Microeconomic mechanisms behind export spillovers from FDI: Evidence from Bulgaria

Andrea Ciani

DICE Heinrich-Heine Universität

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Michele Imbruno*

CERDI Université d'Auvergne & GEP

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Abstract

This paper studies how the presence of multinational enterprises (MNEs) affects the export performance of Bulgarian manufacturing firms (i.e. Export spillovers from FDI). Using export data at the firm-product-destination level over the period 2004-2006, we document positive forward spillovers on export value and quantity, associated with efficiency gains. Conversely, we find insignificant backward and horizontal spillovers on export flows, associated however with efficiency losses and quality downgrading, respectively. When aggregating data at the firm-level and considering that a firm can operate in more sectors, we show that the presence of foreign input suppliers allows domestic firms to upgrade the average quality of incumbent varieties, whereas the presence of foreign customers generates the opposite effect.

Keywords: Export spillover, FDI, Multi-product firms, Unit value, Quality.

JEL: F14, F23, F61.

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* Corresponding author: michele.imbruno@udamail.fr.

1. Introduction

Foreign Direct Investment (FDI) has been considered as one of the most important catalysts for economic growth and development. For this reason, several policy-makers from emerging and developing countries tend to adopt policies aimed at attracting FDI. However, the overall opinion on whether the host economy always benefits from the presence of foreign firms is not concordant. Indeed, a large microeconomic literature investigating how inward FDI affects domestic firms' productivity reaches mixed conclusions (Görg and Greenaway, 2004).

The presence of multinationals (MNEs) within an industry might improve the performance of domestic producers through either competition or learning effects, i.e. local firms might be pushed to increase their efficiency in order to face foreign competition or they can adopt superior technologies employed by foreign competitors (*horizontal* or *intra-industry spillovers*). However, several studies found that these spillovers might be irrelevant or even negative as the ones occurring through buyer-supplier linkages between foreign and domestic firms (*vertical* or *inter-industry spillovers*) are taken in consideration. The presence of foreign firms in upstream sectors could positively influence domestic firms' performance in downstream sectors, by supplying a larger number and/or a higher quality of intermediate inputs (*forward spillovers*). At the same time, the presence of foreign-owned affiliates in downstream sectors might lead to productivity improvements for local firms in upstream sectors, as the former can require higher standards for their intermediate inputs, and therefore can push the latter to improve production efficiency and/or the quality of output (backward spillovers) .[1] A recent meta-analysis of these studies documents that vertical spillovers are more important than horizontal ones, while backward spillovers appear more sizable than forward spillovers (Havranek and Irsova, 2011).

The main purpose of this paper is to empirically investigate whether and how inward FDI influences the export performance, i.e. firm's ability to serve the international market via the trade channel (*export spillovers from FDI*). It has been argued that a large presence of foreign multinationals might positively affect firm-level export performance thanks to technological spillovers – as explained above – and information spillovers, along both horizontal and vertical linkages. In other words, the presence of multinationals can reduce the costs of production and/or more specifically the costs related to exporting. The firm-level literature on export spillovers from FDI is quite scant compared with that on productivity spillovers, and mainly focuses on

[1] See Görg and Greenaway (2004) for more details.

horizontal linkages, providing mixed results.[2] Only few studies consider export spillovers through vertical linkages. Using firm-level panel data from UK, Kneller and Pisu (2007) find that domestic firms' export decisions are only affected by MNEs through positive backward spillovers, whereas domestic firms' export share in total sales is positively affected by horizontal (export-related) and backward spillovers, and negatively by forward spillovers. Using firm-level data from China over the period 2000-2003, Chen, et al. (2013) document positive backward technology spillovers on domestic firms' export value, and positive horizontal export-related information spillovers on the export share of total sales.

Using panel data on Bulgarian exports at the firm-product-destination level, this study aims at exploring the microeconomic mechanisms behind firm-level aggregate export spillovers from FDI, providing new interesting insights in the context of an emerging economy.[3] The majority of existing studies is based on firm-level aggregate export data from developed countries and suffers several shortcomings arising from data availability. First, they are unable to account for either product or destination heterogeneity, although firm-level export performance might depend on the characteristics of both products and countries a firm is involved with, in addition to firm-specific characteristics. Second, they are unable to determine whether the change in export value is mainly due to a change in product quantity and/or a change in price (unit value), and whether the price adjustment is mainly caused by a change in quality. Finally, spillover variables for each firm are usually measured considering only the main sector of the firm, although many studies argue that a large amount of export flows are concentrated within multi-product firms that are often engaged in different industries (Bernard, et al. 2007; Mayer and Ottaviano, 2007).

In this paper, we attempt to address all these issues using detailed data on Bulgarian manufacturing exports in the period 2004-2006. Bulgaria in this period is a very interesting case as the country was further liberalising both its trade and investment regimes, in view of becoming an official member of European Union in January 2007. Indeed, this period was characterized by fast economic growth, accompanied by a drastic increase in exports as well as a sizable amount of FDI inflows.

[2] Using cross-section data at the firm-level, Aitken et al. (1997) document that domestic firms' export probability is positively influenced by the presence of exporting multinational enterprises within the same industry and region. Using firm-level panel data from UK, Greenaway et al. (2004) find that MNEs' exports have a positive impact on domestic firms' export decision, but no effect on how much to export (i.e. firm-level export-to-sales ratios). Ruane and Sutherland (2005) find that domestic firms' export decisions and export intensities are negatively related to MNEs' export intensity, using panel data from Ireland. Exploring similar data in Spain, Barrios et al. (2003) find no significant evidence of export spillovers form FDI, in terms of both probability of exporting and export intensity at firm-level.

[3] Previous studies on spillovers from FDI in Bulgaria focus on the effects on firm productivity, rather than export performance (Monastiriotis and Alegria, 2011).

First, we analyse export spillovers from FDI at the firm-level following the standard approach, i.e. through relating firm-level aggregate export value and industry-level spillovers from FDI, by considering the main sector of each firm over the sample period. These "benchmark" results suggest that Bulgarian manufacturing firms enjoy positive forward export spillovers and suffer negative backward export spillovers, whereas horizontal export spillovers appear statistically insignificant.

Next, we explore this linkage between exports and inward FDI by using firm-product-destination level data (i.e. variety level data), which enable us to account for both product heterogeneity and country heterogeneity in addition to firm heterogeneity. Here, we find only positive forward spillovers from FDI, which are associated with an increase in export quantity and a decline in price. Conversely, both horizontal and backward spillovers play no role in explaining changes in export sales, in terms of both value and quantity. We also report that backward spillovers lead to an increase in prices. Relying on the standard literature on quality and trade, where the unit value of a product would proxy its quality (Schott, 2004), we may conclude that these results provide evidence of quality upgrading from backward spillover and quality downgrading from forward spillover. However, when disentangling the quality component from unit values, as in Khandelwal et al. (2013), we find that changes in unit values arising from vertical spillovers are not due to variations in quality, whereas only horizontal spillovers lead to quality downgrading. Overall, these results seem to suggest that incumbent varieties at firm-product-destination level increase their competitiveness through using more and/or better intermediate inputs from foreign-owned suppliers, decline their efficiency as they are unable to supply foreign-owned customers, and reduce their quality because of tougher competition by FDI. These results are found to be relatively stronger for differentiated goods, intermediate goods, OECD destinations, and EU destinations.

Finally, we aggregate firm-product-destination data to the firm-level in order to investigate whether inward FDI differently affects export performance of incumbent exporters when accounting for the multi-sector dimension of spillover variables for each firm. Surprisingly, we only find a positive backward spillover on export value, rather than a negative one, which takes place through an increase in quantity and a decline in average export price within firm, without any change in average quality. Conversely, we find that forward spillovers lead firms to sell less quantity at higher average prices, without affecting the average quality. These results suggest that previous firm-level studies on export spillovers could have reached different conclusions if the "actual" presence of multinationals was accounted for each domestic firm, i.e. through considering all sectors in which each firm produces.

It is worth noting that these findings might be due the entry-exit of export varieties within firm, and not just to changes for incumbent varieties. Indeed, when we exclude the possibility of a change in the variety (product-destination pair) mix within firm, results turn out to be more in line with our firm-level "benchmark" findings, i.e. we document positive forward spillovers and negative backward spillovers on firm-level export value. Both occur mainly through the quantity channel, since effects on average unit value are statistically insignificant. However, when focussing on the quality measure, we document within-firm quality upgrading from forward spillovers, and within-firm quality downgrading from backward spillovers. Therefore, the presence of foreign suppliers seems to allow firms to export additional varieties of lower quality, and upgrade the quality of incumbent export varieties, whereas the presence of foreign customers would lead firms to drop marginal varieties of lower quality and downgrade the quality of remaining incumbent varieties.

The remainder of the paper is organized as follows. Section 2 discusses the related literature. Section 3 highlights Bulgarian macroeconomic context with a main focus on exports and inward FDI. Section 4 describes the data and provides the preliminary statistics. Section 5 displays the main econometric analysis of the microeconomic linkages between exports and FDI. Section 6 provides some robustness checks and section 7 concludes the paper.

2. Related literature

This paper contributes to the empirical literature on firm-level export spillovers from FDI, providing new interesting microeconomic insights owing to the recent availability of more disaggregate trade data at different dimensions, i.e. firm, product and country-destination. To the best of our knowledge, Bajgar and Javorcik (2016)'s work is most closely related to ours as they also explore the linkage between inward FDI and exports by using firm-product-destination level data on Romanian manufacturing sector. Bajgar and Javorcik (2016) document that unit values are positively affected by backward spillovers and (less robustly by) forward spillovers, concluding that quality upgrading occurs via both vertical spillovers from FDI. Unlike their work, we explore more generally the spillover effects of FDI on total export value at the firm-product-destination level, by disentangling the quantity and the unit value channels. Moreover, we go further by measuring quality following Khandelwal, et al. (2013)'s approach, rather than using unit value as a quality proxy, in order to discern the quality effect from the competitiveness effect.

This paper is also related to the stream of research examining the determinants of firm-level export performance, and more specifically, those factors enabling firms to produce goods

of higher quality. Kugler and Verhoogen (2012), using data on Colombian manufacturers, show that firms producing high quality products tend to employ more costly inputs. Amiti and Khandelwal (2013) find that lower import tariffs are associated with quality upgrading for products close to the world quality frontier, whereas lower tariffs discourage quality upgrading for products distant from the frontier. Fieler et al. (2014) find that lower import tariffs lead exporters to upgrade product quality, increasing the domestic supply of high-quality intermediates. Bas and Strauss-Kahn (2015) document that a reduction in input tariffs allows Chinese firms to access high-quality inputs, implying quality upgrading of their exported products. We contribute to this literature by considering the role of inward FDI in affecting the price and the quality of exported varieties.

This study also relates to the literature investigating the export performance of firms supplying a large array of varieties to the export market. Manova and Zhang (2013) find that more expensive products account for the largest share of revenues for Chinese multiproduct firms earn more revenues from their more expensive products. Moreover, exporters focus on their most expensive goods, drop cheaper goods and earn lower revenues in destinations where they sell fewer varieties. Using data from Mexico, Eckel et al. (2015) find that manufacturers producing more expensive varieties generate higher export revenues worldwide. Our contribution to this literature relies on considering how the presence of foreign MNEs at the industry level might differently affect the export outcomes of multiproduct firms (i.e. revenues, quantity, prices, and quality), rather than focussing on the relationship between these outcomes.

3. Bulgaria context

In the period 2004-2006, Bulgaria was in the midst of a successful recovery path characterised by rapid economic growth and low inflation. From 2001 onwards, the country experienced a positive average growth in real GDP, higher than 4%. In the meanwhile, unemployment was in a declining trend.

Following the accession to the WTO in December 1996, the Bulgarian government was implementing several economic reforms, including trade policy liberalizations. The liberalization of the trade regime was the deepest and the most comprehensive of the region.[4] Given the Bulgaria/Europe Agreement, signed in 1993, the signing partners gradually eliminated import duties and non-tariff measures on manufactured goods and services. These agreements significantly improved the access of Bulgarian exports to the EU market. In 2000, the country

[4] WTO, Trade Policy Review on Bulgaria, report by the Secretariat. WT/TPS/S/121, 2003.

was officially invited to start negotiations to accede the European Union. This spurred additional economic reforms, including trade liberalization. Bulgaria has then joined the EU in 2007. Since the beginning of this century, Bulgarian firms have been highly involved in the international trade of goods and services. Merchandise trade increased from 87% of GDP in 2001 to more than 111% in 2006.[5] Both exports and imports as a percentage of GDP grew steadily at more than 10% from 2001 to 2006.[6]

Bulgarian governments also managed to significantly liberalize the investment regime. Under the reformed legislation, foreign investors were granted equal treatment to domestic ones. No limitations were imposed on the share of foreign participation in newly formed companies, while the transfer of capital abroad had no restriction. In the meanwhile, the majority of state-owned enterprises in the manufacturing sector was privatized. The consequence of these reforms was an unprecedented inflow of FDI between 2003 and 2008. The average FDI inflow in the period reached almost 28 percent of the GDP in 2003. Even if the large bulk of FDIs was directed to the non-tradable sector, FDI in the manufacturing sector accounted for more than 5.5 percent of GDP in 2006. Interestingly, Bulgaria was one of the major recipients of FDI among the former members of the Eastern bloc joining the EU.[7] The inflow of foreign direct investment in Bulgaria throughout 2006 went up by EUR 1 billion, and reached EUR 4.5 billion or 16.8 per cent of GDP. Bulgaria's accession to the EU on 1st January 2007, intensive restructuring, and high returns on investment attracted then a large amount of financial resources in the period 2001-2006, with foreign direct investments and external loans contributing to Bulgaria's economic growth.[8]

4. Data and preliminary analysis

4.1. Data sources

The empirical analysis carried out in the following sections is mainly based on data from the Exporter Dynamics Database (EDD) compiled by the World Bank, and containing comparable information on trade flows from a group of developing and developed economies (Fernandes et al., 2016). In this paper, we focus on data from Bulgarian firms exporting manufacturing products in the period 2004-2006. The database was assembled obtaining custom-

[5] WITS Database.
[6] Exports of goods and service as percentage of GDP grew from 35% in 2001 to 47% in 2006. Imports as a percentage of GDP went from 44% to 64% in the same period.
[7] Bulgaria and Romania joined the EU in 2007. Czech Republic, Hungary, Estonia, Latvia, Lithuania, Poland, Slovakia, and Slovenia entered the Union in 2004.
[8] Bulgarian National Bank, 2007, "Economic Review," 1/2007.

level data, reporting yearly observations on the identification code of the exporting firm, HS6-96 product codes, export destinations, total value, and quantity of trade flows. The monetary value of export flows is measured in Free on Board (FOB) US Dollars (USD), therefore it does not include any cost associated with shipping and freights. Export quantities are measured in kilograms.

These very detailed export data are merged – using concordance tables across different sector classifications – with industry level information on the presence of foreign firms obtained from the Orbis database, managed by Bureau van Dijk. This database provides economic and financial data at the firm-level for Bulgaria (amongst several other countries), such as ownership status, total revenues and the firm's main sector of activity at the four-digit level of NACE classification.

4.2. Export performance

The left panel of **Table A.1** shows that in 2004, Bulgarian exports were related to 116,732 varieties (i.e. firm-product-destination triplets), which concerned about 3,868 products traded by 18,733 firms to 201 destinations. The number of varieties increased to 123,515 in 2006, which is associated with an increase in the average export value by about 6 per cent, mainly due to a positive change in the average price (i.e. unit value)[9] by about 16 per cent, as the average quantity decreased approximately by 9 per cent. These changes might be due to the entry-exit of varieties in the international market. Thus, in the right section of the table, we focus on the balanced panel of 27,464 varieties, concerning 2,278 products exported by 4,269 firms to 138 destinations, which exhibit on average larger value and quantity of export flows in 2004, while the average price remains similar, compared to the case of unbalanced panel. It is however worth noting that the positive change in revenues over time is on average larger (by about 9 per cent), and totally due to a change in unit value. Thus, to the extent that unit value is considered a proxy for product quality, we can highlight that Bulgarian varieties increased their quality over time, as incumbent varieties upgraded their quality on the one hand, and the entering (exiting) varieties were of a higher (lower) quality on the other hand.

Since in this study we focus on within-variety changes, the next summary statistics tables are based on the balanced panel of firm-product-destination triplets. In **Table A.2,** we split the sample in differentiated and non-differentiated goods according to the Rauch (1999)'s classification, to assess whether there are differences in trade outcomes linked to product

[9] In the text, we use price and unit value as synonymous, i.e. both refer to the value-quantity ratio.

characteristics. We expect that differentiated varieties are on average more expensive than the other varieties, because they are more likely to have higher quality, and therefore the changes in their unit values should mostly be due to changes in quality. First, it is worth noting that the majority of the sample concerns differentiated goods. Indeed, only about 15 per cent of varieties are homogeneous or reference-price goods, which on average exhibit smaller unit value, but larger export quantity. Moreover, while differentiated varieties follow the general trend – i.e. an increase in average revenue by 8 per cent, only caused by a change in average price – non-differentiated varieties on average exhibit a larger positive change in export value over time (by about 16 per cent), due to both price (by about 11 per cent) and quantity (by about 5 per cent) changes. Thus, while differentiated varieties seem to upgrade their quality, homogeneous and reference-price varieties appear to become less competitive over time.

Table A.3 distinguishes among final, intermediate, and capital goods, according to the BEC classification, which represent 43.2 per cent, 46.2 per cent and 10.4 per cent of incumbent export varieties, respectively. We expect that capital goods have the largest average value, as they are relatively more costly than the other product categories, and final goods exhibit on average higher revenues and prices than intermediate goods, as the former are produced through combining the latter with other factors of production. These patterns are fully reflected in this table. Moreover, it is worth noting that the value of both capital and intermediate goods on average increased by about 14 per cent in the period under observation, because of changes in both quantity and price. Conversely, the export value of final goods increased relatively less (by about 3 per cent), because of a positive change in price only, since the export quantity on average decreased. Therefore, although all product categories seem to upgrade their quality, we observe an export reallocation, in terms of quantity, from final to both intermediate and capital varieties, which suggests that Bulgaria is becoming relatively more competitive in the upstream stages of production rather than in downstream stages along the global value chain.

In **Table A.4** and **Table A.5**, we show descriptive statistics selecting trade flows with respect to export destination. In particular, we report statistics for exports to OECD and non-OECD countries in the former table, and to EU and non-EU countries in the latter table. Exports to developed economies account for about two-thirds of incumbent varieties, which on average exhibit larger export sales – in terms of both value and quantity – and higher prices. These patterns are consistent with the hypothesis that varieties exported to developed countries have higher quality than those exported to developing countries. However, it is worth noting that the revenues from varieties exported to non-OECD destinations increased on average relatively more (17% versus 5%), because of positive changes in both quantity and price. Conversely, the

quantity exported to the OECD on average fell over time, while the positive change in unit value was similar in the two geo-economic areas. Therefore, it seems that Bulgarian exports reallocated from developed to developing economies.

From Table A.5, it appears that almost two-thirds of exported incumbent varieties are oriented to the European Union, which are on average associated with higher revenues and prices, compared to varieties exported to the non-EU area. Surprisingly, over the three-year period before the accession to EU, revenues increased on average relatively less for exports towards the EU area (4% versus 19%), although changes in unit values were similar between in the two areas. Indeed, these patterns are mainly due to export quantity reallocation from EU to non-EU countries.

In **Table A.6**, we split the sample according to the initial firm size, identifying three groups of firms: small firms, medium firms and large firms, i.e. firms with initial level of export value below the 25^{th} percentile, between the 25^{th} – 75^{th} percentiles, and above the 75^{th} percentile, respectively. This table shows that the majority of exported varieties are from large firms (52.7%), only 7.2 per cent regard small firms, while the remaining share of 40.0% concern medium firms. Large firms' varieties on average exhibit a larger export value and quantity, but at a lower unit value, compared to other verities. The opposite patterns appear for small firms' varieties. Therefore, while export flows, in terms of value and quantity, are increasing in firm size, the unit value seems to be decreasing in firm size, maybe because small firms mainly sell their core varieties, whereas large firms also export additional marginal varieties, which are associated with lower unit values compared with their core varieties.

When focussing on the change over time (2004-2006), we can see that export value at the firm-product-destination level drastically increased for small firms (by about 54%), associated with an increase in both quantity (by 42%), and price (by 12%). Conversely, the export value increased relatively less for large firms (i.e. by about 7%), mainly due to a positive change in price (by 8%). Indeed, the related export quantity slightly fell (by 1%). Medium firms' varieties have a milder positive change in value (i.e. by about 3%), due to a larger decline in quantity (by 6%). Therefore, it appears that a quantity reallocation from both large and medium firms' varieties to small firms' varieties occurs over time, even if both categories exhibit positive change in prices, which might be due to variations in product quality.

4.3. Foreign presence through horizontal and vertical linkages

To obtain a proxy for the presence at the industry-level of foreign competitors within the manufacturing sector, we employ firm-level data from the Orbis database managed by Bureau van Dijk. We first identify foreign-owned firms by considering the nationality of the global ultimate owner (GUO), as defined by Orbis. Then, by using data on firm-level revenues, we measure the foreign presence at the four-digit NACE industry level as the share of foreign firms' sales in total sales (Horizontal spillover):

$$Hspill_{jt} = \left(\frac{Foreign\ firms' sales}{All\ firms' sales}\right)_{jt}$$

Moreover, using the Bulgarian input-output table at the 2-digit IO industry-level and the related concordance table with 2-digit NACE level classification, we obtain a proxy for vertical spillovers. Notice that 2-digit IO codes correspond to 2-digit NACE codes, but some 2-digit NACE codes correspond to a single 2-digit IO code (such as 10-11-12; 13-14-15; 31-32), therefore the number of IO industries (19) is smaller than the number of 2-digit NACE industries (24). Thus, we proxy the presence of foreign-owned suppliers (Forward spillover) and the presence of foreign-owned customers (Backward spillover) for each sector as follows:

$$Fspill_{st} = \sum_{u} (w_{us} * Hspill_{ut})$$

$$Bspill_{st} = \sum_{k} (w_{sk} * Hspill_{kt})$$

Where w_{us} represents the share of intermediate inputs purchased by industry *s* from industry *u*, w_{sk} is the share of intermediate inputs sold by industry *s* to industry *k*. In order to merge this information with our firm-level trade data, we convert these indexes to four-digit ISIC3 level.

The left panel of **Table A.7** displays the simple means of horizontal spillovers at the 2-digit ISIC3 level. First, it appears that horizontal spillover within the manufacturing sector is on average around 21 per cent in 2004. Interestingly, this variable reports a significant heterogeneity at the industry-level: sectors that exhibit the highest presence of foreign firms are Coke, refined petroleum products and nuclear fuel, Tobacco products, and Basic metals; whereas sectors with the lowest presence of foreign firms are Publishing, printing and reproduction of recorded media,

Machinery and equipment, and Other transport equipment. Intra-industry spillovers increased on average by 1.6 percentage points over time. However, it is worth noting that while two-thirds of sectors report an increase in the presence of foreign-owned firms (especially, Machinery and equipment, Coke, refined petroleum products and nuclear fuel, and Other non-metallic mineral products, the most), one-third of them show a decrease (especially, Tobacco products, Textiles, Basic metals).

The remaining columns of **Table A.7** show that the presence of foreign suppliers is relatively higher than the presence of foreign customers in 2004 (20.2% versus 13.8%), and this pattern holds for the majority of industries (except for Food products and beverages, Tobacco products, Coke, refined petroleum products and nuclear fuel, and Basic metals). Both vertical spillovers increase over time, but forward spillover increases (especially, Radio, television and communication equipment and apparatus, Office, accounting and computing machinery, and Basic metals) on average relatively more than backward spillover (especially, Basic metals, Radio, television and communication equipment and apparatus, and Fabricated metal products, except machinery and equipment). It is worth noting that while no industry exhibits a negative change in forward spillover, some industries report a decline in backward spillover over time (Food products and beverages, and Tobacco products).

4.4. Export spillovers from FDI: Firm-level standard approach

In order to explore the linkages between exports and inward FDI, we merge firm-product-destination export data with industry spillover data, employing the concordance table between the six-digit HS96 classification and the four-digit ISIC3 classification. **Table A.8** displays the summary statistics of the main variables used for our investigation along the whole period under analysis.

The majority of previous studies exploring export spillover from FDI are based on firm-level aggregate export data combined with industry-level information on spillover from FDI by considering the main sector of the firm. Therefore, before exploiting more disaggregate data on exports within firms, we first focus on the following "benchmark" specification which is in line with the existing firm-level literature:

$$\ln v_{ft} = \beta_1 Hspill_{st} + \beta_2 Fspill_{st} + \beta_3 Bspill_{st} + \alpha_f + \alpha_t + \varepsilon_{ft}. \quad (1)$$

Where v_{ft} is total export value of firm *f* in year *t*, while all spillover variables refer to the firm's main sector *s*, that in our context corresponds to the firm's four-digit ISIC sector with the largest export value in the period 2004-2006. We also include firm fixed-effects α_f, and time fixed-effect α_t, to control for time-invariant firm characteristics and common macroeconomic shocks across firms. The term ε_{ft} denotes the error. **Table 1** shows the results. In all specifications we cluster standard errors at the sector-level. Estimated coefficients suggest that Bulgarian manufacturing firms enjoy positive forward export spillovers and suffer negative backward export spillovers, whereas horizontal export spillovers are statistically not significant.

These firm-level results might suffer from several shortcomings. First, they do not account for product and/or destination heterogeneity. Second, we cannot determine whether the change in export value is mainly due to a change in quantity or in price (unit value), and whether the latter change is due to a variation in product quality. Finally, spillover variables for each firm are measured considering only the main sector of firms and not all the sectors the firm is involved in. In the next section, we attempt to address all these issues using detailed data on exports at the firm-product-destination level.

5. Microeconomic export spillovers from FDI

This section investigates how inward FDI influences exports within the Bulgarian manufacturing sector, by disentangling several channels and mechanisms. Section 5.1 shows an analysis at the firm-product-destination level, shedding more light on microeconomic linkages between exports and inward FDI. In section 5.2, we collapse data at the firm-level to assess whether export spillover form FDI occur within firm when considering the multi-sector measure of spillovers for each firm involved in more than one sector.

5.1. Firm-product-destination analysis

5.1.1. Export revenues: Quantity versus Price

This section explores how industry-level spillovers from FDI are related to several indicators of a firm's export performance in a given destination-product pair. We rely on the following econometric specification:

$$\ln Y_{fidt} = \gamma_1 Hspill_{st} + \gamma_2 Fspill_{st} + \gamma_3 Bspill_{st} + \alpha_{fid} + \alpha_t + \varepsilon_{fidt} \quad (2)$$

where Y_{fidt} represents total revenue (v), or alternatively, total quantity (q) and price (p) – i.e. unit value – of a specific variety, i.e. 6-digit HS96 product *i* sold by firm *f* in the country destination *d* at the year *t*. Our main explanatory variables are the industry-level spillover variables computed in the previous section. We also include year fixed-effects α_t to control for time-varying factors constant across varieties, as well as firm-product-destination fixed-effects α_{fid} to consider time-invariant characteristics related to a specific product sold by a given firm in a particular destination. ε_{fidt} denotes the error term.

The first three columns of **Table 2** display results based on an unbalanced panel of varieties, where standard errors are clustered at the industry-year level. Results show that when considering for both product heterogeneity and country heterogeneity in addition to firm heterogeneity, only export forward spillovers from FDI turn out to be positive and statistically significant, leading to an increase in export quantity and a decline in unit value.

Conversely, both horizontal and backward spillovers have no role in explaining changes in export sales, in terms of both value and quantity. However, we find evidence that backward spillovers lead to an increase in unit value. Since these findings might be affected by the entry-exit of varieties, in the following three specifications we focus on a balanced panel and we find similar results. By relying on the standard literature on quality and trade, where the unit value of a variety would proxy its quality (Schott, 2004), these findings would provide evidence of quality upgrading from backward spillover and quality downgrading from forward spillover. We further investigate on this in the following section.

5.1.2. Dissecting Quality from Unit Value

The quality of products traded between country pairs is associated with several characteristics of the trading partners. Recent studies found that richer countries consume and export higher quality products than developing ones (Hummels and Klenow; 2005, Schott; 2004). The ability of emerging markets to transition from low-quality to high-quality products is considered a signal for export success and economic development (Hallak and Sivadasan, 2014).

The recent debate on quality and trade highlights that a change in a variety's unit value does not necessarily reflect a variation in product quality since the unit value might incorporate other price determinants, such as the marginal cost of production. In the spirit of Khandelwal (2010), Khandelwal, Schott and Wei (2013) relaxe the quality equals unit value assumption

assigning higher quality to exports with higher market shares in a given destination, conditional on price. In other words, quality is considered any attribute of the good raising consumer demand other than price.

Following Khandelwal, et al. (2013), we are able to discriminate the quality component from unit value. More specifically, we first estimate the following equation:

$$\ln q_{fidt} + \sigma \ln p_{fidt} = \alpha_i + \alpha_{dt} + \xi_{fidt}. \quad (3)$$

Where q_{fidt} and p_{fidt} are respectively the quantity and the price of a 6-digit HS96 product *i* sold by firm f in the destination market *d* in year *t*. Moreover, σ represents the elasticity of substitution at the 3-digit industry level, computed as the average of country-specific elasticities estimated by Broda et al. (2006); α_i and α_{dt} are respectively product fixed effects and country-year fixed effects capturing variation across products as well as yearly country-specific demand characteristics. We obtain the natural log of quality for each product *i* sold by firm f to destination *d* as $\ln \lambda_{fidt} = \widehat{\xi_{fidt}}/(\sigma - 1)$.

Table A.9 reports the summary statistics of our estimates for product quality together with unit value. The left section of the table is based on the unbalanced panel of varieties. First, we can notice that quality represents on average a very small component of unit value for Bulgarian exported varieties. This is not surprising since we are dealing with an emerging economy, which is still one of the least developed countries in the EU. Second, while the unit value on average increased over time, quality seems to further decrease. This suggests that Bulgarian varieties would suffer competitiveness losses and quality downgrading. However, these trends might be due to the entry-exit dynamics of exported varieties, i.e. the entry of less competitive and low-quality varieties and/or the exit of more competitive and high-quality varieties in the international market. Given this, in the right section of the table we restrict our sample to the balanced panel, i.e. to trade flows of incumbent firms constantly exporting a specific product to a given destination. Our concerns are partially confirmed, since the average unit value is slightly lower and the quality is slightly higher than previously. Nevertheless, we can still observe that prices on average increased by about 9 per cent, while the average quality decreased by 10 per cent along the period 2004-2006.

When using this estimated quality as a dependent variable in equation (2), results reported in **Table 3** suggest that changes in unit values arising from vertical spillovers are not due to variations in quality, whereas horizontal spillovers are associated with a decrease in product quality. Therefore, Bulgarian varieties of lower quality are supplied to the foreign

market when facing a stronger domestic competition from foreign multinationals operating in the same sectors. On contrary, the presence of MNEs in upstream or downstream sectors does not have any significant effect on the quality of Bulgarian varieties, while it seems to influence their competitiveness. More specifically, the presence of foreign input suppliers would generate efficiency gains, as domestic firms in downstream sectors can have access to a larger number and/or quality of input varieties, whereas the presence of foreign customers seems to be associated with efficiency losses, most likely because domestic firms in upstream sectors are unable to supply multinationals.

5.2. Firm-level analysis

In this section, we collapse data at the firm level in order to investigate whether export spillovers from FDI differently occur within firm, when considering the multi-sector measure of spillovers. Unlike the standard literature on export spillovers from FDI based on firm-level data, our spillover indices account for the fact that some firms might sell several products in different sectors. In other words, each firm is not simply associated with a spillover measure of its main sector as in Table 1, but it is now associated with the average of the spillover measures of all sectors the firm is actually involved in.

Results based on the balanced panel are presented in the left section of **Table 4** and show that export value spillovers from FDI are statistically significant only via backward linkages. However, the related sign is surprisingly opposite with respect to the one estimated in Table 1, i.e. when we account for the multi-sector dimension of spillovers within firm, Bulgarian firms would increase the total export revenue, rather than decrease, thanks to a higher presence of foreign-owned firms in downstream sectors. This effect seems to be due to an increase in total quantity and a decrease in average price across varieties within firm, without any change in average quality. Moreover, we also find negative forward spillovers in terms of quantity, associated with an increase in average price across varieties within firm and without any change in average quality. Thus, these findings suggest that exporters increase their sales thanks to average competitiveness gains within firm from backward spillovers, and decrease their sales due to average competitiveness losses within firm from forward spillovers.

It is important to notice that these results might still be affected by a change in the variety (product-destination pair) mix. For example, the result regarding the increase in average price across varieties within firm from forward spillovers might be due to the entry of high-priced varieties and/or the exit of low-priced ones, rather than an actual increase in the price of firm's

incumbent varieties. Therefore, we pre-balance firm-product-destination triplets before collapsing the data at the firm-level. Results are displayed in the right panel of Table 4 and show that when excluding the hypothesis of a change in the variety mix, findings in Table 1 are confirmed, although with a slightly smaller magnitude, i.e. we still observe positive forward spillovers and negative backward spillovers on export value. Both occur mainly through the quantity channel, since the impact on average unit values appears statistically not significant. Nevertheless, when using Khandelwal, et al. (2013)'s approach to estimate product quality, we obtain evidence that incumbent exporters increase on average the quality of their incumbent exported varieties thanks to forward spillovers, and decrease it because of backward spillovers.

Therefore, the presence of foreign suppliers seems to allow firms to export additional varieties associated with lower quality, and upgrade the quality of incumbent export varieties, whereas the presence of foreign customers would lead firms to drop marginal varieties associated with lower quality and downgrade the quality of remaining incumbent varieties.

6. Robustness checks

This section provides additional investigations on our main results at the firm-product-destination level displayed in Table 2 and Table 3. More specifically, we start by exploring whether there is any difference in our findings due to product characteristics. We first run our econometric specifications splitting the sample between differentiated and non-differentiated goods, classified according to the Rauch (1999) classification. We then rely on the BEC classification, distinguishing among final, intermediate and capital goods. We then check whether our findings are driven by differences across groups of importing markets, estimating our model separately for OECD, non-OECD, EU, and non-EU countries. Finally, we also provide a sensitivity analysis by using a different measure of vertical spillovers and attempt to address the possible endogeneity of our explanatory variables. In all specifications, we focus on incumbent firms in each product-destination pair, by considering the balanced panel.

Differentiated goods versus non-differentiated goods. Following the literature investigating the role of firm-level determinants for product quality, we assess whether results are robust across different types of products. We first rely on the classification proposed by Rauch (1999), and divide HS6 products exported by Bulgarian firms in two groups: differentiated and non-differentiated goods. It is important to stress that the great majority of trade flows under observation is composed of differentiated products. Since we expect export spillovers to have a prominent role for those products that are perceived by the final consumer as not being direct

substitutes, we expect to find significant coefficients especially in the estimates employing data on differentiated products. Indeed, results in **Table 5** highlight that spillover effects exclusively concern differentiated goods and appear even more evident. Indeed, forward spillover on value and quantity is strongly confirmed for differentiated goods, but without any change in price or quality. Moreover, both horizontal and backward spillovers are now found to be negatively and significantly associated with export value, quantity, and product quality. These results suggest that Bulgarian firms suffer negative competition effects from FDI and are unable to become input suppliers for foreign-owned firms. When using data on non-differentiated goods, the only significant coefficient is the one for forward spillover, which is negatively and significantly associated with product quality. Given these findings, in the following robustness checks we focus on a balanced panel considering only differentiated goods.

Final goods, intermediate goods and capital goods. In **Table 6,** we distinguish the effects across different BEC categories: final goods, intermediate goods, and capital goods. In particular, we expect forward spillovers to be relatively stronger for final goods, while backward spillovers should be more important for intermediate goods. We find that the documented effects on export value and quantity mainly concern intermediate goods, associated however with a decrease in price from forward spillover and an increase in price from backward spillover, without any significant change in quality. In other words, producers of intermediate inputs become more (less) export integrated along the global value chains as they enjoy efficiency gains (losses) from FDI in upstream (downstream) sectors. These findings seem to suggest that foreign suppliers of intermediate inputs follow their multinational customers in Bulgaria, implying some negative effects for domestic producers of intermediates along more upstream stages of the supply chain, and positive effects for domestic producers of intermediates along more downstream stages. Conversely, Bulgarian producers of final goods are subject to quality downgrading from backward spillover. Therefore, to the extent that some finished goods represent inputs for other firms, this result confirms that when potential multinational customers settle in Bulgaria, forcing some domestic customers to exit the market, they are more likely to rely on foreign finished goods, pushing the domestic producers of finished goods to decrease their quality-upgrading investments. Similar effects seem to occur for producers of capital goods as they suffer negative backward export spillovers, in terms of both value and quantity, associated with a reduction in product quality.

OECD versus non-OECD. Spillover effects from FDI on export outcomes might be driven by demand characteristics in specific importing markets (Hallak, 2006; Bernard et al. 2007; Baldwin and Harrigan, 2011; Manova and Zhang, 2012). We expect that our results are stronger for exports oriented to emerging and developing economies, as the latter are more likely to compete with Bulgaria. Yet, at the same time, we have to take in consideration that the positioning of Bulgarian firms in the global value chain might play a role to explain our findings (Sutton, 2007). Indeed, as for other emerging economies, Bulgarian firms are expected to export intermediates for industries based in developed countries.

It is then important to distinguish trade flows with respect to the characteristics of the importing markets. In order to consider how heterogeneity across destinations affects our findings, we estimate equation 2 on data for exports to OECD countries and then compare results with those obtained using data on non-OECD destinations. Findings, reported in **Table 7**, show that trade flows to the OECD are mostly driving the results reported in Table 5

We find positive forward spillovers and negative backward spillovers – in terms of both value and quantity – only for exports to the OECD, which are respectively associated with efficiency gains and quality losses. For exports to non-OECD countries, we only find evidence of negative quality effects from backward spillovers, which are relatively larger in the magnitude. Finally, negative horizontal spillovers, in terms of revenues, are also confirmed only for OECD destinations, which are linked to a reduction in quality. However, it is worth noting that exports directed to non-OECD countries suffer larger declines in quality. Therefore, while the presence of foreign suppliers leads to an increase in efficiency for varieties oriented to developed economies, the presence of either foreign competitors or foreign customers leads to quality downgrading, especially for varieties oriented to economies similar to Bulgaria.

EU versus non-EU. Our results are expected to be more relevant for European Union destinations, as we are analysing the three years before Bulgaria joined the EU. When splitting our sample according to EU destination status in **Table 8**, we first notice that vertical spillovers, in terms of both value and quantity, mainly impact exports to the European Union, whereas horizontal spillovers affect exclusively extra-EU exports. These patterns highlight that Bulgaria was already highly vertically integrated with EU economies in the years preceding its accession to the EU, and was mainly horizontally competing with the rest of the World. In particular, we find stronger positive forward spillovers (negative backward spillovers) – in terms of both revenues and quantity – associated with efficiency gains (quality losses) for EU-oriented exports, whereas for exports to other destinations we document only a positive (negative) effect on

quality. Finally, varieties exported to non-EU destinations are negatively affected by the presence of foreign-owned competitors, in terms of value, price and quality.

Consequently, while the presence of foreign suppliers in Bulgaria leads to efficiency improvements for varieties oriented to more-integrated foreign economies, and quality upgrading for varieties directed to less-integrated foreign economies, the presence of foreign customers leads to quality downgrading of varieties oriented to both groups of countries. Finally, tougher competition from FDI determines a reduction in quality for varieties oriented to less-integrated economies.

Small Firms, Medium Firms and Large Firms. Several empirical studies on spillovers from FDI argue that the capacity to absorb more sophisticated technology arising from both horizontal and vertical linkages with multinationals might be heterogeneous across domestic firms. On the one hand, we expect that large firms are on average relatively more productive, and therefore are more likely to be positively affected by spillovers from FDI as they have the required capacity to absorb multinational knowledge (Cantwell, 1989), whereas small firms could even suffer negative spillovers, as by losing their domestic market shares, they are pushed up along the average cost curve (Aitken and Harrison, 1999; Girma, 2005). On the other hand, it could be argued that small firms are likely to benefit more from spillovers from FDI as they have a larger room for improvements compared to large firms (Findlay, 1978). Therefore, we split the sample according to the initial firm size, i.e. the firm level export value in 2004, into three groups: small firms (1^{st} quartile), medium firms (2^{nd} and 3^{rd} quartiles) and large firms (4^{th} quartile). **Table 9** displays the results.

First, it is worth noting that the findings in Table 5 mainly concern large firms' varieties, i.e. negative horizontal and backward spillovers and positive forward spillovers (in terms of both value and quantity), associated with quality downgrading from the former spillovers. Moreover, we also find evidence of quality upgrading from forward spillover. Conversely, small firms' varieties exhibit opposite effects in terms of both quantity and quality compared with those in Table 5, as well as competitiveness gains from forward spillover. Finally, for medium firms' varieties we find evidence of competitiveness gains from forward spillovers.

It is interesting to notice that forward spillovers determine a decrease in efficiency for small firms, an increase in efficiency for medium firms, and an increase in quality for large firms, which is associated with sales reallocation (in terms of quantity) from small to large firms. These results seem to be in line with the first hypothesis (Cantwell, 1989), and in particular with a recent work by Imbruno, et al. (2015) which studies theoretically and empirically (for Italy)

how the presence of foreign input suppliers can differently affect firm efficiency depending on their capacity to absorb inputs from foreign suppliers. They show that while most productive firms benefit from positive forward spillovers as they are able to use multinational inputs, the other firms might be hurt by negative forward spillovers as they would only suffer a reduction in domestic input varieties, implying business reallocation towards more productive firms. Here, we additionally find that the most productive firms can also upgrade the quality of their products owing to the presence of foreign suppliers.

Conversely, the results about both horizontal and backward spillovers seem to be more coherent with the second hypothesis (Findlay, 1978), as they generate only negative quality effects for large firms, associated with sales reallocation (in terms of quantity) from large to small firms. Therefore, it appears that the presence of foreign competitors hurt mainly their similar counterparts, i.e. the large domestic firms, as through stealing their domestic market shares would push them to reduce their (quality upgrading) R&D investments, determining a further decrease in their domestic sales at the advantage of smaller firms that are not involved in (quality upgrading) R&D activities. Similarly, the presence of foreign customers is detrimental mainly for the largest domestic input suppliers, which are more likely to be engaged in (quality upgrading) R&D activities, associated with sales reallocation (in terms of quantity) from large to small suppliers. This might occur because the majority of domestic suppliers are unable to switch to the multinational technology in order to serve foreign firms, and at the same time, suffer from the business shrinkage of their large domestic-owned customers. Consequently, the largest input suppliers are pushed to reduce their (quality upgrading) R&D investments, determining a further decrease in their domestic sales at the advantage of smaller suppliers that are not engaged with (quality upgrading) R&D activities.

Alternative vertical spillovers: inter-industry measures. So far, our measures of vertical spillovers have been computed by accounting also for intra-industry flows, as highlighted by the diagonal in the input-output matrix, in order to include potential supplier-buyer linkages within the same industry. Alfaro and Charlton (2009) document that many vertical affiliates are only visible at the four-digit level as the intermediate goods they are supplying are so close to their parent companies' final good that they appear to be the same good at the two-digit level. Since our input-output table is at the two-digit level, we prefer to consider intra-industry flows when computing forward (backward) spillovers in order to account for potential intra-industry suppliers (customers) in addition to inter-industry ones. However, when we focus only on inter-industry spillovers, coherently with the previous literature (Javorcik, 2004), in **Table 10**, we

document similar results. In addition, we also find evidence of quality upgrading from forward spillover. Thus, we can conclude that the presence of inter-industry foreign suppliers leads firms to increase exports by upgrading product quality, whereas when considering also intra-industry foreign suppliers, the quality effect vanishes.

Additional controls: Trade policy reforms. As documented in section 2, several studies focus on the impact of trade reforms on export performance, unit value and quality, finding significant results. At the same time, trade liberalisation policies might also influence the presence of foreign firms within an economy. Indeed, Du, et al. (2014) argue that it is important to control for changes in trade policies when studying spillover effects from FDI, as the results might be affected by omitted variables bias. Therefore, following their study on productivity spillovers from FDI in China, we include two additional variables in our specifications to control for import competition effect and the access to foreign intermediate inputs by the trade channel, i.e. output tariff and input tariff. Tariff data are obtained from the World Integrated Trading Solution (WITS), managed by the World Bank. Output tariff is the industry average of six-digit MFN tariffs weighted by their corresponding trade value. Following the previous literature (Amiti and Konings, 2007), input tariff is measured at the industry level, as the weighted average of output tariffs, where the weights are from Bulgarian input-output table. **Table 11** shows that our results on export spillovers from FDI are highly robust when controlling for changes in trade reforms, i.e. both the sign and the significance of coefficients in Table 5 are strongly confirmed. Although both tariff effects are not statistically significant, it is worth noting that the coefficients related to the changes in input tariff exhibit opposite signs with respect to the changes in output tariffs.

Endogeneity: IV approach. Considering that our spillover variables are measured at the industry level, and fixed effects at the firm-product-destination level are included in all specifications, our results are very unlikely to be affected by omitted variables bias or reverse causality. However, in order to address the possible endogeneity of our explanatory variables, we here rely on an instrumental variable approach.

We consider the lagged values of horizontal, backward, and forward spillover from Romanian manufacturing industries as instruments for Bulgarian spillovers. Romania is an economy having many features in common with Bulgaria since both countries are located in South-East Europe, were centrally planned economies until 1990 and then started the transition to a market economy, becoming official members of the European Union in 2007. Thus, it is likely that both countries adopted similar policies to attract FDI across industries, implying

similarities in the evolution of MNEs' presence of foreign firms over time. However, it is unlikely that Romanian spillovers at the industry level are correlated with Bulgarian firm-level export outcomes. Our identification strategy therefore relies on assuming that our dependent variables are affected by the instruments only through their correlation with the endogenous variables.

Results are reported in **Table 12**, and each of the following specifications employs firm-product-destination fixed effects and year fixed effects. They show that forward export spillovers are strongly confirmed in terms of both value and quantity, which are associated with a decrease in price without any change in quality. Conversely, the other spillover effects are less robust. We only find evidence of an increase in price from backward spillover without any change in quality; and a decrease in price from horizontal spillover, mainly due to quality downgrading. These results are in line with the findings in Table 2 and Table 3, which document efficiency gains from FDI through forward linkages, efficiency losses through backward linkages, and quality losses from horizontal spillovers.

7. Conclusion

Using detailed microeconomic trade data from Bulgaria, we investigated how inward FDI affects export performance in the context of an emerging economy, considering both potential horizontal and vertical relationships between domestic firms and foreign counterparts. Our findings show that export spillovers from FDI via horizontal, forward, and backward linkages generate heterogeneous effects across several components of the export value.

When controlling for heterogeneity at the firm-product-destination level, we find positive forward spillovers from FDI on export revenues, associated with an increase in quantity and a decline in price. Conversely, backward spillovers lead to an increase in price. While we exclude that these price changes arising from vertical spillovers are due to variations in quality, we find evidence of quality downgrading from horizontal spillovers. Thus, vertical spillovers are more likely to occur through a change in competitiveness, i.e. either in efficiency or mark-ups, implying gains from forward spillovers and losses from backward spillovers.

These results suggest that unlike Romania (Bajgar and Javorcik, 2016), Bulgaria during the period 2004-2006 was not mature enough to benefit from the presence of multinationals in order to produce and export more sophisticated varieties. Instead, Bulgarian firms are pushed to decrease their quality-upgrading investments because of tougher foreign competition and their inability to supply intermediate inputs to foreign-owned firms. As a result, a large presence of foreign competitors and customers in Bulgaria not only would harm the host economy, but could

also generate negative effects on the rest of the World, through downgrading the quality of Bulgarian exported varieties. These negative effects might occur because downstream multinationals prefer to import inputs – maybe because the majority of foreign direct investments are coming from nearby countries, such as Greece (Monastiriotis and Alegria, 2011) – or purchase inputs from foreign-owned suppliers, which are more likely to follow their customers when the host economy is emerging/developing.

Indeed, from our data it appears that the presence of upstream MNEs is larger and increases faster than the presence of downstream MNEs, which also allow domestic firms in downstream sectors to improve their competitiveness. These findings seem to concern relatively more Bulgarian exports in differentiated and intermediate goods. Interestingly, we document that the presence of foreign input suppliers leads to efficiency improvements for Bulgarian varieties oriented to OECD and EU markets, and quality upgrading for varieties oriented to extra-EU economies. Considering all these results together, we can reach the conclusion that thanks to the presence of foreign suppliers, intermediate varieties produced in Bulgaria contribute to boost the efficiency of final varieties produced in developed and more integrated economies, and upgrade the quality of final varieties produced in less integrated economies.

Finally, our results suggest that the effects are heterogeneous across firms considering their initial size. The presence of foreign suppliers benefits large-medium downstream firms and hurts the small ones, implying business reallocations towards the largest firms in downstream sectors. Conversely, the presence of foreign customers mainly hurt the largest suppliers in upstream sectors, generating business reallocation towards the smallest suppliers. Similarly, the presence of foreign competitors is mostly detrimental for large firms within the same sector, generating business reallocation towards small firms. Considering the heterogeneous firms literature, these results indicate that while foreign suppliers contribute positively to the aggregate efficiency through business reallocation in Bulgaria, foreign customers and foreign competitors would contribute negatively.

Following our findings on Bulgaria, domestic policy-makers should define policies oriented to attract FDI in upstream sectors, as they generate the largest positive effects in the economy. At the same time, international policy-makers should emphasise the importance to establish intermediate production affiliates in an emerging country, like Bulgaria, as other countries would also benefit along international supply chains. Moreover, policies oriented to attract FDI in downstream sectors need to be complemented with innovation policies aimed at decreasing the costs of quality-enhancing investments for Bulgarian firms, which would increase

their ability to supply multinationals and face the competition of MNEs operating in the same sectors.

To conclude, our findings suggest that a thorough attention should be devoted to the various mechanisms behind export spillovers from FDI in the host economy, since their relevance and magnitude might depend on the position of domestic-owned firms along the global value chain with respect to foreign multinationals.

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TABLES

Table 1: Firm linkage between exports and FDI spillovers (Benchmark)

VARIABLES	Unbalanced panel	Balanced panel
	Export value	Export value
	ln *v*	ln *v*
	(1)	(2)
Hspill	0.0675	0.239
	(0.357)	(0.396)
Fspill	8.053***	7.088***
	(1.658)	(1.905)
Bspill	-7.232***	-6.197***
	(1.973)	(1.957)
Observations	24,633	17,001
R-squared	0.872	0.870
Firm FE	YES	YES
Year FE	YES	YES

Standard errors clustered at the sector level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: FDI spillovers are related to the firm's main sector, identified as firm's sector with the largest firm exports along the entire period.

Table 2: Firm-Product-Destination linkage between exports and FDI spillovers

VARIABLES	Unbalanced panel			Balanced panel		
	Export value	Export quantity	Export price	Export value	Export quantity	Export price
	ln *v*	ln *q*	ln *p*	ln *v*	ln *q*	ln *p*
	(1)	(2)	(3)	(4)	(5)	(6)
Hspill	-0.417	-0.327	-0.0896	-0.527	-0.451	-0.0761
	(0.332)	(0.359)	(0.115)	(0.380)	(0.395)	(0.123)
Fspill	3.035**	4.098***	-1.063**	1.587	2.854**	-1.267**
	(1.236)	(1.258)	(0.496)	(1.247)	(1.235)	(0.568)
Bspill	-0.742	-2.463	1.721**	1.889	0.129	1.761*
	(1.799)	(1.536)	(0.830)	(1.874)	(1.511)	(1.039)
Observations	171,698	171,698	171,698	82,392	82,392	82,392
R-squared	0.908	0.929	0.931	0.904	0.927	0.940
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Firm-Product-Destination linkage between exports and FDI spillovers: Unit value versus Quality

VARIABLES	Unbalanced panel		Balanced panel	
	Export price	Export quality	Export price	Export quality
	ln *p*	ln λ	ln *p*	ln λ
	(1)	(2)	(3)	(4)
Hspill	-0.0975	-0.390**	-0.0819	-0.465**
	(0.131)	(0.163)	(0.137)	(0.218)
Fspill	-1.063**	-0.262	-1.271**	-0.854
	(0.504)	(0.834)	(0.573)	(0.970)
Bspill	1.834**	-0.152	1.843*	0.180
	(0.851)	(1.698)	(1.060)	(1.980)
Observations	166,366	166,366	80,220	80,220
R-squared	0.931	0.802	0.940	0.799
Firm-prod-dest FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4: Firm linkage between exports and multi-sector spillovers from FDI

VARIABLES	Balanced panel (without pre-balancing)				Balanced panel (with pre-balancing)			
	Export value (total)	Export quantity (total)	Export price (average)	Export quality (average)	Export value (total)	Export quantity (total)	Export price (average)	Export quality (average)
	ln *v*	ln *q*	ln *ap*	ln *a λ*	ln *v*	ln *q*	ln *ap*	ln *a λ*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hspill	0.00296	0.00780	0.0431	0.0251	-0.219	-0.00387	-0.128	-0.344
	(0.338)	(0.410)	(0.277)	(0.227)	(0.488)	(0.510)	(0.216)	(0.283)
Fspill	-0.729	-5.052***	7.142***	-0.537	6.324***	6.704***	-0.436	1.449*
	(0.960)	(1.064)	(0.718)	(0.644)	(1.530)	(1.579)	(0.723)	(0.869)
Bspill	2.886**	5.552***	-4.128***	-0.643	-4.636**	-5.331**	0.545	-2.600***
	(1.163)	(1.280)	(0.864)	(0.743)	(2.276)	(2.398)	(0.789)	(0.995)
Observations	17,055	17,055	17,055	16,884	12,807	12,807	12,807	12,630
R-squared	0.868	0.909	0.898	0.713	0.929	0.958	0.975	0.878
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the firm level in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firms after balancing firm-product-destinations

Table 5: Firm-Product-Destination linkage between exports and FDI spillovers by Rauch, (1999)'s product classification

VARIABLES	Differentiated goods				Non-Differentiated Goods			
	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality
	ln *v*	ln *q*	ln *p*	ln *λ*	ln *v*	ln *q*	ln *p*	ln *λ*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hspill	-1.021**	-1.032**	0.0104	-0.479**	0.126	0.181	-0.0549	-0.219
	(0.414)	(0.518)	(0.178)	(0.208)	(0.304)	(0.180)	(0.168)	(0.291)
Fspill	4.026***	4.903***	-0.876	0.651	2.479	3.345	-0.866	-4.416**
	(1.106)	(1.172)	(0.569)	(0.827)	(3.774)	(3.386)	(1.047)	(2.219)
Bspill	-3.696**	-4.155**	0.459	-3.851**	3.983	1.534	2.449	5.037
	(1.805)	(1.848)	(0.925)	(1.649)	(3.242)	(2.683)	(1.802)	(3.080)
Observations	67,218	67,218	67,218	67,218	11,040	11,040	11,040	11,040
R-squared	0.896	0.919	0.936	0.799	0.929	0.950	0.945	0.798
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1. Note: balanced panel of firm-product-destination

Table 6: Firm-Product-Destination linkage between exports and FDI spillovers by BEC's product classification

VARIABLES	Final goods				Intermediate goods				Capital goods			
	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Hspill	-0.514	-0.734	0.220	-0.427	-1.420***	-1.509**	0.0892	-0.523	0.144	0.0335	0.111	0.580
	(0.642)	(0.839)	(0.472)	(0.504)	(0.546)	(0.693)	(0.277)	(0.348)	(0.741)	(0.762)	(0.336)	(0.488)
Fspill	3.153	3.359	-0.206	-0.463	5.524***	7.389***	-1.865**	-1.074	1.539	3.969	-2.429	5.756
	(2.775)	(3.074)	(1.422)	(1.821)	(1.680)	(1.536)	(0.726)	(1.259)	(5.586)	(4.921)	(2.135)	(4.789)
Bspill	-3.539	-1.538	-2.001	-5.546**	-5.758**	-7.490***	1.732*	-2.096	-33.90***	-32.14**	-1.762	-32.73*
	(3.367)	(4.031)	(1.799)	(2.452)	(2.882)	(3.526)	(1.527)	(1.834)	(12.83)	(12.49)	(5.680)	(17.35)
Observations	30,714	30,714	30,714	30,714	28,065	28,065	28,065	28,065	8,424	8,424	8,424	8,424
R-squared	0.896	0.896	0.944	0.815	0.895	0.935	0.928	0.784	0.882	0.923	0.938	0.810
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1 Note: balanced panel of firm-product-destinations, considering only differentiated goods.

Table 7: Firm-Product-Destination linkage between exports and FDI spillovers by OECD destination

VARIABLES	OECD				Non-OECD			
	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hspill	-0.634*	-0.765	0.132	-0.465**	-1.360	-1.007	-0.353	-0.757*
	(0.366)	(0.475)	(0.205)	(0.219)	(0.966)	(0.959)	(0.265)	(0.425)
Fspill	4.716***	6.380***	-1.664***	0.566	0.446	-0.547	0.993	1.540
	(1.176)	(1.200)	(0.507)	(0.795)	(2.180)	(2.045)	(1.180)	(1.498)
Bspill	-6.041***	-7.018***	0.977	-4.010**	3.088	3.877	-0.789	-4.442*
	(2.118)	(2.023)	(0.836)	(1.607)	(2.984)	(2.976)	(1.656)	(2.440)
Observations	46,863	46,863	46,863	46,863	20,019	20,019	20,019	20,019
R-squared	0.886	0.915	0.934	0.796	0.910	0.929	0.935	0.809
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firm-product-destinations, considering only differentiated goods..

Table 8: Firm-Product-Destination linkage between exports and FDI spillovers by EU destination

VARIABLES	EU				Non-EU			
	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hspill	-0.349	-0.522	0.173	-0.256	-1.973**	-1.572	-0.401*	-1.087**
	(0.356)	(0.447)	(0.219)	(0.225)	(1.000)	(0.979)	(0.228)	(0.462)
Fspill	4.861***	6.767***	-1.906***	-0.169	1.405	0.251	1.154	2.773*
	(1.352)	(1.289)	(0.580)	(0.926)	(2.358)	(2.440)	(1.035)	(1.535)
Bspill	-7.682***	-8.324***	0.642	-4.314**	3.609	3.861	-0.252	-4.102*
	(2.188)	(2.035)	(1.111)	(1.931)	(3.073)	(3.313)	(1.450)	(2.186)
Observations	44,574	44,574	44,574	44,574	22,308	22,308	22,308	22,308
R-squared	0.890	0.915	0.931	0.795	0.907	0.928	0.942	0.810
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firm-product-destinations, considering only differentiated goods..

Table 9: Firm-Product-Destination linkage between exports and FDI spillovers by firm size

VARIABLES	Small Firms				Medium Firms				Large Firms			
	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Hspill	1.711	2.482**	-0.772	-0.401	0.624	0.421	0.203	0.00677	-2.483***	-2.453***	-0.0296	-0.852***
	(1.414)	(1.255)	(0.575)	(0.797)	(0.633)	(0.594)	(0.271)	(0.387)	(0.518)	(0.656)	(0.210)	(0.216)
Fspill	-8.100	-10.66**	2.565*	-0.309	-0.575	2.592	-3.167***	-2.174	8.464***	8.558***	-0.0947	2.202***
	(5.020)	(4.683)	(1.502)	(2.546)	(2.429)	(2.330)	(1.156)	(1.654)	(1.876)	(1.997)	(0.546)	(0.829)
Bspill	9.225	11.88**	-2.660	-1.078	1.737	-0.870	2.607	-1.887	-10.12***	-10.10***	-0.0155	-5.002***
	(5.612)	(5.457)	(1.896)	(2.710)	(3.277)	(3.351)	(1.792)	(2.923)	(3.417)	(3.387)	(0.920)	(1.411)
Observations	5,013	5,013	5,013	5,013	25,332	25,332	25,332	25,332	36,873	36,873	36,873	36,873
R-squared	0.826	0.900	0.947	0.834	0.896	0.926	0.937	0.784	0.890	0.912	0.931	0.801
Firm-prod-dest FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1 Note: balanced panel of firm-product-destinations, considering only differentiated goods.

Table 10: Firm-Product-Destination linkage between exports and Inter-industry vertical spillovers

VARIABLES	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)
Hspill	-1.122***	-1.147**	0.0247	-0.442**
	(0.400)	(0.501)	(0.182)	(0.212)
Fspill	5.712***	6.026***	-0.314	2.323*
	(1.636)	(1.893)	(0.806)	(1.347)
Bspill	-6.840*	-6.047	-0.794	-8.932**
	(3.928)	(4.343)	(1.660)	(3.671)
Observations	67,218	67,218	67,218	67,218
R-squared	0.896	0.920	0.936	0.800
Firm-prod-dest FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firm-product-destinations, considering only differentiated goods.

Table 11: Firm-Product-Destination linkage between exports, FDI spillovers and trade reforms

VARIABLES	Export value	Export quantity	Export price	Export quality
	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)
Hspill	-1.060***	-1.079**	0.0189	-0.458**
	(0.400)	(0.501)	(0.178)	(0.214)
Fspill	5.263***	6.413***	-1.150	-0.642
	(1.574)	(1.622)	(0.861)	(1.353)
Bspill	-4.378**	-4.995***	0.617	-3.071*
	(2.001)	(1.896)	(0.997)	(1.656)
Output tariff	1.455	1.846	-0.391	-0.806
	(1.824)	(1.843)	(0.618)	(1.130)
Input tariff	-22.56	-27.69	5.136	21.36
	(15.52)	(17.93)	(8.786)	(14.09)
Observations	67,209	67,209	67,209	67,209
R-squared	0.896	0.920	0.936	0.800
Firm-prod-dest FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors clustered at the sector-year level in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firm-product-destinations, considering only differentiated goods.

Table 12: Firm-Product-Destination linkage between exports and FDI spillovers: IV Approach

2^{nd} Stage				
	Export value	Export quantity	Export price	Export quality
VARIABLES	ln v	ln q	ln p	ln λ
	(1)	(2)	(3)	(4)
Hspill	-0.0450	1.332	-1.377**	-1.480*
	(1.357)	(1.307)	(0.618)	(0.800)
Fspill	7.150**	10.89***	-3.738***	-1.987
	(3.504)	(3.403)	(1.375)	(1.836)
Bspill	-2.533	-8.366	5.833**	-2.141
	(5.824)	(5.645)	(2.499)	(3.193)
Observations	44,812	44,812	44,812	44,812
R-squared	0.934	0.949	0.957	0.866
Firm-prod-dest FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Kleibergen-Paap Wald F	1136.76			
Cragg-Donald Wald F	601.72			
P-val. Anderson-Rubin Wald	0.0004			

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: balanced panel of firm-product-destinations, considering only differentiated goods.

Appendix

Table A.1: Descriptive statistics at the firm-product-destination level

	Unbalanced panel			Balanced panel		
	2004	**2005**	**2006**	**2004**	**2005**	**2006**
	Mean	Mean	Mean	Mean	Mean	Mean
Value (ln)	6.90	6.88	6.96	8.62	8.85	8.71
Quantity (ln)	4.92	4.82	4.83	6.65	6.85	6.65
Price (ln)	1.97	2.06	2.13	1.96	2.00	2.05
N. of Firms	18733	18755	18756	4269	4269	4269
N. of Products	3868	3868	3868	2278	2278	2278
N. of Destinations	201	201	201	138	138	138
N. of Firms/Prod./Destin.	116732	119583	123515	27464	27464	27464

Table A.2: Descriptive statistics at the firm-product-destination level by Rauch, (1999)'s product classification

	Differentiated goods			Non-Differentiated goods		
	2004	**2005**	**2006**	**2004**	**2005**	**2006**
	Mean	Mean	Mean	Mean	Mean	Mean
Value (ln)	8.65	8.87	8.73	8.42	8.73	8.58
Quantity (ln)	6.52	6.71	6.52	7.34	7.60	7.39
Price (ln)	2.13	2.16	2.21	1.08	1.13	1.19
N. of Firms/Prod./Destin.	22552	22552	22552	4258	4258	4258

Table A.3: Descriptive statistics at the firm-product-destination level by BEC's product classification

	Final goods			Intermediate goods			Capital goods		
	2004	**2005**	**2006**	**2004**	**2005**	**2006**	**2004**	**2005**	**2006**
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Value (ln)	8.77	9.00	8.80	8.37	8.61	8.51	8.99	9.20	9.13
Quantity (ln)	6.79	7.00	6.75	6.61	6.81	6.65	6.23	6.39	6.29
Price (ln)	1.97	2.00	2.05	1.76	1.79	1.86	2.76	2.81	2.83
N. of Firms/Prod./Destin.	12708	12708	12708	11871	11871	11871	2880	2880	2880

Table A.4: Descriptive statistics at the firm-product-destination level by OECD destination

	OECD			Non-OECD		
	2004 Mean	**2005** Mean	**2006** Mean	**2004** Mean	**2005** Mean	**2006** Mean
Value (ln)	9.07	9.30	9.12	7.72	7.98	7.89
Quantity (ln)	6.89	7.08	6.85	6.22	6.44	6.29
Price (ln)	2.19	2.21	2.28	1.50	1.54	1.61
N. of Firms/Prod./Destin.	18306	18306	18306	8949	8949	8949

Table A.5: Descriptive statistics at the firm-product-destination level by EU destination

	EU			Non-EU		
	2004 Mean	**2005** Mean	**2006** Mean	**2004** Mean	**2005** Mean	**2006** Mean
Value (ln)	8.91	9.13	8.95	8.12	8.40	8.31
Quantity (ln)	6.77	6.95	6.71	6.50	6.73	6.58
Price (ln)	2.15	2.18	2.24	1.63	1.67	1.73
N. of Firms/Prod./Destin.	17405	17405	17405	9850	9850	9850

Table A.6: Descriptive statistics at the firm-product-destination level Firm size

	Small Firms			Medium Firms			Large Firms		
	2004 Mean	**2005** Mean	**2006** Mean	**2004** Mean	**2005** Mean	**2006** Mean	**2004** Mean	**2005** Mean	**2006** Mean
Value (ln)	6.92	7.47	7.46	7.80	8.01	7.83	9.48	9.69	9.55
Quantity (ln)	4.88	5.40	5.30	5.93	6.10	5.87	7.45	7.63	7.44
Price (ln)	2.04	2.06	2.16	1.87	1.91	1.96	2.03	2.06	2.11
N. of Firms/Prod./Destin.	2,000	2,000	2,000	10,980	10,980	10,980	14,484	14,484	14,484

Table A.7: Spillovers from FDI

ISIC Rev.3		*Hspill*			*Fspill*			*Bspill*		
2-digit code	**Description**	2004	2005	2006	2004	2005	2006	2004	2005	2006
15	Manufacture of food products and beverages	0.250	0.271	0.251	0.129	0.130	0.131	0.192	0.191	0.185
16	Manufacture of tobacco products	0.733	0.695	0.659	0.129	0.130	0.130	0.193	0.192	0.185
17	Manufacture of textiles	0.224	0.193	0.197	0.167	0.171	0.174	0.144	0.147	0.149
18	Manufacture of wearing apparel; dressing and dyeing of fur	0.070	0.080	0.124	0.175	0.176	0.179	0.117	0.119	0.123
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.088	0.087	0.111	0.198	0.196	0.204	0.108	0.110	0.115
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.091	0.103	0.114	0.191	0.199	0.207	0.117	0.121	0.131
21	Manufacture of paper and paper products	0.212	0.211	0.234	0.202	0.199	0.202	0.119	0.119	0.122
22	Publishing, printing and reproduction of recorded media	0.004	0.012	0.055	0.191	0.190	0.191	0.076	0.076	0.079
23	Manufacture of coke, refined petroleum products and nuclear fuel	0.888	0.951	0.963	0.023	0.026	0.026	0.063	0.068	0.069
24	Manufacture of chemicals and chemical products	0.239	0.237	0.236	0.168	0.171	0.183	0.157	0.158	0.169
25	Manufacture of rubber and plastics products	0.212	0.222	0.239	0.257	0.277	0.296	0.128	0.138	0.146
26	Manufacture of other non-metallic mineral products	0.096	0.119	0.162	0.208	0.215	0.230	0.130	0.135	0.142
27	Manufacture of basic metals	0.280	0.273	0.262	0.219	0.252	0.273	0.290	0.330	0.356
28	Manufacture of fabricated metal products, except machinery and equipment	0.070	0.067	0.089	0.250	0.276	0.295	0.142	0.156	0.166
29	Manufacture of machinery and equipment n.e.c.	0.063	0.102	0.147	0.246	0.276	0.296	0.150	0.162	0.171
30	Manufacture of office, accounting and computing machinery	0.245	0.265	0.241	0.270	0.310	0.330	0.136	0.152	0.160
31	Manufacture of electrical machinery and apparatus n.e.c.	0.208	0.230	0.217	0.255	0.288	0.305	0.142	0.155	0.162
32	Manufacture of radio, television and communication equipment and apparatus	0.165	0.178	0.173	0.275	0.316	0.335	0.144	0.161	0.169
33	Manufacture of medical, precision and optical instruments, watches and clocks	0.112	0.118	0.120	0.255	0.285	0.302	0.131	0.145	0.154
34	Manufacture of motor vehicles, trailers and semi-trailers	0.192	0.197	0.190	0.219	0.232	0.251	0.163	0.170	0.186
35	Manufacture of other transport equipment	0.028	0.027	0.027	0.204	0.221	0.239	0.096	0.105	0.112
36	Manufacture of furniture; manufacturing n.e.c.	0.122	0.118	0.132	0.217	0.225	0.240	0.108	0.112	0.121
	Manufacturing	**0.209**	**0.216**	**0.225**	**0.202**	**0.217**	**0.228**	**0.138**	**0.146**	**0.153**

Table A.8: Summary statistics at firm-product-destination level over the period 2004-2006

Variable	Obs	Mean	Std. Dev.
Value (ln)	359,830	6.91	3.10
Quantity (ln)	359,830	4.85	3.33
Price (ln)	359,830	2.06	1.82
Horizontal Spillover	359,830	0.16	0.14
Froward Spillover	359,830	0.21	0.06
Backward Spillover	359,830	0.15	0.04

Table A.9: Summary statistics at firm-product-destination level: Unit value versus Quality

	Unbalanced panel			**Balanced Panel**		
	2004	**2005**	**2006**	**2004**	**2005**	**2006**
	Mean	Mean	Mean	Mean	Mean	Mean
Price (ln)	2.00	2.08	2.16	1.98	2.02	2.07
Quality (ln)	0.03	-.002	-.024	0.33	0.32	0.23
N. of Firms/Prod./Destin.	113419	116116	119870	26740	26740	26740