovative technologies closer in a variety of ways. Analysed empirically were the data of the Enterprise Europe Network (2008-2015), as well as the interviews with the centres of the EEN consortium Southern Poland (Śląskie, Małopolskie, Świętokrzyskie and Podkarpackie voivodships), which support companies in the uptake and implementation of international technological cooperation.

Data visualization was made using the Newman- Gastner anamorphic cartogram, in the commercial programme ArcGIS (ESRI Inc., ArcGIS 10.4.1, 2016). The anamorphic cartogram, which in several of the sources is called amorphic or eumorphic, is a slightly different form of cartographic presentation than other cartograms, and its use is limited for quantification. This cartogram is an inverted map, i.e. it shows the scale of the phenomenon by reflecting the change in the size and shape of the reference entity (in the case of this publication - a country). This method of presentation abolishes a common approach to data visualization in the form of a map, according to which each area of the map needs to be reflected in reality. The applied anamorphosis is designed to highlight the territorial diversity of the phenomenon at the expense of the deformation of its actual borders (Boria, 2013, pp. 127-136). By applying the scale, it applies the theory of phenomena perception more than its physical reference to reality. For increased readability of the obtained results, a political map of Europe was attached to the amorphous maps, in one of the popular cartographic projections of Europe, i.e. a Lambert conformal conic projection. In the case of this study, due to the high linear data disper-

sion, an additional data classification was made, using quantile. This means that each class has an equal number of items, and there are no empty classes. However, in the interpretation of the resulting map, one should take into account the fact that similar data values can be placed in adjacent classes, and data with very different values in the same class. In accordance with the principle of uniformity, the content of the classes is shown in grayscale, in the 5 progressive value classes.

Conclusions

International networks run horizontal activities to ensure a favourable legal and institutional environment for entrepreneurship. They also take measures to strengthen the internal security of the European Union, provide information and advisory services in the field of technology transfer, and offer assistance in obtaining funds. On the other hand, for companies in the SME sector, public support in taking up international cooperation (in business and technology) is an important argument in the decision to start the cooperation.

Among the factors, which significantly influence the adoption of international cooperation one should pay attention to the problem of competition. It is increasingly emphasized that the goal of management should be to strive to deliver customer value, which is likely to be better matched through cooperation between organizations and through joint economical actions. The paper has demonstrated the multi-faceted relationship between business cooperation and technology transfer. In addition, demonstrated was their synergistic influence on the international activity of innovative enterprises. However, it appears that the weakest link in the existing relations is technology transfer. The reasons must be sought much deeper than the scope of this paper, probably in sociological relationships, which can be an interesting subject for further research in this area.

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