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Foreign Ownership and Within-MNEs GVC Participation as Determinants of Innovation Activities: A CIS-Based Firm-Level Analysis

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Abstract

In this paper we study the relationship between foreign firm ownership and innovation activities in a wide group of West European and Central and East European countries. Based on a dataset including more than 100,000 firms covered by the 2014 edition of the Community Innovation Survey, we examine the role of home- and host country effects in firms' decisions to introduce various forms of innovation. In addition, we identify a group of foreign-owned firms that specialize in exporting and interpret them as participants of hierarchic global value chains organized by multinational enterprises. We show that while foreign direct investment, especially from Germany, is positively associated with innovation, the opposite effect is observed in the case of hierarchic global value chains' participants. The negative impact of within-multinationals global value chains on innovation is more pronounced in the affiliates located in the Central and East European countries.

Keywords: innovation, FDI, GVCs, MNEs, CIS data

JEL Classification: F23, O33, P33

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1 Introduction

According to the new economic growth theory innovation is responsible for long-run economic development (Aghion and Howitt 1992, 1998; Romer 1990). Similarly, the empirical evidence shows that technological progress, innovative capacity and productivity gains associated with innovation are important sources of economic growth (Geroski 1989; Fagerberg et al. 2007). Due to the key role of technological progress in economic growth and development, subsequent studies attempted to identify the determinants of innovation. These studies have found that innovation is not only positively affected by factors directly related to the generation of new knowledge, such as R&D and the quality of human capital, but also by the economic and institutional environment (Grilliches 1990; Furman et al. 2002; Aghion 2004; Varsakelis 2006). An important element of this environment is foreign direct investment (FDI) made by multinational enterprises (MNEs).

MNEs have been often viewed as important sources of innovation, and the worldwide spread of their activities constitutes an important means of knowledge dissemination (World Bank 1999). Romer (1993) argued that one of the best ways for developing and transition countries to acquire ideas and knowledge was to create an economic environment conducive to the inflow of FDI. Consequently, the ongoing quest for innovation has gained a central position in the policy agenda of both developed and developing countries all around the world. Many governments have enacted laws aimed at making it easier for MNEs to invest in their countries and offered generous tax incentives to encourage inward FDI. The involvement of MNEs in the privatization process, along with the acquisition of indigenous firms have been important aspects of the restructuring processes in developing and transition countries that resulted in denationalization of their economies. FDI may affect the economies of host countries directly by transferring foreign knowledge, capital, marketing techniques and management skills, and indirectly, by bringing the whole range of positive spillovers that affect the performance of indigenous firms. In particular, FDI may influence the technological innovation in host countries through several mechanisms including backward and forward linkages, competition and demonstration effects, the effects on human capital formation, and the dissemination of foreign knowledge (Berger and Diez 2008). Such spillovers are expected to affect the productivity of indigenous firms in host countries, but can also have positive effects on wages and international market access, and on the productivity of firms in upstream and downstream industries (Bedi and Cieślik 2002; Kolasa 2008; Cieślik and Hagemejer 2014). The spillovers may arise due to the leakage of the proprietary knowledge of the MNEs or due to the response of indigenous firms to the establishment of foreign subsidiaries. However, in reality the knowledge spillovers generated by subsidiaries of MNEs to indigenous firms may be smaller than expected. On the one hand, from the perspective of MNEs, it may be rational to transfer the most obsolete technologies to prevent the dissipation of their knowledge assets. On the other hand, the limits to successful international technology transfers may also lie on the host country part. In fact, technological

capabilities of the firms in developing and transition countries and skills of their employees may prevent immediate understanding of advanced foreign technologies (Cohen and Levinthal 1990).

Due to the increasing importance of MNEs, an extensive empirical literature has emerged examining their effects on economic performance in host economies. However, given the aforementioned arguments, it may not be surprising that despite the potential benefits from foreign technology transfers, the results of empirical studies on the effects of FDI on innovation in host economies yield rather mixed results. In particular, it is argued that the positive effects of FDI occur when foreign subsidiaries are well integrated with host economies and maintain close interactions with their domestic suppliers, customers, research institutes and universities, and subsidiaries of other MNEs that also operate in host countries. In addition, the empirical literature has also emphasized the importance of absorptive capacities of both local actors and foreign subsidiaries (Cohen and Levinthal 1990; Marin and Bell 2006; Yokota and Tomohara 2010). In particular, the interactions of foreign subsidiaries with other local actors depend on resources and capabilities of all the parties involved. The process of building-up the capabilities and resources of foreign subsidiaries of MNEs is different than the analogous process going on in indigenous firms. This is due to the dual nature of subsidiaries: they are simultaneously parts of host economies, and parts of a networks controlled from abroad. By implication, the levels of capabilities foreign subsidiaries accumulate overtime are related not only to the local environment in which they operate but also to their strategic roles and positions within their MNE networks (Birkinshaw 1998; Holm et al. 2003).

In this paper we seek to answer two important questions. First, is foreign ownership conducive to various forms of innovation? Second, is the membership in hierarchic global value chains organized by MNEs affecting the innovation performance of participating firms? (We refer to "hierarchic" GVCs in the sense of Gereffi et al. (2005), that is, as vertically integrated firms, wherein the supplier is owned by its foreign customer.) In our analysis we distinguish between FDI incoming from major innovating countries, such as Germany, and then we check whether the impact on firms' innovation depend on the country location of a parent firm. In particular, we study separately the effects of foreign ownership and participation in global value chains (GVC) in West European (WE) and Central and East European (CEE) countries.

MNEs frequently play a leading role in organizing and shaping GVC activities. According to the conceptualization proposed by Antràs (2020, p. 5), "GVC consists of a series of stages involved in producing a product or service that is sold to consumers, with each stage adding value, and with at least two stages being produced in different countries". Global Value Chains reinforce globalization, reshape the structure of international trade, increase direct collaborations between indigenous firms and have implications for individual firms' performance. The literature has verified that the participation in non-hierarchic GVCs can improve the performance of firms in several

ways; providing them a chance to obtain managerial expertise, technical knowledge, innovation, new markets and in this way enhance their efficiency. However, only few empirical studies looked at the hierarchic GVCs, wherein the lead firm works with its foreign subsidiary.

This is why we seek to contribute to the existing literature by examining the firm-level effects of FDI and participation in hierarchic GVCs on innovation in a set of WE and CEE countries. We distinguish between firms in WE and CEE countries, because the former have a generally higher level of human capital and national technological capabilities (cf. Lacasa et al. 2017; Fagerberg and Srholec 2017). Another novel aspect of our work is that we distinguish between the subsidiaries of MNEs coming from specific countries, such as US, Germany, UK, Japan, France and others (we selected world's biggest economies, as well as two countries that are regarded as particularly innovative: Finland and Switzerland). We expect the geographical distance to a parent company do matter for the strategy of the subsidiary. Moreover, we know from other studies that firms from some countries, especially Germany, are more likely to organize and lead GVC networks in Eastern Europe, than firms from other countries (see Ambroziak 2018 and Amador et al. 2018). The analysis is based on the firm-level data from the 2014 edition of the Community Innovation Survey, accessed at the Eurostat's Safecentre in Luxembourg.

The structure of this paper is as follows. In Section 2 we provide the review of the relevant literature on the relationship between the participation of firms in GVCs and their productivity and innovation performance. In Section 3 we describe our empirical methodology and statistical data. In Section 4 we report and discuss our empirical results. Section 5 summarizes and concludes with policy recommendations and directions for future research.

2 Literature review

A number of theoretical studies emphasized the beneficial effects of FDI on innovation and, hence, the rate of economic growth (Blomstrom and Kokko 2002; Berger and Diez 2008). Since 1990s FDI has become synonymous of a first-class-ticket to globalization and MNEs have been welcomed in industries and sectors that were previously forbidden to them (Costa and Filippov 2007). Especially, governments of many developing and transition countries have started to attract FDI with the aim of restructuring their economies, fostering innovation, and promoting closer integration with the world economy. Restructuring implies not only changes to the structure of their national economies and intensification of global integration, but also accelerates technological change. In fact, progress in restructuring has been evaluated by the ability to bring about new technologies and new features to existing technologies, commonly referred to as innovations.

On the other hand, for many years international business scholars and development economists argued that MNEs protect their critical assets and sources of competitive

advantages by centralizing their higher value-adding functions such as R&D, in their source countries home, hence their impact on host countries' technological development would be limited (Lall 1992; Katz and Bercovich 1993). Moreover, MNEs might not be willing to transfer the most advanced technologies due to the fear of the loss of intellectual property and future competition of local firms that would learn these technologies (Hayter and Han 1998). These concerns were related to the stages of firms' internationalization as until the 1980s, the dispersion of value-adding activities by MNEs was mainly limited to assembling and manufacturing operations. Therefore, the transfer of knowledge to foreign subsidiaries from the parent firm was limited to a minimum necessary for their efficient performance. This view led to the development of the first generation models of multinational enterprise by Krugman (1983), Helpman (1984, 1985) and Helpman and Krugman (1985). Accordingly, in such hierarchic models, MNEs affiliates were mainly a replication in smaller scale of their headquarters, but missing their core functions, such as R&D activities, which were centralized at source countries.

However, the modern international business literature questions whether this is still the case, as the corporate governance of MNEs has been evolving rapidly, with implications to the roles and activities of their foreign affiliates. It is often argued that MNEs have been changing from hierarchic structures towards network-based structures. In addition, globalization has put an increased competitive pressure on MNEs which have to be more innovative and able to respond rapidly to the changing needs of host country markets in order to maintain their market shares. In other words, it is argued that MNEs have evolved from exploitation of their firm-specific advantages in host countries, that were based on their knowledge assets created in source countries towards a more internationally-dispersed-generation of such advantages (Pedersen 2006). An important implication of these developments is that new innovative ideas can emerge anywhere within MNEs in the world and not only in the source company (Birkinshaw and Hood 2001). Therefore, the traditional view of MNEs' subsidiaries as mere conduits of corporate strategy and passive recipients of headquarter services may no longer match the present reality of complex corporate network structures. As a result, the effects of changes in terms of knowledge flows between MNEs and their foreign subsidiaries and consequently between MNEs and host economies are still far from being fully understood (Foss and Pedersen 2004).

The new strand in the international business literature that focuses on MNEs subsidiaries has been studying the idiosyncrasies and differences among various units that compose global MNE networks. According to this strand each unit can have a specific strategic role and a different scope. These include business functions or value-added activities they assume; products they produce and markets they serve; the autonomy for management decisions they have, etc. (Birkinshaw 1998; Birkinshaw and Hood 1998; Ghoshal and Nohria 1989; Holm et al. 2003; Pearce 2001; Tavares 2002; Pearce and Papanastassiou 2006). In addition, it is often argued that MNE networks are not only heterogeneous, but also dynamic. This implies

that MNE subsidiaries can be moving up within the corporate networks by assuming more complex and central responsibilities such as commercial functions, strategic marketing, regional headquarters, R&D activities, etc. (Pearce 2005). Several studies show that the chances of a MNE subsidiary to exploit such opportunities do not depend only on assignments determined by its headquarter. They are also affected by subsidiary's own characteristics, such as its own capabilities, which in turn strongly depend on subsidiary's own initiative (Birkinshaw 1996; Birkinshaw 1998; Birkinshaw and Hood 1998; Holm et al. 2003; Pedersen 2006).

In addition to MNE- and subsidiary-own-characteristics, another set of factors that may affect the evolution and development of MNE subsidiaries is related to opportunities and obstacles emerging from the local environment in which they operate. In particular, as argued already by Penrose (1956) the host country may play an important role in defining the development of capabilities within MNE subsidiaries. This includes various features of host economies including fierce competition, sophisticated customers, skilled labor force, supporting industries, intermediate input suppliers, and physical and knowledge infrastructures. The importance of these features and the changes in corporate governance and their effects on subsidiaries' roles and responsibilities within the corporate structure can trigger further changes in host countries' government policies with respect to FDI. This means that the level of capabilities of a foreign subsidiary accumulates over time is related not only to its strategic role and position within the global network it belongs to but also to its local environment in a host country (Birkinshaw and Hood 1998).

In this context it is important to invoke the concept of GVC governance modes, proposed by Gereffi et al. (2005), one of the most important contributions to the GVC literature. Drawing on the variety of literatures in transaction cost economics, production networks, and innovation studies, they distinguished five modes of organizing GVCs. Listed in the ascending order of the degree of explicit coordination of the GVC lead firm these modes are: markets, modular, relational, captive, and hierarchy. They argued that the choice of governance mode is driven by the complexity of transaction, the codifiability of knowledge and the quality of local suppliers.

More importantly, some authors attempted to apply Gereffi's et al. (2005) framework to theorize about the relationship between GVC participation and innovation capabilities of firms, especially those from developing and catching-up countries. For example, Pietrobelli and Rabelotti (2011) linked the five GVC governance modes to the theory of national innovation systems (NIS). They argued that captive and hierarchic modes are more likely to prevail in weak, more fragmented NISs, while the implicitly co-ordinated GVCs should occur more often in well-structured complete NISs. They also argued that all types of GVCs enhance the participants' technological capabilities, but firms in modular and relational types of relationships are more likely to upgrade their position within GVCs than firms in captive and hierarchic GVCs, which can be expected to simply improve their efficiency in existing activities.

However, Morrison et al. (2008) argued that even in the latter case there is room for building technological capabilities in supplier firms. Schmitz (2007) pointed to the crucial role of the GVC lead firms in shaping the knowledge flows within the network, while Lema et al. (2019) described various paths (trajectories) along which firms, participating in GVCs and located in less developed countries, can acquire or lose innovation capability. Depending on how the GVCs co-evolve with local innovation systems, the innovation trajectories of firms can be gradually increasing, leapwise increasing, stagnating, or even declining.

The rapidly growing empirical literature on Global Value Chains is quite heterogeneous (see the excellent review by Antràs 2020). Many authors have analyzed the GVC phenomenon from a country-sector perspective by looking at the input-output tables: this made it possible to assess the role of global value chains in world trade and to identify the main organizers and participants of GVC (WTO 2019; Amador et al. 2018). However, as stressed by Antràs (2020), GVC is essentially a firm-level phenomenon, so it would be natural to use micro data for more insights. Here the major problem is data availability: in particular, it is difficult to tell whether the goods imported or exported are really intermediate inputs produced or used by other firms (p. 15). This is why, most firm-level quantitative studies make an auxiliary assumption that firms involved in GVCs are those that both export and import (see for instance, Benkovskis et al. 2019, Rigo 2020, Cieślik et al. 2019, and Amador and Cabral 2016 for a more detailed discussion on possible measures and data bases for GVC participation). Finally, there is no shortage of case-studies of Global Value Chains in specific industries and countries (e.g. Dolan and Humphrey 2000, Bair and Gereffi 2001, Bazan and Navas-Aleman 2004; Giuliani et al. 2005; Lema et al. 2015). They often fall into what Antràs calls "relational approach to GVC" which is focused the relationships between GVC members. These relationships tend to be complex, as they involve lock-in effects, flows of intangibles and limited contractual security (Antràs 2020, p. 19–20).

The theoretical literature predicts larger innovation gains for GVC participants when the governance mode is more "democratic" than when it is more hierarchic. This hypothesis is at least partly confirmed in empirical studies. Brancati et al. (2017) compare GVC participants to non-participants in a large panel of Italian manufacturing and services firms. They distinguish between different modes of governance based on whether the firm declares a long-lasting and significant relationship with the client and if it participates in the conception of the final product. Relational suppliers show a significant propensity to introduce product and process innovations and to engage in R&D activities, while firms in more hierarchic GVC (and those participating in market-mode GVCs) do not differ from non-participants. Lema et al. (2015) study the cases of Brazilian automotive and Indian software industries, and find substantial gains in terms of innovation capabilities. On the other hand, out of 50 studies of GVCs in developing countries, reviewed by De Marchi et al. (2018) more than half was classified as "marginal innovators", showing low level of

innovation performance, limited use of GVCs knowledge and scarce use of external knowledge sources (however this study does not refer to governance modes). All the same, Rigo (2020) looks at a panel of firms from a number of developing countries and demonstrates that firms involved in GVC are more likely to license foreign technologies (which is shown to enhance their productivity).

3 Data and methodology

In our empirical study we use the Community Innovation Survey (CIS) data to examine if the foreign ownership and the participation of firms in GVCs affect their likelihood of introducing innovation of various sorts. We employ a probit model to a sample of more than 100,000 firms surveyed in 2014 edition of CIS. We estimate the following equation

$$Pr\left(inn_i^k = 1|x_i\right) = \Phi\left(x_i\beta^k\right), \tag{1}$$

where: $inn_i^k = 1$ if and only if firm i introduces innovation of type k (product, process, marketing or organization innovation), and zero otherwise. The variables constituting vector x_i can be divided in five groups:

1) Three variables characterizing firm i. These are: *log_emp_start*, which is the log of the number of workers in 2012; *hr* describing the level of human capital on a four-grade scale based on the percentage of workers with tertiary degree (this measure equals 0 if this share at most 24%, 1 if the share is 25% to 49%, 2 if it is 50% to 74%, and finally 3 if the share is 75% to 100%); *gp_home* which is a dummy variable for firms that are member of groups of firms for which the mother company is located in the same country as the firm.

2) 10 variables of the type *fdi_country,* where *country* is one of the following list: *Germany, US, France, United Kingdom, Italy, Japan, Canada, Finland, Switzerland*, and *other*; *fdi_country* is a dummy variable equal 1 if the firm is a member of the group of firms, and the parent company of the firm is located in *country*, and 0 otherwise.

3) 10 variables of the type *gvc_country;* this is a dummy variable equal 1 if the firm is a member of the group of firms, and the parent company of the firm is located in *country*, *and* if the firm's principal market is a foreign market – and 0 otherwise. As for *country*, the same list as in the case of *fdi_country* is considered.

4) country dummies.

5) industry dummies (we use the 2-digit level of the NACE Rev-2 taxonomy).

The aforementioned definition of variable *gvc_country* requires some explanation. Ideally we would like to identify the members of GVCs as firms that both import intermediate inputs, and export more processed goods (see the discussion in previous section). Unfortunately, data on intermediate inputs are not available in our dataset. We believe, however, that firms that are foreign subsidiaries and focused on exporting, are also likely to import. By implication, at least for hierarchic GVCs our proxy should work. In fact we find some support for this approach when looking at the data from the Enterprise Surveys of the World Bank Specifically, on adopting a traditional measure of participation in hierarchic GVC as a dummy variable equal 1 for firms that are exporters and importers *and* foreign subsidiaries, we find that the correlation between this traditional measure and our measure of hierarchic GVCs, as export-focused daughter companies, is about 0.8 (these calculations are based on the 2019 edition of WB Enterprise Survey data with data available for 10 out of 17 countries we analyze in this paper).

The variable describes the change in probability of implementing a form of innovation, when firm (affiliate) belongs to a given capital group and is participating in international GVCs. For instance, the sign of the estimated parameter on *gvc_DE* describes the change in probability in comparison to all firms in a given country that are subsidiaries of German firms, but not in comparison to all firms in a given country. We argue that the variables related to the foreign ownership of a firm and its focus on exports are related to the decisions of the parent company. Therefore, they can be regarded as exogenous.

We estimate the model for the full sample of firms, and separately for Western European and CEE EU member countries. The number of observations for WE countries is about double of that for CEE countries. We look at the 2014 edition of the Community Innovation Survey, available in the Eurostat Safe-center in Luxembourg in November 2019. There are 22 countries represented in the 2014 edition, however in the probit analysis we will use the data for 17 countries for which data on the human capital are available, because we believe that human capital is a key factor in innovation strategies. The countries in our sample include Belgium, Bulgaria, Cyprus, Germany, Estonia, Greece, Spain, Croatia, Hungary, Italy, Luxembourg, Latvia, Malta, Norway, and Portugal. The total number of observations used in each estimation is about 104,000 depending on the gaps in the data. Table 1 shows the summary statistics of our key variables (these statistics were calculated for the whole sample of 22 countries for which the data is available in the Eurostat Safecentre, i.e., the 17 countries listed in Section 4.1 as well as Czechia, Finland, France, Latvia, and Sweden).

The data from Table 1 may shed some light on the ownership structure of the analyzed firms. The most frequent pattern of business and ownership structure. The majority of firms (close to 71%) are independent ones and not associated with in any business group. About 23.3% of firms are the members of groups of firms for which the parent company is located in the same country as the firm *(gp_home)*. They are the

Table 1: The summary statistics

Variable	Mean	Std. Dev	Min	Max
Product inn. (inn^1)	0.2410682	0.4277331	0	1
Process inn. (inn^2)	0.2404321	0.4273473	0	1
Marketing inn. (inn^3)	0.230645	0.4212471	0	1
Organizational inn. (inn^4)	0.2587438	0.4379461	0	1
log_emp_start	3.672478	1.355411	−1.579879	11.89136
hr	1.048548	0.8075195	0	3
gp_home	0.2333922	0.4229912	0	1
fdi_DE	0.0180419	0.1331035	0	1
fdi_US	0.0132966	0.114542	0	1
fdi_FR	0.0111365	0.1049406	0	1
fdi_GB	0.0054105	0.0733572	0	1
fdi_IT	0.0046425	0.0679777	0	1
fdi_JP	0.0024275	0.0492103	0	1
fdi_CA	0.0008572	0.0292652	0	1
fdi_FI	0.0020847	0.0456106	0	1
fdi_CH	0.0057945	0.0759013	0	1
fdi_oth	0.0973757	0.2964696	0	1
gvc_DE	0.0063706	0.0795614	0	1
gvc_US	0.0027978	0.0528207	0	1
gvc_FR	0.0020709	0.0454607	0	1
gvc_GB	0.0013578	0.0368231	0	1
gvc_IT	0.0015772	0.0396829	0	1
gvc_JP	0.0006446	0.0253809	0	1
gvc_CA	0.00024	0.0154905	0	1
gvc_CH	0.0017075	0.0412868	0	1
gvc_oth	0.0202569	0.1408782	0	1

Source: Calculations based on CIS data.

members of the domestic business groups. Finally, some firms are affiliates of the foreign capital groups. The most important foreign investors in Europe are located in Germany (*fdi_DE*), United States (*fdi_US*) and France (*fdi_FR*). Germany is also the most active country in leading global value chains (*gvc_DE*) of European firms. This feature is in line with other studies devoted to empirical studies of GVC's (eg. Taglioni and Winkler, 2016). In our study we focus attention on the relations between a relatively small group of European affiliates and headquarters of MNEs located in innovating economies.

4 Results

In this section we report the results of probit estimations for firm-level data. The results are shown for four types of innovations and for two groups of countries, i.e. for West European and Central and East European countries. First, we report the results for the pooled group of all European countries. Subsequently, we show the results for both regions separately. In the following tables we report the statistically significant estimates only.

Table 2: The results of probit estimation for all firms in all countries and all types of innovations

Variable\Innovations	Product innovations	Process innovations	Marketing innovations	Organizational innovations
log_emp_start	0.1799873***	0.2068929***	0.117276***	0.1818335***
hr	0.0607538***		0.0164212***	0.0311947***
gp_home	0.1962286***	0.1744221***	0.1192623***	0.1607245***
fdi_DE	0.1762401***	0.101832**	0.1040471**	0.2457524***
fdi_US				0.1546323***
fdi_FR	0.1550218***	0.0942403**		0.145111***
fdi_GB	0.2086549***	0.1699403**		0.2308886***
fdi_IT	0.1794459**	0.1698526**	0.2943157***	0.2125369***
fdi_JP	0.197427*			
fdi_CA			−0.4354755**	
fdi_FI	−0.2311895**			
fdi_CH	0.2456904***			0.1944436***
fdi_oth	0.1134143***	0.0446825*	0.1046057***	0.1827016***
gvc_DE	−0.2401625***		−0.4536682***	
gvc_US				
gvc_FR	−0.1691769*		−0.3752061***	−0.1687651*
gvc_GB	−0.435657***			
gvc_IT	−0.4099486***	−0.3964787***	−0.7546812***	−0.3087512**
gvc_JP	−0.3901941*			
gvc_CA			0.6530857**	0.5893272**
gvc_CH				
gvc_oth		0.0890401*	−0.1597703***	
Number of obs.	104,086	104,240	103,837	103,777
Log likelihood	−46332.102	−49236.906	−50703.293	−52714.562

Standard errors in parentheses: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. The country specific effects are not reported. Only statistically significant estimates are reported.

The results reported in Table 2 show the significant empirical relationships between firm characteristics and various forms of innovations. According to our estimation

larger European firms, in terms of number of workers (and having a higher level of human capital) are more likely to introduce all forms of innovations. The estimates of these two variables (*log_emp_start* and *hr)* are positive and statistically significant at 1% level, which is in line with our expectations and prior empirical studies (cf. Hashi and Stojčić 2013; D'Este et al. (2014); or Szczygielski et al. (2017)). The only exception is the role of human capital (*hr*) in stimulating process innovations.

In our study we focus attention on the relationship between various forms of capital ownership and firms' internationalization and their capabilities to introduce various forms of innovations. According to our estimation the firms that are members of capital groups for which the parent company is located in the same country as an analyzed firm, are introducing more frequently all forms of innovations. The estimated parameter on *gp_home* variable is positive and statistically significant at 1% level for all four forms of innovations.

The role of foreign direct investments, as discussed in the literature review, is differentiated, depending on the country of origin of FDIs. According to our estimation the firms that are members of business groups, and the parent company of the firm is located in Germany, are more likely to introduce all forms of innovations. This result is not surprising given the fact that Germany is one of world's most innovative countries. The estimate for *fdi_DE* is positive and statistically significant at the 1% level for all forms of innovations, with the exception of marketing innovations which is significant at the 5% level. The positive effect on all innovations is also observable in the case Italian direct investments (*fdi_IT*), although the statistical significance is lower (at 5% level) in the case of product and process innovations.

The positive effect of FDI incoming from other countries is less pronounced. The French direct investments (*fdi_FR*) are positively associated with three forms of innovations (product, process and organizational). The investments of British (*fdi_UK*) and Swiss firms (*fdi_CH*) enhance two forms of innovations, namely product and organizational ones. The impact of non-European FDIs on innovations of CEE firms is rather marginal. The US FDIs improve only organizational innovations (*fdi_US*), while the Japanese FDIs affect positively product innovations, but statistical significance of the estimated parameter (*fdi_JP*) is very low (10% level). In the case of FDIs from Canada (*fdi_CA*) and Finland (*fdi_FI*) the estimated parameters on marketing and product innovations respectively reveal negative signs, are significant at the 5% level. The last result can be interpreted that the membership in these business groups may discourage some forms of innovations.

Another important aspect of our empirical study is devoted to the relationship between hierarchic GVC and innovations. Our results suggest that the participation in hierarchically governed GVCs makes firms less inclined to implement innovations as compared to local, standalone firms. According to our estimations the strongest negative effect is observable in the case of Italian firms. The interpretation of this result could be as follows. To compare the innovation performance of the members of hierarchic Italian GVCs (i.e. the GVCs where the lead company is presumably Italian)

we have to add the estimates for *fdi_IT* (0.17944) and *gvc_IT* (−0.2305). We have that $0.17944 - 0.40995 = -0.2305$, so we find that the participation in this type of GVC makes firms less likely to introduce product innovations. Also, if the coefficient for the *fdi*-type variable is not significant, but *gvc*-type variable comes out significant and negative (as is the case with *fdi_FR, gvc_FR* and marketing innovation), we infer that hierarchic GVCs are significantly less likely to introduce a given type of innovation than local firms.

The possible negative impact of within-MNE GVC's participation on innovations is estimated in the case of French firms for 3 types of innovations (i.e. except for process innovations) and in German firms for product and marketing innovations. In the case of British and Japanese firms the negative impact is estimated only for product innovations. Finally, the negative relationship between GVCs and innovation is not observable for American and Canadian firms. In the case of Canadian firms the estimates (*gvc_CA*) reveal positive signs in two cases suggesting that GVCs participation can increase the ability to introduce marketing and organizational innovations. We have to take into consideration that the scope of GVCs of these firms in Europe is rather limited.

We are inclined to think that, in accordance with hierarchic GVC models, the MNEs affiliates are mainly a replication of their headquarters, but missing some core functions, such as R&D, design and marketing activities, which were centralized at source countries. We believe that most of the affiliates (especially in the CEE countries) concentrate on production in the middle of global value chains and are not encouraged to implement innovations. The parent firms and firms at the beginning of the value chain implement product and process innovations, while those at the end introduce marketing and organizational innovations. Most likely, the impacts of FDI and GVC participation may depend on the levels of country development and firm competitiveness. This issue requires, however, further and more detailed investigation. Therefore, we study the relationship between foreign ownership and GVC participation and various forms of innovations separately for sub-samples of CEE and West European countries, respectively. First, we show the results for product and process innovation and then for marketing and organizational innovation.

The role of firm size and human capital endowment for product and process innovation performance does not differ across country subsamples. However, there are visible differences with respect to the role of FDI and GVCs. In the CEE countries the positive effect of foreign ownership on product and process innovations is visible in the case of FDI incoming from Germany, Italy, France, Switzerland and other innovating countries. Here the estimated parameters for both forms of innovations are positive and statistically significant, usually at the 1% level. The British FDI enhances only product innovations in CEE subsidiaries, while non-European investments from US, Japan and Canada have no statistically significant effect on innovations. The impact of FDIs on subsidiaries located in Western Europe, where the home and host countries do not differ that much in terms of innovation capabilities, is much less pronounced,

Table 3: The results of probit estimation for all firms separately for CEE and WE countries, for product and process innovations

Variable\Innovations	Product innovations		Process innovations	
	CEE	WE	CEE	WE
log_emp_start	0.1987685***	0.1754335***	0.2153926***	0.20751***
hr	0.0404631***	0.0669848***		
gp_home	0.3042659***	0.1778084***	0.3471112***	0.1406383***
fdi_DE	0.2882745***	0.1429865***	0.2333122***	
fdi_US				
fdi_FR	0.3265669***	0.1259522***	0.201462*	
fdi_GB	0.5442966***			0.1468013*
fdi_IT	0.3945946**		0.4852854***	0.0549282*
fdi_JP		0.2126019*		
fdi_CA				
fdi_FI		−0.3092441*		
fdi_CH	0.4430529**	0.2067048**	0.3243275**	
fdi_oth	0.3027856***	0.0514782*	0.278948***	
gvc_DE	−0.3122598***			
gvc_US				
gvc_FR	−0.3317302**			
gvc_GB	−1.007929***			
gvc_IT	−0.6951123***		−0.6759943***	
gvc_JP				−0.5058236*
gvc_CA				
gvc_CH	−0.4521595**			
gvc_oth	−0.2366386***			0.1314304**
Number of obs.	31,970	72,001	32,104	72,134
Log likelihood	−9828.7938	−36334.899	−9983.3586	−39127.783

Standard errors in parentheses: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. The country specific effects are not reported. Only statistically significant estimates are reported.

especially when it comes to process innovations. According to the estimations the FDI from Finland (*fdi_FI*) has a negative effect on product innovations in WE firms. However, the statistical significance of the estimated parameter is only at the 10% level.

The innovation performance of hierarchic GVCs seems to be different in the CEE than in the Western European countries. The negative effect of GVC participation on product innovations in the CEE countries is noticeable in the case of firms owned by German, French, British, Italian, and Swiss capital. This negative effect is not statistically significant in the case of affiliates in the in Western subsample of our data. The impact of GVC participation on process innovations is much more limited. The negative impact on these innovations is statistically significant only in the case

of Italian GVCs in the CEE countries and Japanese GVC from firms located in West European countries.

Table 4: The results of probit estimation for all firms separately for CEE and WE countries, for marketing and organizational innovations

Variable\Innovations	Marketing innovations		Organizational innovations	
	CEE	WE	CEE	WE
log_emp_start	0.1469612***	0.1123815***	0.2139523***	0.1751579***
hr	0.024917***		0.0395828***	0.0270509***
gp_home	0.2812462***	0.0852406***	0.3307648***	0.1293895***
fdi_DE	0.2865607***		0.3229818***	0.2299414***
fdi_US	0.2692723**		0.3500676***	0.1242928***
fdi_FR			0.2481508**	0.1280474***
fdi_GB			0.4305203***	0.1799999**
fdi_IT	0.6836041***		0.5585903***	
fdi_JP				
fdi_CA		−0.4392723**		
fdi_FI				
fdi_CH			0.5463096***	
fdi_oth			0.382292***	0.1148549***
gvc_DE	−0.4690795***	−0.7342133***		−0.3928816***
gvc_US	−0.3465858**			
gvc_FR	−0.4078743**	−0.4165599***		−0.2879345**
gvc_GB				
gvc_IT	−1.070174***		−0.5717265***	
gvc_JP				
gvc_CA				
gvc_CH		−0.4999174**		
gvc_oth	−0.3752112***			
Number of obs.	32,059	71,732	32,083	71,692
Log likelihood	−11539.814	−39007.465	−11171.699	−41425.063

Standard errors in parentheses: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. The country specific effects are not reported. Only statistically significant estimates are reported.
Source: Own calculations in STATA 16.

We note that the results are in line with the theoretical literature on GVCs reviewed in Section 2 and with the study by Brancati (2017), who did not find any positive effect of hierarchic GVCs on the introduction of product and process innovation of Italian firms. We obtain the same result for Western European firms. On the other hand, the firms in CEE that participate in within-MNEs GVC are *less* innovative than local firms. This result may be interpreted as follows. The firms located in the CEE countries are deeply engaged in GVCs with other European firms, especially

from Germany. They participate mostly in the "middle stage" production of GVCs. In this stage the new technologies can be implemented (process innovations), while the new products are already introduced to market. So, the parent companies are not interested in developing new product innovations in subsidiaries located in the CEE countries.

The differences between firms from the CEE countries and Western Europe are also marked in the case of marketing and organizational innovations (Table 4). In CEEC the German, Italian and American FDIs are more likely to introduce marketing innovation than local firms. The corresponding effect in Western Europe is not statistically significant, the only exception being the effect of FDI from Canada on marketing innovation. The positive effect of FDI is more pronounced in the case of organizational innovations, especially in the CEE countries. The innovation activities of firms from the CEE countries are stronger in FDI incoming from Italy, the UK, Germany, France Switzerland, the US and other countries. The similar pattern is observable in the West European firms with the exception of Swiss and Italian FDI.

There also some differences with respect to the role of hierarchic GVCs. The participation in GVCs with Italian, German, French, US and "other" lead firms is reduces the likelihood of implementation of marketing innovations in CEE firms. This effect is less pronounced in the case of firms located in Western European countries, where the negative effect is observed for German, French and Swiss suppliers. The impact of GVC participation for organizational innovations is observed only in Italian GVCs located in CEEC, and in German and French GVCs located in Western Europe. It can be noted, however, that in contrast to product and process innovation, we did identify the negative correlation between marketing and organizational innovation performance and the participation in hierarchic GVCs for Western European subsidiaries.

5 Conclusions

In this paper we investigated the relationship between foreign ownership of firms and innovation activities in a wide group of Western European and Central and Eastern countries. In particular, we analyzed the potential effects of FDI and firms' participation in hierarchic GVCs on product, process, marketing and organizational innovations.

First, we examined the role of foreign parent firms, located in world's most developed and innovative countries in implementing various forms of innovations by their subsidiaries. We found that larger firms, in terms of number of workers, and firms with a better stock of human capital were more likely to introduce all four types of innovations. The same was true for firms that were the members of local business groups.

The empirical results indicated that FDIs were positively associated with some forms of innovations in firms located in CEE countries. This relationship is particularly

strong in the case of German FDI which increases the probability of all types of innovations. The significant impact was also visible for the FDIs incoming from France, Italy, UK and some other European countries. It was particularly marked in the case of product and organizational innovations. This positive effect was slightly less pronounced for firms located in West European economies. On the other hand, the positive impact of FDI on organizational innovations was observable in both Western and CEE countries.

Next, we compared the innovation performance of the hierarchic GVC member firms to the innovation performance of local companies. The theoretical literature on relational GVCs expects such firms to gain little if anything in terms of technological ability and innovation performance. According to our estimations – the participation in within-MNE GVCs makes firms less likely to introduce innovations, especially product and marketing innovations, and this effect is particularly remarkable in the CEE countries. In Western Europe we found little difference, in terms of innovation performance, between hierarchic GVCs members and local firms, confirming the results by Brancati et al. (2017).

We hypothesize that the CEE affiliates of Western firms are not involved in some core innovation activities such as R&D ad design: these function are centralized in parent companies in the innovating economies. The affiliates in the CEE countries are probably deeply engaged in GVCs with other European firms, but they participate mostly in the "middle stage" production. In this stage the process innovations can be implemented, while the new products are already introduced to market by their foreign partners. Consequently, it seems that parent companies are not interested in developing new products in their subsidiaries located in the CEE countries. The negative relationship between participation in hierarchic GVCs and innovation activities is less strong in the case of Western Europe. We believe this is because Western affiliates more frequently participate other stages of GVCs. Relatedly, there is a smaller difference, in terms of national innovation capabilities, between the Western European countries and the home countries of the FDIs we studied.

It should be stressed that we only looked at hierarchic GVC members, i.e. the firms that are vertically integrated with their customers. Other GVC governance modes, such as relational or modular could imply better innovation outcomes for the supplying firms (Gereffi et al. 2005). The reviewed empirical literature suggests it indeed might be the case. At the same time, our study has some important limitations. Due to limited data availability we could only observe firms only in a cross section and we proxied the companies in hierarchic GVCs by firms that are foreign-owned and focused on exporting.

Nonetheless, our results enable some important policy implications. In particular, FDI of European firms incoming to the CEE countries stimulate the innovation activities of the subsidiaries located the CEE countries. This relationship is the strongest in the case of German and French firms, but less so in the case of the American companies. Thus, it can be concluded that the CEE governments willing

to increase innovativeness of their indigenous firms should actively participate in the Single Market, and strengthen the ties with other European countries. Moreover, the establishment of bigger affiliates, having a larger stock of human capital, increases probability of introducing innovation in these foreign owned firms.
Although it is generally accepted that governments in host countries, especially those in developing and transition economies, have a limited impact on strategic decisions made by MNEs, there is still some policy space that host-country governments can target their efforts to increase the positive effects of FDI. In particular, there seems to be some space to connect host country inward FDI and innovation policies as FDI-related issues have not received so far much attention in host countries' innovation policies.
Only a limited number of authors addressed the importance of coherence between inward FDI and innovation policies, suggesting that this policy area can offer useful instruments that are in line with the WTO agreements on Trade-Related Investment Measures (TRIMs) (Andersson 2005). These include incentives for R&D projects, consolidation of science and technology infrastructures and the development of skilled labor force for attracting FDI inflows of high quality, such as R&D-related FDI projects. Nevertheless, within the innovation policy domain the links between the host economy and FDI are not straightforward. Moreover, innovation policies are usually designed in such a way that the mutual inter-relationships between foreign affiliates and indigenous firms are often ignored, as such affiliates are perceived as outsiders. We argue that foreign affiliates should be regarded as integral elements of the innovation and production systems of host countries, as so they should be perceived as local actors. The innovation activities of affiliates may depend on firms' characteristics, on their role in within GVCs and on the home- and host country effects.

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References

[1] Aghion P., (2004), Growth and development: A Schumpeterian approach, *Annals of Economics and Finance* 5, 1–25.

[2] Aghion P., Howitt P., (1992), A model of growth through creative destruction, *Econometrica* 60, 323–351.

[3] Aghion P., Howitt P., (1998), *Endogenous growth theory*, MIT Press, Cambridge.

[4] Amador J., Cabral S., (2016), Global value chains: A survey of drivers and measures, *Journal of Economic Surveys* 30(2), 278–301.

[5] Amador J., Cabral S., Mastrandrea R., Ruzzenenti F., (2018), Who's who in global value chains? A weighted network approach, *Open Economies Review* 29(5), 1039–1059.

[6] Ambroziak Ł., (2018), The CEECs in global value chains: The role of Germany, *Acta Oeconomica* 68(1), 1–29.

[7] Antràs P., (2020), *Conceptual aspects of global value chains*, The World Bank.

[8] Andersson T., (2005), Linking national science, technology and innovation policies with FDI policies, [in:] *Proceedings of UNCTAD Expert Meeting on the Impact of FDI on Development*, Geneva.

[9] Bair J., Gereffi G., (2001), Local clusters in global chains: The causes and consequences of export dynamism in Torreon's blue jeans industry, *World Development* 29(11), 1885–1903.

[10] Bazan L., Navas-Aleman L., (2004), The underground revolution in the Sinos Valley: A comparison of upgrading in global and national value-chains, [in:] *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*, [ed.:] Schmitz H., Edward Elgar, Cheltenham, 110–140.

[11] Bedi A. S., Cieślik A., (2002), Wages and wage growth in Poland: The role of foreign direct investment, *Economics of Transition* 10(1), 1–27.

[12] Benkovskis K., Masso J., Tkacevs O., Vahter P., Yashiro N., (2019), Export and productivity in global value chains: Comparative evidence from Latvia and Estonia, *Review of World Economics*, 1–21.

[13] Berger M., Diez J. R., (2008), Can host innovation systems in late industrializing countries benefit from the presence of transnational corporations? Insights from Thailand's manufacturing industry, *European Planning Studies* 16(8), 1047–1074.

[14] Birkinshaw J., (1996), *World mandate strategies for Canadian subsidiaries*, Industry Canada Working Paper 9.

[15] Birkinshaw J., (1998), Foreign owned subsidiaries and regional development: the case of Sweden, [in:] *Multinational Corporate Evolution and Subsidiary Development*, [eds.:] Birkinshaw J., Hood N., McMillian, London, 268–298.

[16] Birkinshaw J., Hood N., (1998), Multinational subsidiary evolution: capability and charter change in foreign-owned subsidiary companies, *Academy of Management Review* 23(4), 773–95.

[17] Birkinshaw J., Hood N., (2001), Unleashing innovation in foreign subsidiaries, *Harvard Business Review* 79(3), 131–137.

[18] Blomstrom M., Kokko A., (2002), *FDI and human capital: A research agenda*, OECD Development Centre, Working Paper no. 195.

[19] Brancati E., Brancati R., Maresca A., (2017), Global value chains, innovation and performance: firm-level evidence from the Great Recession, *Journal of Economic Geography* 17(5), 1039–1073.

[20] Cieślik A., Hagemejer J., (2014), Multinational enterprises, absorptive capacity and export spillovers: evidence from Polish firm-level data, *Review of Development Economics* 18(4), 709–726.

[21] Cieślik A., Michałek J. J., Szczygielski K., (2019), What matters for firms' participation in Global Value Chains in Central and East European countries?, *Equilibrium. Quarterly Journal of Economics and Economic Policy* 14(3), 481–502.

[22] Cohen W. M., Levinthal D. A., (1990), Absorptive capacity: A new perspective on learning and innovation, *Administrative Science Quarterly* 35, 128–152.

[23] Costa I., Filippov S., (2007), *A new nexus between foreign direct investment, industrial and innovation policies*, UNU-MERIT Working Paper #2007-030.

[24] De Marchi V., Giuliani E., Rabellotti R., (2018), Do global value chains offer developing countries learning and innovation opportunities?, *The European Journal of Development Research* 30(3), 389–407.

[25] D'Este P., Rentocchini F., Vega-Jurado J., (2014), The role of human capital in lowering the barriers to engaging in innovation: evidence from the Spanish innovation survey, *Industry and Innovation* 21(1), 1–19.

[26] Dolan C., Humphrey J., (2000), Governance and trade in fresh vegetables: The impact of UK supermarkets on the African horticulture industry, *Journal of Development Studies* 37(2), 147–176.

[27] Fagerberg J., Martin S., Mark K., (2007), The competitiveness of nations: Why some countries prosper while others fall behind, *World Development* 35, 1595–1620.

[28] Fagerberg J., Srholec M., (2017), Capabilities, economic development, sustainability, *Cambridge Journal of Economics* 41(3), 905–926.

[29] Foss N. J., Pedersen T., (2004), Organizing knowledge processes in the multinational corporation: an introduction, *Journal of International Business Studies* 35, 340–349.

[30] Furman J. L., Porter M. E., Stern S., (2002), The determinants of national innovative capacity, *Research Policy* 31, 899–933.

[31] Gereffi G., Humphrey J., Sturgeon T., (2005), The governance of global value chains, *Review of International Political Economy* 12(1), 78–104.

[32] Geroski P. A., (1989), Entry, innovation and productivity growth, *Review of Economics and Statistics* 71, 572–578.

[33] Ghoshal S., Nohria N., (1989), Internal differentiation within multinational corporations, *Strategic Management Journal* 10(4), 323–337.

[34] Giuliani E., Pietrobelli C., Rabellotti R., (2005), Upgrading in global value chains: Lessons from Latin American clusters, *World Development* 33(4), 549–573.

[35] Grilliches Z., (1990), Patent statistics as economic indicators: A survey, *Journal of Economic Literature* 28, 1646–1661.

[36] Hashi I., N. Stojčić, (2013), The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4, *Research Policy* 42(2), 353–366.

[37] Hayter R., Han S., (1998), Reflections on China's open policy towards direct foreign investment, *Regional Studies* 32, 1–16.

[38] Helpman E., (1984), A simple theory of trade with multinational corporations, *Journal of Political Economy* 92, 451–471.

[39] Helpman E., (1985), Multinational corporations and trade structure, *Review of Economic Studies* 52, 443–458.

[40] Helpman E., Krugman P. R., (1985), *Market structure and foreign trade: Increasing returns, imperfect competition and the international economy*, MIT Press, Cambridge.

[41] Holm U., Malmberg A., and Sölvell Ö., (2003), Subsidiary impact on host-country economies: the case of foreign-owned subsidiaries attracting investment into Sweden, *Journal of Economic Geography* 3(4), 389–408.

[42] Katz J. M., Bercovich N. A., (1993), National systems of innovation supporting technical advance in industry: the case of Argentina, [in:] *National Innovation Systems: A comparative analysis*, [ed.:] Nelson R. R., 451–475.

[43] Kolasa M., (2008), How does FDI inflow affect productivity of domestic firms? The role of horizontal and vertical spillovers, absorptive capacity and competition, *Journal of International Trade & Economic Development* 17(1), 155–173.

[44] Krugman P. R., (1983), The "New Theories" of international trade and the multinational enterprise, [in:] *The multinational corporation in the 1980s*, [eds.:] Kindleberger Ch. P., Audretsch D. B., MIT Press, Cambridge, 57–73.

[45] Lacasa I. D., Giebler A., Radošević S., (2017), Technological capabilities in Central and Eastern Europe: an analysis based on priority patents, *Scientometrics* 111(1), 83–102.

[46] Lall S., (1992), Technological capabilities and industrialization, *World Development* 20(2), 165–186.

[47] Lema R., Pietrobelli C., Rabellotti R., (2019), Innovation in Global Value Chains, [in:] *Handbook of Global Value Chains*, [eds.:] Gereffi G., Ponte S., Raj-Reichert G., Edward Elga, Cheltenham and Lyme, 370–384.

[48] Lema R., Quadros R., Schmitz H., (2015), Reorganising global value chains and building innovation capabilities in Brazil and India, *Research Policy* 44(7), 1376–1386.

[49] Marin A., Bell M., (2006), Technology Spillovers from Foreign Direct Investment (FDI): an Exploration of the Active Role of MNC Subsidiaries in the Case of Argentina in the 1990s, *Journal of Development Studies* 42(4), 678–697.

[50] Morrison A., Pietrobelli C., Rabellotti R., (2008), Global value chains and technological capabilities: a framework to study learning and innovation in developing countries, *Oxford Development Studies* 36(1), 39–58.

[51] Pearce R., (2001), Multinationals and industrialisation: the bases of 'inward investment' policy, *International Journal of the Economics of Business* 8(1), 51–73.

[52] Pearce R., (2005), The globalization of R&D: key features and the role of TNCs, [in:] *Proceedings of UNCTAD Expert Meeting on the Impact of FDI on Development*, Geneva.

[53] Pearce R., Papanastassiou M., (2006), Multinationals and national systems of innovation: strategy and policy issues, [in:] *Multinationals, clusters and innovation*, [eds.:] Tavares A. T., Teixeira A., Palgrave Macmillan.

[54] Pedersen T., (2006), Determining factors of subsidiary development, [in:] *Multinationals, clusters and innovation*, [eds.:] Tavares A. T., Teixeira A., Palgrave Macmillan.

[55] Penrose E. T., (1956), Foreign investment and the growth of the firm, *Economic Journal* 66, 220–236.

[56] Pietrobelli C., Rabellotti R., (2011), Global value chains meet innovation systems: are there learning opportunities for developing countries?, *World Development* 39(7), 1261–1269.

[57] Rigo D., (2020), Global value chains and technology transfer: new evidence from developing countries, *Review of World Economics*, 1–24.

[58] Romer P. M., (1993), Idea gaps and object gaps in economic development, *Journal of Monetary Economics* 32, 543–573.

[59] Romer P. M., (1990), Endogenous technological change, *Journal of Political Economy* 98, 71–102.

[60] Schmitz H., (2007), Transitions and trajectories in the build-up of innovation capabilities: Insights from the global value chain approach, *Asian Journal of Technology Innovation* 15(2), 151–160.

[61] Szczygielski K., Grabowski W., Pamukcu M. T., Tandogan V. S., (2017), Does government support for private innovation matter? Firm-level evidence from two catching-up countries, *Research Policy* 46(1), 219–237.

[62] Tavares A. T., (2002), Multinational subsidiary evolution and public policy: two tales from the European periphery, *Journal of Industry, Competition and Trade* 2(3), 195–213.

[63] Varsakelis N. C., (2006), Education, political institutions and innovative activity: A cross-country empirical investigation, *Research Policy* 35, 1083–1090.

[64] Taglioni D., Winkler D., (2016), *Making Global Value Chains Work for Development. Trade and Development*, World Bank, Washington.

[65] World Bank, (1999), *World Development Report*, Oxford University Press, Oxford and New York.

[66] WTO, (2019), *Global Value Chain Development Report 2019: Technological Innovation, Supply Chain Trade, and Workers in a Globalized World.*

[67] Yokota K., Tomohara A., (2010), Modeling FDI-Induced Technology Spillovers, *International Trade Journal* 24(1), 5–34.