

Exporters' stargate: supplying multinationals and entry into new markets

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Abstract

While trade economists have made substantial progress in describing firm-level export dynamics, relatively little is known about what determines which firms succeed in exporting and which do not. This study uses matched firm and customs panel data from Romania to examine how being a supplier to multinationals affects export performance of domestic firms. The results suggest that stronger presence of foreign firms in downstream industries is related to a higher probability of entry into exporting and to a larger number of exported products and export destinations. Only a small part of these effects seems to be due to productivity spillovers. The effect of foreign presence in a firm's own industry appears to be negative. Foreign presence does not seem to affect domestic exporters in terms of unit values or exports per product-destination pair. The main results of the study are in line with descriptive evidence from World Bank Enterprise Surveys.

1 Introduction

Stargate was a 1990s film and television series about a mysterious circular device left on the Earth by an alien civilisation, which allows instantaneous transportation to faraway corners of the universe. In this paper, we ask whether multinational firms can play a role of a stargate for their suppliers in an emerging economy. In other words, does being a supplier to a foreign affiliate help domestic firms reach new foreign markets or start exporting new products?

There are several channels through which supplying inputs to multinationals may help domestic firms start exporting, enter new export destinations or start exporting new products. First, several studies have shown that supplying multinationals increases the productivity of suppliers¹. We also know that more productive firms are more likely to export or export more products or to more destinations, because they are better able to cover the fixed costs related to these activities². It is therefore possible that, through improved

¹See for instance [Javorcik \(2004\)](#). See the literature review in the next section for more examples.

² [Melitz \(2003\)](#) offers theoretical framework for thinking about the relationship between exporting and productivity. See for example [Bernard and Jensen \(1999\)](#) for empirical evidence on exporting and productivity and [Eaton et al. \(2011\)](#) for analysis of the relationship between productivity and the number of export markets.

productivity, supplying multinational companies also leads to expansion of export activity by domestic firms.

Second, foreign-owned firms are likely to require their local suppliers to achieve international standard in terms of quality, consistency and reliability, providing the motivation and potentially also the know-how necessary to achieving it. Once the domestic suppliers manage to do so, they may realize that entering export markets or expanding their export operations is a natural next step and way of capitalizing on this achievement.

Third, for the reasons outlined in the previous paragraph, becoming a supplier to a multinational may serve as a reputational signal in the matching process with potential foreign buyers³.

Fourth, the multinationals may initiate development of new products, which their suppliers produce for them and subsequently add to their export portfolio. The importance of ability to provide highly specialized products is nicely reflected in an interview given by a manager of a Romanian car part manufacturer supplying a multinational to World Bank consultants: “About 10% of Romanian firms are focused on specific products, the rest are assembly line. ... To identify potential [foreign] partners I need to have a base to start with – provide highly specialized products.”

Fifth, the domestic firms may draw on the international networks of the multinationals which they supply to learn about potential buyers in foreign markets.

Finally, firms supplying the local subsidiary of a multinational company may start exporting to subsidiaries of the same multinational in other countries. According to an interviewed manager of a Romanian plant owned by an automotive multinational, “in order to be accredited as official suppliers, firms need to satisfy quality requirements for all the firm’s plants throughout Europe.” This statement suggests that once a domestic firm manages to meet the requirements for supplying the local subsidiary of a multinational, exporting to its other subsidiaries may sometimes require relatively limited additional entry costs.

To examine if supplying foreign firms indeed boosts the export performance of domestic firms, we rely on annual panel data describing all Romanian firms with more than 20 employees and a subsample of smaller firms for the years 2005-2010. The data are matched to detailed customs data recording Romanian exports in the period 2006-2011 at the level of firm-product-destination-year combinations. Our empirical strategy relies on the assumption that domestic firms are more likely to supply to multinational companies when foreign firms account for a larger share of output in their downstream industries, i.e. the industries to which their industry supplies inputs according to the Romanian input-output matrix.

In addition to foreign presence in downstream industries, the exporting activity of domestic firms may also be positively or negatively affected by the presence of multinationals in their own industry. The positive effect may come from increased competition forcing the domestic firms to innovate and cut costs or improve quality. The domestic firms may also imitate their foreign competitors, hire their former employees, benefit from their reputation and learn from them about profitability of new markets. On the negative side, foreign firms compete with domestic ones both in the domestic market for their output and in the factor markets, in particular markets for skilled labour. This can hurt the profitability of domestic firms and consequently

³See [Araujo and Ornelas \(2007\)](#) for a model of such process.

their ability to invest, inovate and compete in international markets. To examine these effects, we look at the impact of the foreign presence in a firm’s own industry.

We regress a range of export performance measures on foreign presence in downstream industries and in own industry, lagging all explanatory variables by 1 year. We include year dummies and control, depending on outcome variable, for firm or firm-product-destination fixed effects.

Our results suggest that supplying multinationals indeed serves as an important gateway to international markets. Stronger presence of foreign firms in downstream industries is related to a higher probability of entry into exporting and to a larger number of exported products and export destinations. Foreign presence in own industry seems to have a negative effect. Although we also find evidence of productivity spillovers from foreign firms in downstream industries, controlling for firm-level productivity explains away only a small part of the effect on exporting. It therefore seems that the export spillovers from supplying multinationals are not a mere side-effect of productivity increase but an additional source of spillovers, beyond and above the productivity spillovers.

We do not find any evidence of domestic exporters upgrading the quality of their exported products as a result of supplying multinationals. Similarly, we do not find any effect at the intensive margin — sales of a particular product to a particular location. These results together with those described in the previous paragraph indicate that export spillover channels related to information, international networks, development of new products or reputation are likely more important than those related to productivity and product quality.

In the past 20 years, research on exporters has made substantial progress in describing firm-level export dynamics. However, our knowledge is still limited as to what determines which firms succeed in exporting and which do not. This question has significant importance for policy, especially in case of the factors under policy makers’ control. In this paper we attempt to analyse one such factor — FDI in downstream industries. We also hope to add to the literature on uncertainty and networks in exporting by proposing supplying multinationals as an important additional way of overcoming the informational constraints inherent in trading over large distances. [Belloc and Di Maio \(2011\)](#) review a number of measures commonly used by policy makers to promote exporting. We show that targeted promotion of FDI inflows is potentially another feasible and actionable export promotion strategy⁴.

We discuss related literature in [Section 2](#). In [Section 3](#), we provide a brief overview of recent trends in Romanian FDI inflows and exports, and we then present some descriptive evidence on supplying multinationals in Romania based on the World Bank Enterprise Surveys. We describe our data and empirical strategy in [Section 4](#). In [Section 5](#), we present our results. Finally, [Section 6](#) concludes.

⁴See [Harding and Javorcik \(2011\)](#) for evidence on effectivity of sector-specific FDI promotion.

2 Related literature

While the evidence on the effect of FDI on exporting is limited, there is now a large amount of empirical research considering separately either effects of FDI on domestic firms or firm-level export dynamics. The literature on FDI spillovers studies mostly the effect that presence of multinationals has on the productivity of indigenous firms. The largest number of studies focus on the horizontal spillovers within the same industry. The domestic firms can learn from their foreign-owned competitors by observing them, directly interacting them or employing their former employees. Presence of FDI may also increase the competitive pressure on domestic firms, forcing them to upgrade their technology, improve their efficiency or look for ways of cutting their costs. But the increased competition may also have a negative effect on the domestic producers, if it decreases their market share and forces them to spread their fixed costs over a smaller amount of output. The empirical evidence on horizontal productivity spillovers is mixed. [Haskel et al. \(2007\)](#) and [Keller and Yeaple \(2009\)](#) estimate positive coefficients on horizontal FDI, but [Harrison and Aitken \(1999\)](#), [Javorcik \(2004\)](#), [Javorcik and Spatareanu \(2008, 2011\)](#) all find insignificant or even negative results. [Poole \(forthcoming\)](#) provides a rare example of empirical evidence on a concrete channel through which the spillovers may take place. Using matched employer-employee data from Brazil, she shows that when domestic firms employ former employees of multinationals, wages of incumbent workers in these firms increase, possibly reflecting a productivity increase. While foreign-owned firms have incentives to prevent their competitors in the same industry from learning from them, they may be more motivated to transfer knowledge to their suppliers in upstream industries. By doing so, they gain access to higher quality and cheaper inputs. Indeed, empirical studies have been much more successful in finding inter-industry (vertical) spillovers than spillovers within industries (horizontal). These include studies by [Javorcik \(2004\)](#), [Kugler \(2006\)](#), [Blalock and Gertler \(2008\)](#), [Javorcik and Spatareanu \(2008\)](#) and [Javorcik and Spatareanu \(2011\)](#). Our present work aims to contribute to the literature on FDI spillovers by considering other dimensions of firm performance than productivity, namely those related to exporting.

The last 15 years have also seen remarkable progress in our understanding of firm-level export dynamics. It has established several stylized facts which have been repeatedly found in many studies. First, only a small minority of firms export ([Bernard et al., 2007](#)). Second, exporters are larger and more productive than non-exporters. This is primarily because the more productive firms self-select into exporting ([Bernard and Jensen, 1999](#)). Third, total exports are heavily skewed towards a small number of large exporters selling many products to many destinations ([Bernard et al., 2007, 2010](#); [Goldberg et al., 2010](#); [Freund and Pierola, 2012](#)). The top 1% of exporters account on average for more than than half of total exports ([Cebeci et al., 2012](#)). Fourth, short-term changes in aggregate exports occur at the within-firm intensive margin, but in the long term or in a cross-section, countries which export more do so because of a larger number of exporters rather than larger exports per exporter ([Eaton et al., 2011, 2004](#); [Cebeci et al., 2012](#)). Fifth, there is substantial export entry and exit. The new entrants tend to be small and often less than half of them still export after two years ([Bernard and Jensen, 2004](#); [Eaton et al., 2007](#); [Iacovone and Javorcik,](#)

2010).

The last stylized fact points to a substantial uncertainty inherent in exporting activity. The role of uncertainty and information in exporting has been highlighted in research for some time. [Rauch and Watson \(2003\)](#) propose a model of matching between less developed country suppliers and potential buyers from developed countries. A small initial order serves to disclose information on the quality of the supplier. The partnership then either terminates or quickly expands. [Araujo and Ornelas \(2007\)](#) pursue similar ideas, with emphasis on imperfect contracts and reputation building. [Albornoz et al. \(2012\)](#) explain the seeming contradiction between repeatedly estimated large sunk costs related to entry into exporting ([Bernard and Jensen, 1999](#); [Das et al., 2007](#)) and the large number of small and short-lived export entries. They suggest that firms learn how good exporters they are only once they start exporting. They are willing to pay the sunk costs despite low initial export sales and high probability of failure because doing so gives them a chance that they succeed and subsequently rapidly expand their exports. Research often highlights networks of personal or professional contacts as an important means of the informational constraints on exporting. [Rauch \(1999\)](#) shows that language and colonial ties are related to larger bilateral trade flows in differentiated products. [Rauch and Trindade \(2002\)](#) then document the example of networks between overseas ethnic Chinese communities. See also [Rauch \(2001\)](#) for a useful summary.

Besides uncertainty and informational constraints, quality seems to be another important determinant of the ability of firms to enter foreign markets. [Brooks \(2006\)](#), shows that Colombian industries in which exporting plants export a larger share of their output are the ones where unit values of exports are closer to those of exports by G7 countries. [Iacovone and Javorcik \(2012\)](#) document quality upgrading taking place prior to products being introduced into export markets by Mexican producers. [Hallak and Sivadasan \(2009\)](#) develop a model of international trade with heterogeneous firms and minimum quality requirements and show that Indian and U.S. exporters produce at higher unit values than non-exporters.

There are only a few microeconomic empirical studies of the effect of FDI on exporting. [Aitken et al. \(1997\)](#) find that Mexican manufacturing plants are more likely to export when there is a higher concentration of exporting activity by multinationals in the same industry and region. They also find an effect of a higher concentration of exporting activity in general, but it is not robust and seems to be driven by a handful of resource-intensive industries. [Greenaway et al. \(2004\)](#) study the impact of MNE presence on export participation and exported share of output of UK firms. They use three variables, varying across sectors, to capture different potential channels for export spillovers. The first one is R&D expenditure by MNEs, measuring the potential for knowledge spillovers. The second one is the MNE share in sectoral employment, measuring the competitive pressure by multinationals. The third one is the MNE share in the total exports of a sector, intended to measure information externalities in the form of information about exporting and foreign markets. All three variables show positive effect on export participation of local firms, but only the first seems to positively affect their export propensity. Overall, domestic activity of MNEs seems to produce stronger spillover than their exporting activity. This is what we would expect if supplier-buyer relationships are the key spillover channel. [Kneller and Pisu \(2007\)](#) similarly study export spillovers from MNEs located

in the United Kingdom, and they consider not only horizontal but also vertical spillovers. In their basic specification, they do not find any effect of MNE presence on export participation of domestic firms, but they find a strong positive effect of MNEs in downstream sectors on the export propensity of domestic firms. When they split the MNEs in the same industry by their export intensity, they find positive horizontal spillovers from export-intensive MNEs, but still no horizontal effect of host market-oriented MNEs. While these studies provide useful suggestive evidence of positive export spillovers from FDI, they suffer from several limitations. First, they do not account for time-invariant firm heterogeneity, and therefore it is not clear whether their results are driven by the composition of the firms within each industry or by actual changes within firms. Second, they only can only look at the aggregate export propensity, because the data does not allow them to analyse particular margins along which firms increase their exports thanks to spillovers from MNEs. Third, the data also do not allow these studies to ask questions about the quality of exports by the domestic firms. Fourth, they do not examine whether the exporting spillovers are merely a by-product of the productivity spillovers or whether they represent an independent type of spillovers. Fifth, with the exception of [Aitken et al. \(1997\)](#), who only look at export participation, they are based on developed-country data, while the potential for learning from multinationals is likely to be larger in developing and emerging economies, and is also likely to be more central to policy debates in these countries. Our study aims to overcome these limitations.

Finally, a few recent studies analyse the effect of FDI on the quality of exports, as proxied by their unit values. [Harding and Javorcik \(2012\)](#) use cross-country data on investment promotion targeted at specific 4-digit SITC sectors. They find that exports in targeted sectors in developing countries enjoy an 11% unit value premium, but their method is unable to pinpoint the exact channels through which FDI affects exporting, and in particular to distinguish between the direct effect of MNEs' own exports and spillovers to domestic exporters. [Chen and Swenson \(2007\)](#) use detailed trade data from China and find that stronger presence of multinationals in the same industry and location is associated with a larger number of trade transactions and a higher unit value of these transactions. [Swenson \(2008\)](#) shows with the same data that these results may be driven by information spillovers. Neither of these studies distinguishes between horizontal and vertical effects.

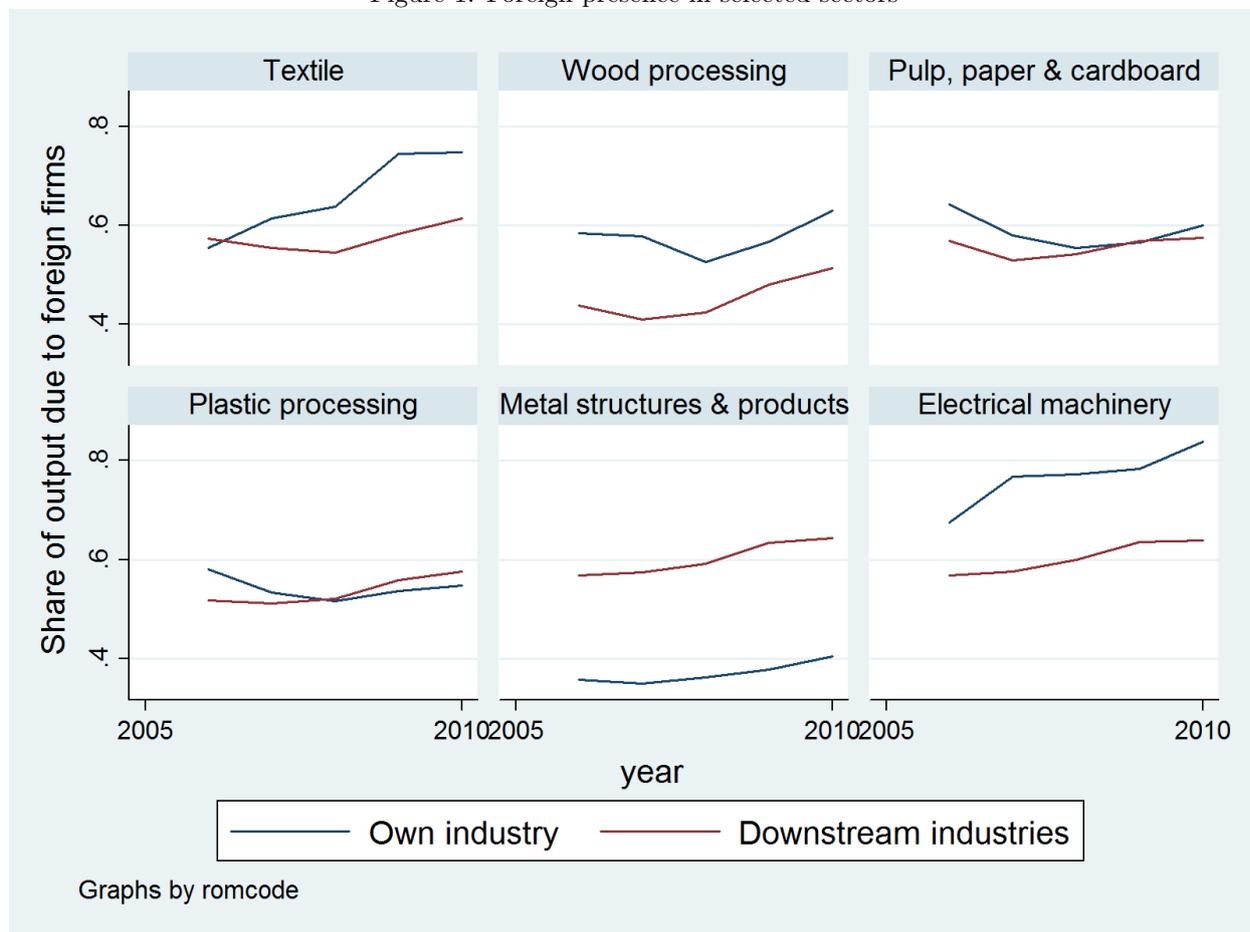
To our knowledge, ours is the first study to test for the presence of horizontal and vertical spillovers from multinationals on different margins of domestic-firm exporting and on the quality of exports by domestic firms.

3 Descriptive evidence

Over the period we study, Romania received large inflows of FDI, which amounted on average to 6% of its GDP and peaked in 2006, immediately preceding its entry to the European Union. [Figure 1](#) shows the development of the foreign share in own industry and in downstream industries for six sectors which supply a substantial share of their output to downstream industries and where a significant share of firms export.

The industries show a substantial heterogeneity in terms of the change in foreign presence over the studied period, although the general trend is positive. As documented in figure 2, exports in these sectors have also increased and so has the average number of destinations per exporter.

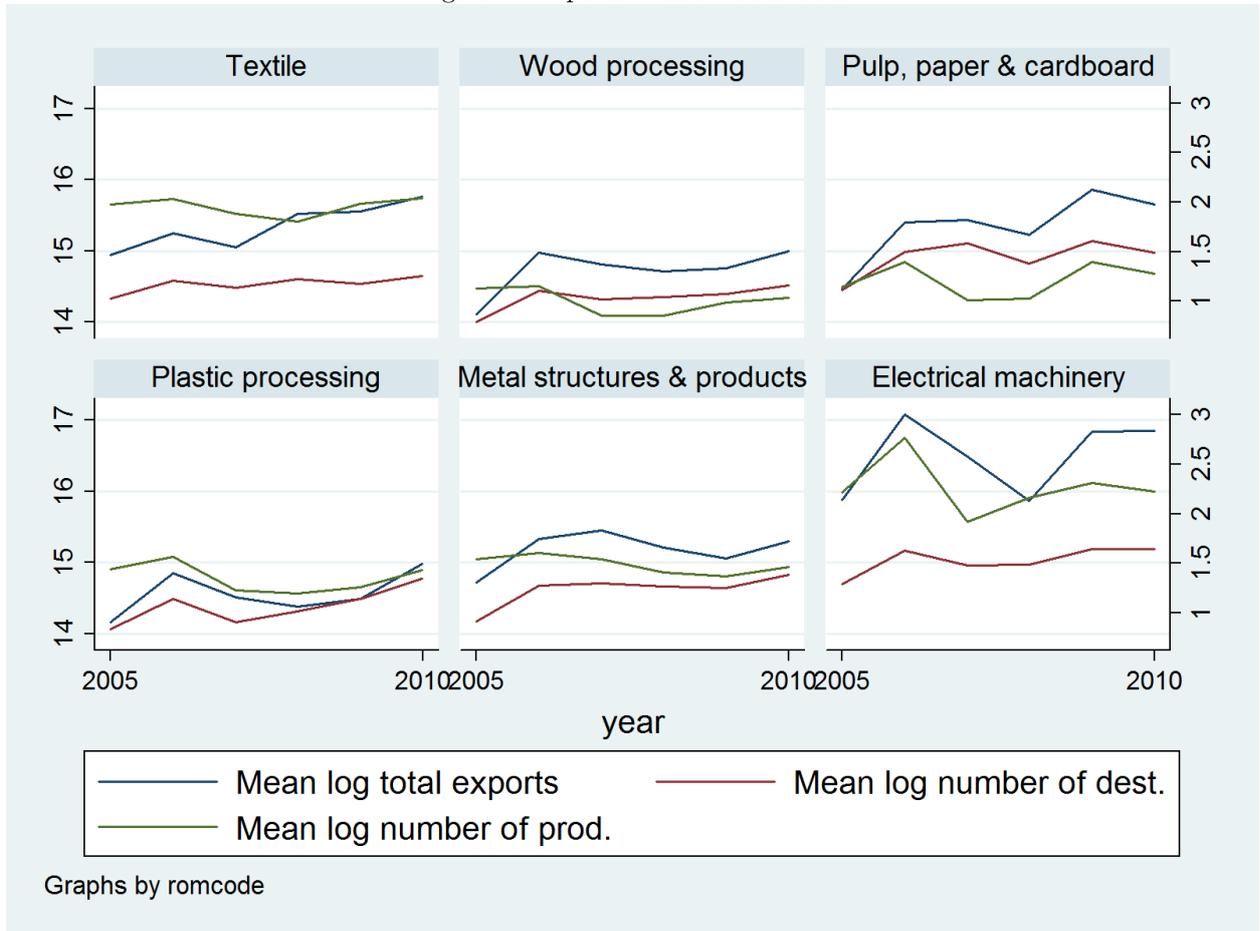
Figure 1: Foreign presence in selected sectors



As an initial step towards better understanding the relationship between supplying multinationals and exporting of domestic firms, we turn to the World Bank Enterprise Surveys for Romania for year 2005. We find them useful because they contain direct information on which firms supply to multinationals located in Romania. We of course need to be cautious when interpreting any comparison between suppliers and non-suppliers, because ‘better’ firms are more likely to become suppliers. However, if we did not find suppliers performing differently from non-suppliers, it would cast doubt on the real-world relevance of our empirical analysis in the following sections. We therefore consider such comparisons as a useful first test of our hypotheses. We consider only domestic-owned manufacturing firms, which leaves us with the initial sample of 244 firms.

The surveys are supportive of the idea that existing customers play an important role in learning about new customers, developing new products, entering new markets and improving productivity. Figure 3 shows that firms consider existing customers or suppliers to be the most important source of information about

Figure 2: Exports in selected sectors

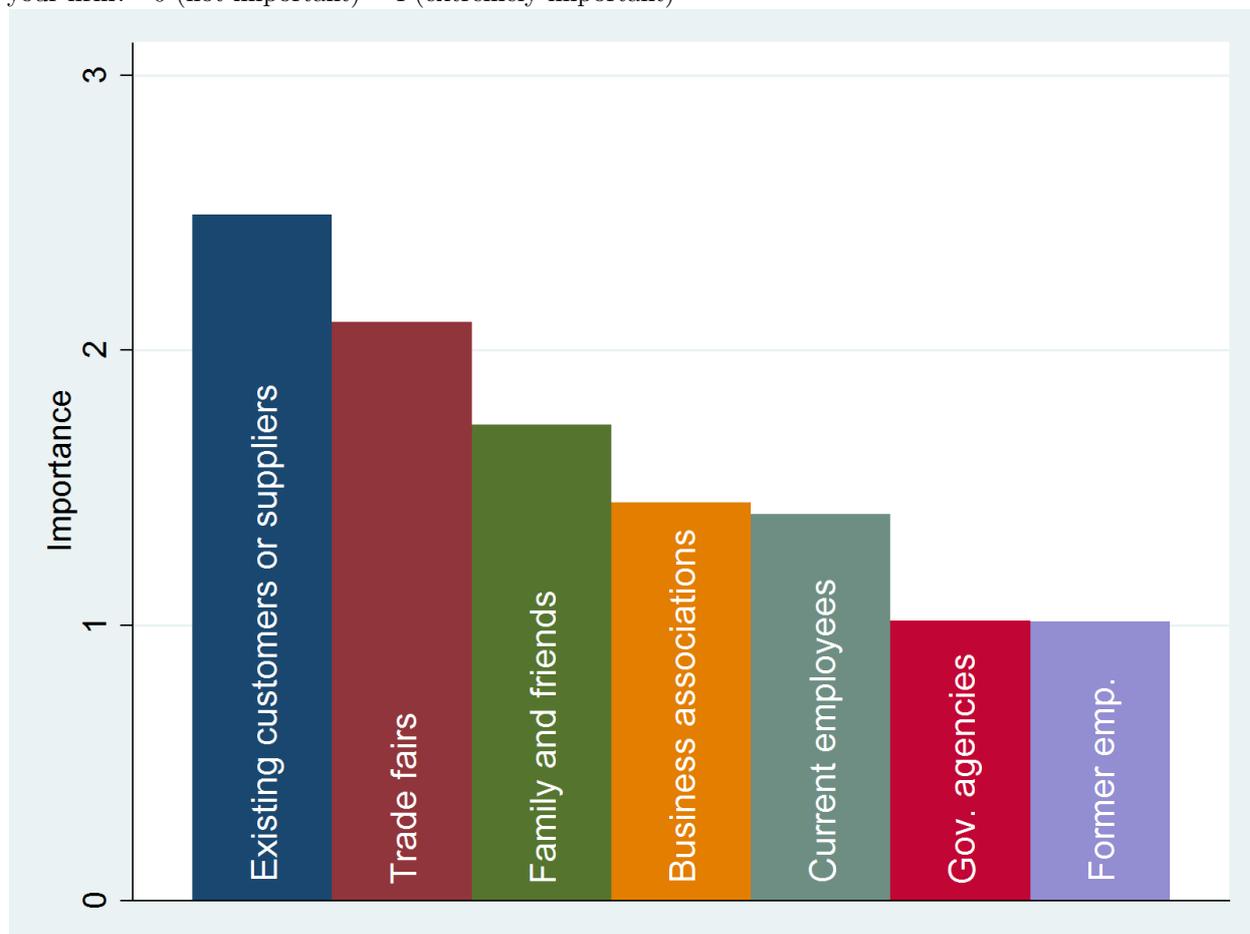


new customers out of 7 options on the list. Figure 4 compares customers, domestic competitors and foreign competitors in terms of their influence on domestic firms' decisions to develop new products or new markets. Customers again turn out to be most important, and their relative importance is considered to be particularly high by firms supplying multinationals. The results are qualitatively similar, although somewhat weaker, for the influence of customers and other factors on decisions regarding improved productivity.

Using a simple cross-sectional linear probability model, we compare firms which supply to multinationals to those which do not in three dimensions. First, we ask if they export. Second, we ask if they have added a new product in the last three years. Third, we ask if they have added a new export destination. In all regressions, we exclude 15 firms which export 100% of their output and therefore it does not make sense to ask if they supply to a multinational located in Romania. In the last regression we include only firms which export and which already exported three years earlier. In all regressions we control for firm size as measured by total employment.

We report the results in Table 1. Firms supplying multinationals are significantly more likely to export, add new products and enter new destinations. The size of the coefficients is quite large, on the order of 15-30%. While we report OLS results here to make them comparable with following IV regressions, probit

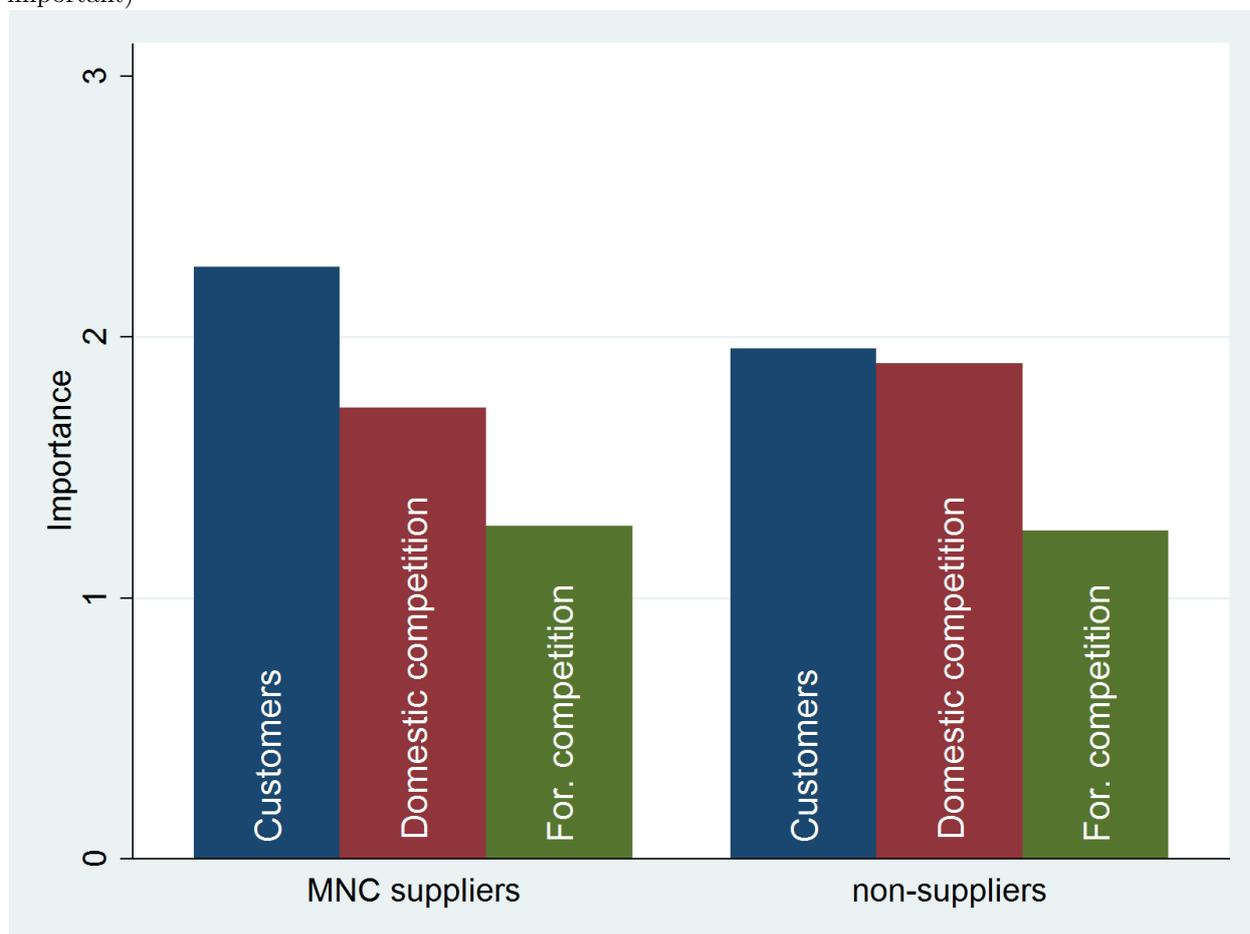
Figure 3: “How important are the following as potential sources of information about new customers for your firm?” 0 (not important) – 4 (extremely important)



results are very similar.

The results from the OLS regressions are consistent with supplying multinationals improving the exporting performance of domestic firms, but as we mention above, they may also reflect mere selection of more innovative firms into becoming suppliers. We dig a little bit deeper with an instrumental variable approach. We use two types of instruments. The first set of our instruments is based on the idea that firms are more likely to be suppliers of MNEs if their sector supplies a larger share of their output to foreign firms in downstream sectors. We measure this with indices of downstream foreign presence, which we describe in more detail in the following section. To make these indices valid instruments, we have to assume that presence of foreign firms in downstream industries affects the export performance of upstream domestic firms only through their buyer-seller relationship. This assumption excludes the possibility that non-suppliers are also affected by foreign firms in downstream industries. To make sure that the downstream FDI instrument does not capture horizontal effects (positive or negative) of FDI in the same industry, we control for presence of foreign firms in own industry. The construction of the corresponding variable is also described in the following section.

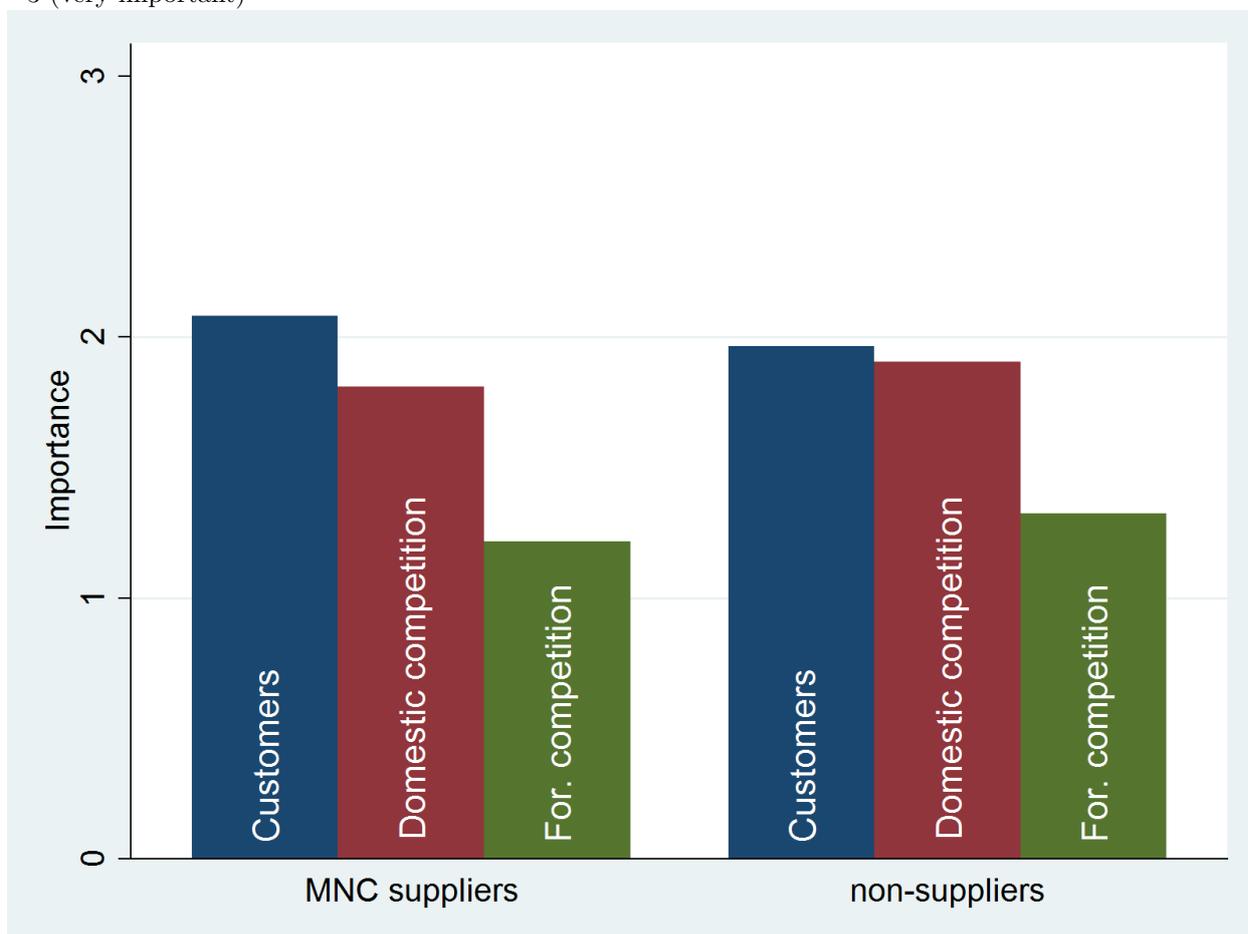
Figure 4: “How would you rate the importance of each of the following factors on key decisions about your business with respect to ‘Developing new products or services and markets?’” 0 (not important) – 3 (very important)



For our second set of instruments, we use the observation that MNEs will more likely be forced to buy from a domestic firm if the firm does not have many competitors offering the same product on the national market. Our instruments include a dummy for firms which say they do not have any competitors and the logarithm of the number of national competitors, which we set to zero if the number of competitors is zero. A substantial number of firms say they do not compete in the national market and therefore do not answer the survey question on the number of national competitors. We set the number of competitors to zero for these firms and control for them with a dummy for competing on the national market.

We present the results using the downstream FDI indices as instruments in Table 2, those using number of competitors in Table 3 and results using simultaneously both sets of instruments in Table 4. In all regressions we again control for the logarithm of total employment. The first stage regression with the downstream FDI instruments reveals that only presence of purely foreign firms in downstream industry is positively related to the probability of a firm reporting that it is an MNE supplier, while the presence of firms with mixed ownership seems to have a negative effect, we include the shares of mixed and fully foreign

Figure 5: “How would you rate the importance of each of the following factors on key decisions about your business with respect to ‘Reducing the production costs of existing products or services’?” 0 (not important) – 3 (very important)



ownership separately.

The results are surprisingly consistent for both sets of instruments. In contradiction to the possibility that the positive effect of the supplier dummy is driven by selection, instrumenting actually leads to an increase in the estimates of the supplier coefficient for all three outcome variables, although the effect becomes insignificant for adding new products. The estimate for the effect on exporting becomes nonsensically large, but this is at least partly a side-effect of using a linear probability model. When we experiment with a seemingly unrelated bivariate probit model (not reported here), we get very similar results in terms of sign and significance of our coefficients, but the marginal effects become reasonable, although still larger than without instrumenting.

Like the figures presented earlier, the descriptive regressions are consistent with idea that supplying multinationals helps domestic firms innovate and enter new markets. But we should not draw strong conclusions from these results. First, they are based only on a cross-section and may therefore be driven by unobserved firm heterogeneity. Second, the the F-statistics for the first stage of the IV regressions using

Table 1: Supplying multinationals and exporting: OLS

	(1)	(2)	(3)
	Exporter	Added product	Added destination
MNC supplier	0.148* (0.077)	0.242*** (0.085)	0.275* (0.144)
Log number of employees	0.114*** (0.014)	0.057*** (0.016)	0.107*** (0.033)
R-squared	0.215	0.070	0.168
N	329	329	63

Confidence: *** 99%, ** 95%, * 90%. Parentheses show robust standard errors.

Table 2: Supplying multinationals and exporting: 2SLS (only sectoral FDI IVs)

	(1)	(2)	(3)	(4)
	MNC supplier	Exporter	Added product	Added destination
MNC supplier		1.768** (0.879)	0.549 (0.552)	0.468** (0.199)
Foreign or mixed share (own industry)	-0.235 (0.467)	0.897 (0.814)	0.724 (0.485)	-0.445 (0.606)
Log number of employees	0.031** (0.013)	0.064* (0.039)	0.045* (0.023)	0.110*** (0.033)
Fully-foreign share (downstream industry)	9.443** (4.111)			
Mixed-ownership share (downstream industry)	-6.009** (2.549)			
R-squared	0.075	.	.	.
N	329	329	329	63
F-statistic		2.784	2.784	5.796
Sargan test (p-value)		0.040	0.429	0.224

Confidence: *** 99%, ** 95%, * 90%. Parentheses show robust standard errors Column (1) shows first stage regression..

Table 3: Supplying multinationals and exporting: 2SLS (only competition IVs)

	(1)	(2)	(3)	(4)
	MNC supplier	Exporter	Added product	Added destination
MNC supplier		0.798***	0.316	1.053***
		(0.209)	(0.380)	(0.296)
Competes on national market	0.097	0.069	0.110*	-0.141
	(0.070)	(0.051)	(0.059)	(0.171)
Log number of employees	0.023*	0.088***	0.042**	0.112***
	(0.013)	(0.018)	(0.019)	(0.042)
Zero competitors on nat. market 3 years earlier	0.802***			
	(0.066)			
Log number of competitors on national market 3 years earlier	-0.026			
	(0.024)			
R-squared	0.050	.	.	.
N	329	329	329	63
F-statistic		515.510	515.510	61.169
Sargan test (p-value)		0.927	0.076	0.645

Confidence: *** 99%, ** 95%, * 90%. Parentheses show robust standard errors Column (1) shows first stage regression..

Table 4: Supplying multinationals and exporting: 2SLS (all IVs)

	(1)	(2)	(3)	(4)
	MNC supplier	Exporter	Added product	Added destination
MNC supplier		1.137***	0.435	0.686***
		(0.360)	(0.292)	(0.181)
Foreign or mixed share (own industry)	-0.126	0.481	0.686*	-0.253
	(0.464)	(0.456)	(0.351)	(0.677)
Competes on national market	0.058	0.060	0.113**	-0.104
	(0.075)	(0.057)	(0.057)	(0.146)
Log number of employees	0.029**	0.077***	0.035*	0.112***
	(0.013)	(0.023)	(0.018)	(0.036)
Fully-foreign share (downstream industry)	9.792**			
	(4.018)			
Mixed-ownership share (downstream industry)	-6.086**			
	(2.580)			
Zero competitors on nat. market 3 years earlier	0.874***			
	(0.068)			
Log number of competitors on national market 3 years earlier	-0.019			
	(0.024)			
R-squared	0.103	.	.	.
N	329	329	329	63
F-statistic		292.283	292.283	35.616
Sargan test (p-value)		0.051	0.235	0.604

Confidence: *** 99%, ** 95%, * 90%. Parentheses show robust standard errors Column (1) shows first stage regression..

downstream FDI as instruments are relatively low suggesting problems with weak instruments. Third, one of our IV regressions fails the Sargan test on the 5% significance level and two more on the 10% level, indicating potential problems with the validity of our instruments. We attempt a more rigorous test of our hypotheses in the following sections.

4 Data and empirical strategy

4.1 Data

One of the reasons why the amount of existing research on the impact of FDI on various margins and quality of firm-level exports is relatively limited is that it requires a firm-level dataset which contains information on ownership and other firm characteristics as well as detailed information on exporting activity of each firm decomposed by narrowly defined products and by destinations.

We draw on rich firm-level data for Romania. It consists of two datasets. The first is Structural Business Statistics (SBS), available for 2005-2010. It is a survey undertaken annually by the Romanian National Statistical Institute among all Romanian firms with at least 20 employees and a subsample of smaller firms. Each firm is sent a questionnaire which it is obliged to fill in. The questionnaire covers the standard variables used for estimation of production functions and other measures of firm performance in the empirical literature on firms. All monetary variables are reported in current Lei. Ownership information in the questionnaire allows us to distinguish between firms with purely domestic ownership, firms with mixed ownership and firms with fully foreign ownership. Unfortunately, we do not observe the share of foreign ownership among the mixed firms. In most of the subsequent analysis, we consider firms to be foreign if they have a strictly positive share of foreign ownership. In several instances, we explicitly treat mixed and foreign firms separately.

The SBS data are matched to Romanian customs data for years 2005-2011 using national tax identifiers assigned to individual firms. They show annual exports for each combination of a firm, product and destination. They cover all exports to countries outside the EU and over 95% of exports to EU member countries. Starting from 2007, when Romania joined the EU, intra-EU exports are not processed at the customs but instead have to be reported to the Intrastat. Firms with annual exports below 900,000 Lei (approx. \$250,000) are exempt from the reporting obligation and therefore do not appear in the customs data. Products are defined in terms of the 8-digit EU Combined Nomenclature (CN8), which is based on the 6-digit Harmonised System classification and further disaggregates it with two additional digits. Export values are recorded in current Lei. Besides export values, there are two variables measuring the physical quantity of exports. One measures it in kilograms and the other in supplementary units. Supplementary units may represent pieces, litres, square metres or other units. Where both measures of physical quantity are available, we use supplementary units⁵.

⁵See appendix for more details on the construction of unit values.

We construct some of our variables with the help of Romanian input-output tables for 2006 prepared by the National Statistical Institute. They use Lei at current prices as units and they are defined in terms of a Romanian industrial classification where each manufacturing industry corresponds to one or several 3-digit industries in terms of NACE (rev. 1.1). The SBS data state the 4-digit NACE codes, which allows us to match the firm data with the input-output table. We use words ‘industry’ and ‘sector’ as synonyms in our analysis, and we use them to refer to the 59 manufacturing industries as defined in the Romanian industrial classification⁶.

To control for fluctuations in international prices of individual products, we use EU trade data from Eurostat. They describe country-level export flows decomposed by exporting and importing countries, years and CN8 products.

4.2 Empirical strategy

Our aim is to evaluate horizontal and vertical spillovers from foreign-owned manufacturing firms located in Romania on several performance measures of domestic manufacturing firms in the same or upstream sectors. Our identification of horizontal spillovers follows the earlier literature (Harrison and Aitken, 1999). It is based on the assumption that domestic firms are more likely to be exposed to them the higher the presence of foreign firms in their industry. We define the presence of foreign firms in an industry (Foreign share (own industry)) as the share of the output of the industry produced by foreign firms. Let J_{st} denote the set of all manufacturing firms operating in Romania in sector s in year t , f_{jt} a dummy for whether firm j is foreign-owned in year t and Y_{jt} the total output of the firm. Then we define own-sector FDI as

$$FDI_{st}^{own} = \frac{\sum_{j \in J_{st}} f_{jt} Y_j}{\sum_{j \in J_{st}} Y_j}. \quad (1)$$

In order to identify vertical spillovers from supplying multinationals in downstream sectors, we rely on the assumption that a domestic firm is more likely to supply multinationals and benefit from vertical spillovers if foreign firms account for a larger share of output in the industries to which the industry of the domestic firm sells inputs. The advantage of looking at sectoral FDI rather than directly comparing firms which supply multinationals to those which do not is that we avoid potentially non-random selection into supplying. We follow Kneller and Pisu (2007) in defining our measure of foreign presence in downstream industries (downstream FDI) as the weighted sum of own-sector FDI in downstream industries, where the weights are given by the shares of the total output of the upstream sector supplied as inputs to each downstream sector. Our approach slightly differs from that of Javorcik (2004), as the denominator of our weights is given by the total output of the upstream sector, not by the output supplied to manufacturing downstream sectors. As a result, our weights sum to less than 1. This effectively means that in our analysis we give more weight to upstream industries which supply a larger share of their output as intermediate inputs to downstream industries rather than selling it for final use. Indeed, we would not expect an industry

⁶See appendix for more details on how we determine the industry affiliation of each firm.

Table 5: Outcome variables

Log (total exports)	firm-year; firm-product-destination-year
Log (exports per product-destination)	firm-year
Log (number of product-destination combinations)	firm-year
Log (number of export destinations)	firm-year
Log (number of exported products)	firm-year
Log (physical quantity)	firm-product-destination-year
Log (unit values)	firm-product-destination-year
Exporting dummy	firm-year

which supplies only a single downstream industry and sells only a tiny proportion of its total output to it to experience significant spillovers only because there is a large increase in foreign ownership in this single downstream industry. Define L_{sd} as the share of the total output of industry s which it supplies as intermediate input to downstream industries d . Define further S as the set of all manufacturing sectors. Then we write the downstream FDI as

$$FDI_{st}^{down} = \sum_{d \in S} L_{sd} FDI_{dt}^{own}. \quad (2)$$

To test for horizontal and vertical FDI spillovers, we regress a number of outcome variables on our FDI measures, as in the following equation:

$$X_{it} = \beta_1 FDI_{s,t-1}^{own} + \beta_2 FDI_{s,t-1}^{down} + \gamma_t + \eta_i + \epsilon_{it} \quad (3)$$

X_{it} is the outcome variable in year t . Depending on the outcome variable, the index i may represent either a firm or a particular firm-product-destination combination. The list of outcome variables we consider together with levels on which they are defined are listed in Table 5. We include year dummies, and we control for fixed effects defined on the level of index i , i.e. either as firm fixed effects or as firm-product-destination fixed effects.

We have to assume that once time-invariant heterogeneity is accounted for, foreign investors do not disproportionately locate in industries where domestic firms operating in the industries or supplying them are experiencing a relative increase in exporting performance. This assumption is more likely to be violated for own-sector FDI, so in the robustness checks we estimate the model also using only downstream FDI. To reduce the risk of the simultaneity bias, we lag all our explanatory variables by 1 year.

Regressions with all outcome variables except the exporting dummy apply only to the sample of domestically-owned exporters. This sample is non-random, and if the determinants of being an exporter are correlated with the error term ϵ_{it} , our results will be biased and inconsistent. To the extent that selection into exporting is driven by time-invariant firm and industry heterogeneity, use of fixed effects estimator solves this problem. Selection becomes a problem if time varying factors related to export entry and survival are correlated with the factors determining our other outcome variables.

In our paper, we rely on the assumption that unobservables driving entry into exporting will be positively correlated with the unobservables driving addition of new products and destinations. Our regressions using exporting dummy as outcome variable show that FDI presence in downstream industries is, if anything, positively related to entry into and survival in exporting. This implies that the observations with stronger FDI presence in downstream industries are more likely to be present in the sample even when they have unobserved characteristics relatively unfavourable to exporting. These observations together mean that if sample selection plays a role, our results will likely underestimate the effect of FDI in downstream industries on the number of products and destinations to which a firm exports. We therefore interpret our estimates as the lower bounds on the positive effect of downstream FDI on exporting.

To check the robustness of our results, we also employ an alternative specification, where we keep only the firms exporting both in the first and the last year of the sample, and estimate the effect of 5-year differences in FDI presence on 5-year differences in outcome variables.

Our empirical specification is somewhat different when we use the exporting dummy as the outcome variable. First, the sample is not restricted to exporters but consists of all domestically-owned manufacturing firms. Second, we are particularly interested in the question whether supplying multinationals can be seen as a gateway to international markets for firms which did not export before. We restrict the sample to firms which operated but did not export in the previous year or in the previous 2 years, so that we analyse entry into exports conditional on not exporting previously. Such a sample is non-random, so in an alternative specification we follow [Bernard and Jensen \(2004\)](#) in estimating a dynamic model of export participation using the difference GMM method due to [Arellano and Bond \(1991\)](#). In this case we do not restrict the sample, but we control for the first and second lag of exporting status, and we allow the FDI variables to have a differential impact on firms not exporting in the previous year (effect on entry) and firms exporting in the previous year (effect on survival). First we estimate the equation by ordinary fixed effects. Because this is an inconsistent estimator of a model with lagged dependent variable, we then estimate the equation using the difference GMM, turning it into first differences and instrumenting the first differences of the regressors with their lagged values.

To test for productivity spillovers and see if these productivity spillovers are the intermediate cause of the exporting spillovers, we calculate productivity using the index number method described in detail by [Aw et al. \(2001\)](#). An important advantage of this method is that it allows for heterogenous technology within industry. We use capital, labour and material and service inputs as inputs to production. We deflate output by sector-specific production price indices; capital by the capital goods industry price index and material and service inputs by a weighted average of sector-specific production price indices of upstream sectors, where the weights come from the input output matrix. All the price indices we use come from the National Statistical Institute.

Our main explanatory variables vary only at the level of industry and over time, we adjust standard errors to allow for correlation between error terms within the same industry and year.

Table 6: Estimation at firm level: baseline specification

	(1)	(2)	(3)	(4)	(5)
	Total exports	Exports per prod.-dest.	Number of prod.-dest.	Number of dest.	Num. of prod.
Foreign share (downstream industry)	7.710** (3.919)	1.137 (2.820)	6.573*** (1.604)	5.478*** (1.287)	3.489*** (1.276)
Foreign share (own industry)	-1.178** (0.510)	-0.266 (0.347)	-0.912*** (0.223)	-0.721*** (0.172)	-0.598*** (0.180)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
R-squared	0.021	0.016	0.062	0.022	0.077
N	13372	13372	13372	13372	13372

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

5 Results

5.1 Export value and its components

We present the results from estimating equation (3) for the first five outcome variables in Table 6. The initial column describes the effect of FDI on the total exports of domestic firms. The coefficient on the presence of foreign firms in downstream sectors is positive and significant at the 5% level. This result is consistent with our hypothesis that domestic firms improve their exporting performance as a result of supplying MNEs. The effect of foreign firms in the same industry is negative. We are not able to pinpoint the reasons for this negative effect. But interviews conducted by World Bank consultants in Romania with managers of local firms, representatives of local MNE subsidiaries and local consultants repeatedly mention and emphasize competition for a limited pool of skilled labour as a key constraint on firm performance and growth in exporting sectors. We therefore tend to interpret the negative result on own-sector FDI as an effect of foreign firms pulling out the skilled workers from the domestic firms and from the labour market. This explanation is in line with the well known fact that foreign firms pay superior wages⁷. A study by [Hale and Long \(2011\)](#) finds that presence of foreign firms in the same industry and region in China leads to higher wages of skilled workers and lower observed quality of engineers in both state-owned and private domestic enterprises. [Alfaro and Chen \(2012\)](#) also document inflows of FDI as having a substantial impact on domestic firms through an increase in factor prices.

Estimates in columns 2 and 3 sum up to those in column 1, and they decompose them respectively into the intensive and extensive margin. Almost all effect of foreign presence in downstream industries on total exports works along the extensive margin, while the estimate for the intensive margin is much smaller and insignificant. In columns 4 and 5 we further decompose the extensive margin and show that both the number of exported products and the number of destinations to which firms export increase with the presence of foreign firms in downstream industries.

⁷See for example [Aitken et al. \(1996\)](#).

Table 7: Estimation at firm level: 5-year differences

	(1)	(2)	(3)	(4)	(5)
	Total exports	Exports per prod.-dest.	Number of prod.-dest.	Number of dest.	Num. of prod.
Foreign share (downstream industry)	15.890** (6.872)	5.110 (4.903)	10.779*** (3.074)	8.629*** (2.449)	5.928** (2.624)
Foreign share (own industry)	-2.075** (1.029)	-0.420 (0.662)	-1.656*** (0.436)	-1.140*** (0.352)	-1.238*** (0.369)
R-squared	0.011	-0.000	0.018	0.022	0.010
N	1170	1170	1170	1170	1170

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year. The regressions are based on a cross-section of 5-year differences 2005-2011.

The effects are economically meaningful. Given our construction of the downstream FDI variable, the effect of a given increase in the share of output due to foreign firms in downstream industries depends on what share of its output the upstream industry sells as inputs to downstream industries. To give an example, for an industry selling a quarter of its output to downstream industries, a 10-percentage-point increase in FDI share of output in its downstream sectors implies a 21% increase in exports, a 15% increase in the number of export destinations and a 9% increase in the number of exported products. A similar increase in the foreign presence in its own industry implies a 11% decrease in exports, a 7% decrease in the number of export destinations and a 6% decrease in the number of exported products.

Table 7 shows the same equations estimated as a cross-section of 5-year differences. The results remain qualitatively similar but become stronger in terms of the size of the coefficients.

The regressions shown so far do not show any significant effect along the intensive margin, but this may be because the additional products and destinations added due to interaction with downstream multinationals are marginal products and destinations with relatively small export values, pushing the average export value per product-destination pair down. To check if this is the case, in Table 8 we estimate the effect of FDI on exports on the level of firm-product-destination, controlling for firm-product-destination fixed effects. The first column shows the effect on total exports, whereas the remaining two columns decompose this effect into physical quantities and prices. We do not find any significant results except for a weakly significant negative effect of downstream FDI on unit values. This table confirms the previous results suggesting that the effect of foreign presence in downstream industries is concentrated at the extensive margin, whereas the intensive margin is not affected.

The negative coefficient in the unit value regression in Table 8 is surprising, as it contradicts our expectation that supplying foreign firms should, if anything, lead to an increased quality of exports. We further explore the relationship between unit values and the presence of foreign firms in Table 9. In all columns we control for mean unit values of exports of a given product by other EU countries, but the control is mostly insignificant and it does not change other estimates. When we split products into the differentiated ones and non-differentiated ones using the classification due to Rauch (1999). If domestic firms were to upgrade the quality of their exports due to contact with multinationals, we would expect to

Table 8: Estimation at firm-product-destination level

	(1)	(2)	(3)
	Export value	Export volume	Unit values
Foreign share (downstream industry)	1.579 (2.087)	2.631 (2.079)	-1.053* (0.585)
Foreign share (own industry)	0.097 (0.203)	0.011 (0.197)	0.086 (0.061)
Firm-prod.-dest. fixed effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
R-squared	0.008	0.013	0.075
N	141226	141226	141226

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

see this effect only for differentiated products. As it turns out, neither of the two types of products shows significant coefficient for downstream FDI. We find a positive coefficient on the effect of own-industry FDI for differentiated products, but is quite small and only weakly significant, so we are reluctant to draw strong conclusions from this finding. Finally, we try to estimate the unit value regression only for products with high potential for quality upgrading as proxied by the length of quality ladder measure due to [Khandelwal \(2010\)](#). We do not find any significant results in this specification. Overall, we do not find evidence of domestic exporters upgrading their exported products as a result of supplying multinationals located in their country. However, this does not necessarily mean that no product upgrading takes place as a result of supplying multinationals. We only observe unit values for products which are already exported. This prevents us from capturing any effect of downstream FDI on product upgrading taking place prior to exporting those products⁸.

5.2 Entry into exporting

Table 10 describes results from estimating the regressions for entry into exporting conditional on not exporting in the previous year or 2 years. Columns 1 and 2 show that similar to our earlier results on entry into new markets, entry into exporting as a whole seems to be positively correlated with presence of foreign firms in downstream industries and negatively with presence of foreign firms in own industry. In columns 3 and 4 we then consider sustained entry into exporting, defined as a dummy equal to 1 if a firm exports in a given year and keeps doing so in the following year. The results are similar to those in columns 1 and 2.

The results from a dynamic model of export participation are presented in table 11. As we would expect, the fixed-effects model shows lower coefficients on the first and second lag of export status than the difference GMM. Our GMM estimates also comfortably pass both the test for second-order autocorrelation and the Hansen test of overidentifying restrictions. In line with estimates in Table 10, both models show

⁸Using data from Mexico, [Iacovone and Javorcik \(2012\)](#) find that strongest product upgrading takes place in the year immediately preceding their exporting.

Table 9: Estimation at firm-product-destination level: unit values

	(1)	(2)	(3)	(4)
	all	differentiated	non-differentiated	long quality ladder
Log mean EU unit values	0.002 (0.006)	-0.002 (0.007)	0.020* (0.012)	-0.008 (0.008)
Foreign share (downstream industry)	-1.052* (0.584)	-0.672 (0.738)	-1.098 (1.088)	-0.734 (0.741)
Foreign share (own industry)	0.086 (0.061)	0.108* (0.065)	-0.007 (0.130)	-0.089 (0.086)
Firm-prod.-dest. fixed effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.075	0.074	0.084	0.063
N	141198	116691	20626	60483

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

Table 10: Estimation at firm-level: entry into exporting

	(1)	(2)	(3)	(4)
	Entry after 1 year	Entry after 2 years	Sus. entry after 1 year	Sus. entry after 1 year
Foreign share (downstream industry)	0.961** (0.474)	1.654*** (0.551)	0.712** (0.276)	1.101*** (0.269)
Foreign share (own industry)	-0.134*** (0.049)	-0.220*** (0.057)	-0.106*** (0.032)	-0.147*** (0.028)
Firm fixed effects	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.004	0.036	0.010	0.024
N	25713	14843	25713	14843

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

Table 11: Estimation at firm-level: entry into exporting

	(1)	(2)	(3)	(4)
	Dynamic FE	Diff. GMM	Dynamic FE	Diff. GMM
Lag of export status	-0.099*** (0.028)	0.301*** (0.044)	-0.007 (0.064)	0.350*** (0.112)
Second lag of export status	-0.125*** (0.011)	0.078*** (0.025)	-0.125*** (0.011)	0.085*** (0.023)
Foreign share (downstream industry)	1.247** (0.521)	2.565** (1.204)		
Foreign share (own industry)	-0.239*** (0.065)	-0.516* (0.306)		
For. share (downstream) - entry			1.240** (0.513)	2.339* (1.287)
For. share (own) - entry			-0.186*** (0.070)	-0.556* (0.307)
For. share (downstream) - survival			0.931 (0.569)	1.913 (1.245)
For. share (own) - survival			-0.310*** (0.107)	-0.566* (0.307)
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.026		0.027	
N	24803	15287	24803	15287
AR2 test (p-value)		.7872156		.987658
Hansen test (p-value)		.1891664		.2329726

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

positive and significant effect of downstream FDI on the probability of exporting and a negative effect of own-industry FDI. In columns 3 and 4, we allow the effect of FDI to differ according to whether the firm exported in the previous year. The effect of FDI on entry is statistically significant while the effect on survival in exports is not, but the actual difference between the two coefficients is not large. Overall, results in Tables 10 and 11 suggest that supplying multinationals may be an important channel helping firms to enter exporting.

5.3 Role of productivity

The discussion so far suggests that there are important export spillovers from downstream FDI, and that these spillovers are concentrated on the extensive margin — entry into exporting, into new destinations and into exporting of new products. But it remains unclear whether they are a genuine new channel of spillovers from FDI or whether they are rather a side-product of productivity spillovers. Table 12 shows, in line with previous studies, a positive effect of downstream FDI on productivity of domestic firms. If more productive firms self-select into exporting, it is possible that multinationals in downstream industries help to improve

Table 12: Estimation at firm-level: productivity

	(1)	(2)
	TFP - all firms	TFP - exporters
Foreign share (downstream industry)	1.475*	1.757**
	(0.790)	(0.857)
Foreign share (own industry)	-0.035	0.069
	(0.078)	(0.113)
Firm fixed effects	Yes	Yes
Year dummies	Yes	Yes
R-squared	0.105	0.107
N	43118	9310

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables are lagged by one year.

Table 13: Estimation at firm level: controlling for productivity

	(1)	(2)	(3)	(4)	(5)	(6)
	Total exports	Total exports	Exports per prod.-dest.	Exports per prod.-dest.	Number of prod.-dest.	Number of prod.-dest.
Foreign share (downstream industry)	8.435**	7.178**	1.358	0.610	7.077***	6.568***
	(3.505)	(3.549)	(2.556)	(2.585)	(1.636)	(1.646)
Foreign share (own industry)	-1.266***	-1.218***	-0.409	-0.380	-0.857***	-0.838***
	(0.459)	(0.464)	(0.326)	(0.329)	(0.209)	(0.211)
Log TFP		0.520***		0.309***		0.210***
		(0.078)		(0.059)		(0.048)
Firm fixed effects		Yes		Yes		Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.023	0.033	0.015	0.020	0.074	0.078
N	10385	10385	10385	10385	10385	10385

Confidence: *** 99%, ** 95%, * 90%. Parentheses show standard errors clustered at industry-year level. All dependent variables are in logs. FDI variables and TFP are lagged by one year.

productivity of domestic firms and this in turn allow them to cover the fixed costs of entry into new markets.

In Table 13, we show the same regressions as in Table 6, but we include lagged firm productivity among the regressors. As we would expect based on theory, productivity is positively related to exporting, both on the intensive and extensive margin. However, its inclusion in the regressions reduces the coefficients on downstream FDI only marginally. This suggests that the export spillovers are indeed a new and additional channel through which contact with downstream multinationals benefits domestic firms.

5.4 Robustness checks

We have also run a number of robustness checks. First, we use an alternative input-output table from Eurostat, defined in terms of 2-digit NACE (rev. 1.1) industries. Second, we exclude own-industry FDI, which is more likely to suffer from reverse causality, from the regression. Third, in addition to excluding own-industry FDI we exclude output supplied to other firms in own industry (diagonal elements of the input-output matrix) in the construction of downstream FDI. Fourth, we define firms as foreign only if they have 100% foreign ownership. Finally, we run the regressions controlling for industry concentration and the

share of state ownership in own and downstream industries. We do not report these robustness checks in detail in this version of the paper, but they do not significantly alter the main results.

6 Conclusion

Multinational companies are widely believed to possess technology, know-how and networks superior to those of domestic companies, especially in developing and emerging markets. An important question for policy makers is whether, and how, these advantages of multinationals spill over to domestic firms and help them to improve their performance. Past research has shown that foreign presence, especially in downstream industries, may lead to increased productivity of domestic firms.

Our study suggests there is an additional channel of spillovers — the effect of foreign presence on exporting activity of domestic firms. Using a panel covering all Romanian firms with more than 20 employees matched with detailed customs data, we find evidence that supplying multinationals, as proxied by their presence in downstream industries, helps domestic firms to overcome the financial or informational costs related to entry to new markets. Entry into exporting, entry into new export destinations and adding new exported products all seem to be positively related to foreign presence in downstream industries. We also find positive productivity spillovers from multinationals in downstream industries, but we show that these do not explain the positive effect on exporting. The exporting spillovers seem to be an independent, additional source of benefits from FDI in downstream industries.

Our main results are in line with descriptive evidence from the World Bank Enterprise Surveys. Romanian manufacturing firms participating in the surveys name their customers as the most important factor in their decisions about developing new products and markets, and the importance of customers is particularly high among the firms which supply to multinationals. The data from the survey also show that domestic firms supplying multinationals are more likely to export, add new products and enter new destinations, and this seems to be true even when we try to instrument for being an MNE supplier.

Despite these positive results, FDI should not be seen as a golden bullet for all challenges facing domestic exporters. First, we do not find any evidence of supplying foreign firms helping domestic exporters to increase the quality of their exports, as proxied by their unit values. Second, the presence of foreign firms in the same industry seems to have a negative effect on the exporting performance of domestic firms. Anecdotal evidence and recent research from other countries suggest that this may be due to foreign and domestic firms competing for a limited pool of skilled labour.

Most countries in the world are engaged in efforts to promote exports by domestic firms as well as attract foreign investors, but they often treat exporting and FDI as separate policy areas. Our findings suggest there may be a case for deeper coordination between export and FDI promotion strategies.

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A Construction of variables

A.1 NACE

SBS data define the main activity of each firm in terms of 4-digit NACE industries. Data for years 2005-2007 use NACE (rev. 1.1) and data for years 2008-2010 NACE (rev. 2). In order to make the SBS data compatible with our input-output table, we first convert all observations to NACE rev. 1.1. There is no unambiguous concordance between rev. 1.1 and rev. 2, so we derive our own concordance from the data so as to maximize the continuity in NACE within firms across time. For each observation from 2008 or later, we define pre-revision NACE as the NACE of the same firm in 2007 (or earlier if we do not observe the firm in 2007). We create a concordance where each 4-digit NACE rev. 2 code corresponds to the most common pre-revision NACE among observations with the same 4-digit NACE rev. 2 code. Then, we convert NACE for years 2008 and later to NACE rev. 1.1 using this concordance. Validity of this method is supported by the fact that on the 2-digit level where our subsequent analysis takes place, the number of firms which change NACE between 2007 and 2008 is very similar to the corresponding numbers for other years, once we apply the concordance. Once we know the 4-digit NACE (rev 1.1) for each firm in each year, we use a concordance table to convert the NACE industries into the Romanian industrial classification in which the input-output table is defined. Finally, to ensure that variation over time in FDI presence in different industries is not driven by firms changing their reported industrial affiliation, we make the affiliation time-invariant by setting it to the mode value for each firm. This procedure modifies NACE for less than 4% of firm-year observations.

A.2 Nationality of ownership

The SBS questionnaire includes a question on a firms type of ownership. The types include various combinations of state ownership, domestic private ownership and foreign ownership plus cooperatives and public enterprises (different from state-owned, very few). In the case of cooperatives, we are not able to tell if they are domestic or foreign, so we drop them from the analysis. We classify the remaining firms as either domestic or foreign by calling a firm foreign if it has any strictly positive share of foreign ownership. The questionnaire unfortunately does not allow us to separately identify minority and majority foreign ownership. But we cross-check the ownership information from the SBS with the Amadeus firm database, which contains more detailed information on ownership. We find that firms in the only quantitatively important SBS ownership type with partial foreign ownership — private Romanian capital + foreign capital — are more than five times more likely to appear majority foreign-owned than minority foreign-owned in the Amadeus dataset. All the other ownership types with partial foreign ownership represent together only 0.22% of observations in the SBS data and 1.51% of observations in the export data. In addition, a majority of observations which we classify as foreign come from the fully foreign-owned category in the SBS dataset. So overall, it seems reasonable to expect that in an overwhelming majority of firms which we classify as foreign, foreign investors indeed have substantial influence on how the firms are run.

There are a number of firms classified as domestic in one year, as foreign one year later and again

as domestic two years later. We set ownership as domestic for these firms for all three years. First, such short-lived foreign ownership is unlikely to lead to any substantial changes in how a firm is run. Second, a cross-check with the Amadeus database shows that these reversed ownership switches tend to be data errors.

A.3 Unit values

We calculate unit value as the monetary value of an export flow divided by its physical quantity. The key question is which measure of physical quantity to use. We proceed as follows. First, we drop observations with export value equal to zero or with both measures of physical quantity equal to zero. Second, we set supplementary units as measure of physical quantity for all products which have supplementary units available for over 95% of the remaining observations. Third, we set kilograms as measure of physical quantity for those of the remaining products which have kilograms available for more than 95% of observations. Finally, we drop all observations for products where neither supplementary quantity nor kilograms are available for more than 95% of observations, and we drop observations where the measure of physical quantity chosen for the given product is equal to zero. Using this procedure, we measure physical quantity in supplementary units for 32% observations and in kilograms for 65.5% observations, and we drop unit values for 2.5% observations.

Some values of unit values and their fluctuations within firm and product over time are too extreme to be likely to be true. We deal with the suspected outliers in three steps. First, we drop observations with physical quantity equal to one. The reason for this step is first that such observations show disproportionately large number of extreme unit values in the data and second that physical quantities in the data only take values of integers, so shipments of very small quantities may require substantial rounding off. Second, to eliminate extreme levels of unit values, we demean each log unit value by the corresponding product-year-specific mean and then drop the 2% smallest and 2% largest observations. Third, to eliminate extreme unit value fluctuations within firm-product-destination links, we drop the 5% links with highest variation of unit values over time.