University of Tartu
Faculty of Economics and Business Administration

WHICH FIRMS USE UNIVERSITIES AS COOPERATION PARTNERS? – THE COMPARATIVE VIEW IN EUROPE

Kärt Rõigas, Marge Seppo, Urmas Varblane, Pierre Mohnen

Tartu 2014

ISSN-L 1406-5967
ISSN 1736-8995
ISBN 978-9985-4-0807-0
The University of Tartu FEBA
www.mtk.ut.ee/en/research/workingpapers

Which Firms use Universities as Cooperation Partners? – The Comparative View in Europe

Kärt Rõigas, Marge Seppo, Urmas Varblane, Pierre Mohnen*

Abstract

This paper presents an econometric analysis of the characteristics of firm's cooperating with universities using Community Innovation Survey (CIS) data for 14 European countries. Our model incorporates three groups of variables which could be related to the probability to cooperate with universities. The first group of variables is related to the size of a firm, the second group measures different innovation activities and the third group describes the internationalisation of firms. In addition, we test for the number of linkages, public financing and the sector of the firm. In order to provide a comparative view across the European countries we use the CIS for the period 2006–2008, where we have data for 14 countries.

We use a standard logit model for firm level data, with a dependent variable indicating whether a firm used a university as a cooperation partner or not. We estimate two separate models for cooperating with home and with foreign universities. Our main findings reveal that despite the origin of the university, firms must have a certain level of capabilities to have universities as cooperation partners – conducting internal or external R&D is a significant factor characterising the cooperation with universities. Investments into machinery and equipment as one of the innovative activities are hindering the cooperation with universities. Significant differences between firms that cooperate with home universities, compared to those cooperating with foreign universities exist. Firms cooperating with foreign universities are characterised by a higher level of internationalisation, measured by an export and foreign ownership dummy.

JEL Classification: O32, O33, O57

Keywords: university- industry cooperation, Europe, comparative view, national innovation system, competitiveness, technological change

* Kärt Rõigas, Junior Research Fellow, University of Tartu, Faculty of Economics and Business Administration, Narva Rd. 4–110, Tartu, 51009, Estonia. E-mail: kart.roigas@ut.ee

Marge Seppo, Prototyping Centre Project Manager, University of Tartu, Office of Research and Development, Ülikooli 18-304, Tartu, 50090, Estonia. E-mail: marge.seppo@ut.ee

Urmas Varblane, Professor of International Business, University of Tartu, Faculty of Economics and Business Administration, Narva Rd. 4–110, Tartu, 51009, Estonia. E-mail: urmas.varblane@ut.ee

Pierre Mohnen, Professor of Microeconometrics, Maastricht University and UNU-MERIT, P.O. Bos 616, 6200 MD Maastricht, The Netherlands. E-mail: mohnen@merit.unu.edu

The authors acknowledge financial support from the Estonian Ministry of Education and Research project IUT20-49 "Structural Change as the Factor of Productivity Growth in the Case of Catching up Economies" and from the Estonian Research and Innovation Policy Monitoring Programme (4.1).

1. INTRODUCTION

Competitiveness of firms and nations is based on the well-functioning national innovation system. It is a combination of linkages between the government, strong universities and an active business sector (Carayannis et al. 2012). The linkages between universities and enterprises could be used for transferring knowledge, which supports the generation of the different type of innovations. The EU's Europe 2020 strategy for smart, sustainable and inclusive growth (EC, 2010) stressed the important role of active cooperation between the universities and enterprise sector for maintaining the competitiveness of the EU. It requires a better understanding of the mechanism of cooperation between the firms and higher education institutions.

This has been an intensive research field for a couple of decades. The motivation for our research was the publication of the report "*The State of European University- Business Cooperation"*, which showed the deep variations across European countries in the field of industry and university cooperation (Davey et al. 2011). It pointed out the necessity of applying the comparative view to this phenomenon. The main contribution of the following paper is to provide some new empirical insights by answering the question, which type of firms cooperates with universities? Is it possible to identify common characteristics of firms which cooperate with universities across European countries or can we also trace country (or country group) specific features? In addition, we also try to figure out whether firms that cooperate with home and foreign universities are similar or whether they differ.

The research questions will be tested on the firm level data from the Community Innovation Survey (hereinafter CIS) 2006–2008 for 14 European countries. We use a standard logit model, which incorporates variables of the size of a firm, different innovation activities, internationalisation, and the number of linkages, public financing and the sector of the firm. We estimate two separate models for cooperating with home and with foreign universities.

The rest of the paper is organised as follows. The next section reviews the existing literature about the determinants of university-industry cooperation. Section 3 details the research questions, introduces the applied dataset and explains the model. Section 4 presents and discusses the empirical results. The final section draws some conclusions, provides some limitations and suggests ideas for future research.

2. PREVIOUS EMPIRICAL RESEARCH ABOUT UNIVERSITY-INDUSTRY COOPERATION

The rationale behind university- industry cooperation is to create different linkages in order to exchange and transfer knowledge between the parties. The nature of knowledge has many dimensions (Nonaka and Takeuchi 1995). A distinction can be made between explicit and tacit knowledge, multidisciplinary versus mono-disciplinary or basic versus applied (Brennenraedts et al. 2006). In addition, universities can provide firms with graduates and faculty members to serve as employees and consultants or provide access to its facilities in order to effectively evolve the firm's capabilities. Through cooperation with universities, by taking part in curriculum development and delivery, industry can shape future employees. Access to highly trained students is one of the most acknowledged benefits from the industry side (Varblane et al, 2008). Research results indicate that firms also value an enhanced image,

which they get from collaborating with a prominent academic institution (Santoro and Chakrabarti 2002).

Depending on the specific needs, cooperation between universities and industry may take different forms. According to an extensive study among European universities, there are eight types of university-industry cooperation (Davey et al. 2011): curriculum development and delivery, lifelong learning, student mobility, academic mobility, commercialisation of R&D results, collaboration in R&D, entrepreneurship, and governance.

The major understanding of researchers has been that university–industry interaction is not a single process of interaction, but covers a huge variety of relations, each being determined by partially different variables (Polt et al. 2001). The cooperation between universities and industry is embedded into policy framework conditions, which depend on the institutional and social setting within a society (e.g. regulations, promotion measures, incentive schemes). This gives the university–industry cooperation a strong path dependency flavour – history of the specific countries matters.

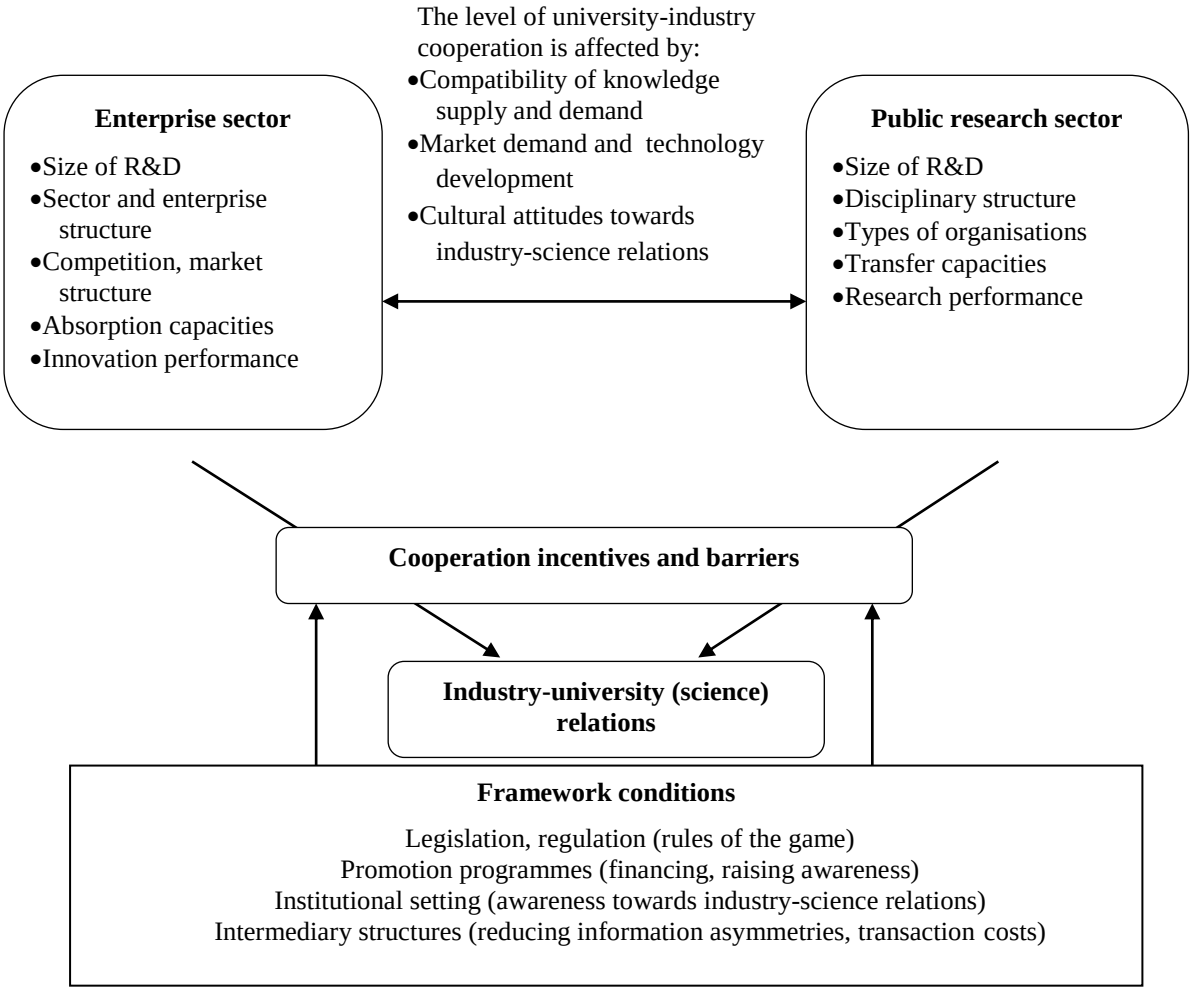


Figure 1. The model for analysing industry–university (science) relations (Polt et al. 2001: 249 with modifications by the authors).

Figure 1 is constructed based on Polt et al. 2001 with authors' modifications and it presents the model for analysing industry- university relations. It shows how the nature of linkages will vary along with market conditions, demand characteristics, technology characteristics, and national and international industry networks.

The government tries to reduce the market failures by removing the barriers to knowledge transfer and cooperation between universities and industry. Polt *et al* 2001 define different characteristics and aspects of firms, universities and the environment which influence the university-industry relations. The cooperation of enterprises and universities is affected by the cultural attitudes towards industry-science relations, compatibility of knowledge supply and demand, and market demand and technology development. From the enterprise sector side the cooperation is influenced by the size of R&D (relative size of research in different fields of technology), sector and enterprise structure (relevance of large corporations versus SMEs, relevance of foreign-owned firms), competition and market structure (e.g. degree of competition), absorption capacities (skills and innovation management capabilities of firms), and innovation performance (activities with respect to certain stages in the innovation cycle).

From the public research sector side the cooperation is influenced by the size of R&D, disciplinary structure (e.g. share of different scientific disciplines), types of organisations (e.g. universities, public research laboratories, joint industry-university labs), transfer capacities (research orientation and mission, mode of financing, personnel qualification, staff capacities), and research performance (science excellence).

It is important to stress that the cooperation per se is not important, but the outcome of this cooperation or even more precisely the positive impact to the partners. This is especially true from the viewpoint of industry (Pertuzé et al. 2010). For enterprises, the cooperation partners can be also customers, suppliers or even competitors, whose role and impact on the firm's R&D is somewhat different. Firms take into account the benefits and costs when considering the cooperation with universities. The previous studies have revealed that outgoing spillovers (information flows going out from the enterprise) may reduce the wish for cooperation while incoming spillovers (external information flow useful for the innovation process of the enterprise) increase the attractiveness for cooperation. (Belderbos et al. 2004)

Cohen and Levinthal (1989) show that in the case of a firm's own R&D activities, the external knowledge is more important and effective for the innovation process. Investments in internal R&D increase the absorptive capacity of the firm and in this way as well the effectiveness of incoming information and knowledge (Belderbos et al. 2004).

Enterprises operate in the environment of intense global competition, rapid technological change, and short product life cycles (Elmuti et al. 2005). In the situation of rapid changes, limited resources, and knowledge, firms look for different external sources for advancing their knowledge and technology. The sources include customers, suppliers, competitors, public and private research organisations, and universities (Santoro and Chakrabarti 2002). Different partnerships may be used for different purposes. Customer cooperation is used more frequently in the case of bringing new products to the market or making product improvements. With supplier cooperation the aim is often to reduce costs. When cooperating with universities, the firms look for privileged access to new knowledge and also the possibility to increase the firm's scientists' understanding of scientific developments. (Belderbos et al. 2004) Universities are institutions outside of the industry and hence may possess unique and different knowledge, skills and resources than the other partners in the industry. Previous research has shown that university-industry cooperation has a positive

influence on product innovation of the firm (Kang and Kang 2010). Therefore, the universities are especially valuable cooperation partners for the firms.

The determinants of the university-industry linkages have not been empirically studied much, although the literature on that topic is starting to grow. The size of the firm as the cooperation factor has been studied in various countries using different datasets, e.g. Tether (2002) (based on data for UK, CIS2); Mohnen and Hoareau (2003) (Germany, France, Ireland and Spain, CIS2), Capron and Cincera (2003) (Belgium, CIS2); Miotti and Sachwald (2003) (France, CIS2), Fontana, Geuna, and Matt (2006) (seven EU countries, KNOW survey), Busom and Fernándes-Ribas (2008) (Spanish Innovation Survey); Eom and Lee (2010) (Korean Innovation Survey). Tether (2002) argues that smaller enterprises have fewer internal resources and need more external knowledge, which means more cooperation partners. It is also stated in Tether's (2002) paper that cooperation with universities and other research organisations is positively related to the enterprise's size and the reason behind that is again resources – compared to smaller firms, larger ones have more internal resources to engage in that type of cooperation and larger firms are more likely aware of capabilities of universities. In contrast, Eom and Lee (2010) found that the size of an enterprise measured by the log of the average number of employees does not matter either in the case of university-industry cooperation or in the case of cooperation with government research institutes. However, all previously mentioned studies based on European countries' data reveal that size measured by the log of the number of employees is positively related to the probability to cooperate with universities.

Belonging to an enterprise group is considered to make it more likely to have cooperation partners. The reason behind that is the same as the one we mentioned in the case of larger firms: they have more knowledge about the capabilities of universities (Tether 2002) and it is easier for them to access the information and establish contacts due to belonging to a network (Mohnen and Hoareau 2003). At the same time they have more internal resources, which on one hand give more opportunities for searching for a partner outside the firm, but on the other hand they might not need universities as knowledge sources as they can use knowledge from their own group (Tether 2002). However, empirical results show different relations between belonging to a group and cooperating with universities: Tether (2002) found a positive relation, Mohnen and Hoareau (2003) and Miotti and Sachwald (2003) a negative relation, while Eom and Lee (2010) found this relation to be insignificant.

Absorptive capacity is seen as one of the determinants of university-industry cooperation. One possible proxy to use for absorptive capacity can be R&D intensity. Cohen and Levinthal (1990) assume that R&D plays an important role in increasing firm's absorptive capacity and therefore does not only create new knowledge, but helps the firm to exploit knowledge from external sources, for example universities. Mohnen and Hoareau (2003) argue that firms with a higher R&D intensity are more likely to cooperate with universities as they have the need to be connected to basic research. Fontana et al. (2006) also emphasise that firms engaged in R&D activities, compared to those who do not conduct any R&D activities, rely more on scientific development. Fontana et al. (2006) use the share of R&D employment to total employment as the indicator of R&D intensity. Both Mohnen and Hoareau (2003) and Eom and Lee (2010) use the ratio of R&D expenditures to sales as a R&D intensity measure, and in both studies it was insignificant for cooperating with universities, while Fontana et al. (2006) found R&D intensity to be significant and positive. In addition, Tether (2002) controls for R&D engagement and finds that engagement in R&D activities, at least on an occasional basis increases the probability to cooperate with universities. Busom and Fernándes-Ribas (2008) include knowledge capital in their model, using five variables, from which two variables were

positive and significant: the share of R&D researchers to non-R&D employees and patenting variable indicating whether a firm has applied for a patent both in Spain and in some international patent office. Miotti and Sachwald (2003) also found the R&D dummy to be positively related to the probability to cooperate with universities.

In some studies, in addition to R&D, other innovation activities are considered as cooperation determinants. For example, Tether (2002) assumes that acquiring technologies developed outside the firm are related to cooperation, but his empirical results revealed that engaging in external technologies is not a cooperation factor in the case of universities. Mohnen and Hoareau (2003) also use other innovation expenditures (R&D excluded) as a possible cooperation determinant. However, these expenditures are insignificant while cooperating with universities. Results found by Capron and Cincera (2003) also reveal that innovative intensity other than R&D is not significant in cooperating with universities.

Openness of the firm is another important factor for cooperation. Laursen and Salter (2004) find that firms with a larger number of external knowledge sources are more likely to use universities as their cooperation partners as well. Their suggestion is that the more open the firm, the more likely it cooperates with universities. Fontana et al. (2006) use three different variables to measure openness following the research of Laursen and Salter (2004): searching, screening and signalling. Screening, proxied by two variables, publications and subsidies[1], was found to increase the probability to cooperate with universities.

As additional determinants of cooperation, foreign ownership and exporting are also used in a few of the previous studies. Tether (2002) finds that foreign-owned firms have a higher probability to engage in innovation cooperation. Empirical results by Busom and Fernándes-Ribas (2008) support the fact that foreign owned firms have in general a higher probability to cooperate, but foreign ownership is insignificant in the case of cooperating with public research organisations (PROs). They also control for export intensity, measured as a share of exports in total sales, which was also found to be insignificant in the case of cooperating with PROs.

Financial support from the EU or government can be an increasing factor for cooperating with universities. Firstly, it helps to overcome the lack of finances that is necessary for establishing links with universities. Secondly, some governmental support measures require cooperation with universities as the prerequisite of funding (Seppo et al. 2014). Mohnen and Hoareau (2003) show that getting support from the government is related to a higher probability to cooperate with universities. Results gained by Capron and Cincera (2003), Miotti and Sachwald (2003), Busom and Fernándes-Ribas (2008), Eom and Lee (2010) support this finding.

Tether (2002) argues that sectors can be seen as a proxy for technological opportunity if divided into high- and low-technologies. Mohnen and Hoareau (2003) use a similar classification (scientific and traditional industries) and find a positive link between belonging to a scientific sector and cooperating with universities. Busom and Fernándes-Ribas (2008) use five variables for dividing firms into high- and low-technologies. Eom and Lee (2010) look at the average number of patents in an industry as a sector characteristic, which is positively related to the probability to cooperate with universities.

[1] Subsidies indicate taking part in projects that are subsidised by regional, national or EU authorities (Fontana et al. 2006).

3. RESEARCH QUESTIONS, DATA AND MODEL

Based on the previous empirical research that revealed different factors to be determinants of university[2]-industry cooperation and gave somewhat contradictory results, we intend to find answers to the following research questions:

1. Which type of firms cooperates with universities?
    a. Which type of firms cooperates with home universities?
    b. Which type of firms cooperates with foreign universities?
2. What are the common patterns of university-industry cooperation across European countries?
3. What are the differences between the characteristics of firms cooperating with universities across European countries?
4. Are there any differences between new and old member states of the EU (the question about path dependency)?

To answer the above stated questions, we use firm level data from the Community Innovation Survey (hereinafter CIS) 2006–2008 for several European countries (14 countries). The CIS questionnaire has its limitations. Firstly, only technologically innovative firms are required to answer questions about their cooperation partners; therefore, our sample is biased towards technologically innovative firms. See Appendix 1 for the shares of technologically innovative firms from the whole sample by the analysed countries. In Germany, the share of innovative enterprises is the highest, followed by Portugal and Estonia. Latvia, Slovakia, Hungary, Romania and Bulgaria have the lowest shares. Appendix 1 also provides information about the share of innovative firms which use cooperation partners for innovation activities. It shows that among the innovative firms, the share of firms which cooperate with universities is highest in Cyprus, Estonia and Slovenia. The share is lowest in Bulgaria, Spain, Italy and Romania. Due to data availability, countries from Central and Eastern Europe are overrepresented in our sample, which is the second limitation of our data. As the third limitation, the time frame 2006–2008 should be highlighted. This is the period when new member states were starting to use the EU's support measures and Romania and Bulgaria joined the EU in 2007.

For the descriptive data and countries analysed in this paper, see Table 1. This gives an overview about the average values of the explanatory variables in the model and also information for the dependent variables used in different models. It can be seen from Table 1 that the share of firms cooperating with universities is rather low. Slovenia and Germany have the highest shares (around 24%), while Italy, Bulgaria and Romania have the lowest shares. Table 1 distinguishes between the firms that cooperate with home and foreign universities. The overwhelming majority (more than 90% of the firms cooperating with universities) choose their partners inside their country. The share of firms using foreign universities as their cooperation partners is quite low, but differs significantly across countries, for example the share of foreign universities as cooperation partners is highest in Latvia (7.96%) and the lowest in Italy (0.73%).

Figure 2 illustrates the share of firms cooperating only with home or foreign universities and the share of firms cooperating with both home and foreign universities. It can be seen from Figure 2 that the share of cooperating with home universities from the whole cooperation with universities is very high, as mentioned before. Countries with a higher share of co-operators,

[2] We use the term universities for all types of public sector research institutions, in the CIS cooperation partners 6 and 7 taken together.

like Slovenia and Germany, have a higher share of firms cooperating with both home and foreign universities. At the same time, they have a rather small share of firms cooperating only with foreign universities. Latvia can be singled out as an exception: the share of using foreign universities as cooperation partners is remarkably higher compared to other countries.

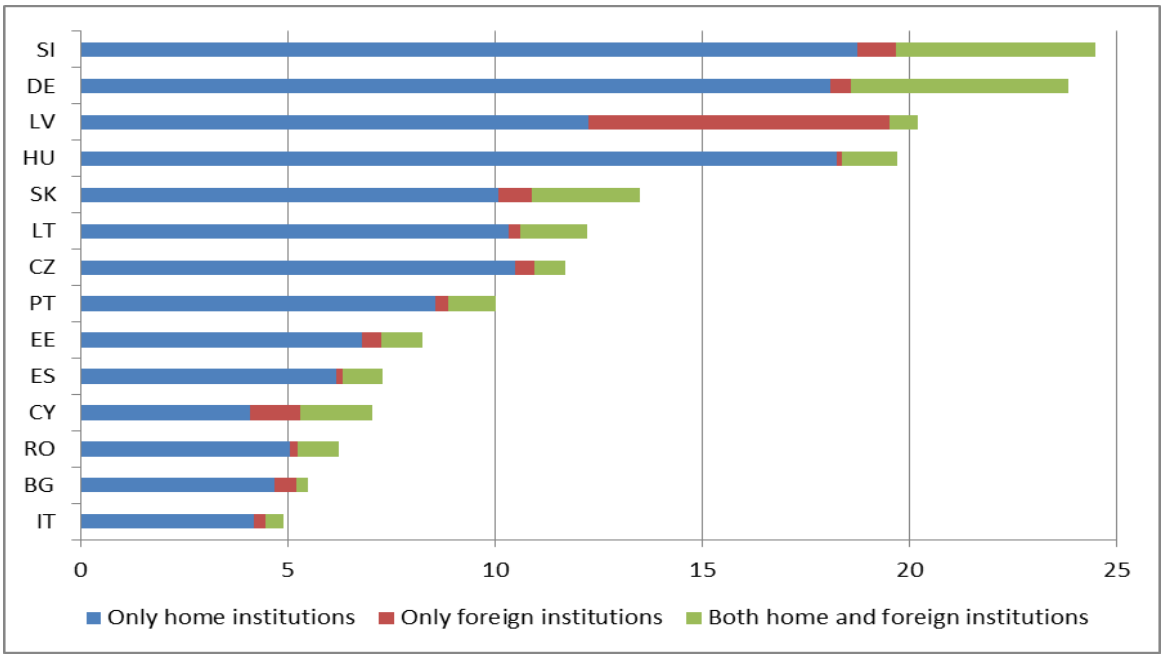


Figure 2. The share of co-operators with home, foreign and both home and foreign public sector institutions (calculated by the authors based on CIS 2006–2008 data).

In Table 1, all the dummy variables are presented as the share of values equal to 1. Explanations as to when these dummy variables take the values 1 and 0, are given in the description of the model below. For example, in Estonia 48.09% of all innovative enterprises in the sample belong to an enterprise group, highest proportion of all 14 countries. The share is lowest in Romania and also low in Bulgaria, respectively 14.44% and 16.43%.

The share of those enterprises that belong to an enterprise group and at the same time are larger is on average around 17%. All the shares of innovation activities vary heavily among analysed countries. The range is the largest in the case of training, where the share of training as an innovative activity is around 10% in Spain and more than 97% in Cyprus.

The average number of other cooperation partners is quite low. The average of all the countries is around 0.8. Slovenia and Cyprus have the most diverse set of partners. In the case of public funding, differences between countries are again remarkable, especially in the case of funding from central government. In Latvia, only 1.83% of technologically innovative enterprises included in the CIS survey got support from central government, while in Cyprus the share of those enterprises is around 31%. In most countries, the share of service sector enterprises is smaller than the share of manufacturing enterprises. There are a few exceptions: the Czech Republic, Spain, and Lithuania.

Table 1. Descriptive statistics

Variable	BG	DE	CY	CZ	EE	ES	HU	IT	LT	LV	PT	RO	SI	SK
University and/or public research institution as cooperation partner (%)	5.50	23.81	7.03	11.69	8.24	7.30	19.70	4.91	12.22	20.20	10.03	6.23	24.47	13.48
Home research institution as cooperation partner (%)	4.95	23.30	5.83	11.22	7.77	7.16	19.58	4.64	11.91	12.94	9.71	6.02	23.53	12.67
Foreign research institution as cooperation partner (%)	0.83	5.73	2.93	1.22	1.46	1.12	1.45	0.73	1.91	7.96	1.47	1.19	5.74	3.41
Log(turnover)	13.64	16.51	15.09	14.47	14.58	14.96	14.95	8.23	14.03	14.32	14.40	14.25	15.27	14.92
Belonging to an enterprise group (%)	16.43	46.13	25.99	29.92	48.09	22.01	33.30	16.98	24.38	23.91	21.11	14.44	40.73	28.57
Large enterprise group (%)	10.51	38.64	13.48	17.42	22.45	11.10	22.44	8.42	12.91	12.89	11.33	8.77	24.63	21.26
In-house R&D (%)	8.86	68.89	17.81	47.32	42.49	27.55	46.51	35.30	44.34	24.01	43.91	24.69	74.08	43.37
External R&D (%)	7.31	33.77	20.47	26.29	23.93	15.71	25.45	15.01	14.11	12.19	22.50	8.62	35.88	22.57
Machinery (%)	59.76	70.90	99.33	76.95	87.29	36.47	72.69	82.85	65.09	58.09	72.50	86.84	78.35	78.79
External knowledge (%)	17.47	32.17	56.58	27.06	46.20	2.82	19.37	12.27	23.09	21.76	19.48	10.79	35.76	16.81
Training (%)	23.37	62.84	97.70	50.13	46.14	10.37	47.75	46.11	48.81	37.29	54.99	37.25	48.95	56.62
Exporting dummy (%)	35.21	64.88	32.23	53.85	78.12	39.85	64.33	49.52	56.20	66.06	57.38	35.24	77.85	61.39
Foreign ownership (%)	7.99	65.52	5.53	16.20	21.46	83.20	20.85	4.72	9.23	89.64	5.33	95.03	7.85	90.38
No. of different types of partners	0.34	0.61	1.40	0.77	0.92	0.22	0.90	0.29	1.14	1.10	0.68	0.34	1.46	0.88
Funding from state (%)	5.92	18.89	30.93	7.78	8.62	10.72	19.04	10.39	4.87	1.83	9.70	5.62	17.78	5.56
Funding from EU (%)	5.08	5.60	6.10	7.09	5.65	1.94	13.03	3.43	7.55	12.19	4.37	6.10	11.83	9.34
Services dummy (%)	29.32	37.64	43.98	54.75	47.29	62.09	48.94	44.86	66.90	44.20	42.96	40.59	39.29	46.42
Number of observations	3817	3124	474	2828	1119	16350	1453	7475	703	338	3769	2465	1000	651

Note: the acquisition of advanced machinery, equipment and computer hardware or software.
Source: calculated by the authors based on CIS data for 2006–2008.

According to the previous research, the size of the firm is the most common variable included in the model. Therefore, a group of variables indicating size is included in our model. These are, first of all, "log of turnover", then a variable named "enterprise group dummy" – taking value 1 for belonging and 0 for not belonging to an enterprise group. To avoid multicollinearity with log of turnover, we do not add a size group dummy (in our dataset, the number of employees is not available and only three size groups can be used), but we include an interaction term between the size group dummy and the dummy indicating whether a firm belongs to an enterprise group. Due to the heterogeneous set of European countries, only two size groups are considered as some smaller European countries do not have three size groups in this dataset. The two size groups are the following: small enterprises with less than 50 employees and larger enterprises with more than 50 employees. The interaction dummy in the model takes the value 1 in the case of larger enterprises belonging to an enterprise group and 0 in all other cases.

There have been several different explanations for how the size of an enterprise is related to its innovation patterns. Therefore, in our paper, we assume that size measured by the log of turnover is positively related to the propensity to cooperate with universities. Based on previous research, we assume that the dummy indicating belonging to an enterprise group can be country specific, depending on the quality of knowledge sources available, especially universities as a possible knowledge source.

The second set of variables measures different innovation activities; all these variables are dummies, where 1 stands for conducting this type of activities and 0 for not conducting. The model includes the following innovation activities: "in-house R&D"; "external R&D" and "machinery". The latter means the acquisition of advanced machinery, equipment and computer hardware or software to produce new or significantly improved products and processes. "External knowledge" stands for the purchase or licensing of patents and non-patented inventions, know-how, and other types of knowledge from other enterprises or organisations, and training for innovative activities. (Eurostat 2008)

"Exporting" and "foreign ownership" form the third set of variables that is called internationalisation. "Exporting" indicates whether an enterprise has sold something outside of its own country. "Foreign ownership" is also a dummy, showing whether the head office of the enterprise is located in the same country or in a foreign country. Both variables described in this paragraph take the values 1 and 0, where 1 indicates that an enterprise is an exporter in the case of the "exporting" dummy and has a foreign head office in the case of "foreign ownership". In the literature, for studying cooperation, firms belonging to an enterprise group are divided into domestic or foreign-owned, as for example in Tether (2002). In our case, we also intend to form an interaction term between belonging to an enterprise group and being foreign owned, but in many Eastern European countries all foreign-owned firms belong to an enterprise group, therefore we study foreign ownership and belonging to an enterprise group separately.

The variable "different partners" shows the number of other types of cooperation partners of the firm excluding universities. The maximum value of this variable can be 5; on average it is around 1, which means that firms do not have many types of cooperation partners. All together there are seven different cooperation partners in the CIS questionnaire. This variable shows the openness of an enterprise, and it is assumed that the more open (meaning the higher number of other types of cooperation partners) an enterprise is, the more likely it is that one of the cooperation partners is also a university (Laursen and Salter 2004).

The following two variables are dummies, showing whether an enterprise has received (1 stands for receiving, 0 for not receiving) support for innovation activities from central government or the EU. It can be assumed that when an enterprise receives support for innovation activities, it is more likely to have resources for cooperating with universities. As was also found in the theoretical background, one of the hindering factors of cooperation is lack of finances and funding. If a third party (central government or EU) can help to overcome this type of problem, it should create new possibilities for cooperation, especially with universities. Therefore, we assume that firms getting financial support for innovative activities are more likely to cooperate with universities.

The last variable in the model is a dummy for the service sector, which has the value of 1 when a company belongs to the service sector and 0 when it belongs to the manufacturing sector. This variable is included in the model to see whether there are differences in the probability of cooperating with universities between service and manufacturing sector. In our case, it is not possible to divide sectors based on their technological intensity as has been done in previous research, because in some countries detailed information about the sectors is not available.

Using the above mentioned variables as determinants of university-industry cooperation, a model is set up with university-industry cooperation as the dependent dummy variable (see equation 1 for the final model). Models for cooperation with home and foreign universities as dependent variables are estimated separately; the same explanatory variables are used in both models. As an estimation method, we use a standard logit [3]model.

$$
\begin{aligned}
&University-industry\_cooperation_i = \beta_0 + \beta_1 \log(turnover)_i + \beta_2 Enterprise\_gr_i + \\
&+ \beta_3 (Size * Enterprise\_group)_i + \beta_4 In-house\_RD_i + \beta_5 External\_RD_i + \\
&+ \beta_6 Machinery_i + \beta_7 External\_knowledge + \beta_8 Training_i + \beta_9 Exporting_i + \\
&+ \beta_{10} Foreign\_owned_i + \beta_{11} Different\_partners_i + \beta_{12} Funding\_state_i + \\
&+ \beta_{13} Funding\_EU_i + \beta_{14} Services_i + u_i
\end{aligned} \tag{1}
$$

The dependent variable "university-industry cooperation" shows, whether a firm has used universities as a partner for innovation cooperation. "University-industry cooperation" can have the values 1 and 0, where 1 indicates the cooperation and 0 means no cooperation. The location of the university is also taken into account, therefore separate models for cooperation with home[4] and foreign universities as dependent variables are estimated.

4. RESULTS AND DISCUSSION

The specific intention of the empirical analysis is to examine whether differences exist between the firms which cooperate with the domestic and the foreign universities. Therefore, the following section presents the marginal effects of the explanatory variables separately for

[3] We used a logit model for estimating the results instead of a probit model to get comparable results with relogit estimations. Relogit gave similar results in the case of coefficients and p-values, therefore the results of logit estimations are given. Relogit is a logistic regression in rare events data, where one outcome is rarer than the other (see King and Zeng 2001).

[4] There is no model estimated for all universities as cooperation partners, because the share of home universities as cooperation partners compared to foreign universities is much higher and therefore the model estimated for both type of universities together will reflect the results of the model for home universities.

collaborations with home and foreign universities. In order to make the presentation of results easier we present marginal the effects in the following Tables 2–5 by groups of factors.

Table 2 provides the marginal effects of size indicators. Size matters while cooperating with home universities: firms with a higher turnover have a higher propensity to cooperate with home universities (see Table 2). However, for cooperating with foreign universities size is not a significant factor; which means that both smaller and larger firms are cooperating with foreign universities. The only exception is the Czech Republic, where size measured as the log of turnover increases the propensity to cooperate with foreign universities (see Table 2).

Table 2. Marginal effects for size indicators

Country	Home universities as cooperation partners			Foreign universities as cooperation partners		
	Log(turnover)	**Enterprise group**	**Large in an enterprise group**	**Log(turnover)**	**Enterprise group**	**Large in an enterprise group**
BG	0.001	-0.024	0.025	0.000	0.001	-0.001
	(0.002)	(0.018)	(0.019)	(0.001)	(0.006)	(0.006)
DE	-0.002	**-0.046**	0.030	0.003	0.010	0.006
	(0.003)	**(0.027)***	(0.026)	(0.002)	(0.017)	(0.018)
CY	0.004	**0.037**	-0.047	0.004	**0.033**	**-0.045**
	(0.007)	**(0.020)***	(0.032)	(0.003)	**(0.012)*****	**(0.014)*****
CZ	0.007	-0.033	-0.011	**0.002**	-0.012	0.003
	(0.005)	(0.026)	(0.026)	**(0.001)****	(0.011)	(0.010)
EE	-0.002	-0.012	0.019	0.001	-0.004	-0.015
	(0.007)	(0.030)	(0.027)	(0.006)	(0.021)	(0.031)
ES	0.000	**-0.021**	0.002	-0.000	-0.002	0.000
	(0.001)	**(0.007)*****	(0.009)	(0.000)	(0.004)	(0.002)
HU	**0.032**	-0.041	0.046	0.001	-0.003	-0.006
	(0.006)***	(0.047)	(0.049)	(0.001)	(0.011)	(0.010)
IT	**0.008**	-0.001	-0.003	-0.001	-0.004	0.006
	(0.002)***	(0.009)	(0.011)	(0.001)	(0.004)	(0.004)
LT	0.008	**-0.053**	0.008	0.001	-0.015	0.008
	(0.006)	**(0.029)***	(0.033)	(0.003)	(0.013)	(0.014)
LV	0.007	-0.012	-0.047	0.002	0.039	-0.111
	(0.010)	(0.048)	(0.053)	(0.008)	(0.060)	(0.074)
PT	0.004	-0.001	0.018	0.001	-0.010	**0.015**
	(0.003)	(0.015)	(0.016)	(0.001)	(0.006)	**(0.006)****
RO	0.002	-0.002	-0.015	0.001	0.005	-0.003
	(0.003)	(0.019)	(0.019)	(0.001)	(0.008)	(0.009)
SI	**0.023**	-0.021	-0.022	0.000	**-0.043**	0.027
	(0.007)***	(0.031)	(0.033)	(0.005)	**(0.024)***	(0.022)
SK	0.009	**-0.091**	0.037	-0.004	-0.036	0.034
	(0.008)	**(0.049)***	(0.054)	(0.005)	(0.031)	(0.037)

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.
Source: calculated by the authors based on CIS data for 2006–2008.

Belonging to an enterprise group decreases the willingness of firms to cooperate with universities in general. This is more clearly visible in the case of cooperation with the home universities. In Table 2 the sign of the marginal effect is negative in all countries belonging to an enterprise group, with the only exception of Cyprus, where belonging to an enterprise group increases the probability to cooperate both with home and foreign universities. We also used the interaction term of being a large firm and belonging to an enterprise group, but it was not a significant factor of cooperation in the case of home universities. However, in the model with foreign universities two countries had significant results: in the case of Cyprus, it is decreasing the probability to cooperate with foreign universities and it has an opposite effect

in the case of Portugal. This is also in line with literature, where it is stated that in the case of belonging to enterprise groups, the relation with propensity to cooperate with universities can be both negative (because there is enough knowledge available inside the group) and positive (more resources available for cooperating), and as we assumed before, it is country specific.

As highlighted in the literature, there has to be a certain level of capabilities to cooperate with universities (see Table 3). Our results strongly support that statement: in-house R&D, which can be interpreted as indicating a firm's research and innovation capability (absorptive capacity), is clearly a significant supportive factor both for cooperating with home (significant in 11 countries) and foreign (significant in 8 countries) universities. In the case of Estonia, not conducting in-house R&D perfectly predicts not cooperating with foreign universities. External R&D is also an important factor, especially in the case of cooperating with home universities (in 8 countries).

External knowledge as a cooperation factor has significant differences depending on whether firms are cooperating with home or foreign universities. External knowledge sources are not necessary for cooperating with home universities. In Germany, Bulgaria and Romania it even decreases the probability to cooperate with home universities. Only in Portugal there is a positive relationship between cooperation with home universities and the external knowledge dummy. In the case of foreign universities, differences between countries occur again: external knowledge can both support and hinder cooperation with foreign universities, depending on the country analysed. External knowledge can be looked at as openness. This kind of openness results in situations, where home universities as knowledge sources are not important. At the same time, foreign universities are seen as significant cooperation partners.

Other variables that also show openness and orientation towards internationalisation, like export and foreign ownership dummy, show that for this type of firm, foreign universities are a very important knowledge source and in the case of cooperating with home universities, having a foreign owner decreases the probability to cooperate.

The relationship between the investments into machinery and cooperation with universities shows very interesting trends. Those investing in machinery are less likely to cooperate with home universities (seen in the case of 7 countries) and foreign universities (3 countries) as well. This may indicate that firms which heavily invest in machinery focus on other cooperation partners like suppliers, intra-consortia members, etc. They do not need support from a university as the emphasis could be more on the process driven innovation and less on the product driven innovation, which requires more R&D cooperation. In Lithuania and Cyprus, investing in machinery is a hindering factor both for cooperation with home and foreign universities. In Estonia by contrast firms not investing in machinery do not cooperate with foreign universities as is the case with in-house R&D activities.

Table 3. Marginal effects for innovation activities

Country	Home universities as cooperation partners					Foreign universities as cooperation partners				
	In-house R&D	**External R&D**	**Machinery**	**External knowledge**	**Training**	**In-house R&D**	**External R&D**	**Machinery**	**External knowledge**	**Training**
BG	**0.016 (0.007)****	**0.019 (0.008)****	**-0.012 (0.006)****	**-0.013 (0.007)***	0.007 (0.006)	**0.006 (0.003)***	0.002 (0.004)	-0.001 (0.004)	**-0.006 (0.003)***	**-0.009 (0.004)****
DE	**0.114 (0.019)*****	**0.085 (0.012)*****	-0.019 (0.013)	**-0.029 (0.013)****	-0.009 (0.013)	**0.048 (0.019)****	**0.031 (0.009)*****	-0.012 (0.009)	**0.015 (0.007)****	-0.011 (0.009)
CY	**0.035 (0.018)****	0.018 (0.020)	**-0.164 (0.043)*****	0.028 (0.022)	**-0.099 (0.052)***	-0.007 (0.014)	0.010 (0.011)	**-0.099 (0.025)*****	-0.003 (0.015)	PFP
CZ	0.029 (0.018)	0.013 (0.014)	-0.016 (0.016)	-0.022 (0.016)	0.007 (0.017)	**0.010 (0.006)***	0.001 (0.004)	-0.000 (0.004)	0.006 (0.004)	0.004 (0.004)
EE	0.031 (0.023)	**0.048 (0.019)****	-0.045 (0.034)	0.036 (0.023)	-0.025 (0.019)	**PFP**	0.032 (0.022)	**PFP**	0.027 (0.025)	-0.009 (0.018)
ES	**0.070 (0.005)*****	**0.043 (0.004)*****	**-0.009 (0.004)****	-0.009 (0.009)	**0.015 (0.008)****	**0.016 (0.003)*****	0.004 (0.003)	-0.001 (0.001)	0.003 (0.002)	-0.000 (0.002)
HU	**0.037 (0.020)***	**0.105 (0.018)*****	-0.029 (0.021)	-0.010 (0.024)	0.005 (0.021)	0.012 (0.007)	-0.007 (0.007)	-0.007 (0.006)	0.010 (0.006)	0.005 (0.007)
IT	**0.044 (0.009)*****	**0.025 (0.009)*****	**-0.017 (0.007)*****	-0.007 (0.009)	0.001 (0.007)	**0.007 (0.003)****	**0.005 (0.002)****	-0.000 (0.003)	-0.001 (0.003)	0.003 (0.003)
LT	**0.052 (0.023)****	**0.035 (0.019)***	**-0.077 (0.025)*****	0.003 (0.020)	-0.025 (0.022)	**0.028 (0.009)*****	-0.012 (0.011)	**-0.023 (0.010)****	**0.025 (0.010)****	-0.006 (0.013)
LV	**0.080 (0.038)****	0.011 (0.036)	**-0.125 (0.031)*****	0.050 (0.072)	**0.174 (0.056)*****	-0.017 (0.057)	0.030 (0.034)	0.013 (0.049)	-0.027 (0.036)	-0.036 (0.041)
PT	**0.045 (0.011)*****	**0.021 (0.011)****	-0.013 (0.011)	**0.022 (0.010)****	-0.011 (0.011)	**0.009 (0.005)***	0.005 (0.003)	**-0.006 (0.004)***	0.004 (0.003)	-0.002 (0.004)
RO	**0.043 (0.009)*****	0.020 (0.013)	**-0.017 (0.008)***	**-0.025 (0.013)****	0.002 (0.009)	**0.008 (0.003)****	-0.001 (0.004)	-0.006 (0.004)	-0.003 (0.004)	**0.013 (0.006)****
SI	**0.133 (0.039)*****	0.024 (0.022)	-0.027 (0.028)	-0.030 (0.022)	0.017 (0.021)	0.035 (0.030)	0.019 (0.016)	0.003 (0.028)	**-0.035 (0.015)****	0.016 (0.017)
SK	0.043 (0.027)	0.005 (0.025)	0.036 (0.031)	-0.014 (0.033)	0.010 (0.028)	0.012 (0.015)	**0.028 (0.014)***	**0.059 (0.030)****	-0.006 (0.014)	**-0.036 (0.016)****

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. PFP – predicts failure perfectly, variable that predicts failure perfectly is dropped from the analysis.
Source: calculated by the authors based on CIS data for 2006–2008.

Our results indicate that if firms have a diverse knowledge base and a high level of openness (reflected by many external sources), then foreign universities as cooperation partners are more important compared to home universities. Home universities are not able to provide the necessary knowledge to exporting and foreign-owned firms. This type of firm does not find the cooperation with home universities either useful or necessary.

Table 4. Marginal effects for internationalisation and cooperation partners

Country	Home universities as cooperation partners			Foreign universities as cooperation partners		
	Exporting	**Foreign ownership**	**Number of cooperation partners**	**Exporting**	**Foreign ownership**	**Number of cooperation partners**
BG	0.000	-0.013	**0.034**	0.001	0.002	**0.008**
	(0.006)	(0.015)	**(0.001)*** **	(0.003)	(0.004)	**(0.001)*** **
DE	**0.044**	-0.014	**0.101**	**0.044**	**0.035**	**0.023**
	(0.014)* **	(0.018	**(0.004)*** **	**(0.012)*** **	**(0.010)*** **	**(0.002)*** **
CY	-0.003	-0.015	**0.027**	**0.046**	**0.037**	**0.013**
	(0.020)	(0.038)	**(0.007)*** **	**(0.016)*** **	**(0.015)** **	**(0.004)*** **
CZ	0.022	-0.025	**0.058**	**0.017**	0.008	**0.008**
	(0.019)	(0.022)	**(0.005)*** **	**(0.007)** **	(0.005)	**(0.002)*** **
EE	-0.016	0.006	**0.038**	0.037	0.022	**0.016**
	(0.022)	(0.023)	**(0.005)*** **	(0.030)	(0.028)	**(0.006)** **
ES	**0.011**	**-0.015**	**0.044**	**0.005**	0.001	**0.007**
	(0.005) **	**(0.006)*** **	**(0.003)*** **	**(0.002)** **	(0.002)	**(0.001)*** **
HU	-0.005	-0.021	**0.071**	**0.026**	0.016	**0.011**
	(0.024)	(0.031)	**(0.007)*** **	**(0.011)** **	(0.010)	**(0.003)*** **
IT	-0.005	0.001	**0.032**	**0.006**	0.000	**0.005**
	(0.008)	(0.008)	**(0.002)*** **	**(0.003)** **	(0.003)	**(0.001)*** **
LT	**-0.036**	0.018	**0.062**	0.011	0.018	**0.012**
	(0.020)*	(0.031)	**(0.004)*** **	(0.011)	(0.013)	**(0.003)*** **
LV	0.065	-0.027	**0.061**	0.080	0.028	**0.033**
	(0.044)	(0.053)	**(0.011)*** **	(0.052)	(0.056)	**(0.009)*** **
PT	0.012	**-0.027**	**0.051**	**0.007**	**0.007**	**0.008**
	(0.011)	**(0.014)** **	**(0.003)*** **	**(0.004)** **	**(0.004)** **	**(0.001)*** **
RO	0.010	0.025	**0.034**	0.002	0.010	**0.007**
	(0.008)	(0.015)	**(0.002)*** **	(0.004)	(0.006)	**(0.002)*** **
SI	0.020	**-0.063**	**0.085**	0.034	0.009	**0.036**
	(0.030)	**(0.036)***	**(0.004)*** **	(0.025)	(0.022)	**(0.007)*** **
SK	0.031	**-0.079**	**0.059**	**0.059**	-0.007	**0.019**
	(0.025)	**(0.045)***	**(0.006)*** **	**(0.023)** **	(0.021)	**(0.005)*** **

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.
Source: calculated by the authors based on CIS data for 2006–2008.

Public funding could be used as the support mechanism for directing firms to cooperate with universities. Our results show that the funding from central government increases the probability to cooperate with home universities in 12 countries. The strongest positive influence was found in Germany, where the marginal effect was 0.167. However, disappointingly, in Italy and Latvia the public funding did not increase the intention to cooperate with home universities at all. This could be interpreted as the sign of weak governmental support to the university-industry cooperation in these countries. The case of Latvia looks particularly interesting, as 89.6 % of all firms included in the CIS sample from Latvia are foreign-owned. However, following the CIS methodology, only technologically innovative firms are required to answer questions about their cooperation partners. Therefore we could conclude that in Latvia, among the technologically innovative firms, only 10.4% were domestically owned in 2006–2008. Consequently, the foreign-owned firms in Latvia

behaved like an enclave – they did not benefit from the public funding and did not cooperate with local universities.

Firms receiving support from the EU are more likely to cooperate with universities, especially with foreign universities (in 9 countries out of 14). Firms from some new EU member states – Romania, Bulgaria, Latvia, Hungary, and Slovakia – did not show an increase in the cooperation with foreign universities due to EU funding. This shows the path dependency elements in the cooperation process and sends the message about the necessity to involve these countries more closely into new EU funding schemes.

Based on these findings it seems that the cooperation supporting measures financed by the central governments maybe focus too much on cooperating with home universities. It could be not the appropriate outcome in the cases where the home universities from the small countries are not capable of providing knowledge requested by their firms. Instead, the governmental support measures should focus more on supporting cooperation with foreign universities and promoting the use of different EU funding schemes for the cooperation with foreign universities.

Table 5. Marginal effects for financing by the state and the European Union

Country	Home universities as cooperation partners		Foreign universities as cooperation partners	
	Financing by the state	**Financing by the EU**	**Financing by the state**	**Financing by the EU**
BG	**0.065**	0.014	0.002	-0.001
	(0.008)* **	(0.009)	(0.004)	(0.004)
DE	**0.167**	**0.040**	**0.037**	**0.071**
	(0.011)* **	**(0.022)***	**(0.007)*** **	**(0.008)*** **
CY	**0.043**	**0.065**	**0.034**	**0.031**
	(0.021) **	**(0.018)*** **	**(0.015)** **	**(0.011)*** **
CZ	**0.104**	0.044	**0.006**	**0.015**
	(0.018)* **	(0.034)	**(0.003)***	**(0.004)*** **
EE	**0.067**	-0.010	0.016	**0.065**
	(0.023)* **	(0.026)	(0.019)	**(0.024)*** **
ES	**0.036**	**0.041**	0.001	**0.017**
	(0.005)* **	**(0.006)*** **	(0.002)	**(0.002)*** **
HU	**0.111**	**0.052**	0.008	0.009
	(0.022)* **	**(0.025)** **	(0.006)	(0.006)
IT	0.000	**0.042**	0.001	**0.011**
	(0.007)	**(0.007)*** **	(0.002)	**(0.002)*** **
LT	**0.091**	0.028	0.009	**0.030**
	(0.023)* **	(0.019)	(0.009)	**(0.009)*** **
LV	-0.032	-0.097	0.023	-0.055
	(0.066)	(0.079)	(0.044)	(0.044)
PT	**0.036**	**0.046**	**0.013**	**0.019**
	(0.011)* **	**(0.014)*** **	**(0.003)*** **	**(0.003)*** **
RO	**0.074**	-0.005	**0.012**	0.004
	(0.009)* **	(0.012)	**(0.004)*** **	(0.004)
SI	**0.082**	**0.062**	0.006	**0.063**
	(0.024)* **	**(0.031)** **	(0.015)	**(0.016)*** **
SK	**0.118**	-0.033	-0.013	-0.028
	(0.027)* **	(0.034)	(0.031)	(0.021)

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.
Source: calculated by the authors based on CIS data for 2006–2008.

According to the results presented in the paper, it can be seen that there are significant differences between firms that cooperate with home and foreign universities. Therefore there is not one measure suitable for all the firms, but providing support for cooperation should be separated: there are different ways for directing firms to cooperate with home and foreign universities. Home universities are currently not interesting partners for firms actively engaged in internationalisation, because they do not offer the type of knowledge international firms need, therefore, these firms cooperate with foreign universities.

Home universities should try to strengthen cooperation with exporting and foreign-owned firms to understand their needs better and hence adjust their needs. Cooperating with foreign universities and networking could be one solution (the possibility to adjust).

5. CONCLUSIONS

This paper is focused on the cooperation between firms and universities. The main contribution of the paper is to provide new empirical insights about the characteristics of the firms that cooperate with universities and to identify differences between the firms that cooperate with home or foreign universities. The paper also addresses the comparative issue – is it possible to identify common characteristics of firms that cooperate with universities across European countries or can we also trace country (or country group) specific features?

The research questions were tested on the firm level data from the Community Innovation Survey 2006–2008 for 14 European countries. We used a standard logit model, which incorporated variables related to the size of a firm, different innovation activities, internationalisation, and the number of linkages, public financing and the sector of the firm. Two separate models for cooperating with home and foreign universities were estimated.

The results strongly supported the central role of the research and innovation capability of the firm as the precondition of cooperation with universities. In-house R&D was clearly a significant supportive factor both for cooperating with home and foreign universities. External R&D is also an important factor, especially in the case of cooperating with home universities.

Firms investing in machinery are less likely to cooperate with universities. This may indicate that firms that are heavily investing in machinery are focusing on the other cooperation partners or they do not need support from the universities as they are engaged mainly in process driven innovation, which requires less cooperation with universities. Another universal result showed that belonging to an enterprise group decreases the willingness of firms to cooperate with both types of universities.

We also managed to identify significant differences between the firms that cooperate with home universities, compared to those cooperating with foreign universities. The size of the firm matters while cooperating with home universities, but it is not a significant factor in cooperating with foreign universities. Firms cooperating with foreign universities are characterised by a higher level of internationalisation, measured by an export and foreign ownership dummy. Having a foreign owner decreases the probability to cooperate. External knowledge sources are not necessary for cooperating with home universities. In Germany, Bulgaria and Romania it is even decreasing the probability to cooperate with home universities.

Our results showed that the funding from the central government increases the probability to cooperate with home universities in 12 countries. Only in Italy and Latvia did public funding not increase the intention to cooperate with home universities. This could be interpreted as a sign of a weak governmental support mechanism for university-industry cooperation in these countries. Firms receiving support from the EU are more likely to cooperate with universities, especially with the foreign universities (in 9 countries out of 14). Firms from the economically weaker new EU member states – Romania, Bulgaria, Latvia and Hungary – did not show an increase in cooperation with foreign universities due to EU funding. This shows the path dependency elements in the cooperation process and sends a message about the necessity to involve these countries more closely in new EU funding schemes.

It seems that the cooperation supporting measures financed by the central governments maybe focus too much on cooperating with home universities. It could be not the appropriate outcome in the cases where the home universities from the small countries are not capable of providing knowledge requested by their firms. Instead, the governmental support measures should focus more on supporting the cooperation with foreign universities and promoting the use of different EU funding schemes for cooperation with foreign universities.

It is reasonable to apply a single policy measure targeted to support university industry cooperation, but instead these measures should be separated for directing firms to cooperate with home and foreign universities. Home universities are currently not interesting partners for firms actively engaged in internationalisation, because they do not offer the type of knowledge international firms need, therefore, these firms cooperate with foreign universities. Home universities should try to strengthen cooperation with exporting and foreign-owned firms to understand their needs better and hence adjust to their needs. Cooperating with foreign universities and networking could be one solution.

Due to the specific design of the CIS questionnaire only technologically innovative firms are required to answer questions about their cooperation partners. Therefore, the sample of responding firms has a certain bias, which is the first limitation of the paper. In the dataset that we used the Central and Eastern Europe countries are overrepresented due to data availability, which is the second limitation of the paper.

The current paper could be further developed in at least three directions. The first could be to include indicators that describe the framework conditions of university-industry cooperation in the respective countries, e.g. about the institutional setting, promotion programmes, social capital, etc. The second direction could be to pay more attention to the sectoral specificity of firms that cooperate with universities. It may help to reveal sectoral patterns of cooperation with universities. The third possible extension of the paper would be to add innovation outcome indicators into analyses. This would allow to answer questions about the relationship between the success of firms and their cooperation with universities.

REFERENCES

Belderbos, R., Carree, M., Diederen, B., Lokshin, B., and Veugelers, R. (2004), "Heterogeneity in R&D cooperation strategies", *International Journal of Industrial Organization*, 22, 1237–1263.

Busom, I., and Fernándes-Ribas, A. (2008), "The impact of firm participation in R&D programmes", *Research Policy*, 37, 240–257.

Brennenraedts, R., Bekkers, R., and Verspagen, B. (2006), "The different channels of university-industry knowledge transfer: Empirical evidence from Biomedical Engineering", Eindhoven Centre for Innovation Studies, Working paper, 06-04.

Capron, H., and Cincera, M. (2003), "Industry-University S&T Transfers: What can we learn from Belgian CIS-2 Data?", *Brussels Economic Review*, 46 (3), 59–86.

Carayannis, E., Roolaht, T., and Varblane, U. (2012), *Innovation Systems in Small Catching-Up Economies: New Perspectives on Practice and Policy*. New York, Dordrecht, Heidelberg, London: Springer.

Cohen, W.M., and Levinthal, D.A. (1989), "Innovation and Learning: the two faces of R&D", *Economic Journal*, 99 (397), 569–596.

Cohen, W.M., and Levinthal, D.A. (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation", *Administrative Science Quarterly*, 35 (1), 128–152.

Davey, T., Baaken, T., Galan Muros, V., and Meerman, A. (2011), "The State of European University-Business Cooperation." Part of the DG Education and Culture Study on the cooperation between higher education institutions and public and private organisations in Europe.

Elmuti, D., Abebe, M., and Nicolosi, M. (2005), "An overview of strategic alliances between universities and corporations", *The Journal of Workplace Learning*, 17 (1/2), 115–129.

Eom, B-Y., and Lee, K. (2010), "Determinants of industry–academy linkages and, their impact on firm performance: The case of Korea as a latecomer in knowledge industrialization", *Research Policy*, 39, 625–639.

European Commission. (2010), EUROPE 2020. A strategy for smart, sustainable and inclusive growth, Brussels, 3.3.2010. [http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF].

Eurostat. (2008), The Community Innovation Survey 2008 (CIS 2008). The harmonised survey questionnaire. 28.11.2008.

Fontana, R., Geuna, A., and Matt, M. (2006), "Factors affecting university–industry R&D projects: The importance of searching, screening and signaling", *Research Policy*, 35, 309–323.

Kang, K.H., and Kang, J. (2010), "Does partner type matter in R&D collaboration for product innovation?", *Technology Analysis & Strategic Management*, 22 (8), 945–959.

King, G., and Zeng, L. (2001), "Logistic Regression in Rare Events Data", *Political Analysis*, 9, 137-163.

Laursen, K., and Salter, A. (2004), "Searching high and low: what types of firms use universities as a source of innovation?", *Research Policy*, 33, 1201–1215.

Miotti, L., and Sachwald, F. (2003), "Co-operative R&D: why and with whom? An integrated framework of analysis", *Research Policy*, 32, 1481–1499.

Mohnen, P., and Hoareau, C. (2003), "What Type of Enterprise Forges Close Links with Universities and Government Labs? Evidence from CIS 2", *Managerial and Decision Economics*, 24, 133–145.

Nonaka, I., and Takeuchi, H. (1995), *The knowledge-creating company. How Japanese companies create the dynamics of innovation*, New York, Oxford: Oxford University Press.

Pertuzé, J., Calder E.S., Greitzer, E.M., and Lucas, W.A. (2010), "Best practices for industry-university collaboration", *MIT Sloan Management Review*, 51(4), 83–90.

Polt, W., Rammer, C., Gassler, H., Schibany, A., and Schartinger, D. (2001), "Benchmarking industry-science relations: the role of framework conditions", *Science and Public Policy*, 28 (4), 247–258.

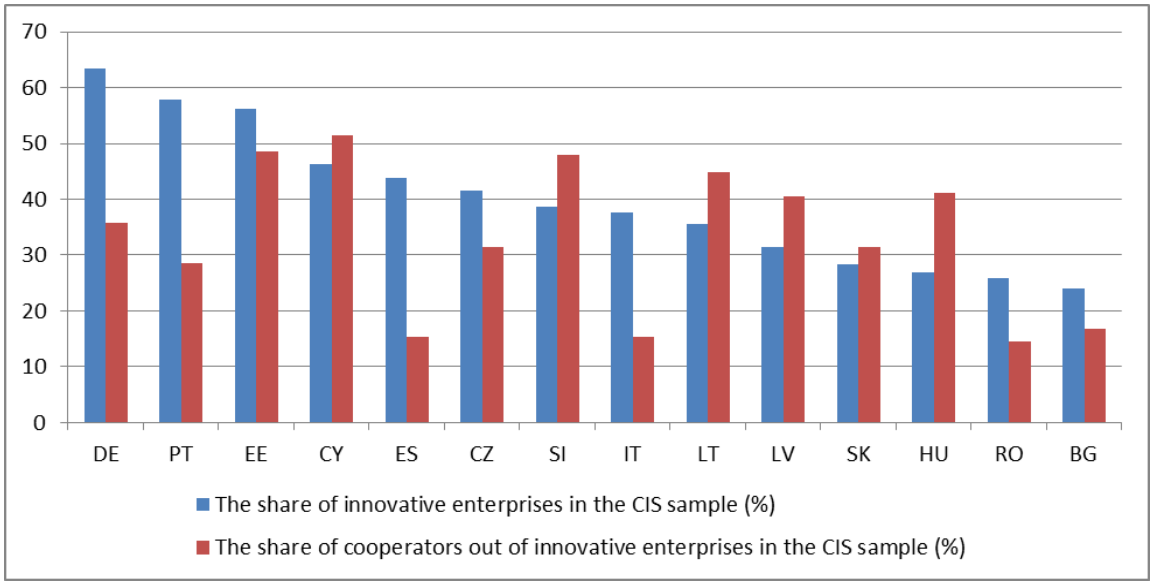
Santoro, M., and Chakrabarti A. (2002), "Firm size and technology centrality in industry-university interactions", *Research Policy*, 31, 1163–1180.

Seppo, M., Rõigas, K, and Varblane, U. (2014), "Governmental Support Measures for University-Industry Cooperation-Comparative View in Europe", *Journal of the Knowledge Economy*, March, early bird online version [http://link.springer.com/article/10.1007%2Fs13132-014-0193-8].

Tether, B.S. (2002), "Who co-operates for innovation, and why. An empirical analysis", *Research Policy*, 31, 947–967.

Varblane, U., Mets, T., and Ukrainski, K. (2008), "The role of the University-Industry-Government linkages in the innovation processes of the small catching-up economy", *Industry and Higher Education*, 22 (6), 373–386.

Appendix 1. The share of innovative enterprises and the share of cooperators among them



Source: calculated by the authors based on CIS data for 2006–2008.

Appendix 2. List of country codes

Country code	Country
BG	Bulgaria
DE	Germany
CY	Cyprus
CZ	The Czech Republic
EE	Estonia
ES	Spain
HU	Hungary
IT	Italy
LT	Lithuania
LV	Latvia
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia

Appendix 3. Marginal effects of all the variables used in the model (cooperation with home universities as dependent variable)

Country	Log (turnover)	Enterprise group	Large in enterprise group	In-house R&D	External R&D	Machinery	External know-ledge	Training	Exporting	Foreign owner-ship	Nr. of coop. partners	Financed by the state	Financed by the EU	Services
BG	0.001	-0.024	0.025	**0.016**	**0.019**	**-0.012**	**-0.013**	0.007	0.000	-0.013	**0.034**	**0.065**	0.014	**0.012**
	(0.002)	(0.018)	(0.019)	**(0.007)****	**(0.008)****	**(0.006)****	**(0.007)***	(0.006)	(0.006)	(0.015)	**(0.001)*****	**(0.008)*****	(0.009)	**(0.006)****
DE	-0.002	**-0.046**	0.030	**0.114**	**0.085**	-0.019	**-0.029**	-0.009	**0.044**	-0.014	**0.101**	**0.167**	**0.040**	-0.017
	(0.003)	**(0.027)***	(0.026)	**(0.019)*****	**(0.012)*****	(0.013)	**(0.013)****	(0.013)	**(0.014)*****	(0.018	**(0.004)*****	**(0.011)*****	**(0.022)***	(0.013)
CY	0.004	**0.037**	-0.047	**0.035**	0.018	**-0.164**	0.028	**-0.099**	-0.003	-0.015	**0.027**	**0.043**	**0.065**	**0.059**
	(0.007)	**(0.020)***	(0.032)	**(0.018)****	(0.020)	**(0.043)*****	(0.022)	**(0.052)***	(0.020)	(0.038)	**(0.007)*****	**(0.021)****	**(0.018)*****	**(0.025)****
CZ	0.007	-0.033	-0.011	0.029	0.013	-0.016	-0.022	0.007	0.022	-0.025	**0.058**	**0.104**	0.044	-0.017
	(0.005)	(0.026)	(0.026)	(0.018)	(0.014)	(0.016)	(0.016)	(0.017)	(0.019)	(0.022)	**(0.005)*****	**(0.018)*****	(0.034)	(0.017)
EE	-0.002	-0.012	0.019	0.031	**0.048**	-0.045	0.036	-0.025	-0.016	0.006	**0.038**	**0.067**	-0.010	0.014
	(0.007)	(0.030)	(0.027)	(0.023)	**(0.019)****	(0.034)	(0.023)	(0.019)	(0.022)	(0.023)	**(0.005)*****	**(0.023)*****	(0.026)	(0.018)
ES	0.000	**-0.021**	0.002	**0.070**	**0.043**	**-0.009**	-0.009	**0.015**	**0.011**	**-0.015**	**0.044**	**0.036**	**0.041**	**-0.007**
	(0.001)	**(0.007)*****	(0.009)	**(0.005)*****	**(0.004)*****	**(0.004)****	(0.009)	**(0.008)****	**(0.005)****	**(0.006)*****	**(0.003)*****	**(0.005)*****	**(0.006)*****	**(0.004)***
HU	**0.032**	-0.041	0.046	**0.037**	**0.105**	-0.029	-0.010	0.005	-0.005	-0.021	**0.071**	**0.111**	**0.052**	0.007
	(0.006)***	(0.047)	(0.049)	**(0.020)***	**(0.018)*****	(0.021)	(0.024)	(0.021)	(0.024)	(0.031)	**(0.007)*****	**(0.022)*****	**(0.025)****	(0.020)
IT	**0.008**	-0.001	-0.003	**0.044**	**0.025**	**-0.017**	-0.007	0.001	-0.005	0.001	**0.032**	0.000	**0.042**	0.005
	(0.002)***	(0.009)	(0.011)	**(0.009)*****	**(0.009)*****	**(0.007)*****	(0.009)	(0.007)	(0.008)	(0.008)	**(0.002)*****	(0.007)	**(0.007)*****	(0.007)
LT	0.008	**-0.053**	0.008	**0.052**	**0.035**	**-0.077**	0.003	-0.025	**-0.036**	0.018	**0.062**	**0.091**	0.028	0.004
	(0.006)	**(0.029)***	(0.033)	**(0.023)****	**(0.019)***	**(0.025)*****	(0.020)	(0.022)	**(0.020)***	(0.031)	**(0.004)*****	**(0.023)*****	(0.019)	(0.021)
LV	0.007	-0.012	-0.047	**0.080**	0.011	**-0.125**	0.050	**0.174**	0.065	-0.027	**0.061**	-0.032	-0.097	-0.053
	(0.010)	(0.048)	(0.053)	**(0.038)****	(0.036)	**(0.031)*****	(0.072)	**(0.056)*****	(0.044)	(0.053)	**(0.011)*****	(0.066)	(0.079)	(0.052)
PT	0.004	-0.001	0.018	**0.045**	**0.021**	-0.013	**0.022**	-0.011	0.012	**-0.027**	**0.051**	**0.036**	**0.046**	-0.003
	(0.003)	(0.015)	(0.016)	**(0.011)*****	**(0.011)****	(0.011)	**(0.010)****	(0.011)	(0.011)	**(0.014)****	**(0.003)*****	**(0.011)*****	**(0.014)*****	(0.010)
RO	0.002	-0.002	-0.015	**0.043**	0.020	**-0.017**	**-0.025**	0.002	0.010	0.025	**0.034**	**0.074**	-0.005	0.005
	(0.003)	(0.019)	(0.019)	**(0.009)*****	(0.013)	**(0.008)***	**(0.013)****	(0.009)	(0.008)	(0.015)	**(0.002)*****	**(0.009)*****	(0.012)	(0.008)
SI	**0.023**	-0.021	-0.022	**0.133**	0.024	-0.027	-0.030	0.017	0.020	**-0.063**	**0.085**	**0.082**	**0.062**	**0.044**
	(0.007)***	(0.031)	(0.033)	**(0.039)*****	(0.022)	(0.028)	(0.022)	(0.021)	(0.030)	**(0.036)***	**(0.004)*****	**(0.024)*****	**(0.031)****	**(0.025)***
SK	0.009	**-0.091**	0.037	0.043	0.005	0.036	-0.014	0.010	0.031	**-0.079**	**0.059**	**0.118**	-0.033	0.032
	(0.008)	**(0.049)***	(0.054)	(0.027)	(0.025)	(0.031)	(0.033)	(0.028)	(0.025)	**(0.045)***	**(0.006)*****	**(0.027)*****	(0.034)	(0.025)

Source: calculated by the authors based on CIS data for 2006–2008.

Appendix 4. Marginal effects of all the variables used in the model (cooperation with foreign universities as dependent variable)

Country	Log (turnover)	Enterprise group	Large in enterprise group	In-house R&D	External R&D	Machinery	External know-ledge	Training	Exporting	Foreign owner-ship	Nr. of coop. partners	Financed by the state	Financed by the EU	Services
BG	0.000	0.001	-0.001	**0.006**	0.002	-0.001	**-0.006**	**-0.009**	0.001	0.002	**0.008**	0.002	-0.001	0.003
	(0.001)	(0.006)	(0.006)	**(0.003)***	(0.004)	(0.004)	**(0.003)***	**(0.004)****	(0.003)	(0.004)	**(0.001)*****	(0.004)	(0.004)	(0.005)
DE	0.003	0.010	0.006	**0.048**	**0.031**	-0.012	**0.015**	-0.011	**0.044**	**0.035**	**0.023**	**0.037**	**0.071**	**0.020**
	(0.002)	(0.017)	(0.018)	**(0.019)****	**(0.009)*****	(0.009)	**(0.007)****	(0.009)	**(0.012)*****	**(0.010)*****	**(0.002)*****	**(0.007)*****	**(0.008)*****	**(0.008)*****
CY	0.004	**0.033**	**-0.045**	-0.007	0.010	**-0.099**	-0.003	PFP	**0.046**	**0.037**	**0.013**	**0.034**	**0.031**	-0.017
	(0.003)	**(0.012)*****	**(0.014)*****	(0.014)	(0.011)	**(0.025)*****	(0.015)		**(0.016)*****	**(0.015)****	**(0.004)*****	**(0.015)****	**(0.011)*****	(0.014)
CZ	**0.002**	-0.012	0.003	**0.010**	0.001	-0.000	0.006	0.004	**0.017**	0.008	**0.008**	**0.006**	**0.015**	**0.011**
	(0.001)**	(0.011)	(0.010)	**(0.006)***	(0.004)	(0.004)	(0.004)	(0.004)	**(0.007)****	(0.005)	**(0.002)*****	**(0.003)***	**(0.004)*****	**(0.005)***
EE	0.001	-0.004	-0.015	**PFP**	0.032	**PFP**	0.027	-0.009	0.037	0.022	**0.016**	0.016	**0.065**	**0.041**
	(0.006)	(0.021)	(0.031)		(0.022)		(0.025)	(0.018)	(0.030)	(0.028)	**(0.006)****	(0.019)	**(0.024)*****	**(0.021)***
ES	-0.000	-0.002	0.000	**0.016**	0.004	-0.001	0.003	-0.000	**0.005**	0.001	**0.007**	0.001	**0.017**	0.001
	(0.000)	(0.004)	(0.002)	**(0.003)*****	(0.003)	(0.001)	(0.002)	(0.002)	**(0.002)****	(0.002)	**(0.001)*****	(0.002)	**(0.002)*****	(0.002)
HU	0.001	-0.003	-0.006	0.012	-0.007	-0.007	0.010	0.005	**0.026**	0.016	**0.011**	0.008	0.009	0.006
	(0.001)	(0.011)	(0.010)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	**(0.011)****	(0.010)	**(0.003)*****	(0.006)	(0.006)	(0.006)
IT	-0.001	-0.004	0.006	**0.007**	**0.005**	-0.000	-0.001	0.003	**0.006**	0.000	**0.005**	0.001	**0.011**	**0.006**
	(0.001)	(0.004)	(0.004)	**(0.003)****	**(0.002)****	(0.003)	(0.003)	(0.003)	**(0.003)****	(0.003)	**(0.001)*****	(0.002)	**(0.002)*****	**(0.003)****
LT	0.001	-0.015	0.008	**0.028**	-0.012	**-0.023**	**0.025**	-0.006	0.011	0.018	**0.012**	0.009	**0.030**	-0.001
	(0.003)	(0.013)	(0.014)	**(0.009)*****	(0.011)	**(0.010)****	**(0.010)****	(0.013)	(0.011)	(0.013)	**(0.003)*****	(0.009)	**(0.009)*****	(0.007)
LV	0.002	0.039	-0.111	-0.017	0.030	0.013	-0.027	-0.036	0.080	0.028	**0.033**	0.023	-0.055	**-0.064**
	(0.008)	(0.060)	(0.074)	(0.057)	(0.034)	(0.049)	(0.036)	(0.041)	(0.052)	(0.056)	**(0.009)*****	(0.044)	(0.044)	**(0.037)***
PT	0.001	-0.010	**0.015**	**0.009**	0.005	**-0.006**	0.004	-0.002	**0.007**	**0.007**	**0.008**	**0.013**	**0.019**	**0.005**
	(0.001)	(0.006)	**(0.006)****	**(0.005)***	(0.003)	**(0.004)***	(0.003)	(0.004)	**(0.004)****	**(0.004)****	**(0.001)*****	**(0.003)*****	**(0.003)*****	**(0.003)***
RO	0.001	0.005	-0.003	**0.008**	-0.001	-0.006	-0.003	**0.013**	0.002	0.010	**0.007**	**0.012**	0.004	0.006
	(0.001)	(0.008)	(0.009)	**(0.003)****	(0.004)	(0.004)	(0.004)	**(0.006)****	(0.004)	(0.006)	**(0.002)*****	**(0.004)*****	(0.004)	(0.004)
SI	0.000	**-0.043**	0.027	0.035	0.019	0.003	**-0.035**	0.016	0.034	0.009	**0.036**	0.006	**0.063**	**0.034**
	(0.005)	**(0.024)***	(0.022)	(0.030)	(0.016)	(0.028)	**(0.015)****	(0.017)	(0.025)	(0.022)	**(0.007)*****	(0.015)	**(0.016)*****	**(0.016)****
SK	-0.004	-0.036	0.034	0.012	**0.028**	**0.059**	-0.006	**-0.036**	**0.059**	-0.007	**0.019**	-0.013	-0.028	0.000
	(0.005)	(0.031)	(0.037)	(0.015)	**(0.014)***	**(0.030)****	(0.014)	**(0.016)****	**(0.023)****	(0.021)	**(0.005)*****	(0.031)	(0.021)	(0.013)

Source: calculated by the authors based on CIS data for 2006–2008.

KOKKUVÕTE

Millised ettevõtted kasutavad ülikoole koostööpartnerina? – Euroopa riikide võrdlevanalüüs

Ettevõtete konkurentsivõime põhineb hästi toimival riigi innovatsioonisüsteemil, mis loob tiheda koostöövõrgustiku tugevate ülikoolide ja ettevõtlussektori vahel. Ülikoolide ja ettevõtete omavaheline suhtlus soodustab teadmussiiret, mis omakorda toetab erinevat tüüpi innovatsioonide loomist. Euroopa Liidu strateegia „Euroopa 2020“, mille eesmärk on arukas, jätkusuutlik ja kaasav majandus (EK, 2010), rõhutab ettevõtete ja ülikoolide aktiivse koostöö olulisust Euroopa Liidu konkurentsivõime säilitamisel. Selleks on vajalik ettevõtete-ülikoolide koostöömehhanismi parem mõistmine. Käesolev töö keskendubki ettevõtete ja ülikoolide vahelisele koostööle. Töö peamine panus on pakkuda uut empiirilist informatsiooni ülikoolidega koostööd tegevaid ettevõtteid iseloomustavate tunnuste kohta ning tuua välja erinevused ettevõtetes, kes teevad koostööd kodumaiste ja kes välisülikoolidega. Olulisel kohal on ka Euroopa riikide omavaheline võrdlus – kas leidub tunnuseid, mis on sarnased üle erinevate Euroopa riikide või esineb pigem tunnuseid, mis on omased vaid teatud riigi (riigigrupi) ettevõtetele.

Käesoleva artikli eesmärgiks on anda vastus küsimusele: millised ettevõtted kasutavad ülikoole koostööpartnerina? Vastamaks töös püstitatud uurimisküsimustele, kasutatakse innovatsiooniuuringu (*Community Innovation Survey* – CIS) andmeid aastate 2006-2008 kohta, analüüsi on kaasatud 14 Euroopa riigi ettevõtete taseme andmed. Tuleb silmas pidada, et tulenevalt innovatsiooniuuringu metoodikast, on võimalik koostöötegureid hinnata vaid tehnoloogiliselt innovaatiliste ettevõtete jaoks. Teise piiranguna, mis on põhjustatud andmete kättesaadavusest, võib välja tuua valimi kallutatuse Kesk- ja Ida-Euroopa riikide suunas. Samuti tuleneb andmete kättesaadavusest ka analüüsitava perioodi (2006-2008) valik. Sel perioodil liitusid uued liikmesriigid Euroopa Liidu meetmetega ning Rumeenia ja Bulgaaria alles astusid Euroopa Liitu.

Töös vaatleme erinevaid muutujate gruppe, et uurida, kuivõrd ettevõtet iseloomustavad näitajad on seotud tõenäosusega teha koostööd ülikoolidega. Esimese muutujate grupina lisasime mudelisse suuruse näitajad, teise grupi moodustasid innovatsioonitegevusi iseloomustavad näitajad, nagu teadus-arendustegevus, masinatesse ja seadmetesse investeerimine, muude teadmiste hankimine väljastpoolt ettevõtet ning innovatsioonialane koolitus. Kolmas muutujate grupp kannab nimetust rahvusvahelistumine, kuhu kuuluvad ekspordi ja välisosaluse näitajad. Lisaks testisime koostööpartnerite arvu ja avaliku sektori poolse innovatsioonitegevuse rahastamise olulisust koostöö teguritena. Erinevate tegurite olulisuse selgitamiseks kasutasime standardset logit-mudelit, mis hinnati eraldi kodumaiste ja välisülikoolide jaoks.

Peamiste tulemustena leidsime, et olenemata koostööpartneri asukohast, peavad ettevõtted omama teatud võimekuse taset, et ülikoolidega koostööd teha – ettevõtte-sisene ja –väline teadus-arendustegevus on oluline tegur iseloomustamaks koostööd ülikoolidega. Masinatesse ja seadmetesse investeerimine, mis on üheks võimalikuks innovatsioonitegevuseks, on ülikoolidega koostöö puhul takistavaks teguriks. Ettevõtted, kes investeerivad masinatesse, kasutavad rohkem teist tüüpi koostööpartnereid või nad ei vaja ülikoolide tuge, kuna tegelevad peamiselt protsessiinnovatsiooniga, mis ei nõua ja nii tihedaid sidemeid ülikoolidega. Koostööd (nii kodumaiste kui välisülikoolidega) takistava tegurina võib välja tuua ka kontserni kuulumise, mis vähendab tõenäosust teha koostööd ülikoolidega. Üldine

koostööpartnerite arv suurendab aga tõenäosust teha koostööd ülikoolidega: mida rohkem on ettevõttel erinevaid partnereid, seda tõenäolisem on, et koostööd tehakse ka ülikoolidega.

Analüüsi käigus selgus, et ettevõtted, kes teevad koostööd kodumaiste ülikoolidega erinevad olulisel määral nendest ettevõtetest, kelle koostööpartneriks on välisülikool. Teguriks, mis neid ettevõtteid eristab, on rahvusvahelistumise tase väljendatuna eksportimise ja välisosalusega. Ettevõtted, kes ekspordivad ja omavad välisosalust, valivad oma koostööpartneriks pigem välisülikooli, sest kodumaised ülikoolid ei suuda neile vajalikku teadmust pakkuda. Ettevõtte suurus on oluline tegur koostöö tegemisel kodumaiste ülikoolidega, kuid ebaoluline välisülikoolidega koostöö puhul. Teadmiste hankimine väljastpoolt ettevõtet on omakorda ebaoluline kodumaiste ülikoolidega koostöö tegemisel. Samas leidub näiteid (Saksamaa, Bulgaaria, Rumeenia), kus teadmiste väljastpoolt hankimine vähendab tõenäosust teha koostööd kodumaiste ülikoolidega.

Lisaks eelmainitud teguritele osutus kodumaiste ülikoolidega koostöö tegemisel oluliseks valitsusepoolne toetus, mis tõstis koostöö tõenäosust 12 riigis. Itaalia ja Läti olid ainsad erandid, kus taoline toetus ei suurendanud koostöö tõenäosust. Seda võib tõlgendada kui märki nõrgast valitsuse toetusmehhanismist ettevõtete-ülikoolide koostöö toetamisel. Ettevõtted, kes saavad toetust Euroopa Liidult, teevad suurema tõenäosusega koostööd ülikoolidega, eriti aga välisülikoolidega. Majanduslikult nõrgemate uute ELi liikmesriikide, nagu Rumeenia, Bulgaaria, Läti ja Ungari ettevõtete puhul ei suurendanud ELi-poolsed toetused koostööd välisülikoolidega. See näitab rajasõltuvust koostööprotsessis ning annab märku vajadusest kaasata neid riike tugevamalt uutesse ELi rahastamisskeemidesse.

Saadud tulemuste põhjal saab järeldada, et valitsuse-poolsed koostöömeetmed suunavad liigselt koostööle kodumaiste ülikoolidega. See aga ei ole soovitav tulemus olukorras, kus väikeste riikide kodumaised ülikoolid ei ole suutelised pakkuma teadmust, mida neis riikides tegutsevad ettevõtted vajavad. Selle asemel peaksid valitsuse-poolsed meetmed suunama ettevõtteid rohkem koostööle välisülikoolidega ja soodustama ettevõtteid kasutama erinevaid ELi toetusmeetmeid välisülikoolidega koostööks.