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COOPERATION BETWEEN UNIVERSITIES AND COMPANIES IN LESS DEVELOPED REGIONS OF THE SLOVAK REPUBLIC

Spolupráca medzi univerzitami a podnikmi v menej rozvinutých regiónoch SR

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Annotation
Business and university cooperation, and in particular research cooperation, is one of the key factors for the development of innovation and subsequent economic growth. However, despite the positive benefits, cooperation in some countries, such as the Slovak Republic, is not very significant. The importance of cooperation is growing in regions where a critical mass of innovative enterprises is lacking. The aim of this article is to analyze the current state of cooperation between manufacturing companies and universities in less developed regions of the Slovak Republic. We examined this through a questionnaire survey conducted among manufacturing companies. The results show that universities are one of the least used sources of information for innovation for companies, and the overall low level of cooperation with them compared to other countries corresponds to this. Large companies and companies producing more complex products cooperate significantly more. At the same time, we did not find differences between domestic and foreign companies, nor are there any statistically significant differences between companies from different regions.

Key words
research cooperation, universities, less developed regions

Anotace
Spolupráca podnikov a univerzít, a najmä spolupráca v oblasti výskumu, je jedným z kľúčových faktorov pre rozvoj inovácií a následný ekonomický rast. Napriek pozitívnym prínosom však nie je spolupráca v niektorých krajinách, akou je aj Slovenská republika, veľmi výrazná. Význam spolupráce ešte narastá v regiónoch, v ktorých chýba kritický objem inovačných podnikov. Cieľom tohto článku je analyzovať súčasný stav spolupráce medzi výrobnými podnikmi a univerzitami v menej rozvinutých regiónoch Slovenskej republiky. To sme skúmali prostredníctvom dotazníkového prieskumu realizovaného medzi výrobnými podnikmi. Výsledky ukazujú, že pre podniky sú univerzity jedným z najmenej využívaných zdrojov informácií pre inovácie a tomu zodpovedá aj celková nízka miera spolupráce s nimi v porovnaní s inými krajinami. Výrazne viac spolupracujú najmä veľké podniky a podniky vyrábajúce komplexnejšie výrobky. Zároveň sme nezistili rozdiely medzi domácimi a zahraničnými podnikmi a takisto nie sú štatisticky významné rozdiely medzi podnikmi z rôznych regiónov.

Klíčová slova
výskumná spolupráca, univerzity, menej rozvinuté regióny

JEL Classification: *R11, O30, I23*

1 Introduction

Cooperation between universities and the private sector is becoming increasingly important as it creates reciprocal benefits for all stakeholders and for society in general. Cooperation between universities and industry has intensified since the 1980s, which is why researchers, policy makers and practitioners are paying close attention to it (Etzkowitz, 1998). Increasing competition and globalization further motivate industrial and academic institutions to improve cooperation (Sandberg et al., 2011). Universities work with the private sector at all levels, from education and information exchange through entrepreneurship to collaborative research (Edquist, 2005), with research being considered key to the development of innovation and subsequent economic development. Although cooperation brings several benefits, in fact there are various constraints that prevent cooperation, which is reflected in the different levels of involvement of companies and other institutions in innovation activities.

The Slovak Republic is one of the countries with a very low level of cooperation in the creation of innovations, which also includes a low level of cooperation between companies and universities. The aim of this paper is to point out the current state of cooperation between universities and companies in the Slovak Republic based on a questionnaire survey among manufacturing companies in Slovakia.

2 Theoretical framework

There is now substantial evidence of the positive contribution universities can make to helping firms' innovation. The transfer of knowledge between universities and other actors in an economy–business, government, media and the public–is a core driver of innovation (Mueller, 2006). In the knowledge economy, universities are increasingly expected to provide vital contributions to regional innovation and economic development processes (Sánchez-Barrioluengo, 2014). Collaboration between universities and industries is widely recognised as one of key factors which contribute to the improvement of innovative capabilities of companies (Lundvall, 1992; Dyer et al., 2004) and the development of innovative countries (Lundvall, 1992; Nelson, 1993). Recent studies show that university-industry collaborations are now likely to have a significant impact on firms' development of innovations and of performance also in a broader sense (Un et al., 2010; Siegel and Wessner, 2012).

Building university-business collaborations, however, confronts the 'two-worlds' paradox, and the difference in institutional logics and priorities between businesses and universities (Hewit-Dundas, Gkypali & Roper, 2019). In addition, the culture of universities and businesses also vary, evidenced in differences in social behaviours, norms, beliefs, languages and opinions all of which make collaboration more difficult (De Wit-de Vries et al., 2019).

In less-developed regions, the specific structure of the economy is a key factor determining the innovation capacity (Novotný et al., 2016). Liagouras (2010) argues that the main reason for the past failures of technology and innovation policies in peripheral European countries is a 'lack of domestic demand for technology', related to the dominant organisational forms in these economies – such as an overreliance on foreign direct investment in CEE countries. The industrial profile of a region will also strongly influence the main knowledge bases and mode of innovation in its economy; with firms in many regions, and particularly those dominated by traditional manufacturing or engineering-based sectors, likely to be more dependent on learning-by-doing through practical problem solving and responding to customer needs than on participation in or access to scientific-based R&D processes (Asheim, 2012; Isaksen and Karlsen, 2010). One of possible solutions to overcome this is university industry cooperation.

R&D collaborations between industry, research centres and universities are attracting growing interest both at the policy level, because the social value of technological progress developed by private agents is recognized, and policies are designed to affect industrial technology development and innovation, and from the point of view of the firms which look at public agents as an important source of technical knowledge (Bozeman et al., 2013). Hall et al. (2003) have emphasized the growing patterns of industry-university relationships in recent decades, pointing to access to complementary research and to key university personnel as the main factors promoting it. More collaborative forms of university-industry engagement may help cultivate the inter-organisational network capabilities in a region (Vallance at al., 2018).

Despite all the mentioned advantages, in many countries, including Slovakia, the development of cooperation between companies and universities is very slow. There appear to be several and partly natural barriers to

cooperation (Lopes and Lussuamo, 2021; Parmentola et al. 2021) that need to be phased out, often mainly through government support.

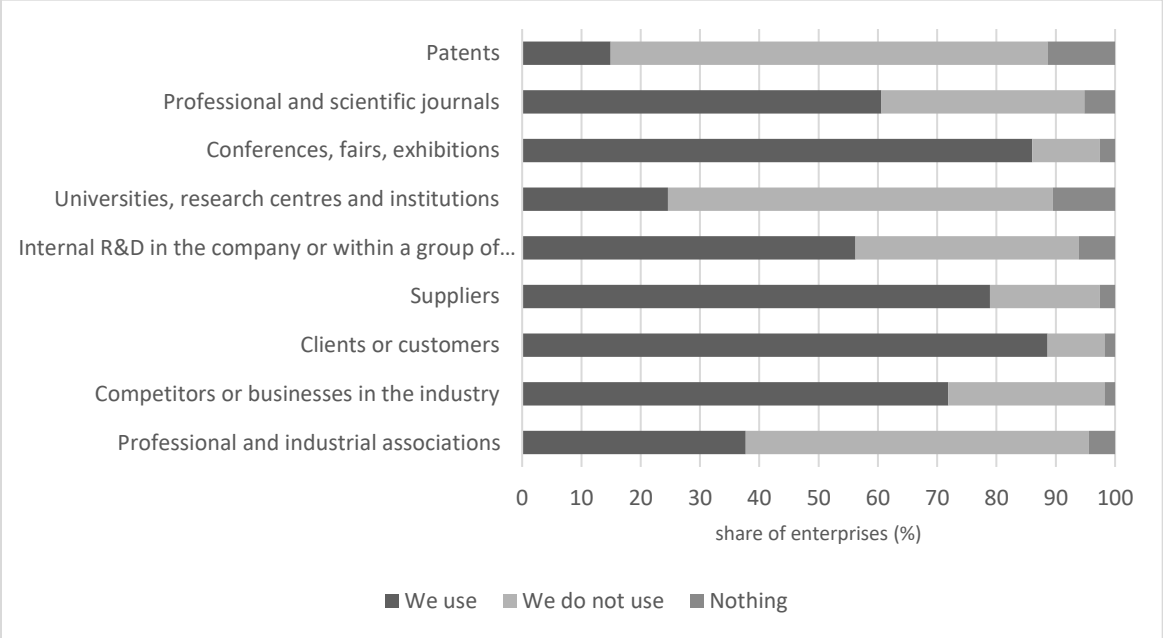
3 Methodology

The data for the analyses in this article were obtained within a questionnaire survey, which was conducted on a sample of 200 manufacturing companies with more than 20 employees in regions that fall under the less developed regions within the European Union classification - all regions of Slovakia except Bratislava region. The survey was conducted by the Technical University in Košice and was primarily focused on innovative activities of companies as part of the European Manufacturing Survey (EMS) which was carried out in 2018. Dataset of questions consists of basic characteristics of companies, types of production or types of product development, but the survey focuses on internal company processes. With an emphasis on innovation development in the corporate environment, the questionnaire survey finds questions regarding the identification of new models of innovation among companies, networks and industries. It also included issues focused on cooperation between companies and universities in Slovakia. A total of 114 responses were obtained, in which was different rate of return on questions. In the case of company size, 38 % of all companies represented small enterprises, 46 % medium-sized and 16 % large enterprises. The regional dimension represents the distribution of enterprises in less developed regions – 29 % in the Eastern Slovakia (Košice and Prešov region), 30 % in the Central Slovakia (Banská Bystrica and Žilina region) and 41 % in the Western Slovakia (Nitra, Trenčín and Trnava region). Regarding the industrial sector by (SK NACE Rev. 2) classification, the most represented manufacturing industries were Manufacture of machinery and equipment (16 %); Manufacture of motor vehicles, trailers and semi-trailers (15 %) and Manufacture of fabricated metal products, except machinery and equipment (10 %). We focused on the questions of the survey on the ways of innovation activities of companies and especially on the forms and ways of cooperation between companies and universities. Subsequently, these data were statistically analysed in order to identify different characteristics of companies that may affect the level of cooperation with universities. The significance of statistical differences was evaluated using the chi2 test.

4 Results and discussion

In innovation activities, it is very important what kind and source of information companies use to create or improve their corporate innovation processes. This indicates which resources are most important to him. Fig. 1 shows the various sources of information that the companies identified as being used in the survey. Most companies (86 %) use information from their clients and customers, as well as from conferences, fairs, and exhibitions, in which they participate and share knowledge and technological procedures. As many as 78 % of companies mentioned as a source of information for the innovation processes of their suppliers, 71 % from competing companies or companies in the same industry, 60 % draw information from professional and scientific journals. Only 24 % of companies obtain information from universities and research centres, making universities, as institutions, one of the least used channels for obtaining information in Slovakia. These results are similar to other studies (for example Odei and Stejskal, 2018), which suggest very low of the importance of universities in the innovative activities of companies in Slovakia.

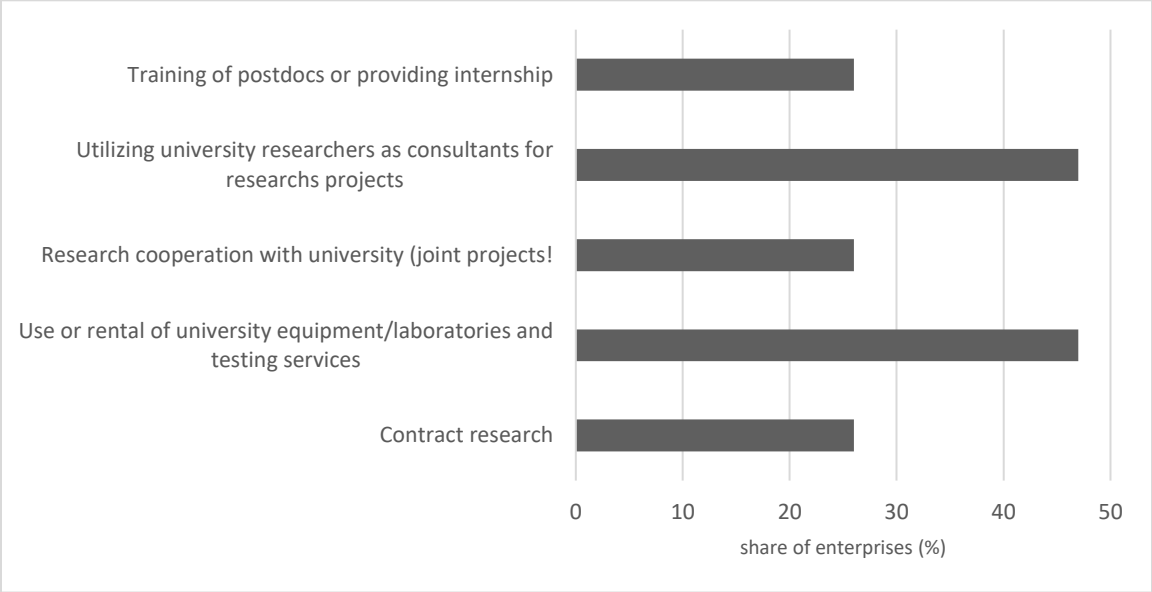
Fig. 1: Source of information for innovation activities in the companies (N = 114 responses)



Source: own calculations based on survey results

In the case of companies that indicated that they cooperated with universities or other research institutions, we further investigated the form of their cooperation. Fig. 2 shows the activities that selected companies carry out together with academic workplaces. We can see that 57 % of companies use or rent university premises / facilities and consult together on various research projects. The research collaboration itself is less represented. More than half of the cooperating companies identified only one of the forms of cooperation and only 7 companies stated that they cooperated in more than three different areas mentioned in the questionnaire.

Fig. 2: Different forms of cooperation between enterprises and universities (as percentage of enterprises that used given form of cooperation) (N = 34 responses)



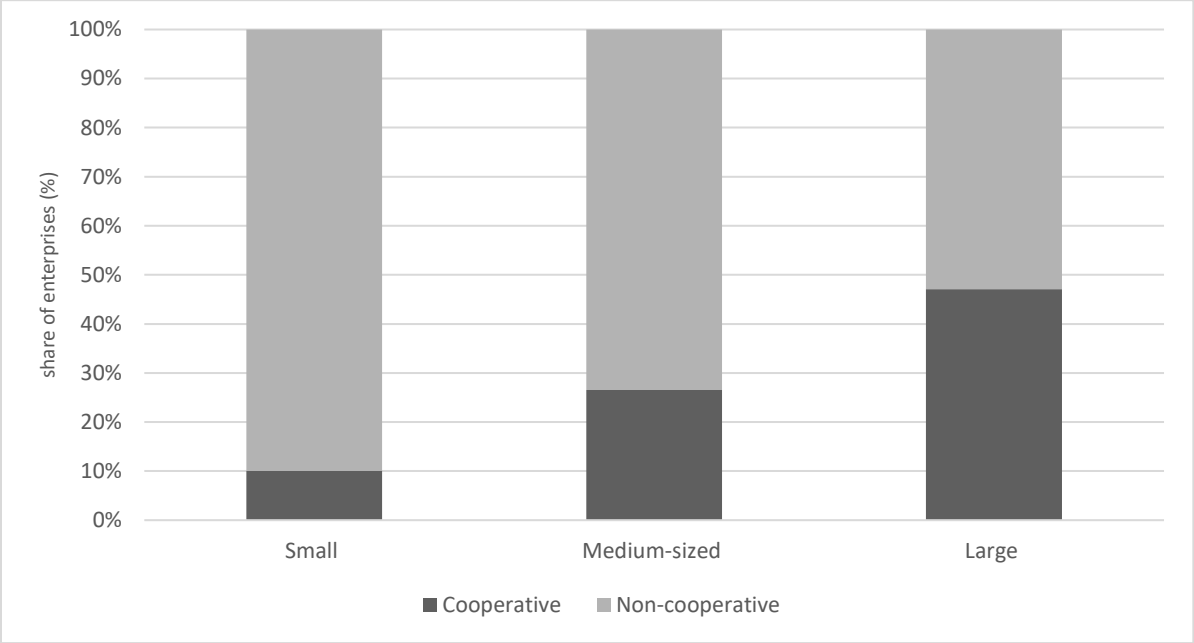
Source: own calculations based on survey results

Overall, 7.8 % of companies in the survey carried out research cooperation, which is a higher number than the results of the Community Innovation Survey 2018 (www.eurostat.eu), according to which only 3.1 % of companies cooperate with universities in research. However, this survey examines cooperation in all, not just manufacturing, companies. A comparison of the overall cooperation of companies is only possible with CIS 2016, where more than 18 % of companies reported any cooperation with universities, while in our survey it is 24 %, which is slightly higher again.

If we look more closely at the characteristics of companies that cooperate or do not cooperate with universities, the most significant difference can be seen in the category of company size. While less than 10 % of small companies cooperate with universities, in the case of large companies it is more than 40 %. We can see more detailed numbers in Fig. 3. The Chi2 test confirmed the statistical significance at p <.01 and the p-value is .008525.

When we look at regional aspect, there are differences between regions, however, there is no clear line of this division. Two extremes are in more developed regions of the Western Slovakia, both regions belonging to regions with lowest level of unemployment in Slovakia. The share of enterprises that cooperate with universities at regional level shows the values from 10 % in Trenčín region to 50 % in Trnava region. The share of cooperating companies in other region varies between 25 – 35 % (Prešov region, Košice region, Banská Bystrica region, Nitra region and Žilina region). There are slight differences in terms of the types of tools used in the regions. Surprisingly, however, in regions with strong technical universities, which have the best preconditions for research cooperation with manufacturing companies, we do not see a higher share of research cooperation compared to other regions. Our results thus have no significant correlation with the unemployment rate or the number of companies in the region. Our results thus have no significant correlation with the unemployment rate or the number of companies in the region.

Fig. 3: Share of enterprises that cooperate with universities according to their sizes (N = 110 responses)



**N (small) = 42, N (medium-sized) = 50, N (large) = 18*
Source: own calculations based on survey results

Businesses also often do not have to cooperate because they have their research centres outside Slovakia. This applies especially to foreign investment in Slovakia. These companies accounted for 13.1 % of responses in our survey. However, our assumption was not confirmed in our survey and the share of cooperating companies was comparable in both groups. While in the case of FDI 26.6 % of companies cooperated, in the case of Slovak companies it was 26.25 %. The p-value of chi2 test is .826315.and the result is not significant. This may be because foreign companies are more accustomed from home countries to at least partly cooperating with universities, even if their research is in another country.

The last area where we can observe significant differences in cooperation concerns the complexity of their own products. Only less than 10% of companies that produce simple products cooperate with universities compare to companies with complex products where more than 40 % cooperate. The complexity of production significantly increases cooperation with universities. The p-value of Chi2 test is .045786 and the result is significant at p < .05. Overall, we can see that cooperation between companies and universities in Slovakia is very low compared to other EU countries (www.eurostat.eu), even though this cooperation is relatively intensively supported (Lešková and Šipikal, 2019) and in other countries this support proves to be important for development of innovation (Anderson and Odei, 2018; Klímová et al. 2020). This suggests that there are significant barriers to this cooperation and to research that needs to be addressed. One explanation of what may be the hitherto low focus of universities is on commercial research and activities. On the part of universities, this may be partly because funding is more linked to student numbers and publishing activities than to cooperation with companies themselves. Also, support

from the state has so far focused on building technical infrastructure rather than on developing human resources at universities, which has probably also been reflected in forms of cooperation. The survey itself showed that the use of university premises, which was often created thanks to this support, is a significantly more common form of cooperation than research itself, which already requires human resources in addition to the technical infrastructure.

5 Conclusion

The degree of cooperation between businesses and universities can significantly affect the innovation performance of regions. Especially in less developed regions, where there are no strong links between companies, it is the cooperation between companies and universities that can bring significant impetus to innovation.

The aim of this paper is to point out the current state of cooperation between universities and companies in the less developed Slovak Republic. Our results confirm that there is overall low level of cooperation among companies and universities in Slovakia compared to other countries in Europe. According to the survey, even in less developed regions, private companies prefer other forms of innovation cooperation and knowledge acquisition than universities. Thus, universities in these regions still do not act as an integral part of regional innovation systems. The degree of cooperation itself is influenced mainly by the size and focus of the companies. Large companies and companies producing more complex products cooperate significantly more. At the same time, we did not find differences between domestic and foreign companies, nor are there any statistically significant differences between companies from different regions. The results from a regional point of view are particularly surprising. Although the level of cooperation varied relatively differently in different regions, we were unable to identify possible reasons for these differences when the results do not correlate with the economic or innovation performance of the regions. This aspect therefore needs further investigation. The results also show a large space for active state policies in the field of support for cooperation between companies and universities.

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