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Potential and Actual FDI Spillovers in Global Value Chains

The Role of Foreign Investor Characteristics, Absorptive Capacity and Transmission Channels

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Abstract

Using newly collected survey data on direct supplier-multinational linkages in Chile, Ghana, Kenya, Lesotho, Mozambique, Swaziland, and Vietnam, this paper first evaluates whether foreign investors differ from domestic producers in terms of their potential to generate positive spillovers for local suppliers. It finds that foreign firms outperform domestic producers on several indicators, but have fewer linkages with the local economy and offer less supplier assistance, resulting in offsetting effects on the spillover potential. The paper also studies the relationship between foreign investor characteristics and linkages with the local economy as well as assistance extended to local suppliers. It finds that foreign investor characteristics matter for both.

The paper also examines the role of suppliers' absorptive capacities in determining the intensity of their linkages with multinationals. The results indicate that several supplier characteristics matter, but these effects also depend on the length of the supplier relationship. Finally, the paper assesses whether assistance or requirements from a multinational influence spillovers on suppliers. The results confirm the existence of positive effects of assistance (including technical audits, joint product development, and technology licensing) on foreign direct investment spillovers, while the analysis finds no evidence of demand effects.

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Key words: Foreign direct investment, vertical spillovers, linkages, global value chains, foreign firm characteristics, absorptive capacity, transmission channels, agribusiness, apparel, mining.

JEL: F1, F2

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1 Introduction

Most countries devote considerable attention and resources to attracting foreign direct investment (FDI). This is done in the hope not only of generating benefits like jobs, foreign exchange, and tax revenues, but perhaps more importantly in realizing dynamic benefits to the domestic economy through so-called "spillovers" from FDI. These "spillovers" generally refer to productivity improvements resulting from knowledge diffusion from multinational affiliates to domestic firms – both in the form of unintentional transmission or intentional transfer if the multinational is not compensated for by the domestic firm – encompassing both technology and all forms of codified and 'tacit knowledge' related to production, including management and organizational practices. The existence of spillovers is based on the assumption that multinational firms enjoy technological and other advantages and have, therefore, higher levels of productivity (Hoekman and Javorcik 2006).

Numerous econometric studies show ambiguous effects of FDI on domestic firm productivity within the same sector, also known as horizontal spillovers (see, e.g., extensive literature reviews in Görg and Greenaway 2004; Lipsey and Sjöholm 2005; Smeets 2008, among others). Other studies have shifted the focus to vertical spillovers to domestic firms in upstream and downstream sectors (e.g., Javorcik 2004, Blalock and Gertler 2008, Havranek and Irsova 2011). These studies support the existence of positive backward spillovers from multinationals on local suppliers, while evidence on forward spillovers is mixed.

Significant policy relevant research gaps remain, as identified in a recent survey of the empirical literature (Javorcik 2009). Among the gaps identified, there is the need to (i) determine the conditions under which spillovers are likely to materialize; (ii) understand more specifically the mechanisms behind the observed patterns; and (iii) extend the scope of investigations beyond the manufacturing sector (Javorcik 2009). The second research gap is also a function of the FDI measure being used. The econometric studies above, for example, measure FDI only at the broad sectoral level, but don't include direct supplier relationships with multinational firms which are based on survey data and could reveal the exact underlying mechanisms (Javorcik and Spatareanu 2009).

Using newly collected survey data on direct supplier-multinational linkages in Chile, Ghana, Kenya, Lesotho, Mozambique, Swaziland, and Vietnam, this paper addresses these research gaps as follows. We first evaluate whether foreign investors differ from domestic producers in terms of

their overall performance, linkages with the local economy, and supplier assistance which all influence the firms' potential to generate productivity spillovers. Second, we also study the relationship between foreign investor characteristics and linkages with the local economy as well as assistance extended to local suppliers. In the second part of the paper, we shift the focus to domestic suppliers and examine the role of supplier firm characteristics – the so-called absorptive capacities – for their linkages with multinationals. Fourth, focusing on assistance and demand effects, we assess how factors within the transmission channels between multinationals and local suppliers affect FDI spillovers.

Studies on FDI spillovers that focus on direct supplier-multinational linkages based on foreign investor or supplier survey data are rare. Focusing on foreign affiliates in five transition economies, Giroud, Jindra and Marek (2012) find that foreign firm characteristics have a positive impact on backward FDI linkages and spillovers. Javorcik and Spatareanu (2009) find evidence of "learning-by-supplying" for a sample of Czech manufacturing firms, although there is also evidence of self-selection into supplying due to a higher productivity ex ante. Jordaan (2011) also confirms the existence of positive backward spillovers on manufacturing suppliers in Mexico. Specifically, positive spillovers are facilitated through supplier firms' absorptive capacities and the level of support from the multinational. Studying the Polish automotive sector, Gentile-Lüdecke and Giroud (2012) examine the mechanisms behind knowledge spillovers of suppliers. While the authors don't find evidence of a supporting role of suppliers' absorptive capacities on knowledge acquisition, they find evidence of a supportive role on performance improvement and new knowledge creation.

This study is structured as follows. The next section provides a literature review that identifies major foreign investor characteristics and suppliers' absorptive capacities which have shown to influence FDI spillovers. It also discusses the main transmission channels through which FDI spillovers can be generated. Section 3 compares foreign investors and domestic producers in terms of their potential to generate productivity spillovers and also studies the role of foreign investor characteristics for their FDI spillover potential. Section 4 then evaluates the role of suppliers' absorptive capacities for FDI linkages, while section 5 analyzes various factors within the transmission channels between suppliers and multinationals that increase FDI spillovers. Section 6 concludes.

2 Literature Review

2.1 Foreign Investor Characteristics

The degree of *foreign ownership* affects local firms' potential to absorb FDI spillovers. A higher share of foreign ownership, and, thus, larger control over management and lower potential for knowledge leakages, correlates positively with the parent firm's incentive to transfer knowledge, e.g., in the form of technology which has been confirmed by empirical studies for Greece (Dimelis and Louri 2002) and Indonesia (Taaki 2005). On the other hand, a larger domestic ownership share could also be beneficial for local firms, since the foreign investor's interests are less-well protected making technology leakages more likely (demonstration effect). A larger domestic participation might further increase the likelihood to rely on domestic suppliers (Crespo and Fontoura 2007). Toth and Semjen (1999) confirm that a larger domestic ownership share led to more inter-sectoral linkages (reported in Crespo and Fontoura 2007).

Empirical studies controlling for different *structures of foreign ownership* tend to support the more positive spillover effects of joint ventures. Explanations include the possibility of more vertical linkages as well as stronger technology leakages for partially-owned foreign firms (Javorcik and Spatareanu 2008). For example, Havranek and Irsova (2011) find evidence of lower spillovers in fully-owned foreign affiliates, and Javorcik (2004) and Javorcik and Spatareanu (2008) find a positive vertical spillover effect on domestic firms in supplying industries from multinationals with partial foreign ownership, but not from multinationals with full foreign ownership. Abraham et al. (2010) find for a sample of Chinese manufacturing firms that foreign ownership in a domestic firm's sector only results in positive horizontal spillovers when foreign ownership is organized as a joint-venture. By contrast, the presence of fully-owned foreign firms is found to have a negative impact on local firms, due to technology intensity of multinationals crowding-out local producers within the same sectors (Abraham et al. 2010).

In addition, the *length of foreign presence* of a multinational in the host country also influences FDI spillovers. Focusing on FDI spillovers from old versus new firms in 17 Central and Eastern Europe transition economies, Turkey and the Commonwealth of Independent States, Gorodnichenko, Svejnar, and Terrell (2007), for example, find significantly positive forward and horizontal FDI spillovers from older firms (i.e. firms that were established before 1991), while these effects cannot be confirmed for newer firms (i.e. firms that were established in or after 1991).

FDI spillovers also depend on the *technology intensity* of the multinational's goods produced in the host country. More technology- or R&D-intensive products generally contain a greater element of knowledge and broader set of skills. However, the production of high-tech products might also involve low-tech processes which could offset this effect (Paus and Gallagher 2008). Focusing on FDI in technology-intensive industries, Buckley, Wang, and Clegg (2007) find positive spillovers on Chinese firms to be stronger if originated by Western-owned multinationals compared to affiliates from Taiwan, China; Hong Kong SAR, China; and Macau which they relate to the higher technology intensity in Western-owned affiliates. Analogously, Lin, Liub, and Zhanga (2009) the positive horizontal and vertical spillovers for FDI from other countries, while FDI from Taiwan, China; Hong Kong SAR, China; and Macao, results in positive forward FDI spillovers only, but in no backward spillovers and negative horizontal FDI spillovers. This is also explained with the more labor-intensive nature of foreign affiliates from Taiwan, China; Hong Kong SAR, China; and Macao (Lin et al. 2009).

Related to the previous is the *FDI home country* which may have an effect on the production strategy pursued and on the technologies used in host countries, but may also have other effects on the spillover potential. The home country of FDI influences managerial practices and cultures which are related to differences in the use of expatriate workers, attitudes and strategies to the training of local workers and general skills development. Further, end market segmentation – closely linked to FDI home countries through historical, cultural and language ties, as well as trade policies – is a common practice. In the apparel sector, for example, European-owned firms in the apparel sector in Mauritius and Madagascar largely export to Europe whereas Asian owned firms serve the U.S. market (Gibbon 2003, 2008; Staritz and Morris 2012). These patterns impact on spillover potential, as buyer sourcing requirements and practices can vary considerably by market. Moreover, production for one specific market may bring a firm set up and an overhead structure that is uncompetitive for other markets (Gibbon 2003, 2008).

Analogously, a multinational firm's *sourcing strategy* may affect the FDI spillover potential. If a multinational firm sources on a global scale, it may follow a co-sourcing strategy, resulting in an increased reliance on imported inputs from established suppliers abroad. Alternatively, a multinational firm might follow co-location strategies requiring an established foreign input supplier to also enter the host country. Both could render the entrance of new local suppliers more difficult. This is particularly common for multinationals in the clothing, footwear, electronics and automotive sector (Paus and Gallagher 2008). Moreover, the share of intermediates sourced locally by multinationals is likely to increase with the distance between the host and the source economy.

It is also likely to be larger for multinationals originating in countries outside the preferential trade agreement to which the host country belongs, as it makes imports from the home country less attractive (Javorcik and Spatareanu 2011).

Different *motivations* for undertaking FDI – i.e. market-seeking, cost-seeking, resource-seeking, and asset-seeking – are likely to mediate spillover potential. The conventional wisdom is that resource-seeking FDI has less potential for spillovers, due to its capital and technology intensity and limited time horizons. By contrast, it is often considered that FDI in the manufacturing sector has higher spillover potential as it is largely driven by efficiency-seeking motives. Indeed, the more labor-intensive nature of manufacturing investment, its requirements for a broad range of goods and services inputs, and the lower barriers to domestic forward linkages (relative to resource-seeking FDI), make it a strong candidate for contributing spillovers. Market-seeking FDI, in particular in retail, is also considered as providing higher spillover potential as retailers tend to source from local producers, in particular for food and other perishable products. However, evidence remains ambiguous, suggesting that the situation may be context-specific.

2.2 Absorptive Capacities

The *technology gap* of domestic firms has been identified as one the most important mediating factors for FDI spillovers (Kokko 1994; Kokko, Tansini, and Zejan 1996; Grünfeld 2006)[2]. Views on the role of the technology gap for FDI spillovers conflict. Some studies find that a large technology gap is beneficial for local firms since their catching-up potential increases (Findlay 1978; Wang and Blomström 1992; Smeets 2008). Other studies argue that local firms might not be able to absorb positive FDI spillovers if the technology gap between the multinational and local producers is too big or too small (e.g. Blalock and Gertler 2009).

The literature suggests that there is solid evidence of the supportive role of *research and development* (*R&D*) in local firms in high income countries, e.g. Spain (Barrios and Strobl 2002; Barrios, Dimelis, Louri, and Strobl 2004), the US (Keller and Yeaple 2009), Ireland (Barrios et al. 2004), and Sweden (Karpaty and Lundberg 2004), among others. There are also studies confirming the supportive role of R&D in domestic firms for developing or emerging countries, including the Czech Republic (Kinoshita 2001), India (Kanturia 2000, 2001, 2002), Hungary and Slovakia (Damijan, Knell, Majcen, and Rojec 2003), and Indonesia (Blalock and Gertler 2009) among others.

[2] The technology gap is usually measured as a domestic firm's productivity level relative to a benchmark productivity level within the same sector – often of the leading firms (Griffith, Redding, and Simpson 2002; Girma 2005; Girma and Görg 2007) or of foreign firms (Castellini and Zanfei 2003).

One exception is Damijan et al. (2003) finding a negative role of firm-level R&D on FDI spillovers for Estonia and Latvia (reported in Crespo and Fontura 2007). Gentile-Lüdecke and Giroud (2012) find no impact of suppliers' R&D intensity on their knowledge acquisition from multinationals, but on local suppliers' new knowledge creation in terms of new products, services and technologies.

A domestic firm's ability to absorb foreign technology might also be positively related to its share of *skilled labor*. Blalock and Gertler (2009), for example, find that the proportion of employees with college degrees significantly increases domestic firms' productivity gains from FDI in Indonesian manufacturing. However, Girma and Wakelin (2007) only confirm such a finding for smaller firms in the U.K. – they find that FDI does not affect large firms with a high proportion of human capital, as these firms are probably the most similar to multinationals in terms of technology and market share. In contrast, Sinani and Meyer (2004) find for a sample of Estonian firms that a larger share of human capital reduces the positive spillover effects for domestic firms, but increases it for large firms. Their explanation for this contradicting result is that the competition effect might reduce workers' possibility to extract additional rents from local firms, since multinationals tend to pay better wages. The competition effect might also enable larger firms to keep skilled workers compared to smaller firms who might lose skilled workers to foreign firms.

Firm size has been positively related to a domestic firm's capacity to absorb FDI spillovers (e.g. Jordaan 2011 for Mexico). Larger firms may be better positioned to compete with multinationals and to imitate their tools (Crespo and Fontoura 2007). Analogously, larger firms may pay better wages and therefore find it easier to attract workers employed by multinational firms. Larger firms might also be more visible, e.g. organized in associations, and, thus, more likely selected as local suppliers by foreign firms. While Aitken and Harrison (1999) find negative spillovers from FDI on domestic plants in Venezuela, these effects are only significant for firms with less than 50 employees. This suggests that smaller firms are less competitive and less capable of absorbing positive spillover effects. In contrast, other studies find that small and medium-sized firms benefit more strongly from FDI spillovers, especially those firms with a higher proportion of skilled labor (e.g. Girma and Wakelin 2007; Sinani and Meyer 2004). Gentile-Lüdecke and Giroud (2012) also find evidence of a negative effect of firm size on knowledge acquisition from multinationals for suppliers in the Polish automotive sector.

Exporting has been linked to a domestic firm's absorptive capacity for at least two reasons. First, local exporting firms are generally characterized by a higher productivity, be it via learning-by-exporting or self-selection into exporting, rendering them more competitive to bear up against

negative rivalry effects created by multinationals (Crespo and Fontoura 2007). Second, the more a local firm exports, the lower will competitive pressures from multinational firms be felt (assuming that the multinational firm does not enter the same export market), hence, the incentive to improve, which lowers the extent of positive FDI spillovers. However, studies show no clear evidence whether exporting increases or lowers the productivity gains from FDI. While several studies find evidence of lower productivity gains for exporters (e.g. Blomström and Sjöholm 1999, Ponomareva 2000, Sinai and Meyer 2004, Abraham et al. 2010, and Du, Harrison, and Jefferson 2011). In contrast, some studies find that the gains from FDI are larger for exporting firms (e.g. Barrios and Strobl 2002, Schoors and van der Tol 2002, Lin at al. 2009, Jordaan 2011).

Several aspects of domestic firm *location* have been shown to be important for the extent of productivity spillovers from FDI. Barrios, Luisito, and Strobl (2006) find evidence that foreign firms collocating (agglomeration) in the same sector and region significantly increase productivity and employment of local manufacturing firms in Ireland. Some studies contest the positive role of agglomeration for a firm's absorptive capacity. For example, while Sjöholm (1999) confirms positive spillover effects when FDI is measured at the country-sector level in Indonesia, he finds negative spillovers when foreign presence is measured at the region-sector level. Aitken and Harrison (1999) and Yudaeva, Kozlov, Malentieva, and Ponomareva (2003) find similar results for Russia.

Besides agglomerations, studies have focused on other aspects of location. Firm location in special economic zones, for example, can have a negative impact on FDI spillovers if the zone focuses on export processing combined with a high percentage of imported inputs (Abraham et al. 2010). More regional development (e.g. Ponomareva 2000, Torlak 2004, Girma 2005, Girma and Wakelin 2007) and a domestic firm's geographical proximity to multinational firms (Girma and Wakelin 2007, Resmini and Nicolini 2007) seem to have a positive effect.

2.3 Transmission Channels

Understanding the transmission channels and mechanisms through which FDI spillovers can be generated in the first place is important when exploring how such spillovers are shaped by mediating factors. In the FDI literature, several channels for spillovers are identified (Hoekman and Javorcik 2006; Crespo and Fontoura 2007; among many others). These can be categorized in three main channels: (i) changing market forces (i.e. competition and demonstration effect), (ii) labor

turnover, and (iii) value chains (i.e. demand and assistance effect, diffusion effect, availability and quality effect). The focus of this paper is on value chains.[3]

Spillovers through global value chains emerge, e.g., when local firms become input or service suppliers of multinational firms. Specifically, FDI spillovers can be generated through the demand of multinationals for better and/or more diverse inputs (*demand effect*). Hereby, multinational affiliates might help local producers to upgrade their technological capabilities directly through sharing of production techniques and product design and assisting with technology acquisition (*assistance effect*) (Paus and Gallagher 2008). Spillovers to supplying industries may also be generated through personnel training, advance payment, leasing of machinery, provision of inputs, help with quality assurance and organization of product lines (Lall 1980; Crespo and Fontoura 2007; Javorcik 2008).

While the demand and assistance effects are intentional, unintentional knowledge spillovers can occur, e.g., through technology leakages to other supplying firms in the sector (*diffusion effect*). Finally, while the previously described effects refer to backward spillovers from multinationals to suppliers, there is also the case where a multinational firm supplies to a local producer in downstream sectors. This increases the availability, variety, and reliability of higher-quality inputs (*availability and quality effects*) (Javorcik 2008). Given our data sample which covers surveys of suppliers that produce inputs for multinationals, we are only able to examine demand and assistance effects in the following.

3 Which Foreign Investor Characteristics Increase the FDI Spillover Potential?

This section focuses on the role of foreign investor characteristics for the FDI spillover potential. Section 3.1 presents the dataset being used in this section. Section 3.2 evaluates if there are differences between foreign investors and domestic producers in terms of their potential to generate positive spillovers. Section 3.3 examines if there are differences in the extent of FDI spillover potential between different groups of foreign investors, depending on their characteristics.

[3] Note that the general managers experience in other foreign-owned firms at home or abroad in the strict sense could also be considered part of the transmission channel "labor turnover".

3.1 Data

The surveys, which form the basis for this paper, have been developed as part of a project by the International Trade Department of the World Bank which aims to assist low-income countries (LICs), particularly from Sub-Saharan Africa (SSA), to take better advantage of spillovers from FDI within the context of global value chains. Specifically, the project aims to identify the critical factors for the realization of FDI-related spillovers – including dynamic interactions between FDI and local suppliers.

Acknowledging that the extent and nature of potential FDI-generated spillovers differ importantly by sector and FDI motive, the project focuses not exclusively on manufacturing but includes, besides light manufacturing (apparel) two natural resources-based sectors which are particularly relevant for SSA LICs: mining and agribusiness. Given the share of FDI that goes into natural resources-intensive sectors, particularly in developing countries, understanding better the unique dynamics of FDI linkages and spillovers in sectors like agribusiness and mining represents an important opportunity. In addition, the study includes benchmark countries for these two sectors – Chile (for mining) and Vietnam (for agribusiness) – to be compared with the SSA countries.

Between March and October 2012, three different types of firms have been surveyed by various consultants, namely (i) national suppliers, i.e. firms with a national ownership of at least 75 percent that supply to multinationals in the country, (ii) foreign investors, i.e. firms that have a foreign ownership share of at least 25 percent, and (iii) national producers, i.e. domestic firms that are final goods producers and have a national ownership of at least 75 percent. In cases where reported data seemed unlikely, either consultants or the firms themselves were contacted again to make sure we obtained the correct numbers.

The focus of this section is on foreign investors, but we also compare their characteristics with domestic producers. The foreign investors' surveys cover 87 firms in Chile (5), Ghana (16), Kenya (20), Lesotho (15), Mozambique (10), Swaziland (11) and Vietnam (10). Table 1 shows that the majority of foreign investors are in apparel (43), followed by agribusiness (30) and mining (14). Domestic producers' surveys cover 64 firms in Chile (5), Ghana (10), Kenya (26), Mozambique (6) and Vietnam (17). The majority of these firms are in agribusiness (46), followed by apparel (13) and mining (5).

Table 1: Number of Firms by Type of Firm and Sector

Type	Sector	No. of firms	%
Foreign investor	Agribusiness	30	34.5%
Foreign investor	Apparel	43	49.4%
Foreign investor	Mining	14	16.1%
Foreign investor	*All sectors*	*87*	*100.0%*
Domestic producer	Agribusiness	46	71.9%
Domestic producer	Apparel	13	20.3%
Domestic producer	Mining	5	7.8%
Domestic producer	*All sectors*	*64*	*100.0%*

3.2 Differences between Foreign Investors and Domestic Producers

In this section, we assess if foreign investors are different from domestic producers in terms of their potential to generate positive spillover effects for domestic suppliers. In the following, we look at three types of indicators that all influence the spillover potential, namely the firms' overall performance, their linkages with the local economy, and supplier assistance.

Performance Indicators

Table 2 (column 1) shows the mean differences, controlling for country-sector fixed effects. Column (2) additionally controls for employment, since firm size may also explain some of the differences between multinationals and domestic producers. All variables refer to FY 2012. The summary statistics for both foreign investors and domestic producers can be found in Appendix 1.

The results indicate that multinationals sell significantly more than domestic suppliers (ln*sales*), although the effect becomes smaller when controlling for firm size. Foreign firms are also more productive (ln*labprod*), and this effect is slightly larger when we additionally control for firm size. They also have a smaller technology gap (*tech*) to the leading domestic competitor (i.e. domestic producers generally lag further behind the domestic leader in the sector) which could be the result of being more productive.

The positive coefficient sign on the share of workers with tertiary education (*emp_ter*) and the negative coefficient sign on the share of workers with secondary education (*emp_sec*) seem to indicate that foreign firms have a labor force that is more skilled, although the effects are not significant. Foreign firms are more likely to export (*exporting*). The share of direct exports is clearly

higher for foreign firms (*expsh_dir*), while the share of direct exports shows a negative coefficient sign, but has no statistically significant impact.

In sum, we find that foreign investors tend to outperform domestic producers in terms of sales, firm size, productivity, technology gap, exporting behavior, and direct export share. This would imply a higher knowledge and productivity spillover potential compared to domestic firms.

Table 2: Performance Indicators, Foreign Investors vs. Domestic Producers (Mean Difference)

Variable	Definition	Difference	Additional controls for ln*emp*
		(1)	(2)
ln*sales*	Firm's sales (USD) in natural logarithms	2.5893***	2.1162***
		(0.000)	(0.000)
ln*age*	Number of years since firm has started operations in natural logarithms	-0.1429	-0.2192
		(0.389)	(0.233)
ln*emp*	Firm's number of employees in natural logarithms	0.3410	n.a
		(0.270)	n.a.
ln*labprod*	Firm's sales per number of employees (USD) in natural logarithms	1.9528***	2.1162***
		(0.000)	(0.000)
tech	Technology gap between firm and its leading domestic competitor in the same sector, where 1 means "not existent" and 4 means "large"	-0.4982***	-0.6094***
		(0.003)	(0.000)
emp_ter	Percentage of workers with tertiary education in the firm's workforce	6.5680	8.9122
		(0.262)	(0.106)
emp_sec	Percentage of workers with secondary education in the firm's workforce	-6.7298	-7.8271
		(0.315)	(0.225)
export	Dummy taking the value of 1 if a firm exports, and 0 otherwise	0.6418**	0.5233*
		(0.025)	(0.083)
expsh_dir	Percentage of direct exports of firm's total sales	35.7146***	33.3476***
		(0.000)	(0.000)
expsh_ind	Percentage of indirect exports of firm's total sales	-1.6483	-4.8535
		(0.681)	(0.206)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: Variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Linkages with the Local Economy

Table 3 compares foreign investors' and domestic producers' linkages with the local economy. Linkages are measured in terms of the share of domestic inputs and workers as well as a firm's percentage of sales going to the domestic market. All are expected to increase the potential of positive spillovers for local suppliers (see section 2.1). We also examine differences between types of inputs and workers. We follow the specification of the previous section. All variables refer to FY

2012. The summary statistics for both foreign investors and domestic producers are shown in Appendix 2.

Foreign investors source a lower share of their total inputs from domestic suppliers (*inp_dom*) compared to domestic producers. We also evaluate if foreign investors and domestic producers differ in terms of their sourcing patterns. Foreign investors source a significantly lower share of raw materials (*inp_dom_mat*) and equipment and machinery (*inp_dom_equip*) as percentage of their total domestic inputs compared to domestic producers. On the other hand, their share of technical services (*inp_dom_tech*) as well as transport, security, cleaning, catering, and other services (*inp_dom_oth*) is significantly larger in comparison with domestic producers.

We now focus on the firms' use of local workers. Foreign firms clearly employ a lower share of domestic workers (*emp_dom*) than domestic producers. The differences are slightly larger when we control for firm size (column 2). These differences are no longer statistically significant if we differentiate between types of workers by educational level. As could be expected, foreign investors significantly make less use of domestic managers (*man_dom*) compared to domestic producers. While the coeffient signs are consistently negative for supervisors (*super_dom*) and technical positions (*tech_dom*), they narrowly miss the threshold of statistical significance.

Finally, we also look at forward linkages, measured as a firm's percentage of sales going to the domestic market (*market*). The results show unambiguously that foreign investors sell a lower percentage to the local market than domestic producers.

In sum, foreign investors are characterized by fewer linkages with the local economy, as they make less use of domestic workers and inputs and also sell a lower share of their output to the domestic market. However, the findings also show that certain service inputs, namely technical services and transport, security, cleaning, catering, and other services, show a higher potential for linkages.

Table 3: Linkages, Foreign Investors vs. Domestic Producers (Mean Difference)

Variable	Definition	Difference (1)	Additional controls for ln*emp* (2)
Inputs			
inp_dom	Percentage of inputs sourced from domestic suppliers	-16.0734***	-12.4843**
	in the firm's total inputs	(0.008)	(0.043)
inp_dom_mat	Percentage of raw materials from domestic firms of firm's	-16.1221***	-12.4158**
	total input purchases from domestic firms	(0.002)	(0.029)
inp_dom_comp	Percentage of parts and components from domestic	-0.1020	-0.3504
	firms of firm's total input purchases from domestic firms	(0.938)	(0.807)
inp_dom_pack	Percentage of packaging from domestic firms of firm's	3.7895	5.6411
	total input purchases from domestic firms	(0.331)	(0.201)
inp_dom_equip	Percentage of equipment and machinery from domestic	-5.0125**	-5.0252**
	firms of firm's total input purchases from domestic firms	(0.025)	(0.041)
inp_dom_bus	Percentage of business services from domestic firms of firm's	0.7942	-0.1636
	total input purchases from domestic firms	(0.693)	(0.940)
inp_dom_tech	Percentage of technical services from domestic firms of	3.7713**	3.7013**
	firm's total input purchases from domestic firms	(0.018)	(0.031)
inp_dom_oth	Percentage of transport, security, cleaning, catering, and	13.9780***	9.5439***
	other services from domestic firms of firm's total input purchases from domestic firms	(0.000)	(0.001)
Labor			
emp_dom	Percentage of domestic workers in the firm's total	-4.0758***	-4.4249***
	workforce	(0.002)	(0.002)
emp_ter_dom	Percentage of domestic workers with tertiary education	2.8700	4.1928
	in the firm's workforce	(0.613)	(0.445)
emp_sec_dom	Percentage of domestic workers with secondary education in	-7.6005	-8.0573
		(0.261)	(0.225)
emp_oth_dom	Percentage of other domestic workers in the firm's	-0.1145	-0.7786
	workforce	(0.986)	(0.906)
man_dom	Percentage of domestic managers of firm's total managers	-15.5842***	-16.4872***
		(0.000)	(0.000)
super_dom	Percentage of domestic supervisors of firm's total	-6.6335	-8.5360
	supervisors	(0.181)	(0.100)
tech_dom	Percentage of technical positions of firm's total technical	-5.9357	-5.8431
	positions	(0.159)	(0.185)
Output			
market	Percentage of sales to domestic market of firm's total sales	-34.0663***	-28.4941***
		(0.000)	(0.001)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: Variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Supplier Assistance

Finally, we also assess if there are differences between foreign investors and domestic producers in terms of their supplier assistance, as assistance increases the FDI spillover potential (as discussed in section 2.3). For each indicator we measure the probability of assisting suppliers, which takes the value of 1 if a firm offers assistance, and 0 otherwise. The data do not allow us to identify when and how often supplier assistance took place. The summary statistics for both foreign investors and domestic producers can be found in Appendix 3.

The negative coefficient signs in Table 4 suggest that foreign investors seem to offer less assistance to local suppliers than domestic producers, although the effects are only significant for five types of assistance, namely (i) help with organization of production lines (*assist_orga*), (ii) help with quality assurance (*assist_qual*), (iii) help with the supplier's business strategy (*assist_strat*), (iv) help with finding export opportunities (*assist_exp*) which is only significant if we control for firm size (column 2), and (v) help with implementing health, safety, environmental, and/or social conditions (*assist_hse*).

In sum, foreign investors outperform domestic producers in terms of sales, firm size, productivity, exporting behavior, and direct export share. While this would imply a higher knowledge and productivity spillover potential compared to domestic firms, foreign investors have fewer linkages with the local economy in terms of using domestic inputs and workers. There is also some evidence that foreign firms offer less assistance to local suppliers. Fewer linkages and less supplier assistance both can limit the positive impact from FDI.

Table 4: Supplier Assistance, Foreign Investors vs. Domestic Producers (Mean Difference)

Variable	Definition	Difference	Additional controls for ln*emp*
		(1)	(2)
assist	Dummy taking the value 1 if firm offered assistance to	-0.1725	-0.2994
	domestic suppliers, and 0 otherwise	(0.636)	(0.437)
assist_pay	Advance payment	-0.4019	-0.2117
		(0.203)	(0.523)
assist_impr	Provision of financing for improvements	-0.3675	-0.4821
		(0.155)	(0.081)
assist_funds	Support to get funds from other sources	-0.0831	-0.1474
		(0.747)	(0.587)
assist_plan	Financial planning	-0.1670	-0.1160
		(0.522)	(0.669)
assist_inp	Provision of inputs	-0.1683	-0.1846
		(0.509)	(0.496)
assist_sourc	Support for sourcing raw materials	-0.2125	-0.1645
		(0.405)	(0.544)
assist_train	Training of workers	0.0801	0.0111
		(0.760)	(0.968)
assist_equip	Lending/leasing of machines or equipment	-0.0590	0.0247
		(0.827)	(0.931)
assist_tech	Product or process technologies	-0.1584	-0.3123
		(0.546)	(0.302)
assist_maint	Repair/maintenance of machines	-0.1376	-0.1472
		(0.620)	(0.619)
assist_license	Licensing of patented technology	-0.0022	0.0006
		(0.994)	(0.999)
assist_orga	Help with organization of production lines	-0.5224**	-0.6778**
		(0.046)	(0.024)
assist_qual	Help with quality assurance	-0.5166*	-0.5547*
		(0.060)	(0.057)
assist_invent	Help with inventory control	0.0303	0.0262
		(0.907)	(0.925)
assist_audit	Help with audits	-0.1651	-0.1779
		(0.536)	(0.538)
assist_strat	Help with business strategy	-0.6606**	-0.7690***
		(0.012)	(0.007)
assist_exp	Help with finding export opportunities	-0.4629	-0.5017*
		(0.101)	(0.089)
assist_hse	Help with implementing health, safety, environmental,	-0.6467**	-0.6589**
	and/or social conditions	(0.017)	(0.024)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

3.3 Premia by Foreign Investor Characteristics

The analysis in the previous section treated foreign firms as homogenous. The literature survey in section 2.1, however, showed that certain types of FDI seem to be more beneficial than others since actual FDI spillovers also depend on foreign firm characteristics. In this section, we therefore split the foreign investors into several groups to investigate if firms with certain characteristics have a larger FDI spillover potential than others.

We estimate the following equation:

$$potential_{isc} = \alpha_0 + FC_{isc} + D_{cs} + \varepsilon_{isc} \quad (1)$$

where subscript *i* stands for firm, *s* for the firm's sector, and *c* for country. α_0 designates the constant, D_{cs} country-sector fixed effects, and ε_{isc} the idiosyncratic error term. *FC* is a vector representing several foreign firm characteristics which take the value of 1 if a foreign investor fulfills a certain characteristic, and 0 otherwise. *potential* is our measure of FDI spillover potential. Building on the theoretical discussion in section 2.1, we include the foreign investor characteristics shown in Table 5. The summary statistics are presented in Appendix 4.

Table 5: Foreign Investor Characteristics, Definition

Variable	Definition
own	A firm's percentage of foreign ownership
age_fdi	Number of years since a multinational has started its operations in the host country
tech	A foreign firm's technology gap with its leading domestic competitor in the same sector, where 1 means "not existent" and 4 means "large"
origin_SSA	Dummy taking the value of 1 if the largest foreign investor's region of origin is SSA, and 0 otherwise
origin_Asia	Dummy taking the value of 1 if the largest foreign investor's region of origin is Asia (including South Asia) and 0 otherwise
motive_market	Importance of access to (local and regional) markets, where 1 means "not important" and 4 means "very important"
motive_cost	Importance of access to reduced labor and non-labor related costs, where 1 means "not important" and 4 means "very important"
motive_res	Importance of access to raw materials and specific inputs, where 1 means "not important" and 4 means "very important"
motive_asset	Importance of access to skills and technology, where 1 means "not important" and 4 means "very important"

We apply four FDI spillover potential measures related to a foreign firm's linkages with and assistance to domestic suppliers, as these are the categories where foreign firms lag behind domestic producers: (i) the percentage of purchased goods and services sourced from domestic

suppliers (*inp_dom*), (ii) the percentage of domestic workers in the firm's total workforce (*emp_dom*), (iii) the percentage of sales to the domestic market (*market*), and (iv) the likelihood of supplier assistance (*assist*). While foreign investor characteristics refer to FY 2012, we don't know when supplier assistance took place. However, it is relatively safe to assume that major foreign characteristics remained constant over time.

Table 6 shows the descriptive statistics. Each line represents a foreign investor characteristic, *FC*, using different thresholds, while columns 1 to 4 refer to our four measures of FDI spillover potential. Each panel in a column is estimated as a separate regression.

The share of foreign ownership (*own*) matters for the FDI spillover potential. Multinationals with a foreign ownership share of at least 50 and less than 100 percent source more inputs locally compared to other firms, and this effect is even slightly higher for firms with full foreign ownership (column 1). However, we don't find any effects on alternative measures of FDI spillover potential.

A multinational's presence in the host country (*age_fdi*) is negatively associated with the share of domestically sourced inputs if the firm has been in the country for at least 20 years (column 1), but positively related with the percentage of domestic workers (column 2). A presence in the host country of at least 10 but less than 20 years is also positive related with the probability to offer supplier assistance (column 4).

If a foreign firm has a moderate technology gap (*tech*) to the leading domestic competitor in the same sector, it is more likely to offer supplier assistance (column 4).

The region of origin (*origin*) also matters for the FDI spillover potential. Interestingly, foreign firms with the largest investor from SSA are more likely to assist domestic suppliers compared to other firms (column 4). In addition, they sell a higher share of their output to the local market (column 3). Firms with their largest foreign investor from Asia (including South Asia) also sell a significantly larger share of output to the local market, but offer significantly less assistance to their domestic suppliers (columns 3 and 4).

In a next step, we evaluate whether the FDI motive influences the extent of FDI linkages. As could be expected, market-seeking FDI (*motive_market*) is positively correlated with the share of sales to the host country (column 3). It is also positive correlated with the probability of supplier assistance (column 4). However, firms where market-seeking FDI is moderate make significantly less use of local workers (column 2).

Table 6: Premia by Foreign Investor Characteristics

Variable	Thresholds	Measure of FDI Spillover Potential			
	foreign investor = 1 if …	(1)	(2)	(3)	(4)
	and 0 otherwise	***inp_dom***	***emp_dom***	***market***	***assist***
own	50 >= *own* < 100%	19.3783*	0.8246	18.4457	0.7381
		(0.053)	(0.751)	(0.533)	(0.433)
	own = 100%	20.1105***	0.5891	15.6657	1.0395
		(0.006)	(0.769)	(0.575)	(0.185)
age_fdi	5 >= *age_fdi* < 10	-4.1679	1.1154	-5.3242	-0.4357
		(0.518)	(0.730)	(0.707)	(0.638)
	10 >= *age_fdi* < 20	6.3996	1.9615	-6.8739	1.5076*
		(0.176)	(0.403)	(0.487)	(0.080)
	age_fdi >= 20	-13.8976*	6.9023**	-0.8358	0.9591
		(0.055)	(0.040)	(0.965)	(0.210)
tech	*tech* = 2	0.6802	0.7089	20.1645	6.1271***
		(0.945)	(0.784)	(0.133)	(0.000)
	tech = 3	-1.2057	0.8178	9.5329	.
		(0.924)	(0.705)	(0.487)	.
origin	*origin* = SSA	2.6070	-1.2141	31.4395***	4.5044***
		(0.739)	(0.800)	(0.000)	(0.000)
	origin = Asia	-1.1053	-7.1175	30.3003***	-1.5248*
		(0.890)	(0.171)	(0.001)	(0.072)
motive_market	*motive_market* = 2	0.0312	-4.1798*	16.9894	.
		(0.998)	(0.075)	(0.290)	.
	motive_market >= 3	-0.4772	-2.2504	26.7538***	1.1809**
		(0.926)	(0.252)	(0.000)	(0.040)
motive_cost	*motive_cost* = 2	2.3507	-12.0948**	3.0408	-1.6694*
		(0.770)	(0.050)	(0.786)	(0.051)
	motive_cost >= 3	-0.9970	-3.6712	8.7955	-0.0534
		(0.877)	(0.109)	(0.440)	(0.940)
motive_res	*motive_res* = 2	-10.0951	-4.0206	3.0942	-5.3253***
		(0.223)	(0.292)	(0.810)	(0.000)
	motive_res >= 3	10.3145	-2.0761	-33.1588**	-10.5863***
		(0.274)	(0.509)	(0.023)	(0.000)
motive_asset	*motive_asset* = 2	3.7012	2.9197	4.6732	.
		(0.682)	(0.369)	(0.688)	.
	motive_asset >= 3	-5.4219	2.6393	2.5715	-0.6596
		(0.669)	(0.485)	(0.814)	(0.458)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses).
Note: All variables except for *assist* refer to FY 2012. Each panel in a column is estimated as a separate regression. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity. No observations for *tech*=4. Missings indicate variables that were dropped from the regressions.

Cost-seeking FDI (*motive_cost*) is negatively correlated with the share of local workers (column 2) as well as the probability of offering supplier assistance (column 4) if this motive has a moderate importance for multinationals.

Resource-seeking FDI (*motive_res*) clearly shows a negative correlation with the share of sales going to the host country if this motive is important (column 3). Moreover, it is also negatively associated with supplier assistance, regardless of the importance of this motive (column 4).

4 Which Absorptive Capacities Facilitate FDI Linkages?

This section focuses on the role of domestic supplier characteristics for FDI linkages. In section 4.1, we present the data, while section 4.2 introduces the empirical model where we relate absorptive capacities with FDI linkages. Section 4.3 examines if there are differences in the extent of FDI linkages between different groups of suppliers, depending on their absorptive capacities. Section 4.4 describes the regression results.

4.1 Data

The focus of sections 4 and 5 is on national suppliers (see section 3.1 for a description of our dataset). The national suppliers' surveys cover 148 firms in Chile (18), Ghana (26), Kenya (29), Mozambique (36) and Vietnam (39). More than half of the suppliers (88) supply to multinationals in agribusiness, followed by mining (48) and apparel (12). These suppliers produce a variety of inputs across the value chain, as shown in Table 7, ranging from chemicals, to equipment, to food and food processing, to business, technical, and other services, among others.

Table 7: Distribution of Suppliers by Sector

Sector	No. of firms	%
Apparel accessories	4	2.7%
Chemicals	22	14.9%
Equipment	22	14.9%
Food and food processing	24	16.2%
Inputs to mining	8	5.4%
Packaging	10	6.8%
Seeds	11	7.4%
Business services	17	11.5%
Technical services	20	13.5%
Other services	10	6.8%
All sectors	*148*	100.0%

4.2 Empirical Model

We define the following equation:

$$linkage_{isc} = \alpha_0 + AC_{isc} + D_{cs} + \varepsilon_{isc} \quad (2)$$

AC is a vector denoting supplier-specific absorptive capacities which facilitate FDI linkages, and *linkage* is our measure of FDI linkages. Building on the theoretical discussion in section 2.2, we include the following absorptive capacities, as defined in Table 8:

$$\begin{aligned} outp_{isc} = \alpha_0 + gap_{isc} + soph_{isc} + emp\_ter_{isc} + emp\_sec_{isc} + \ln exper_{isc} + man\_educ_{isc} \\ + man\_exper_{isc} + \ln emp_{isc} + export_{isc} + \ln dist_{isc} + D_{cs} + \varepsilon_{isc} \end{aligned} \quad (3)$$

Due to lacking data on R&D activity, we use *soph* as a proxy. *emp_ter* and *emp_sec* serve as our direct measures of worker skills. *exper* measures a supplier's experience and thus serves as an indirect measure of skills. We also include characteristics related to the skills and experience of the general manager, *man*, namely *man_educ* and *man_exper*. *emp* captures firm size, *export* export activity, and *dist* firm location. We also include a measure of technology gap (rather than firm-level productivity per se), *gap*, as has been outlined in the literature.

Table 8: Definition of Supplier Characteristics

Variable	Definition
gap	Technology gap to the leading domestic competitor's technology in the firm's sector, ranging from 1 to 4, where 1 means "no difference" and 4 means "large difference
soph	Degree of sophistication of the firm's production process, ranging from 1 to 4, where 1 means "standardized" and 4 means "highly sophisticated"
emp_ter	Percentage of workers with tertiary education in the firm's workforce
emp_sec	Percentage of workers with secondary education in the firm's workforce
exper	Number of years since firm has started operations in country
man_educ	Highest level of education of the general manager, ranging from 1 to 3, where 1 means "primary education (without vocational education)", 2 means "secondary education (vocational education and training)" and 3 means "tertiary education (college or university degree)"
man_exper	Dummy taking the value of 1 if the general manager has previous work experience in a foreign firm in the country or abroad, and 0 otherwise
export	Dummy taking the value of 1 if a firm exports, and 0 otherwise
dist	Geographical distance of firm to foreign client in km

Since the supplier characteristics refer to the survey year (2012), we are constrained to use a *linkage* measure of the same year. We use the percentage of a supplier's output to foreign customers (*outp*). While *outp* does not capture direct productivity gains or other FDI spillovers, a

higher share of output to foreign customers makes positive spillovers, for instance via assistance or requirements from the multinational, more likely. The summary statistics are shown in Appendix 5.

4.3 Supplier Premia by Absorptive Capacity

In this section, we split suppliers into several groups to investigate if suppliers with certain characteristics benefit from larger FDI linkages than others. Modifying the specification of equation (2), we assign a dummy taking the value of 1 for suppliers with a certain absorptive capacity, *AC*, and 0 for all other suppliers in the sample and estimate the impact on the percentage of a supplier's output to foreign customers (*outp*).

Table 9 shows the descriptive statistics. Each line represents a supplier's absorptive capacity, *AC*, applying different thresholds. Each panel is estimated as a separate regression. A highly sophisticated production process (*soph*) has a significantly positive impact on suppliers' output to foreign firms. Moreover, FDI linkages tend to increase with a more sophisticated production process, as can be seen by the growing coefficient signs on *soph* and the decreasing p-values.

Firms with a share of workers with secondary education (*emp_sec*) of at least 20 and below 50 percent supply a significantly higher share to foreign investors than other firms. This effect becomes slightly smaller for suppliers employing at least 50 but less than 80 percent of workers with secondary education. However, the effect is no longer significant for suppliers with a share of workers with secondary education of at least 80 percent. The results imply that multinationals in our sample source inputs from domestic suppliers that are somewhat but not too skill-intensive.

Firm size also has an influence on FDI linkages. Suppliers with at least 50 but less than 250 employees have a significantly lower output share than other suppliers. The effect is also negative for alternative threshold levels, but misses the levels of statistical significance narrowly.

Finally, geographical location also matters. FDI linkages are significantly lower for suppliers that are located more than 500 km from their foreign clients (*dist*), but the negative effect levels off for suppliers that are located closer to their foreign client. Given the existence of premia for several supplier groups, we assess the impact of supplier characteristics on the extent of FDI linkages in the next section.

Table 9: Supplier Premia by Absorptive Capacity

Variable	Thresholds	Measure of FDI Linkage: *outp*	
	supplier = 1 if … and 0 otherwise	**Difference**	**p-value**
gap	*gap* = 2	-7.2833	(0.448)
	gap >= 3	-2.8160	(0.713)
soph	*soph* = 2	0.7105	(0.941)
	soph = 3	5.7639	(0.516)
	soph = 4	23.1604*	(0.072)
emp_ter	20% >= *emp_ter* < 50%	12.6626	(0.112)
	50% >= *emp_ter* < 80%	-5.5474	(0.541)
	emp_ter >= 80%	-8.9682	(0.526)
emp_sec	20% >= *emp_sec* < 50%	18.2152**	(0.042)
	50% >= *emp_sec* < 80%	15.5753*	(0.095)
	emp_sec >= 80%	8.4187	(0.484)
exper	3 >= *exper* < 10	20.9871	(0.139)
	10 >= *exper* < 20	14.4016	(0.296)
	20 >= *exper* < 30	6.4514	(0.647)
	exper >= 30	27.5507*	(0.080)
man_educ	*man_educ* = 2	3.3842	(0.841)
	man_educ = 3	-10.1846	(0.493)
man_exper	*man_exper* = 1	7.3526	(0.314)
emp	10 >= *emp* < 50	-18.1670	(0.157)
	50 >= *emp* < 250	-24.1310*	(0.072)
	emp >= 250	-23.7696	(0.118)
export	*export* = 1	9.8261	(0.121)
dist	20 >= *dist* < 100	-19.9154*	(0.056)
	100 >= *dist* < 500	-18.0726*	(0.057)
	dist >= 500	-26.1891***	(0.005)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: All variables refer to FY 2012. Each panel is estimated as a separate regression. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

4.4 Regression Results

Overall Results

Table 10 reports the regression results based on the specification of equation (3). Given the differences between supplier sectors and countries, all regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity. A more sophisticated production process (*soph*) has a significantly positive impact on suppliers' output to foreign firms, supporting the positive role of R&D for local firms in the literature. Firm location also matters for FDI linkages. A larger distance to the foreign firm (ln*dist*) reduces the supplier's output share going to foreign

clients, supporting the findings of Barrios et al. (2006) who find evidence that foreign firms collocating in the same sector and region significantly increase productivity and employment. A larger size (ln*emp*) seems to be negatively associated with FDI linkages, while exporting (*exp*) seems to have a positive impact, although both narrowly miss the 10 percent threshold of statistical significance. Including all absorptive capacities simultaneously (column 9) confirms the findings only for firm size (ln*emp*) and distance to the foreign firm (ln*dist*).

Table 10: The Effect of Suppliers' Absorptive Capacity on Output Share to Foreign Firms, OLS

Dependent variable: $outp_{isc}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
gap_{isc}	-1.6276								-1.0695
	(0.609)								(0.800)
$soph_{isc}$	5.9014*								6.4544
	(0.094)								(0.120)
emp_ter_{isc}		-0.1314							-0.2208
		(0.317)							(0.234)
emp_sec_{isc}			0.1005						0.0037
			(0.396)						(0.980)
ln$exper_{isc}$				1.4755					4.7960
				(0.744)					(0.450)
man_educ_{isc}					-10.0299				-6.3287
					(0.142)				(0.412)
man_exper_{isc}					6.0535				9.7105
					(0.419)				(0.283)
lnemp_{isc}						-3.4974			-6.7818*
						(0.106)			(0.051)
$export_{isc}$							9.8261		10.2026
							(0.121)		(0.296)
ln$dist_{isc}$								-4.0871**	-2.9573*
								(0.014)	(0.069)
$constant_{isc}$	48.7270**	63.7402***	54.2755***	54.3062**	83.3056***	70.1656***	56.2935***	69.4351***	80.0081***
	(0.013)	(0.001)	(0.002)	(0.013)	(0.000)	(0.000)	(0.001)	(0.000)	(0.003)
Country- sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.31	0.32	0.31	0.29	0.33	0.33	0.30	0.34	0.48
Observations	109	107	107	109	112	107	110	105	93

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: All variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Results for Established Suppliers

It is likely that firms having a longer supplier experience have different absorptive capacities compared to firms that just started supplying to a foreign client, especially as structural changes (such as changes in the supplier's capacity, sophistication of production processes or skill levels) may happen early on during their relationship. We therefore rerun the regressions for supplier firms that have a supplier relationship of at least three years (see Table 11).

While the positive impact of a more sophisticated production process (*soph*) and the negative impact of a larger distance to the foreign firm (ln*dist*) can be confirmed, we also find a significantly

negative impact of the share of workers with tertiary education (*emp_ter*) on the supplier's share of output going to foreign firms. A higher educational level of the general manager (*man_educ*) also reduces FDI linkages. While our focus here is on the suppliers' output share to foreign firms and not on FDI spillovers, our findings can be related to those by Sinani and Meyer (2004) who find that a larger share of human capital leads to negative FDI spillovers (see section 2.2), although the underlying mechanisms may be different. It may be possible that suppliers with highly educated managers supply a larger share of inputs to firms abroad, for instance, because they may have fewer language barriers. In the overall sample (column 9), however, only distance to the foreign firm (ln*dist*) shows a significant effect.[4]

Table 11: The Effect of Suppliers' Absorptive Capacity with Supplier Relationship of at Least Three Years on Output Share to Foreign Firms, OLS

Dependent variable: $outp_{isc}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
gap_{isc}	-3.1899								-3.4042
	(0.341)								(0.412)
$soph_{isc}$	6.9340*								6.8075
	(0.055)								(0.102)
emp_ter_{isc}		-0.2337*							-0.2822
		(0.067)							(0.105)
emp_sec_{isc}			0.1797						-0.0169
			(0.179)						(0.911)
ln$exper_{isc}$				-2.2745					-0.0370
				(0.709)					(0.996)
man_educ_{isc}					-14.2539**				-13.6016
					(0.048)				(0.176)
man_exper_{isc}					5.5674				10.0019
					(0.469)				(0.265)
lnemp_{isc}						-2.3064			-4.5781
						(0.302)			(0.200)
$export_{isc}$							10.8120		7.7413
							(0.114)		(0.414)
ln$dist_{isc}$								-3.7772**	-2.5183*
								(0.025)	(0.097)
$constant_{isc}$	49.5283**	67.6262***	50.7481***	65.6000**	95.1645***	66.2781***	56.0470***	68.6250***	113.8197***
	(0.015)	(0.001)	(0.008)	(0.014)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.33	0.36	0.34	0.30	0.35	0.33	0.32	0.36	0.54
Observations	102	100	100	102	105	100	103	99	87

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: All variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

[4] We also interact each absorptive capacity with a SSA dummy to test for location-specific effects. The SSA dummy takes the value of 1 if the supplier is located in Ghana, Kenya, and Mozambique, and 0 if the supplier is located in Chile and Vietnam. We find that the effects are more favorable if firms are located in SSA. A larger share of workers with secondary education has a more positive impact on FDI linkages in SSA compared to non-SSA countries, while a higher educational level of the general manager and larger distances between suppliers and multinationals both have a less negative effect (results available upon request).

5 Which Factors within Transmission Channels Support FDI Spillovers?

5.1 Supplier Premia by Factors within Transmission Channel

In this section, we evaluate whether suppliers that benefited from any demand or assistance effects are characterized by higher FDI linkages and spillovers than suppliers that don't. Table 12 shows the supplier premia by transmission channel (see Appendix 5 for summary statistics). Focusing on FDI linkages first, firms that received assistance from the foreign customer to make improvements (*assist*) supply a significantly higher share of their output to foreign clients than firms that don't (*outp* column).

Table 12: Supplier Premia by Factors within Transmission Channel

Variable	Definitions	Measure: *outp*	Measure: *exp_start*
audit	Dummy taking the value of 1 if supplier received technical audits	-0.6666	0.8551**
	before or after signing a contract with the foreign customer, and 0 otherwise	(0.909)	(0.049)
impr	Dummy taking the value of 1 if the foreign customer required	1.9031	0.3366
	the supplier to make improvements before or after signing the contract, and 0 otherwise	(0.796)	(0.468)
assist	Dummy taking the value of 1 if supplier received assistance from	16.5684**	1.3256***
	the foreign customer to meet any requirements before or after signing the contract, and 0 otherwise.	(0.013)	(0.008)
dev	Dummy taking the value of 1 if supplier developed product jointly	10.7522	1.2506***
	with the foreign customer, and 0 otherwise.	(0.129)	(0.006)
license	Dummy taking the value of 1 if supplier licensed technology	5.1151	1.2387**
	from the foreign customer, and 0 otherwise.	(0.498)	(0.014)

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Besides FDI linkages, we also include *exp_start* as our FDI spillover measure, which is a dummy taking the value of 1 if the firm started exporting as a consequence of supplying to a foreign customer, and 0 otherwise. The results confirm that several transmission channels matter for backward FDI spillovers. Suppliers receiving technical audits before or after signing the contract (*audit*), suppliers receiving assistance from their foreign clients (*assist*), suppliers with joint product development with their customers (*dev*), and suppliers licensing technology from their foreign client (*license*) are more likely to export as a result of their supplier-relationship (*exp_start* column). In sum, we find evidence of the existence of positive assistance effects (including technical

audits, joint product development, and technology licensing) in global value chains, while demand effects (measured as requirements to improve) do not have any impact.

5.2 Empirical Model

In this second exercise, we focus on the role of transmission channels for FDI spillovers:

$$spillover_{isc} = \alpha_0 + TC_{isc} + D_{cs} + \varepsilon_{isc} \quad (4)$$

TC is a vector relating to various factors within transmission channels through which multinationals influence national suppliers and thus make FDI spillovers more likely, and *spillover* is our measure of FDI spillover.

We specify the following transmission channels, as defined in section 5.1:

$$spillover_{isc} = \alpha_0 + audit_{isc} + impr_{isc} + assist_{isc} + dev_{isc} + license_{isc} + D_{cs} + \varepsilon_{isc} \quad (5)$$

audit and *impr* capture demand effects in global value chains, while *assist, dev,* and *license* represent assistance effects. We use *exp_start* as our spillover measure (see section 5.1. for a definition).

5.3 Regression Results

Overall Results

Table 13 follows the specification of equation (5) and uses exporting as a consequence of supplying to a foreign customer (*exp_start*) as the spillover measure. Technical audits (*audit*), assistance by foreign customers (*assist*), joint product development (*dev*), and licensed technology from the foreign customer (*license*) all significantly influence a supplier's likelihood of starting to export as a result of supplying to a foreign customer. In the combined sample (column 6), we can confirm the significantly positive effects of technical audits (*audit*) and assistance by foreign customers (*assist*). Again, requirements to improve (*impr*) do not have any impact, supporting our previous finding of no demand effects.[5]

[5] We also interact each transmission channel with a SSA dummy to test for location-specific effects. The SSA dummy takes the value of 1 if the supplier is located in Ghana, Kenya, and Mozambique, and 0 if the supplier is located in Chile and Vietnam. We find that technical audits from and joint product development with the foreign investor have a more positive effect on suppliers in SSA compared to non-SSA countries, while assistance and licensed technology from the foreign customer lower the positive impact in SSA (results available upon request).

Table 13: The Effect of Factors within Transmission Channels on the Probability of Starting to Export, Probit

Dependent variable: exp_start_{isc}						
	(1)	(2)	(3)	(4)	(5)	(6)
$audit_{isc}$	0.8551**					0.9166*
	(0.049)					(0.071)
$impr_{isc}$		0.3366				-0.1203
		(0.468)				(0.827)
$assist_{isc}$			1.3256***			1.4075***
			(0.008)			(0.008)
dev_{isc}				1.2506***		0.8537
				(0.006)		(0.138)
$license_{isc}$					1.2387**	0.8975
					(0.014)	(0.105)
$constant_{isc}$	-6.9418***	-6.4233***	-6.0867***	-7.3373***	-6.0867***	-7.7367***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2[1)]	-0.219	-0.267	-0.161	-0.172	-0.197	-0.121
Observations	55	55	55	55	55	55

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). [1)] McFadden's adjusted pseudo R2. Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Results by Types of Requirements

The non-existence of demand effect, i.e. spillovers from a customer's requirements to improve (*impr*), raises the question whether only specific types of requirements to improve may be relevant to FDI spillovers. Appendix 6 shows the summary statistics and definitions of the different sub-indicators of *impr* available in our dataset. A sub-indicator takes the value of 1 if the foreign customer required the supplier to make improvements before or after signing the contract, and 0 otherwise. Using the specification of equation (4), we substitute each of these sub-indicators for *impr*. Appendix 7 shows the regression results. Of the 13 sub-indicators of *impr*, none shows a significant impact. In sum, the regression results give evidence of strong assistance effects in global value chains, but no evidence of demand effects.

Results by Types of Assistance

In this section, we study in more detail which types of assistance are most effective in generating positive FDI spillovers in our data sample. Table 4 shows the definitions of the different sub-indicators of *assist* available in the dataset, while Appendix 8 shows the summary statistics. Again, assistance is measured as a dummy taking the value of 1 if a supplier obtains assistance from the multinational, and 0 otherwise. Table 14 and Table 15 report the results using the specification of equation (5) substituting various types of assistance for *assist* and using the likelihood to start

exporting due to a supplier-relationship with a foreign customer (*exp_start*) as the dependent variable.

Table 14: The Effect of Assistance on the Probability of Starting to Export due to Relationship with Foreign Firm, Part 1, Probit

Dependent variable: exp_start_{isc}									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$audit_{isc}$	0.9181*	0.9638*	0.9207*	0.9022*	0.8890*	1.0122*	0.9072*	0.9092*	0.9766*
	(0.070)	(0.055)	(0.071)	(0.071)	(0.077)	(0.062)	(0.073)	(0.068)	(0.051)
$impr_{isc}$	-0.2019	0.2380	-0.0289	0.0364	-0.1210	-0.1012	-0.1148	0.0158	-0.0980
	(0.712)	(0.659)	(0.955)	(0.945)	(0.817)	(0.845)	(0.824)	(0.976)	(0.853)
dev_{isc}	0.6726	0.4277	0.7549	0.8038	0.9490*	0.8419	0.8734*	0.7910	0.3870
	(0.221)	(0.458)	(0.185)	(0.127)	(0.061)	(0.102)	(0.084)	(0.130)	(0.509)
$license_{isc}$	0.8968*	0.5970	0.8004	0.7349	0.6149	0.8788*	0.5805	0.6898	0.7940
	(0.097)	(0.324)	(0.159)	(0.191)	(0.277)	(0.092)	(0.305)	(0.223)	(0.187)
$assist\_pay_{isc}$	1.1684**								
	(0.024)								
$assist\_impr_{isc}$		1.7908**							
		(0.026)							
$assist\_funds_{isc}$			0.8546						
			(0.286)						
$assist\_plan_{isc}$				0.9034					
				(0.210)					
$assist\_inp_{isc}$					0.9644				
					(0.143)				
$assist\_sourc_{isc}$						1.1450*			
						(0.083)			
$assist\_train_{isc}$							1.2032*		
							(0.067)		
$assist\_equip_{isc}$								0.9497	
								(0.160)	
$assist\_tech_{isc}$									1.6031**
									(0.020)
$constant_{isc}$	-7.4756***	-7.7162***	-7.7334***	-7.8291***	-7.8037***	-7.8395***	-7.7525***	-7.8026***	-7.3524***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2[1)]	-0.159	-0.163	-0.205	-0.202	-0.197	-0.179	-0.184	-0.199	-0.163
Observations	55	55	55	55	55	55	55	55	55

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). [1)] McFadden's adjusted pseudo R2. Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Ten types of assistance significantly increase the likelihood to start exporting as a consequence of supplying to foreign firms, namely (i) advance payment (*assist_pay*), (ii) provision of financing for improvements (*assist_impr*), (iii) support for sourcing raw materials (*assist_sourc*), (iv) training of workers (*assist_train*), (v) product or process technologies (*assist_tech*), (vi) licensing of patented technology (*assist_license*), (vii) help with the organization of production lines (*assist_orga*), (viii) help with quality assurance (*assist_qual*), (ix) help with finding export opportunities (*assist_exp*), and (x) help with implementing health, safety, environmental, and/or social conditions (*assist_hse*). Overall, all types of assistance show a positive coefficient sign, and many miss the threshold level of

statistical significance only narrowly. In sum, we find strong evidence of assistance effects in global value chains for FDI spillovers.

Table 15: The Effect of Assistance on the Probability of Starting to Export due to Relationship with Foreign Firm, Part 2, Probit

Dependent variable: exp_start_{isc}									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$audit_{isc}$	0.8834*	0.9558*	0.8693*	0.7906*	0.8267*	0.8267*	0.8751*	0.7924*	1.0472*
	(0.079)	(0.061)	(0.075)	(0.099)	(0.087)	(0.087)	(0.079)	(0.099)	(0.053)
$impr_{isc}$	0.0178	0.0100	-0.1796	0.0824	-0.1168	-0.1168	-0.1327	-0.1387	-0.1363
	(0.973)	(0.985)	(0.740)	(0.875)	(0.826)	(0.826)	(0.802)	(0.794)	(0.798)
dev_{isc}	0.8849*	0.8012	0.6690	0.8825*	0.9440*	0.9440*	0.8656*	0.8684*	0.6131
	(0.081)	(0.134)	(0.236)	(0.091)	(0.065)	(0.065)	(0.089)	(0.099)	(0.258)
$license_{isc}$	0.6547	0.7734	0.7828	0.6869	0.6901	0.6901	0.7473	0.5457	0.7957
	(0.254)	(0.141)	(0.179)	(0.236)	(0.228)	(0.228)	(0.185)	(0.330)	(0.136)
$assist\_maint_{isc}$	0.6738								
	(0.260)								
$assist\_license_{isc}$		1.4250**							
		(0.016)							
$assist\_orga_{isc}$			1.0601*						
			(0.060)						
$assist\_qual_{isc}$				1.0160**					
				(0.041)					
$assist\_invent_{isc}$					0.6007				
					(0.387)				
$assist\_audit_{isc}$						0.6007			
						(0.387)			
$assist\_strat_{isc}$							0.6723		
							(0.145)		
$assist\_exp_{isc}$								1.2943**	
								(0.027)	
$assist\_hse_{isc}$									1.4993**
									(0.014)
$constant_{isc}$	-7.8728***	-7.8537***	-7.4454***	-7.8423***	-7.7406***	-7.7406***	-7.6948***	-7.6089***	-7.6106***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2[1)]	-0.204	-0.150	0.183	-0.183	-0.209	-0.209	-0.199	-0.179	-0.139
Observations	55	55	55	55	55	55	55	55	55

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). [1)] McFadden's adjusted pseudo R2. Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

6 Summary and Conclusions

6.1 Summary of Results

Using newly collected survey data on direct supplier-multinational linkages in Chile, Ghana, Kenya, Lesotho, Mozambique, Swaziland, and Vietnam, this paper evaluated whether foreign investors differ from domestic producers in terms of their overall performance, linkages with the local economy, and supplier assistance which all influence the firms' potential to generate productivity spillovers. Besides apparel, the firms in our sample cover two natural resources-intensive industries, namely agribusiness and mining. We found that foreign investors outperform domestic producers in terms of sales, firm size, productivity, exporting behavior, and direct export share. While this would imply a higher knowledge and productivity spillover potential compared to domestic firms, foreign investors have fewer linkages with the local economy in terms of using domestic inputs and workers. However, the findings also show that certain service inputs, namely technical services and transport, security, cleaning, catering, and other services, show a higher potential for linkages. There is also some evidence that foreign firms offer less assistance to local suppliers. Fewer linkages and supplier assistance both can limit the positive impact from FDI.

In a next step, we studied the relationship between foreign investor characteristics and the FDI spillover potential. In sum, we found that foreign investor characteristics matter for FDI linkages and supplier assistance, but the size and direction of the relationship depends on the measure of FDI spillover potential we used. For example, a multinational's presence in the host country is negatively associated with the share of domestically sourced inputs if the firm has been in the country for at least 20 years, but positively related with the percentage of domestic workers. Other foreign firm characteristics, on the other hand, show a less ambiguous picture. Market-seeking FDI, for example, shows a positive relationship with the share of sales to the host country as well as the probability of supplier assistance. And suppliers with the largest investor from SSA are associated with a larger share of sales to the local market and a higher likelihood of supplier assistance. Suppliers with the largest investor from Asia also sell a significantly larger share of output to the local market, but offer significantly less assistance to their domestic suppliers.

The second part of this paper first examined the role of supplier firms' absorptive capacities for FDI linkages. These firms supply to multinationals in agribusiness, mining, and apparel, but produce a variety of inputs across the value chain. The results indicated that several supplier characteristics

matter for FDI linkages, measured as the share of output going to multinationals, which in turn increases the FDI spillover potential. A more sophisticated production process has a significantly positive impact on FDI linkages, whereas a larger geographical distance to the foreign client shows a negative effect. The descriptive statistics also showed that firms with a share of workers with secondary education of at least 20 percent supply a significantly higher share to foreign investors than other firms. While this effect could not be confirmed by the regression results covering the full sample, we found a significantly negative impact of the share of workers with tertiary education on FDI linkages when we focus on suppliers with a supplier relationship of at least three years. The general manager's educational level also has a negative effect. Overall, these findings suggest that a larger share of human capital leads to reduced FDI linkages in supplier firms. One possible explanation for this unexpected result could be that suppliers with highly educated managers supply a larger share of inputs to firms abroad, for instance, because they may have fewer language barriers. Finally, we also found evidence that a higher number of employees reduce the supplier's share of output to foreign firms.

In a next step, we assessed whether factors within the transmission channels between multinationals and suppliers influence FDI spillovers, focusing on assistance and demand effects. We used exporting as a consequence of supplying to a foreign customer as our spillover measure. The results confirmed that several transmission channels matter for backward FDI spillovers. Suppliers receiving technical audits before or after signing the contract, suppliers receiving assistance from their foreign clients, suppliers with joint product development with their customers, and suppliers licensing technology from their foreign client are more likely to export as a result of their supplier-relationship. In sum, we find evidence of the existence of positive assistance effects (including technical audits, joint product development, and technology licensing) in global value chains, while demand effects (measured as requirements to improve) do not have any impact.

Finally, we also studied which types of assistance are most effective in generating positive FDI spillovers in our data sample. Ten types of assistance significantly increase the likelihood to start exporting as a consequence of supplying to foreign firms, namely advance payment, provision of financing for improvements, support for sourcing raw materials, training of workers, product or process technologies, licensing of patented technology, help with the organization of production lines, help with quality assurance, help with finding export opportunities, and help with implementing health, safety, environmental, and/or social conditions.

6.2 Policy Conclusions

Our findings suggest that the FDI spillover potential via global value chains depends on the extent, durability, and quality of linkages between foreign investors and the local economy. Investment promotion alone is not sufficient to benefit from FDI spillovers. It is important to embed foreign investors into the local economy to increase the amount and quality of linkages, and therefore the possibility for supplier assistance and the potential for FDI spillovers in the long-term. In order to integrate foreign investors into local value chains, government agencies could identify potential domestic suppliers, and encourage foreign investors to participate in supplier development and assistance, and give incentives to multinationals to collaborate with local universities, research institutes or other firms which would improve the local skill and innovation capacity (Potter 2002).

Policies that aim at increasing FDI linkages will be more targeted if foreign firm characteristics and the absorptive capacities of domestic suppliers are taken into account. Our results have shown, for example, that the foreign investor's origin and investment motive as well as the share of foreign ownership matter for FDI linkages and supplier assistance. In addition, policies should aim at strengthening absorptive capacities that have shown to increase FDI linkages, including the degree of sophistication of suppliers' production processes. Policies should also target some of the obstacles to FDI linkages, such as large geographical distances between suppliers and their foreign clients. Removing barriers to natural agglomeration, for example, through investments in infrastructure, the provision of social services, or regional integration arrangements, could reduce geographical distances between suppliers and multinationals and thus increase the FDI spillover potential.

Finally, researchers should focus more strongly on understanding better the transmission channels leading to FDI spillovers. While our paper focused on assistance and demand effects, other transmission channels in value chains include diffusion, availability, and quality effects. Besides transmission channels in value chains, research also needs to explore better the effect of changing market forces (demonstration and competition effects) and labor turnover. This will help guide policies designed to remove barriers within transmission channels, enabling the FDI spillover potential to translate into actual FDI spillovers.

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Appendix 1: Summary Statistics, Performance Indicators, Foreign Investors vs. Domestic Producers

Variable	Obs.	Mean	Std. Dev.	Min	Max
Foreign Investors					
ln*sales*	65	16.38186	2.512822	4.941642	22.13425
ln*age*	84	2.445032	0.743037	0.693147	4.330733
ln*emp*	61	4.707492	1.782078	1.098612	7.880048
ln*labprod*	49	11.44877	2.538011	1.722767	15.21508
tech	64	1.9375	0.663684	1	3
emp_ter	56	25.72391	27.66972	0	100
emp_sec	54	39.66316	31.66977	0	100
export	80	0.8875	0.317974	0	1
expsh_dir	80	66.7125	42.24587	0	100
expsh_ind	80	15.2375	32.88386	0	100
Domestic Producers					
ln*sales*	61	14.12134	2.875685	6.899886	21.35878
ln*age*	64	2.717949	0.88649	0.693147	4.174387
ln*emp*	61	4.079635	1.548334	0	7.201916
ln*labprod*	59	10.00994	2.606257	3.808844	15.28303
tech	61	2.311475	0.940585	1	4
emp_ter	60	21.62548	22.2074	0	100
emp_sec	59	47.1937	32.36794	0	99
export	64	0.59375	0.495015	0	1
expsh_dir	64	28.5	36.01455	0	100
expsh_ind	64	8.6875	22.53313	0	100

Appendix 2: Summary Statistics, Linkages with the Local Economy, Foreign Investors vs. Domestic Producers

Variable	Obs.	Mean	Std. Dev.	Min	Max
Foreign Investors					
inp_dom	82	23.45122	31.71289	0	100
inp_dom_mat	71	19.66197	28.90227	0	97
inp_dom_comp	71	5.866197	8.557352	0	40
inp_dom_pack	71	13.66197	21.56117	0	100
inp_dom_equip	71	4.647887	10.00014	0	50
inp_dom_bus	71	11.75352	13.27346	0	50
inp_dom_tech	71	8.323944	10.99191	0	40
inp_dom_oth	71	31.26761	29.93897	0	100
emp_dom	53	94.8098	8.372224	50	100
emp_ter_dom	57	18.84145	24.28294	0	100
emp_sec_dom	59	41.4293	34.03931	0	100
emp_oth_dom	55	38.71246	38.97893	0	98.67625
man_dom	77	67.76623	32.88973	0	100
super_dom	76	86.28289	24.95227	0	100
tech_dom	75	81.88	28.89869	0	100
market	80	18.05	34.76391	0	100
Domestic Producers					
inp_dom	61	56.11475	37.29884	0	100
inp_dom_mat	61	47.92254	25.45926	0	100
inp_dom_comp	61	6.217231	6.652131	0	25
inp_dom_pack	61	11.6986	13.90248	0	100
inp_dom_equip	61	10.15503	13.04946	0	75
inp_dom_bus	61	8.680931	9.005137	0	45
inp_dom_tech	61	5.014548	4.373453	0	20
inp_dom_oth	61	6.655383	6.648983	0	25
emp_dom	58	99.06956	2.881322	83.33334	100
emp_ter_dom	61	20.71564	22.0243	0	100
emp_sec_dom	61	48.30881	32.71255	0	99
emp_oth_dom	58	31.51797	32.04285	0	100
man_dom	60	95.3	15.87269	5	100
super_dom	59	95.45763	18.0596	0	100
tech_dom	59	93.64407	19.42249	5	100
market	64	62.8125	38.28916	0	100

Appendix 3: Summary Statistics, Assistance, Foreign Investors vs. Domestic Producers

Variable	Obs.	Mean	Std. Dev.	Min	Max
Foreign Investors					
assist	66	0.696970	0.463090	0	1
assist_pay	66	0.606061	0.492366	0	1
assist_impr	66	0.303030	0.463090	0	1
assist_funds	66	0.363636	0.484732	0	1
assist_plan	66	0.272727	0.448775	0	1
assist_inp	66	0.333333	0.475017	0	1
assist_sourc	65	0.415385	0.496623	0	1
assist_train	66	0.409091	0.495434	0	1
assist_equip	66	0.257576	0.440650	0	1
assist_tech	66	0.348485	0.480142	0	1
assist_maint	66	0.333333	0.475017	0	1
assist_license	66	0.196970	0.400757	0	1
assist_orga	66	0.272727	0.448775	0	1
assist_qual	66	0.439394	0.500117	0	1
assist_invent	66	0.363636	0.484732	0	1
assist_audit	66	0.272727	0.448775	0	1
assist_strat	65	0.200000	0.403113	0	1
assist_exp	65	0.184615	0.391005	0	1
assist_hse	65	0.415385	0.496623	0	1
Domestic Producers					
assist	62	0.919355	0.274512	0	1
assist_pay	61	0.868853	0.340363	0	1
assist_impr	60	0.583333	0.497167	0	1
assist_funds	62	0.516129	0.503819	0	1
assist_plan	62	0.467742	0.503032	0	1
assist_inp	62	0.580645	0.497482	0	1
assist_sourc	62	0.677419	0.471280	0	1
assist_train	62	0.483871	0.503819	0	1
assist_equip	62	0.387097	0.491062	0	1
assist_tech	62	0.564516	0.499868	0	1
assist_maint	62	0.467742	0.503032	0	1
assist_license	61	0.262295	0.443533	0	1
assist_orga	62	0.596774	0.494550	0	1
assist_qual	61	0.770492	0.424006	0	1
assist_invent	62	0.532258	0.503032	0	1
assist_audit	62	0.403226	0.494550	0	1
assist_strat	62	0.532258	0.503032	0	1
assist_exp	62	0.435484	0.499868	0	1
assist_hse	62	0.725807	0.449749	0	1

Appendix 4: Summary Statistics, Foreign Investor Characteristics

Variable	Obs.	Mean	Std. Dev.	Min	Max
own	87	93.77356	15.74507	30	100
age_fdi	74	14.55405	14.81774	2	89
tech	64	1.9375	0.663684	1	3
origin_SSA	87	0.149425	0.358574	0	1
origin_Asia	87	0.471264	0.502067	0	1
motive_market	83	2.433735	1.380993	1	4
motive_cost	85	2.329412	1.028038	1	4
motive_res	84	2.130952	1.172268	1	4
motive_asset	85	1.717647	0.917577	1	4

Appendix 5: Summary Statistics, Suppliers

Variable	Obs.	Mean	Std. Dev.	Min	Max
FDI Linkage and Spillover Measures					
outp	113	39.34513	29.13539	0	100
exp_start	78	0.410256	0.495064	0	1
Absorptive Capacities					
gap	144	2.145833	1.127958	1	4
soph	142	2.197183	1.06684	1	4
emp_ter	138	30.83214	29.49302	0	100
emp_sec	138	40.31338	29.34871	0	100
ln*exper*	120	2.308353	0.876459	0	4.49981
man_educ	147	2.782313	0.503644	1	3
man_exper	147	0.496599	0.501698	0	1
ln*emp*	138	3.471092	1.701048	0	8.050385
export	141	0.595745	0.492497	0	1
ln*dist*	116	4.59394	2.105027	0	9.615806
Transmission Channels					
audit	124	0.620968	0.487114	0	1
impr	124	0.395161	0.490869	0	1
assist	124	0.282258	0.451924	0	1
dev	124	0.290323	0.455753	0	1
license	126	0.238095	0.427618	0	1
iso	134	0.052239	0.223343	0	1

Appendix 6: Summary Statistics, Suppliers, Requirements to Improve

Definition	Obs.	Mean	Std. Dev.	Min	Max
Reorganize the product lines	123	0.195122	0.397915	0	1
Invest in new equipment and/or technology	123	0.268293	0.444883	0	1
Improve product quality	123	0.260163	0.440518	0	1
Improve quality control	122	0.262295	0.441696	0	1
Improve productivity	123	0.235772	0.426217	0	1
Increase volume of production	123	0.252033	0.435956	0	1
Cut waste	123	0.227642	0.421025	0	1
Improve timeliness of delivery	123	0.284553	0.453047	0	1
Improve inventory management	123	0.243902	0.431191	0	1
Acquire ISO 9000 or 14000	122	0.196721	0.399159	0	1
Improve business management	123	0.227642	0.421025	0	1
Improve health, safety, environmental, and/or social conditions	123	0.252033	0.435956	0	1
Train employees	123	0.260163	0.440518	0	1

Appendix 7: The Effect of Factors within Transmission Channels on the Probability of Starting to Export by Requirements to Improve, Probit

Dependent variable: *exp_start*$_{isc}$													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
audit$_{isc}$	1.0151**	0.9601**	0.8902*	1.0185**	0.9435*	0.8995*	0.8802*	0.8895*	0.8837*	0.9801*	0.8807*	0.9137*	0.9067*
	(0.035)	(0.046)	(0.066)	(0.041)	(0.054)	(0.067)	(0.074)	(0.077)	(0.070)	(0.052)	(0.078)	(0.059)	(0.061)
assist$_{isc}$	1.5255***	1.4471***	1.4298***	1.4778**	1.4244***	1.4050***	1.3978***	1.4665***	1.3987***	1.4102**	1.6152***	1.4226***	1.4016***
	(0.005)	(0.005)	(0.009)	(0.011)	(0.009)	(0.009)	(0.008)	(0.007)	(0.009)	(0.010)	(0.003)	(0.005)	(0.009)
dev$_{isc}$	0.9740*	0.8323	0.8756	1.0750**	0.9525*	0.8342	0.8126	0.8149	0.8379	0.9676*	1.0308*	0.8511	0.8939*
	(0.085)	(0.153)	(0.141)	(0.044)	(0.078)	(0.157)	(0.150)	(0.153)	(0.146)	(0.076)	(0.069)	(0.136)	(0.086)
license$_{isc}$	0.5010	0.8166	0.8852	0.8761	0.8256	0.9181	0.8616	1.0614**	0.8607	0.8739	0.8375	0.8962	0.8969
	(0.422)	(0.167)	(0.113)	(0.104)	(0.125)	(0.109)	(0.133)	(0.047)	(0.131)	(0.104)	(0.143)	(0.119)	(0.121)
impr_orga$_{isc}$	0.9419												
	(0.279)												
impr_equip$_{isc}$		0.4176											
		(0.514)											
impr_qual$_{isc}$			-0.2135										
			(0.753)										
impr_contr$_{isc}$				-0.8171									
				(0.118)									
impr_prod$_{isc}$					-0.3105								
					(0.609)								
impr_volume$_{isc}$						0.0892							
						(0.882)							
impr_waste$_{isc}$							0.1826						
							(0.771)						
impr_time$_{isc}$								-0.5053					
								(0.391)					
impr_invent$_{isc}$									0.1875				
									(0.749)				
impr_iso$_{isc}$										-0.3695			
										(0.520)			
impr_business$_{isc}$											-0.8291		
											(0.169)		
impr_hse$_{isc}$												-0.0574	
												(0.921)	
impr_train$_{isc}$													-0.1465
													(0.819)
constant$_{isc}$	-9.0537***	-8.3582***	-7.7777***	-8.2225***	-8.0564***	-7.8695***	-7.8948***	-7.2857***	-7.9271***	-8.0344***	-7.9983***	-7.8250***	-7.8301***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2[1)]	-0.105	-0.115	-0.120	-0.093	-0.118	-0.121	-0.120	-0.113	-0.120	-0.116	-0.103	-0.122	-0.121
Observations	55	55	55	55	55	55	55	55	55	55	55	55	55

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses). [1)] McFadden's adjusted pseudo R2.
Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Appendix 8: Summary Statistics, Suppliers, Assistance

Variable	Obs.	Mean	Std. Dev.	Min	Max
assist_pay	124	0.225807	0.419809	0	1
assist_impr	124	0.120968	0.327413	0	1
assist_funds	124	0.088710	0.285478	0	1
assist_plan	124	0.104839	0.307588	0	1
assist_inp	124	0.120968	0.327413	0	1
assist_sourc	124	0.129032	0.336596	0	1
assist_train	124	0.145161	0.353692	0	1
assist_equip	124	0.104839	0.307588	0	1
assist_tech	124	0.137097	0.345345	0	1
assist_maint	124	0.104839	0.307588	0	1
assist_license	124	0.129032	0.336596	0	1
assist_orga	124	0.137097	0.345345	0	1
assist_qual	124	0.177419	0.383573	0	1
assist_invent	124	0.080645	0.273394	0	1
assist_audit	124	0.088710	0.285478	0	1
assist_strat	124	0.120968	0.327413	0	1
assist_exp	123	0.105691	0.308699	0	1
assist_hse	124	0.169355	0.376587	0	1