Productivity spillovers in the GVC

The case of Poland and the New EU Member States

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Abstract

The New Member States have been experiencing firm internationalization not only through inward foreign direct investment but also through exporting, importation of foreign technology in investment goods and increased use of imported intermediates. We argue that there are important productivity spillovers within the global value chains, ie. FDI alone does not tell the whole story of the reallocation processes going on in the economies of the NMS. We augment the standard TFP spillover empirical model with modern measures of GVC participation. We show that increased foreign content of exports brings additional productivity gains on top of the ones attributed to exporting. Moreover, we show that in selected cases, participation in the GVC leads to a smaller productivity gap between foreign and domestic firms. In Poland the productivity gains for domestic firms are located in production of intermediate goods with high foreign value content as well as in goods located close to the final demand. In many other NMS the benefits are concentrated close to the final demand.

Keywords: global value chains, productivity, New Member States, productivity spillovers

JEL: L25, C67, F10, F23, O12.

1   Introduction

The new EU member states (of the 2004 EU enlargement, NMS hereafter) have been undergoing a structural change for the past 25 years that was due to two ongoing processes. Since the early 1990s, a transition from a centrally planned to a market economy has been going on, initially often in the form of shock therapy, where prices were freed and rapid privatization begun. By the mid-1990s, the region was already deeply involved in a process of integration with the western part of the European Union, both through the Association Agreements and through bilateral and multilateral trade agreements within the Central and Eastern Europe group. This process was culminated through the EU enlargement in 2004 and subsequent liberalization measures (the Schengen treaty, greater opening up of EU-15 labour markets and the EU Service Directive).

However, the NMS have been caught in another, global trend related to the establishment of the Global Value Chains (GVC) and the ongoing fragmentation of world production. At the firm level, one could observe increasing internationalization, both through inward foreign direct investment and also through exporting, importation of foreign technology in investment goods, increased use of imported intermediates and also, to a limited extend, through outward FDI. The fragmentation of world production involved either assembly of final goods (for domestic demand and exporting) or taking part in production of intermediates that were subsequently exported to be embedded into final goods elsewhere. This fragmentation involved increased participation in both exports and imports.

In this paper we analyze the NMS and Poland in particular. We believe that compared to the other NMS, Poland is special due to its size, relatively large internal market, large diversification in productive activities and a sustained importance of the agriculture and food sector in the output and exports of goods. Therefore we attempt to establish the differences between the Polish and other NMS firm-level responses to participation in the GVC.

We bridge the literature on firm internationalization and productivity spillovers together with the growing literature on the global value chain. We base our empirical model on the now-standard spillover equation specification coming from Smarzynska-Javorcik (2004) and the earlier analysis of Haddad and Harrison (1993), Aitken and Harrison (1999) as well as

Djankov and Hoekman (2000) or Konings (2001). The Smarzynska-Javorcik methodology has been used extensively in a number of similar papers as reviewed by Crespo, Fontoura, and Proença (2009). Iršová and Havránek (2013) analyse more than a thousand estimates of FDI spillovers in a large-scale up-to date meta-analysis showing that, in the case of the NMS, the overall evidence of FDI spillovers is heterogeneous. As far as Poland is concerned, Kolasa (2008) provides evidence on horizontal and backward spillovers. A larger study by Hagemejer and Kolasa (2011) shows large spillovers from sectoral internationalization (FDI, exporting, imports of intermediates) in the largest available dataset for Poland at the time of publication. Additionally, Bijsterbosch and Kolasa (2010) provide sectoral data evidence on important productivity effects of FDI in Central and Eastern Europe that underline the importance of the absorptive capacity for materialization of productivity gains from FDI.

We make the argument that FDI is just one source of productivity spillovers that can bring productivity gains. Furthermore, we argue that there are important productivity spillovers within the GVC, ie. FDI alone is not fully telling of the reallocation and upgrading processes going on in the economies of the NMS. Clearly in the environment of the European Union, FDI remains an important feature of the catching up economies. However, due to low trade barriers, it seems natural that it is vertical FDI that matters most. Still, while the GVC is to a large extent managed by multinationals, it also encompasses the domestic firms that may benefit from access to global demand. Examples include the car manufacturing industry in Poland, Slovakia and the Czech Republic, where small and medium enterprises supply parts, components and intermediate services to large multinational car and car component plants, or the Polish aviation sector producing specialized aircraft parts and components.

We also want to contribute to the ongoing debate among academics, policy makers and media in Poland and other NMS regarding the "favorable" position in the GVC. It is often believed that being close to the final demand is more beneficial than producing intermediate goods that are subsequently used in production somewhere else. However, another view seems to see benefits in producing complex intermediate goods that require skills and technology and may involve technology transfer. This debate to the non-linear character of benefits stemming from different location in the GVC, often called the 'smile curve', as analyzed, among others, by Ye, Meng, and Wei (2015), Kowalski et al. (2015) or Cheng et al.

(2015). However, we we take aside the sectoral domestic value added creation as a measure of benefits and verify if there are important productivity effects from a particular position and the degree of involvement in GVC.

We augment the standard spillover empirical model with measures of GVC participation. Here, we combine two related strands of literature – the fragmentation and the supply chain literature. We build on seminal work of Hummels, Ishii, and Yi (2001) who proposed the term "vertical specialization" (VS) in order to describe the increasingly sequential nature of world production, a broad measure of foreign content of country's exports. The measures of VS was further combined with the notion of foreign value added in exports, as described by another seminal paper of Johnson and Noguera (2012), which decomposes gross exports into domestic and foreign components by taking care of the so-called double counting of intermediate goods that inflate the value of gross exports by crossing borders several times. These measures have been further refined by Koopman, Wang, and Wei (2012) to provide full accounting of gross exports and finally by Wang, Wei, and Zhu (2013) who provide a complete decomposition framework of gross exports into domestic and foreign components, intermediate and final goods, and various forms of double counting. This framework provides accurate measures of domestic and foreign components and both sector and bilateral levels, thus making it suitable for sectoral and firm-level analysis. On the other hand, we use the upstreamness measures coming from the supply chain literature, notably Antras et al. (2012). This analysis would not be possible without the tremendous work on the international input-output data within the World Input-Output Database, and the work by Timmer et al. (2015) and Stehrer (2012).

This paper is organized as follows: in the subsequent section we shed some light on the methodology used, the sources of data, and procedures of data handling. We then provide some preliminary and descriptive results. We progress to the detailed analysis of the foreign firm productivity premia and its relation to the position in the GVC. Subsequently we provide an analysis of TFP spillovers augmented with GVC measures. The last section concludes the paper.

2 Methodology

In our study we combine firm-level data with international sectoral input-output data. Firm level data come from the Amadeus database. In order to maximize the number of observations, we combine data from multiple Amadeus waves. The resulting firm-level data sample covers the period of 1997-2011. However, the number of observations in the initial years is rather limited, therefore the bulk of the data comes from 2000-2011. Thanks to the identifier common across the different revisions of Amadeus, we are able to track individual firms over time. The combined database contains information from the balance sheets and the income statements, in particular the levels of fixed assets, the use of materials and the firms' value added together with the NACE codes of the main activity (revision 1 and revision 2 where applicable), as well as the level of employment. We also identify firms with foreign ownership using the information on the origin of firm ownership.

In this paper, we use the methodology by Smarzynska-Javorcik (2004) augmented with measures of GVC participation to analyze the various channels of internationalization. In order to obtain a measure of total factor productivity we use the now-standard approach by Levinsohn and Petrin (2003). The estimated equation will take the form:

$$y_{it} = \alpha_0 + \alpha_1 l_{it} + \alpha_2 k_{it} + \epsilon_{it}, \tag{1}$$

where y_{it} is log of i value added at time t, l_{it} is the labor input and k_{it} is the capital input, ϵ_{it}. As a capital variable we use the (log of) stock of fixed assets deflated with the deflator of investment goods at sector level (WIOD classification). Value added is deflated by a sectoral value added deflator (WIOD classification).

The first part of the subsequent analysis is aimed at determining the relevant differences between the foreign and domestic firms. The following equations are estimated:

$$TFP_{it} = \beta_1 foreign_{it} + \beta_2 foreign_{it} \cdot GVC_{it} + \beta_3 GVC_{it} + \epsilon_{it} \tag{2}$$

Where TFP_{it} is log of firm level total factor productivity and $foreign_{it}$ is the foreign ownership dummy variable. We also include an interaction term of the $foreign_{it}$ dummy with the measures of the position of a particular sector and country in the global value

chains. These measures include the share of foreign value added in exports of intermediate and final goods, the degree of vertical specialization (total foreign content) in exports of intermediate and final goods, and the upstreamness measures. The sign of the interaction term shows whether participation in a particular stage of the value chain leads to a catching up of domestic firms to the TFP levels of foreign firms or vice versa. We estimate all the foreign ownership premia equations using standard panel methods — by employing sector and year-level fixed effects to account for sectoral variation and business cycles.

The above analysis will be complemented by an analysis of spillovers from foreign-owned firms. At the firm level we estimate the following equation:

$$\Delta TFP_{ijt} = \alpha_0 + \alpha_1 \Delta HZ_{jt} + \alpha_2 \Delta BW_{jt} + \alpha_3 \Delta FW_{jt} + \alpha_4 \Delta GVC_{jt} + \alpha_5 \Delta EXP_{jt} + \epsilon_{it} \quad (3)$$

Where ΔTFP_{ijt} is a change of TFP in firm i in sector j and time t. HZ_{jt}, BW_{jt},FW_{jt} are the measures of horizontal, backward and forward linkages as defined originally by Smarzynska-Javorcik (2004). In their study, they measure the share of foreign firms in the output of sector j (HZ), the shares of foreign firms in the downstream sectors (FW) weighted by their respective input-output shares, and the shares of foreign firms in the upstream sectors (BW) weighted by their respective input-output shares. We augment this equation with other modes of (sectoral) internationalization, notably the share of exports in output (to take into account the Melitz-type selection effects) and GVC indicators to verify if the position in the GVC and the foreign content of exports have additional effects on firm-level growth.

As far as the sectoral data is concerned, we extensively use the freely available World Input-Output Database (WIOD) as described in Timmer et al. (2015). This database provides us with sectoral gross output levels, imports and exports of final as well as intermediate goods and sectoral deflators of intermediate use, capital goods and value added. We use the WIOD database to construct most of the GVC indicators indicated above.

We measure upstreamness according to the definition provided by Antras et al. (2012).

$$U_i = 1 \cdot \frac{X_i}{Y_i} + 2 \cdot \frac{\sum_{ij}^N z_{ij} X_j}{Y_i} + 3 \cdot \frac{\sum_{k=1}^N \sum_{ij}^N z_{ij} z_{jk}}{Y_i} + ... \quad (4)$$

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Where Y_i is the gross output of sector i and X_i is the final demand for goods from sector i where Z_{ij} is the input-output coefficient of the intermediate use of goods from sector i used in the production of sector j. Therefore the measure weighs the stages of production with the number of the stage: 1 if output is used in final demand, 2 if output is used in production of goods that are subsequently used in final demand, 3 if output is used in production of goods that are used further in production of intermediate goods that are then used in satisfying final demand and so on. This measure is therefore bounded below by 1. Instead of computing the upstreamness indicators using national input-output changes, we use the World Input Output Database and instead compute the upstreamness indicator for the global input output database, therefore encompassing all the national and international production stages (in the same vein as Miller, Temurshoev et al. (2013)). For details and some comparative analysis see Hagemejer and Ghodsi (2014).

Wang, Wei, and Zhu (2013) provide a way of decomposing foreign content of exports by distinguishing exports of intermediate and final goods. The difference between foreign value added and vertical specialization share provided by Wang et al. 2013, is the share of pure double counting due to the back and forth intermediate goods trade originating from a foreign countries. The new methodology allows for identification of these four components of the foreign content of country's exports. The double counting stems from the fact that whenever intermediate goods are exported, used to produce other intermediates goods and then exported again, they appear in gross trade statistics but do not attribute to GDP of any trading partner. *A large share of foreign value-added in a country's final goods exports may indicate that the country mainly engages in final assembling activities based on imported components and just participates in cross-country production sharing on the low end of a global value chain, while an increasing foreign value added share in a country's intermediate exports may imply the country is upgrading its industry to start producing intermediate goods for other countries, especially when more and more of these goods are exported to third countries for final goods production* (Wang et al. 2013, p. 34). Moreover, if additionally the share of double counting increases over time, it indicates a greater degree of production sharing in the particular section and therefore a greater involvement in the GVC. The sectoral measures of foreign value added in exports split into intermediate goods and final goods together with

the revised measures of vertical specialization are taken from a database provided by Wang, Wei, and Zhu (2013).

The spillover estimations are all performed in annual changes to take care of firm-specific heterogeneity (firm-level fixed effects). To capture sector-level heterogeneity and the business cycle effects, we also include sectoral dummies and time-dummies. In the cross-country regression we make all the fixed effects country-specific. Moreover, as all the explanatory variables are measured at sector level, we cluster all standard errors accordingly.

3 Descriptives and preliminary results

The process of opening up of the New Member States that has been ongoing since the beginning of the 1990s manifested itself in the increased importance of international trade in the NMS economies as well as an increased participation of foreign capital in the ownership of enterprises. Figure 1 shows shares of foreign enterprises in the total number of firms as portrayed by the Amadeus database for the selected NMS economies. In most of the analyzed countries this share was between 5 to 15 percent. However, in terms of the value added produced, the foreign firms in all analyzed economies generated over 20 percent of the value added of all enterprises in the Amadeus database.
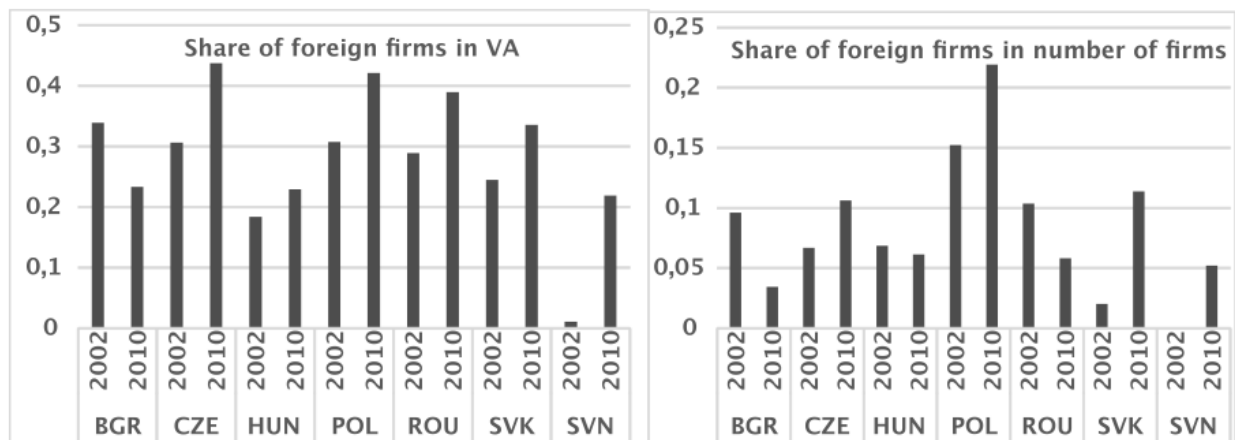

Figure 1: Shares of foreign firms

Foreign firms tend to be larger than domestic firms. They are also more productive. We compute the TFP premia from foreign ownership filtering out the sectoral and time fixed

effects to account for sector-specific heterogeneity. We find that the difference in productivity levels between domestic and foreign firms is gigantic and ranges from 37% in Poland to over 60% in Czech Republic, Estonia and Hungary over the analyzed period.

Table 1: TFP premia from foreign ownership

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(5) POL	(6) ROU	(7) SVK	(8) SVN
Foreign	0.418***	0.614***	0.648***	0.651***	0.374***	0.385***	0.530***	0.394***
	(0.0226)	(0.0213)	(0.0261)	(0.0492)	(0.0130)	(0.0146)	(0.0252)	(0.0260)
Constant	-4.591***	-0.896***	-2.104***	-1.151***	-0.274***	-4.158***	-0.466***	-0.966***
	(0.0552)	(0.0393)	(0.283)	(0.0177)	(0.0393)	(0.0381)	(0.0333)	(0.0476)
Observations	66,761	95,901	17,385	13,761	57,173	350,733	33,855	17,650
R-squared	0.626	0.546	0.306	0.383	0.459	0.292	0.494	0.431

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

However, foreign capital is not the only mode of internationalization that gained importance over the time of analysis. What we also observe in many NMS is a significant increase in the importance of imported intermediates in the production costs, which by 2011 amounted to roughly 15% of the value of gross output in most economies. We also observe that even though intermediates constituted a large part of exports already in 1997, this share grew over time in many NMS economies. The upstreamness of exports (the distance from final demand) has also increased over time both due to the overall increases of fragmentation in the world production and the greater specialization of NMS economies in intermediate goods. We observe that over the analyzed period the foreign content of exports (vertical specialization, as defined by Wang et. al, 2013) has increased and by 2011 was the lowest in Romania an Latvia (around 20%) and the highest in Czech Republic and Hungary (over 40%). It is worth noting that in Poland the content has increased from 15% to almost 30%.

We also provide the decomposition of the foreign content of exports into the foreign value added (in final and intermediate goods, FVA) and the double counting components (FDC, also due to final and intermediate goods). It is worth noting that in some countries the FVA in final goods is more important that in intermediate goods:, as is the case in the Czech republic, Hungary, Slovakia and Slovenia. In the remaining countries, the two shares are
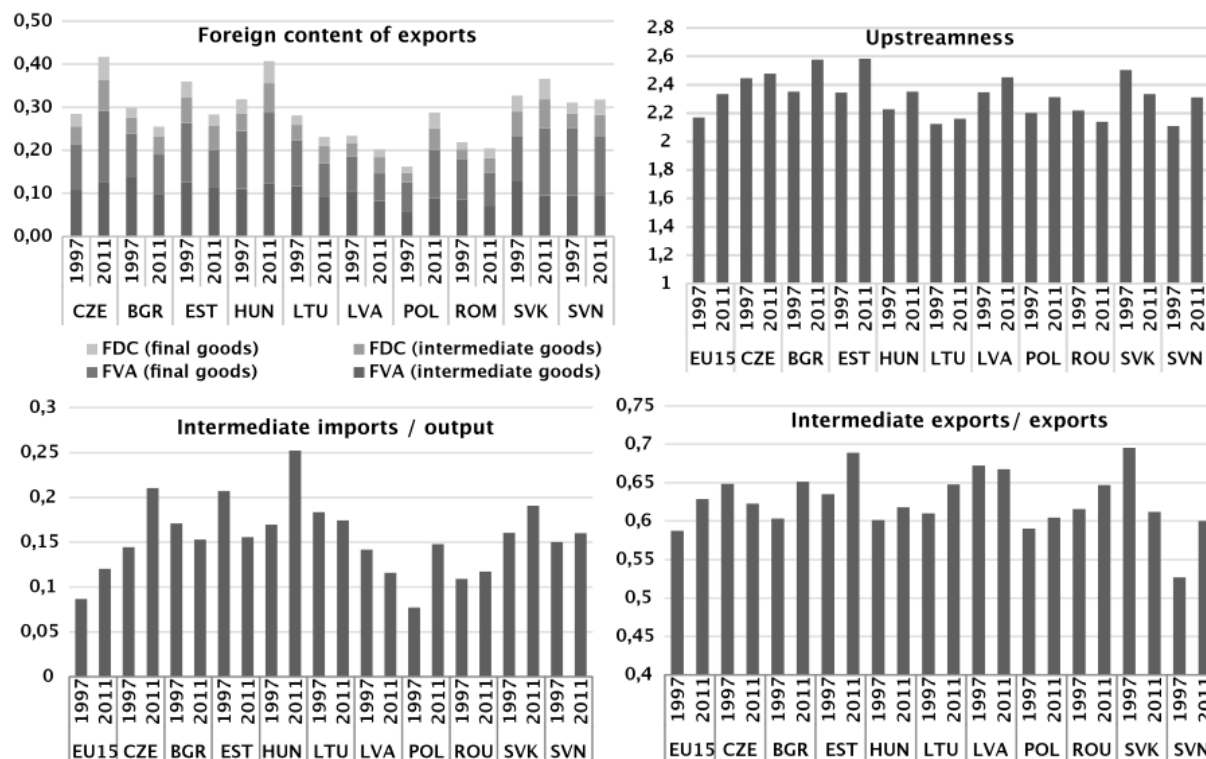
Figure 2: Standard GVC indicators

at similar levels. It is can also be noted that countries with a higher value added export content of final goods have a larger double counting component as the production process of the exported final goods involves the use of imported intermediate goods that cross borders several times. As a first step, we estimate the standard spillover equation for all the NMS with available firm level data. Estimation results show that the incidence of foreign productivity spillovers is quite heterogeneous and present only in selected countries. We find significant horizontal spillovers from foreign ownership in manufacturing only in Poland and the Czech Republic. The only country where positive forward spillovers are found is Hungary. Czech Republic and Slovakia also enjoy backward spillovers. When we consider the full sample (not just manufacturing, Table A1), on top of spillovers found for manufacturing we also find evidence of forward spillovers in Slovenia and backward spillovers in Estonia.

Table 2: Productivity spillovers in individual countries (manufacturing)

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(6) POL	(7) ROU	(8) SVK	(9) SVN
Horizontal FDI	-0.825**	0.104	-0.1	0.00311	0.143	-0.106	0.162*	0.138
	(0.385)	(0.113)	(0.0878)	(0.0784)	(0.103)	(0.0786)	(0.0904)	(0.0971)
Forward FDI	0.341	-0.867***	-0.0875	-0.721	-0.155	-0.12	-0.436*	0.245
	(0.468)	(0.303)	(0.145)	(0.462)	(0.366)	(0.199)	(0.237)	(0.775)
Backward FDI	1.717	1.972***	0.0563	-0.322	1.323***	0.228	0.405*	-0.908*
	(1.174)	(0.337)	(0.19)	(0.331)	(0.39)	(0.144)	(0.238)	(0.525)
Constant	-0.0789*	-0.00488	-0.00826	-0.175***	-0.117***	-0.0946***	-0.0569***	-0.0433***
	(0.0425)	(0.0146)	(0.0712)	(0.0131)	(0.0138)	(0.012)	(0.0162)	(0.0123)
Observations	35,840	63,348	10,114	7,029	30,041	218,561	21,834	9,966
R-squared	0.108	0.083	0.036	0.046	0.1	0.082	0.051	0.093

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4   Foreign productivity premia and the GVC

We interact the productivity premia with various GVC indicators to understand the degree of complementarity or substitutability of various modes of internationalization in its impact on TFP. As far as the Polish economy is concerned, we observe that upstreamness of a particular sector (distance from final demand) is not significant in explaining the productivity differences among domestic and foreign firms. The foreign content of exports is related to a overall higher productivity of entreprises while at the same time it reduces the productivity gap between the foreign and domestic firms, i.e. in sectors with high foreign content embedded in exports, domestic firms are able to perform better than in sectors with low foreign content, relative to foreign firms. This relationship is however not statistically significant when the sample is reduced to just the manufacturing sectors. In order to further analyze this relationship, we split the foreign content of exports into exports of final and intermediate goods. While in both cases foreign content of exports is related to overall higher productivity of enterprises, it seems that it is the production of intermediate goods that are rich in foreign content that makes the domestic firms able to catch up with the foreign ones.

Table 3: Foreign firms productivity premia (Poland)

VARIABLES	(1) All	(2) Mnfc	(3) All	(4) Mnfc	(5) Mnfc	(6) Mnfc
Foreign	0.721***	0.497***	0.612***	0.531***	0.455***	0.420***
	(0.0399)	(0.0629)	(0.0571)	(0.0639)	(0.0539)	(0.0232)
Foreign * Upstreamness	0.0145	-0.0815	0.173**	-0.148		
	(0.0483)	(0.0602)	(0.0752)	(0.0987)		
Upstreamness	0.301	0.230	0.366**	0.260		
	(0.184)	(0.325)	(0.172)	(0.351)		
Foreign * VS	-1.277***	-0.228				
	(0.128)	(0.202)				
VS	3.130***	2.544***				
	(0.355)	(0.587)				
Foreign * VS (final goods)			-0.782***	-0.314	-0.210	
			(0.214)	(0.213)	(0.222)	
VS (final goods)			4.051***	2.681***	2.459***	2.395***
			(0.514)	(0.857)	(0.744)	(0.685)
Foreign * VS (intermediate goods)			-1.929***	0.00648	-0.427*	-0.365**
			(0.233)	(0.405)	(0.244)	(0.139)
VS (intermediate goods)			2.062***	2.373***	2.527***	2.504***
			(0.532)	(0.622)	(0.638)	(0.545)
Constant	2.196***	2.177***	2.164***	2.160***	2.359***	2.368***
	(0.189)	(0.373)	(0.182)	(0.387)	(0.249)	(0.249)
Observations	138,117	57,173	138,117	57,173	57,173	57,173
R-squared	0.425	0.502	0.426	0.502	0.501	0.501

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When we pool all the NMS data together and estimate a similar equation by additionally controlling for country-sector-year heterogeneity, we find that there is indeed a significant relationship between the premium of foreign firms and the upstreamness of sectors, i.e. the closer the sector is to the final demand (and upstreamness is lower), the smaller is the foreign premium. This is also true whenever the sample is reduced to just the manufacturing sector. However, by pooling the data we are able to explore the heterogeneity of NMS and therefore trace this relationship more fully.

As the pooled sample is larger, we seems to be capturing different regularities that are present across widely defined sectors as opposed to the ones within sectors. Where all sectors of firm activity are included in the regression equation we see that overall firm productivity the closer it is to final demand. When we restrict the sample to just manufacturing, the sign of that relationship becomes opposite. However, the further away the firm is from the final demand, the smaller is the foreign firm productivity premium. Looking at the coefficients on the vertical specialization - it is related to a higher overall productivity. In the full sample, it seems that it is only the foreign content of intermediate goods that leads to lowering of the gap between the foreign and domestic firms. However, this relationship does not hold when only manufacturing sectors are taken into account.

Inspection of foreign ownership premium in individual countries shows a great deal of heterogeneity. The results show that in Bulgaria, Czech Republic, Hungary, Poland and Romania, the large degree of vertical specialization in final goods is related to a lower productivity premium of foreign enterprises. In Estonia, the interaction term is also negative, but it remains statistically insignificant. However, in Slovakia and Slovenia, high degree of VS in final goods in fact increases the productivity gap between domestic and foreign enterprises.

Turning to the effects of vertical specialization in intermediate goods, one can see that the negative interaction term remains significant in the Czech Republic and Hungary, with the coefficient being of roughly similar magnitude. In Slovakia the interaction coefficient is also negative showing, thus, that moving further away from final demand is more beneficial to domestic firms. One can also observe that a direct relationship between productivity and VS is positive whenever it is statistically significant. This is the case for Czech Republic,

Table 4: Foreign firms productivity premia (NMS)

VARIABLES	(1) All	(2) Mnfc	(3) All	(4) Mnfc	(5) Mnfc	(6) Mnfc
Foreign	0.280***	0.294***	0.236***	0.288***	0.352***	0.360***
	(0.0213)	(0.0321)	(0.0231)	(0.0372)	(0.0299)	(0.0179)
Foreign * Upstreamness	0.218***	0.135***	0.307***	0.150***		
	(0.0244)	(0.0297)	(0.0326)	(0.0566)		
Upstreamness	0.168	0.485***	-0.442***	0.489***		
	(0.174)	(0.119)	(0.155)	(0.141)		
Foreign * VS	0.0814	0.161				
	(0.0628)	(0.0987)				
VS	0.615	1.678***				
	(0.424)	(0.260)				
Foreign * VS (final goods)			0.268***	0.182	0.0434	
			(0.0917)	(0.118)	(0.113)	
VS (final goods)			0.173	1.697***	1.125***	1.134***
			(0.166)	(0.376)	(0.326)	(0.326)
Foreign * VS (intermediate goods)			-0.326**	0.102	0.577***	0.560***
			(0.133)	(0.201)	(0.113)	(0.104)
VS (intermediate goods)			3.670***	1.668***	1.548***	1.552***
			(0.445)	(0.301)	(0.311)	(0.312)
Constant	0.914***	0.660***	1.152***	0.657***	1.058***	1.056***
	(0.129)	(0.117)	(0.115)	(0.132)	(0.0639)	(0.0641)
Observations	2,172,952	654,105	2,172,952	654,105	654,105	654,105
R-squared	0.818	0.854	0.819	0.854	0.854	0.854

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Foreign firms productivity premia in individual countries (NMS)-interaction with VS in final goods, manufacturing

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(5) POL	(6) ROU	(7) SVK	(8) SVN
Foreign	0.709***	0.601***	0.686***	1.036***	0.382***	0.434***	0.389***	0.287***
	(0.0605)	(0.0483)	(0.0517)	(0.125)	(0.0279)	(0.024)	(0.037)	(0.0584)
Foreign * VS (final goods)	-1.786***	0.0443	-0.208	-1.952***	-0.0684	-0.365***	0.832***	0.649**
	(0.317)	(0.213)	(0.234)	(0.456)	(0.197)	(0.115)	(0.208)	(0.322)
VS (final goods)	0.398	4.517***	0.726**	1.252**	1.730**	-0.0175	-0.417	0.313
	(0.855)	(0.43)	(0.349)	(0.545)	(0.726)	(0.416)	(0.647)	(1.184)
Constant	-1.269***	2.288***	1.280***	2.394***	2.897***	-0.755***	3.188***	2.903***
	(0.168)	(0.0791)	(0.288)	(0.103)	(0.103)	(0.0563)	(0.0874)	(0.16)
Observations	66,761	95,901	17,385	13,761	57,173	350,731	33,855	17,651
R-squared	0.549	0.53	0.371	0.545	0.501	0.251	0.497	0.591

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Foreign firms productivity premia in individual countries (NMS) - interaction with VS in intermediate goods

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(5) POL	(6) ROU	(7) SVK	(8) SVN
Foreign	0.295***	0.749***	0.616***	0.987***	0.421***	0.350***	0.555***	0.455***
	(0.0312)	(0.0523)	(0.0574)	(0.0913)	(0.0368)	(0.0237)	(0.0584)	(0.0761)
Foreign * VS (intermediate goods)	0.885***	-0.741***	0.162	-1.693***	-0.359**	0.369**	-0.164	-0.366
	(0.195)	(0.239)	(0.272)	(0.4)	(0.134)	(0.168)	(0.353)	(0.414)
VS (intermediate goods)	0.603	3.745***	0.881**	-0.127	1.739***	0.834*	3.960***	-0.309
	(0.541)	(0.679)	(0.379)	(0.637)	(0.651)	(0.466)	(0.607)	(1.036)
Constant	-1.275***	2.281***	1.206***	2.648***	2.878***	-0.822***	2.556***	2.998***
	(0.0705)	(0.137)	(0.293)	(0.128)	(0.107)	(0.0499)	(0.0943)	(0.192)
Observations	66,761	95,901	17,385	13,761	57,173	350,731	33,855	17,651
R-squared	0.549	0.528	0.371	0.544	0.501	0.251	0.498	0.591

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Estonia, Hungary and Poland in the case of VS in final goods and additionally for Slovakia in the case of intermediate goods but not for Hungary.

5 Productivity spillovers to domestic firms within the GVC

Turning to the analysis of spillovers, we perform several regressions of the spillover equation including the various measures of GVC participation for the economy of Poland. It has to

be noted that due to some partial correlation between the sectoral measures related to FDI and participation in the GVC together with sectoral export intensity, inclusion of the GVC terms in the spillover equation renders the"traditional" spillovers measures not significant in explaining domestic firms productivity. Sectors where there is high presence of FDI are also usually involved in global value chains. We only find some evidence of backward spillovers whenever all firms are considered. This channel of interaction is however not significant when the sample is restricted to manufacturing.

As expected, export intensity is positively related to productivity both in manufacturing and in the overall sample of firms, which is consistent with the findings of the new-new trade literature focused on firm heterogeneity. We find, also, that once we include all sectors in the sample, higher productivity of domestic firms relates to a more downstream position in the value chain. This relationship is robust to the sample choice and it holds even in manufacturing where the variation of upstreamness is much smaller. We also find a strong and positive relationship between the overall vertical specialization measure and domestic firm productivity both in overall sample and in manufacturing. Turning to the split between vertical specialization in final and intermediate goods, we find a significant coefficient only in the case of intermediate goods (both for the value added content and overall foreign content of exports). Therefore there are two important regularities: 1) the productivity of domestic firms is higher the closer firms are to the final demand and 2) foreign content is important for productivity only when it is embedded in produced intermediate goods and not final goods. This second finding is consistent with the foreign firm premia estimations.

As a robustness check, we offer several additional regressions that are shown in the table A2. We perform the spillover analysis using labour productivity instead of TFP. We find similar magnitude of the backward spillovers and positive relationship between vertical specialization and domestic firms labour productivity. We also run standard TFP spillover regression on the sample of all firms (domestic and foreign) and then foreign firms separately. We find that the elasticity on the vertical specialization is even higher for those specifications and the coefficients on VS (final goods) is roughly the same as the one on VS (intermediate goods). One can conclude that while the presence of the sector in the GVC brings overall welfare gains on top of the standard FDI-related spillovers. However, in the case of domestic

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producers, those GVC-related productivity spillovers are associated with their presence in the middle of the value chain: what matters is the foreign content of exported goods but it is also important that the exported goods are intermediate and further used in the production processes. Such firms enjoy the type of spillovers that resemble the backward and forward spillovers from FDI but are transmitted through the production global production process. On the other hand, production of goods close to the primary resources (high upstreamness and low foreign content) is related to relatively low productivity levels.

Table 7: Spillovers (Poland)

VARIABLES	(1) All	(2) Mnfc	(3) Mnfc	(4) Mnfc	(5) Mnfc	(6) Mnfc	(7) Mnfc	(8) Mnfc
Horizontal FDI	-0.0894	-0.00942						
	(0.0799)	(0.0900)						
Forward FDI	-0.903**	-0.390						
	(0.351)	(0.359)						
Backward FDI	1.584***	1.180***	0.993***	1.046***	1.046***	1.004***	1.050***	1.040***
	(0.370)	(0.350)	(0.206)	(0.218)	(0.218)	(0.206)	(0.218)	(0.228)
Export share	0.710***	0.834***	0.861***	1.184***	1.184***	1.233***	1.071***	0.995***
	(0.160)	(0.132)	(0.142)	(0.170)	(0.170)	(0.168)	(0.0993)	(0.196)
VS	0.676	1.071***	0.939***					
	(0.519)	(0.327)	(0.350)					
Upstreamness	-0.731***	-0.252*	-0.233*	-0.413**	-0.413**	-0.408**	-0.294**	-0.409**
	(0.170)	(0.133)	(0.135)	(0.184)	(0.184)	(0.191)	(0.135)	(0.165)
Foreign VA (final goods)				-0.790	-0.790	-1.059		
				(0.751)	(0.751)	(0.737)		
Foreign VA (intermediate goods)				0.769	0.769		1.078*	
				(0.577)	(0.577)		(0.558)	
VS (final goods)								0.0652
								(0.718)
VS (intermediate goods)								1.311***
								(0.354)
Constant	-0.0469	-0.0157	-0.0581	-0.0471	-0.0471	-0.0388	-0.0534	-0.0582
	(0.158)	(0.285)	(0.275)	(0.276)	(0.276)	(0.275)	(0.276)	(0.277)
Observations	71,336	30,041	30,041	30,041	30,041	30,041	30,041	30,041
R-squared	0.113	0.122	0.122	0.121	0.121	0.121	0.121	0.122

Robust (clustered) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We perform a similar analysis of the pooled sample of all NMS. Similarly to the Polish example, we observe significant backward productivity spillovers. The relationship between the export share and domestic firms FDI is positive and stable across specification. Unlike in

the case of Poland, we do not find an overall effect of vertical specialization on productivity. This stems both from the heterogeneity of response to VS in final and intermediate goods as well as from inter country heterogeneity (and different country overall positions in the GVC). We follow up on that heterogeneity later by performing additional regressions for each individual country. Robustness checks shown in A3 include extra regressions for different groups of firms and different productivity measures. Vertical specialization in final goods is associated with an even higher productivity of foreign firms

Table 8: Spillovers (NMS)

VARIABLES	(1) All	(2) Mnfc	(3) Mnfc	(4) Mnfc	(6) Mnfc	(7) Mnfc	(8) Mnfc
Horizontal FDI	-0.185**	-0.121					
	(0.0786)	(0.0793)					
Forward FDI	-0.0592	-0.0226					
	(0.131)	(0.164)					
Backward FDI	0.345***	0.466**	0.365**	0.337**	0.343**	0.346***	0.334**
	(0.132)	(0.182)	(0.142)	(0.135)	(0.139)	(0.131)	(0.139)
Export share	0.663***	0.650***	0.643***	0.557***	0.504***	0.649***	0.568***
	(0.106)	(0.159)	(0.159)	(0.154)	(0.124)	(0.0876)	(0.167)
VS	-0.335***	-0.116	-0.129				
	(0.117)	(0.417)	(0.417)				
Upstreamness	-0.204**	-0.183	-0.189	0.0115	0.00729	-0.106	0.0613
	(0.0891)	(0.125)	(0.127)	(0.0882)	(0.0879)	(0.130)	(0.0866)
Foreign VA (final goods)				0.740	1.006*		
				(0.686)	(0.546)		
Foreign VA (intermediate goods)				-0.805		-1.148***	
				(0.606)		(0.402)	
VS (final goods)							0.805
							(0.575)
VS (intermediate goods)							-0.885**
							(0.409)
Constant	0.0112	-0.419***	-0.420***	-0.419***	-0.419***	-0.423***	-0.418***
	(0.0210)	(0.0233)	(0.0229)	(0.0228)	(0.0227)	(0.0225)	(0.0229)
Observations	1,295,481	397,210	397,210	397,210	397,210	397,210	397,210
R-squared	0.090	0.102	0.101	0.103	0.102	0.102	0.103

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

An analysis of spillovers in the individual NMS countries shows that the response to FDI spillovers, internationalization and the involvement in GVC is heterogeneous. Once the additional variables are included in the spillover equations, the standard FDI spillovers are

significant only in the case of Bulgaria, Czech Republic and Poland. Sectoral export share is positively related to domestic firms productivity in Bulgaria, Czech Republic, Poland Romania and Slovakia. Vertical specialization in final goods is related positively to domestic firms productivity only in the Czech Republic, Estonia, Hungary and Slovakia, while VS in intermediate goods is important in the Hungary, Poland and Slovakia. In Czech Republic and Slovakia, where the most important manufacturing sectors are the car manufacturers that are relatively close to final demand is where most of the productivity growth is located. However, in Poland and Hungary, it is the middle of the supply chain that is associated with the highest productivity spillovers - foreign content of exports matters for productivity much more in the case of intermediate goods.

Table 9: Spillovers – individual countries

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(5) POL	(6) ROU	(7) SVK	(8) SVN
Horizontal FDI	-0.820**	0.180*	-0.116	0.00571	0.0122	-0.111	0.0862	0.127
	(0.338)	(0.105)	(0.0831)	(0.0701)	(0.0852)	(0.0747)	(0.0803)	(0.0921)
Forward FDI	0.123	-0.695**	-0.0122	-1.420***	-0.393	-0.121	-0.518**	-0.127
	(0.414)	(0.284)	(0.15)	(0.289)	(0.357)	(0.199)	(0.23)	(0.597)
Backward FDI	1.333**	0.907***	-0.0893	0.0704	1.204***	0.212	0.11	-0.585
	(0.61)	(0.287)	(0.132)	(0.243)	(0.364)	(0.131)	(0.218)	(0.383)
Export share	1.673***	0.441***	-0.0413	-1.152***	0.965***	0.282**	0.376**	-0.141
	(0.522)	(0.13)	(0.0627)	(0.34)	(0.183)	(0.122)	(0.189)	(0.315)
VS (final goods)	-0.149	2.424***	0.648**	1.484*	0.202	0.241	2.463***	1.628
	(1.404)	(0.441)	(0.319)	(0.789)	(0.664)	(0.426)	(0.59)	(1.159)
VS (intermediate goods)	-3.243***	-1.490***	-0.219	3.265***	1.439***	-0.583**	1.464**	0.608
	(1.109)	(0.541)	(0.194)	(0.547)	(0.347)	(0.249)	(0.592)	(0.609)
Upstreamness	-0.0374	0.705***	0.419***	-0.0785	-0.426**	0.0437	0.0132	-0.00488
	(0.402)	(0.16)	(0.103)	(0.214)	(0.17)	(0.0623)	(0.233)	(0.19)
Constant	-0.0618	0.00707	-0.0207	-0.189***	-0.129***	-0.0953***	-0.0566***	-0.0372***
	(0.0404)	(0.0154)	(0.0668)	(0.0124)	(0.0119)	(0.0116)	(0.0204)	(0.0142)
Observations	35,840	63,348	10,114	7,029	30,041	218,561	21,834	9,966
R-squared	0.151	0.108	0.038	0.064	0.122	0.083	0.073	0.11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6   Conclusions

The New Member States have been experiencing firm internationalization both through inward foreign direct investment but also through exporting, importation of foreign technology in investment goods and increased use of imported intermediates. We argue that there are

important productivity spillovers within the global value chains, ie. FDI alone is not telling the whole story of the reallocation processes that are going on in the economies of the NMS. We augment the standard TFP spillover empirical model with modern measures of GVC participation.

By merging multiple editions of the Amadeus database we are able to track a long sample (1997 to 2013) of firms from the new EU member states and we revisit the evidence of foreign productivity spillovers. We show that most of that spillovers in the now-standard notion due to Smazynska-Javorcik in the region are backward oriented (with limited evidence of horizontal spillovers for individual countries). We also analyze the foreign firm productivity premia over the domestic firms that unequivocally turns out to be large and significant.

We argue that those productivity spillovers from FDI do not account for the whole story of internationalization-driven productivity growth. Somewhat different strand of literature related to global value chain provides measures for the foreign content of exports and up-streamness that shows the degree of involvement and the type of involvement in the global value chain on the sectoral level. The estimates of the spillover equation augmented with those measures show a significant relationship between the GVC measures and firm-level productivity. While backward spillovers are still important in the analyzed sample, foreign value content of exports and exporting itself are important productivity drivers.

However, the productivity response to the foreign content of export is heterogeneous and consistent with the results of the estimations of the determinants of foreign premia. In Poland, most of the GVC related productivity gains are in the production of intermediate goods and this is where foreign content of exports is associated with lower productivity differences between domestic and foreign enterprises. At the same time productive firms are, other things equal, located close to the final demand. Therefore in Poland, it pays of to be on close to the final consumer unless being further away involves a high content of imported foreign value added in exported goods.

On the other hand, in most of the other countries (except Hungary where results are similar to that of Poland) where positive spillovers in the GVC exist, they tend to stem from production of final goods. However, the new member states differ economically in many dimensions: eg. size and the degree of economic specialization. Poland's economy is

relatively diversified unlike those of eg. the Czech Republic and Slovakia. This degree of specialization may lead to different outcomes in the actual presence of spillovers within the GVC and other productivity driving forces, such as eg. factor allocation. Moreover, while the above estimations clearly show a significant but heterogeneous response to GVC, a more rigorous theoretical framework linking the presence in the GVC to other factors already present in the Melitz (2003) derived framework would be needed to inquire the source of that heterogeneity. This could be a promising avenue for further research.

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Appendix

Table A1: Productivity spillovers in individual countries (all firms)

VARIABLES	(1) BGR	(2) CZE	(3) EST	(4) HUN	(6) POL	(7) ROU	(8) SVK	(9) SVN
Horizontal FDI	-0.457**	-0.0492	0.169*	0.00696	0.0171	-0.267*	0.0643	0.146**
	(0.209)	(0.0726)	(0.0935)	(0.0749)	(0.0948)	(0.142)	(0.0765)	(0.0707)
Forward FDI	-0.0197	-0.0765	-0.366***	0.419	-0.740*	-0.00662	-0.418	-0.0516
	(0.196)	(0.208)	(0.126)	(0.378)	(0.39)	(0.204)	(0.27)	(0.516)
Backward FDI	0.859	1.447***	0.149	-0.639**	1.290***	0.144	0.109	-0.775**
	(0.642)	(0.233)	(0.17)	(0.277)	(0.354)	(0.0895)	(0.228)	(0.361)
Constant	-0.0473*	-0.0359**	0.191	-0.131***	-0.128***	0.0621***	-0.0594***	-0.0306***
	(0.0243)	(0.017)	(0.124)	(0.0173)	(0.00997)	(0.0203)	(0.00972)	(0.0073)
Observations	111,971	176,676	38,638	20,597	71,336	773,269	72,494	29,057
R-squared	0.074	0.05	0.031	0.029	0.093	0.093	0.029	0.096

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2: Spillovers (Poland) - extra regressions

VARIABLES	(1) Mnfc	(2) Labprod	(3) Labprod	(4) All_firms	(5) Foreign
Horizontal FDI	0.143	0.163*	0.0594	0.039	0.181
	(0.103)	(0.0877)	(0.0757)	(0.0845)	(0.123)
Forward FDI	-0.155	0.422	0.256	-0.476	-0.796**
	(0.366)	(0.287)	(0.244)	(0.324)	(0.37)
Backward FDI	1.323***	0.657**	0.357*	1.115***	0.789*
	(0.39)	(0.318)	(0.193)	(0.339)	(0.414)
Export share			0.531***	0.860***	0.633***
			(0.126)	(0.162)	(0.203)
VS (final goods)			1.249***	0.772	1.708*
			(0.452)	(0.629)	(0.89)
VS (intermediate goods)			1.362***	1.589***	2.129***
			(0.315)	(0.367)	(0.68)
Upstreamness			0.128	-0.421***	-0.555*
			(0.0973)	(0.156)	(0.282)
Constant	-0.0457	-0.145	-0.112	0.257	0.863***
	(0.28)	(0.298)	(0.3)	(0.287)	(0.0538)
Observations	30,041	30,041	30,041	37,561	7,520
R-squared	0.1	0.117	0.13	0.12	0.128

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3: Spillovers (NMS) - extra regressions

VARIABLES	(1) Mnfc	(2) Labprod	(3) Labprod	(4) All firms	(5) Foreign
Horizontal FDI	-0.00157	-0.135	-0.146*	-0.00201	0.164**
	(0.0941)	(0.0823)	(0.0762)	(0.0838)	(0.0769)
Forward FDI	-0.0327	0.0248	-0.0432	-0.0742	0.264
	(0.193)	(0.148)	(0.14)	(0.172)	(0.183)
Backward FDI	0.275	0.338*	0.288*	0.188	-0.0419
	(0.182)	(0.176)	(0.152)	(0.145)	(0.107)
Export share			0.355***	0.576***	0.433***
			(0.124)	(0.145)	(0.103)
VS (final goods)			0.888**	1.004**	1.708***
			(0.445)	(0.489)	(0.406)
VS (intermediate goods)			-0.831**	-0.742**	0.25
			(0.371)	(0.334)	(0.372)
Upstreamness			0.147*	0.0835	-0.0105
			(0.0873)	(0.0831)	(0.144)
Constant	-0.405***	-0.604***	-0.611***	-0.139***	0.102***
	(0.033)	(0.0499)	(0.0474)	(0.0333)	(0.0226)
Observations	397,213	397,221	397,221	438,207	40,994
R-squared	0.093	0.125	0.128	0.099	0.094

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A4: Summary statistics, first differences

variable	NMS			Poland		
	mean	p50	sd	mean	p50	sd
TFP	-0,03123	-0,01346	0,60020	0,03223	0,02514	0,44632
Labprod	0,07147	-0,00818	2,738,400	0,53189	0,24310	1,529,800
Horizontal	0,01182	0,00718	0,10132	0,01211	0,01096	0,07275
Forward	0,00977	0,01091	0,04472	0,00641	0,00336	0,03421
Backward	0,01001	0,01027	0,04350	0,00795	0,00510	0,03501
Exports	0,00162	0,00000	0,05451	0,00330	0,00222	0,06031
FVA_i	-0,00050	0,00001	0,01361	0,00058	0,00073	0,01018
FVA_f	0,00018	-0,00013	0,04899	0,00043	0,00037	0,01375
VS_i	-0,00042	0,00000	0,01872	0,00108	0,00124	0,01616
VS_f	0,00010	-0,00028	0,04891	0,00053	-0,00015	0,01520
Upstreamness	0,00169	0,00344	0,06893	0,00371	0,00628	0,05794

Table A5: Summary statistics, levels

variable	NMS			Poland		
	mean	p50	sd	mean	p50	sd
foreign	0,069	0	0,253	0,166	0	0,373
TFP	0,514	0,032	1,83	2,94	2,92	0,88
Labprod	6,81	0,428	44,4	16	9,14	31,5
Export share	0,196	0,163	0,195	0,179	0,077	0,213
FVA_i	0,071	0,067	0,044	0,063	0,055	0,034
FVA_f	0,061	0,053	0,065	0,063	0,055	0,043
VS_i	0,095	0,088	0,063	0,089	0,068	0,052
VS_f	0,075	0,061	0,068	0,08	0,067	0,049
Upstreamness	0,738	0,768	0,277	0,759	0,8	0,22

Table A6: Correlation table, spillovers, differences, NMS sample

	TFP	Labprod	Horizontal	Forward	Backward	Exports	FVA_i	FVA_f	VS_i	VS_f	Upstreamness
Labprod	0.12	1									
	(0.00)										
Horizontal	-0.02	0	1								
	(0.00)	(0.44)									
Forward	-0.1	0	0.27	1							
	(0.00)	(0.00)	(0.00)								
Backward	-0.07	0	0.26	0.54	1						
	(0.00)	(0.05)	(0.00)	(0.00)							
Exports	0.02	0.01	0.08	0.08	0.14	1					
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)						
FVA_i	0	0	0.07	0.02	0.12	0.2	1				
	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)	(0.000)					
FVA_f	-0.01	0	0.01	0.04	-0.05	0.31	-0.19	1			
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
VS_i	0.01	0	0.09	0.03	0.14	0.28	0.95	-0.21	1		
	(0.00)	(0.6)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
VS_f	-0.01	0	0.02	0.05	-0.04	0.35	-0.14	1	-0.15	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Upstreamness	0.01	0	0.05	0.01	0.21	0.14	0.36	-0.18	0.41	-0.15	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

$p - values$ below the correlation measure

Table A7: Correlation table, spillovers, differences, Poland sample

	TFP	Labprod	Horizontal	Forward	Backward	Exports	FVA_i	FVA_f	VS_i	VS_f	Upstreamness
Labprod	0.49	1									
	(0.00)										
Horizontal	0	0.03	1								
	(0.71)	(0.00)									
Forward	0.04	0.04	0.47	1							
	(0.00)	(0.00)	(0.00)								
Backward	0.05	0.01	0.5	0.61	1						
	(0.00)	(0.02)	(0.00)	(0.00)							
Exports	0.13	0.07	0.21	0.1	0.11	1					
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)						
FVA_i	0.05	0.05	0.01	0.08	-0.07	0.32	1				
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)					
FVA_f	0.11	0.05	0.14	0.08	-0.03	0.58	-0.05	1			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
VS_i	0.08	0.06	0.07	0.13	0.05	0.42	0.92	-0.04	1		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
VS_f	0.14	0.07	0.18	0.11	0.02	0.72	0.11	0.96	0.18	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Upstreamness	-0.01	0.04	0.17	0.18	0.25	0.11	0.3	-0.36	0.44	-0.2	1
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

P-values below the correlation measure

Table A8: Correlation table, spillovers, levels, NMS sample

	foreign	TFP	Labprod	Exports	FVA_i	FVA_f	VS_i	VS_f	Upstreamness
TFP	0.11	1							
	(0.00)								
Labprod	0.05	0.26	1						
	(0.00)	(0.00)							
Exports	0.09	0.06	0	1					
	(0.00)	(0.00)	(0.00)						
FVA_i	0.01	0.19	0.04	0.13	1				
	(0.00)	(0.00)	(0.00)	(0.00)					
FVA_f	0.04	0.08	0.01	0.49	-0.18	1			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
VS_i	0.02	0.25	0.05	0.24	0.97	-0.16	1		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
VS_f	0.05	0.15	0.03	0.58	-0.04	0.98	0.01	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Upstreamness	0.02	0.26	0.07	0.11	0.5	-0.42	0.56	-0.3	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	0

P-values below the correlation measure

Table A9: Correlation table, spillovers, levels, Poland sample

	foreign	TFP	Labprod	Exports	FVA_i	FVA_f	VS_i	VS_f	Upstreamness
TFP	0.25	1							
	(0.00)								
Labprod	0.17	0.37	1						
	(0.00)	(0.00)							
Exports	0.12	0.24	0.02	1					
	(0.00)	(0.00)	(0.00)						
FVA_i	0.04	-0.06	0.01	0.36	1				
	(0.00)	(0.00)	(0.00)	(0.00)					
FVA_f	0.06	0.26	-0.01	0.68	-0.12	1			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
VS_i	0.06	0	0.02	0.49	0.95	-0.08	1		
	(0.00)	(0.88)	(0.00)	(0.00)	(0.00)	(0.00)			
VS_f	0.09	0.28	0	0.83	0.07	0.96	0.16	1	
	(0.00)	(0.00)	(0.56)	(0.00)	(0.00)	(0.00)	(0.00)		
Upsreamness	0.11	-0.08	0.04	0.21	0.42	-0.33	0.54	-0.13	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

P-values below the correlation measure