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 unique survey data on direct supplier-multinational linkages in Chile, Ghana, Kenya, Lesotho, Mozambique, Swaziland, and Vietnam, this paper first evaluates how 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.

Additionally, this paper 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 the 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 we find no evidence for demand effects.

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1. INTRODUCTION

1.1. Motivation

Typically coordinated by lead firms, global value chains (GVCs) involve international trade flows within their networks of foreign affiliates, contractual partners, and arm's-length external suppliers (UNCTAD 2013). GVCs "unbundle" factories by offshoring firm-specific know-how along the stages of production, and those international flows of know-how are a key reason why GVCs offer unprecedented development opportunities to participating countries. Developing countries can now industrialize by joining GVCs without the need to build their own value chain from scratch, as Japan and the Republic of Korea had to do in the twentieth century (Baldwin 2012). That enables developing countries to focus on specific tasks in the value chain rather than producing the entire product, thereby lowering the threshold and costs for industrial development. Developing countries can benefit from foreign-originated intellectual property; trademarks; operational, managerial, and business practices; marketing expertise; and organizational models. Countries can join GVCs either by facilitating domestic firms' entry or by attracting foreign investors. The foreign direct investment (FDI) option includes more direct access to foreign know-how and technology (Taglioni and Winkler 2016).

In this context, many developing countries devote considerable attention and resources to attracting foreign investment from GVC lead firms as a means to enter GVCs. This is done in the hope not only of generating benefits like jobs, foreign exchange, tax revenues, but more importantly of realizing dynamic knowledge "spillovers" to the domestic economy, especially when there is too little domestic private capital to stimulate growth. 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. It also includes the benefits that can accrue to local participants when they link into the global networks of multinational investors.

A vast set of empirical evidence has been amassed over the past decade on the existence and direction of FDI-generated horizontal and vertical productivity spillovers. 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 (see, e.g., seminal contributions by Javorcik 2004 and Blalock and Gertler 2008). The increasing number of studies has encouraged researchers to quantitatively synthesize the empirical results in meta-analyses (e.g. Görg and Strobl 2001; Meyer and Sinani 2009; and Havranek and Irsova 2011). The most recent and largest meta-analysis, for instance, takes into account 3,626 estimates from 55 studies on FDI spillovers and finds evidence for positive and economically important backward spillovers from multinationals on local suppliers in upstream sectors and smaller positive effects on local customers in downstream sectors. However, the authors reject the existence of horizontal FDI spillovers (Havranek and Irsova 2011). This paper focuses on backward spillovers from multinationals to local suppliers.

Significant 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

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include direct supplier relationships with multinational firms which are based on survey data and could reveal the exact underlying mechanisms (Javorcik and Spatareanu 2009).

Theoretical contributions in this field include the models by Rodríguez-Clare (1996), Markusen and Venables (1999), Lin and Saggi (2007), and Carluccio and Fally (2013). The theoretical models show that FDI leads to positive and negative backward, forward, and horizontal spillovers via several transmission channels, such as the variety, competition, and delinkage effects. In addition, the models underline that foreign investor characteristics matter for the extent of welfare effects from multinational entry. Finally, the theoretical literature review also shows that domestic firms' absorptive capacity influences the direction of FDI spillovers.

For policy makers in developing countries, this means that not all FDI generates the same potential for spillovers. In many lower-income countries, FDI attraction happens through export-processing zones (EPZs), which can provide a way for the country not only to attract FDI, but also to connect the local labor force to established GVCs and to increase exports. Within the framework of GVCs, EPZs have a clear rationale, but empirical research also shows that their ability to generate development yields mixed results, as they often fail to connect to the rest of the economy. Therefore, attracting the "right" foreign investors under the right conditions matters strongly. At the foreign investor level, several characteristics have shown to influence the spillover potential of multinationals, including their degree of foreign ownership, length of foreign presence, technology intensity, sourcing strategy, and FDI motive, among others (Farole, Staritz, and Winkler 2014; Taglioni and Winkler 2016).[2]

Similarly, not all domestic firms benefit from FDI spillovers to the same extent. Studies have identified several domestic firm characteristics which determine their absorptive capacity to internalize FDI spillovers. These include their technology gap, research and development (R&D), human capital, firm size, export behavior, and firm location. Finally, it is important to identify the transmission channels through which knowledge and productivity gains spill-over from multinationals to domestic firms. These include demand, assistance, diffusion, availability and quality effects. Insights into the conditions and mechanisms help policy makers in developing countries maximize the gains from GVC participation by targeting foreign investors more strategically, putting in place policies that prepare local firms to better to absorb knowledge spillovers, and optimizing the functioning of the transmission channels between them (Farole, Staritz, and Winkler 2014; Taglioni and Winkler 2016).

1.2. Contribution

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. First, we evaluate how foreign investors differ from domestic producers in terms of their overall performance, linkages with the local economy, and supplier assistance which all influence their potential to generate productivity spillovers. In a developing country context, it could be expected that multinationals show a higher spillover potential, in particular in terms of their technological level. We find that while foreign investors outperform domestic producers in many relevant aspects, they have fewer linkages and seem to offer less assistance to local suppliers which both can limit the positive impact from FDI.

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 sum, we find that foreign investor characteristics matter for FDI linkages and supplier assistance, but the size and

[2] In an early attempt to determine the role of foreign investor characteristics in China, Tian (2007) identified variables at the multinational firm level that influence the extent of FDI spillovers. The variables in his study include the type of asset (tangible versus intangible), product (new versus traditional), consumer (exports versus domestic consumption), and employment (skilled vs. less-skilled workers). Positive FDI spillovers were generated through tangible assets, traditional products, domestically-consumed products, and less-skilled workers.

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direction of the relationship depends on the measure of FDI spillover potential being used. Third, we shift the focus to domestic suppliers and examine the role of supplier firm characteristics (absorptive capacities) for their linkages with multinationals. The results indicate that several supplier characteristics matter for FDI linkages, which in turn increases the FDI spillover potential.[3]

Fourth, focusing on assistance and demand effects, we assess how factors within the transmission channels between multinationals and local suppliers affect FDI spillovers. While the former effect increases domestic supplier productivity through direct assistance from multinationals, the latter effect focuses on spillovers through the demand of multinationals for better and/or more diverse inputs. The results confirm that several transmission channels matter for backward FDI spillovers. In sum, we find evidence for the existence of positive assistance effects in GVCs, while demand effects do not have any impact. We also study which types of assistance are most effective in generating positive FDI spillovers in our data sample.

Fifth, while the majority of studies focuses on FDI spillovers in manufacturing sectors, this paper addresses this knowledge gap by also covering two natural resources-intensive industries, namely agribusiness and mining (besides apparel), in our sample. Sixth, much of the empirical evidence on FDI spillovers focuses on the transition economies of Central and Eastern Europe and China. Only few empirical studies focus on developing countries, including India, Indonesia, Mexico, Uruguay and Venezuela. The reason for this small country coverage is probably limited data availability, as firm-level data are rarely existent in developing countries, especially smaller ones.

Finally, our paper contributes to the low number of studies on FDI spillovers that focus on direct supplier-multinational linkages based on foreign investor or supplier survey data. 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 for "learning-by-supplying" for a sample of Czech manufacturing firms, although there is also evidence for 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 for a supporting role of suppliers' absorptive capacities on knowledge acquisition, they find evidence for a supportive role on performance improvement and new knowledge creation.

This paper is structured as follows. The next section provides a review of the theoretical and empirical literature on FDI spillovers. It discusses the main transmission channels through which FDI spillovers can be generated, and identifies major foreign investor characteristics and domestic firms' absorptive capacities which can influence FDI spillovers. 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.

[3] Note that while the data are not suited to measure actual spillovers, the extent of linkages and supplier assistance seem to be appropriate proxies for spillover potential. Driffield, Munday, and Roberts (2002), for example, find that the intensity of linkages between foreign and domestic firms have an impact on productivity growth in domestic manufacturing industries.

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2. LITERATURE REVIEW

2.1. Theoretical Background

This section reviews the small theoretical literature on the welfare effects of FDI in the host country, discusses the underlying transmission channels, and identifies how foreign investor and domestic firm characteristics influence FDI spillovers in these models.

The earliest model by Rodríguez-Clare (1996) assumes a developing country context in which multinational and domestic producers source specialized inputs from the upstream sector in the host country. The domestic upstream sector is characterized by monopolistic competition. Other assumptions include (i) the love of variety for inputs in the production of final goods, (ii) high transportation costs for specialized inputs, and (iii) increasing returns in the firms' production.[4] Foreign entry raises the demand for inputs from the domestic upstream sector via backward linkages which, in turn, increases the variety of inputs due to monopolistic competition. The larger variety of upstream inputs creates a positive externality in the form of productivity gains to domestic final good producers which could be considered positive backward spillovers (variety effect).

Rodríguez-Clare (1996) specifically takes into account characteristics of the multinational which influence the extent of backward spillovers. In the model, the strength of the multinational-domestic supplier linkages depends on (i) the communication costs between the multinational's headquarters and the production plant in the host country, (ii) the complexity of the production process, and (iii) the levels of development in the home and host countries which determine the variety of upstream inputs that are available in the host country. The backward linkage effect is stronger when communication costs are higher, the production process of multinationals is more complex, and the host country is more developed. The model also allows for the existence of forward linkages (which could be considered positive forward spillovers), as the expansion of specialized input production enables firms to produce more complex goods at competitive costs (availability effect). In sum, the model shows that foreign investor characteristics such as the complexity of the production process or the development gap between the host and home country mediate the extent of backward and forward spillovers.

The theoretical model by Markusen and Venables (1999) examines the effects of multinational entry on the host economy in a similar setup, and differentiates between two effects. The first is an increased product market competition between multinationals and domestic producers, driving out some domestic firms within the same sector (competition effect). This effect is absent in the model by Rodríguez-Clare (1996) due to the assumption that the final good is only produced by the multinational. The second is a backward linkage effect on local suppliers in the upstream sector. The backward linkage effect, in turn, could benefit domestic final producers via forward linkages, through the entry of input suppliers, raising local production and lowering input prices. The extent of the positive backward linkage effect depends on the multinational's intensity of sourcing local inputs compared to domestic producers. Again, this model shows that foreign investor characteristics, such as the local sourcing intensity in the host country, matter.

Integrating technology transfer from multinationals to domestic suppliers and exclusive contracts into their model, Lin and Saggi (2007) show that multinational entry can also lead to negative forward linkage effects. The model allows for the possibility for selected local suppliers to benefit from technology transfer by a multinational, but only if the suppliers contractually agree to exclusively supply inputs to the latter.[5] For the multinational firm, exclusivity has two

[4] While access to foreign inputs is a common motivation for lead firms in GVCs, the model's assumption of high transportation costs for specialized inputs is less realistic given falling transportation and trade costs in many countries.

[5] The exclusive contractual agreement between local suppliers and the multinational in this model exemplifies a captive governance structure. Gereffi, Humphrey and Sturgeon (2005) distinguish between five governance structures that can exist between lead firms and suppliers in GVCs – market, modular, relational, captive, and hierarchical – which increase in their degree of explicit coordination by the lead firm and power asymmetry between the lead firm and its suppliers.

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advantages: (i) Technology transfer lowers production costs, but only of those selected local suppliers, via backward linkages. (ii) And exclusivity reduces the amount of local suppliers that sell to domestic producers (delinkage effect), thereby reducing their competition and raising their production costs (forward linkage effects). The delinkage effect emphasizes that multinationals displace existing linkages between local suppliers and producers, while the forward linkage effect focuses on the welfare implications for domestic producers.

Three variables determine whether selected suppliers benefit from this contractual agreement: (i) the number of other local suppliers that sell exclusively to the multinational, (ii) the extent of technology transfer, and (iii) the demand for upstream inputs by domestic producers. The gains for exclusive suppliers are higher if the number of selected suppliers is smaller (as their competition declines, while the competition of suppliers selling to domestic producers increases), if the extent of technology transfer is sufficiently large, and if demand for upstream inputs by domestic producers is smaller (as the additional demand created by multinational entry is more likely to offset the negative forward linkage effect). The model confirms that foreign investor characteristics, such as the extent of technology transfer, matter for the overall welfare impact of multinational entry.

While Carluccio and Fally (2013) also allow for the possibility of a negative forward linkage effect, this externality can be reversed for domestic producers with a high absorptive capacity. Their model setup allows for firm heterogeneity, free entry, and free technological choice for all types of firms. Multinational entry reorganizes the domestic upstream sector, as multinationals require different types of inputs compared to domestic producers due to technological differences. The more efficient the foreign technology is with regard to the domestic technology (i.e. the higher the technology gap), the larger is the share of local suppliers that wants to produce for multinationals, and the smaller are relative input costs for these suppliers. This, in turn, raises the demand for inputs from these suppliers and encourages them to increase the variety of their inputs (variety effect).

These spillovers affect the adoption of foreign technology in the downstream sector. Only those domestic producers that are capable to adopt the foreign technology benefit from multinational entry, while lower-productivity domestic producers maintain their technology gap and face negative welfare effects. While the model confirms the mediating role of foreign firm characteristics, such as the technology gap, on welfare, it introduces another important feature, namely that domestic firm characteristics matter for FDI spillovers. In the model, only the most productive local producers are capable to adopt the foreign technology and thus benefit from the variety effect. In other words, the welfare effects of multinational entry also depend on the domestic firms' absorptive capacity[6].

In summary, the theoretical models show that FDI leads to positive and negative backward, forward, and horizontal spillovers via several transmission channels, such as the variety, competition, and delinkage effects. In addition, the models underline that foreign investor characteristics matter for the extent of welfare effects from multinational entry. Such characteristics include the complexity of the production process, the development gap between the host and home country, the local sourcing intensity, the extent of technology transfer, and the technology gap between foreign and local firms. Finally, the theoretical literature review also shows that domestic firms' absorptive capacity such as their capability to adopt foreign technology influences the direction of FDI spillovers.

[6] Grünfeld (2006) explicitly models the concept of absorptive capacity in a three-stage Cournot duopoly model in which multinational firms decide whether they serve foreign markets via exports or via an affilicate in the host country. While the model focuses on an industrialized country context where host country R&D spillovers are the main FDI motive for the multinational, it shows that the extent of R&D spillovers is influenced by the multinational's own R&D investments.

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2.2. Factors that Shape FDI Spillovers

This section reviews empirical studies on FDI spillovers that explicitly take into account the mediating role of foreign investor characteristics and local firms' absorptive capacity. We deliberately focus on studies only that are undertaken in a developing or emerging country context, as some findings could be expected to be different in a developed country setting. Much of the empirical evidence focuses on the transition economies of Central and Eastern Europe and China. Only few empirical studies focus on developing countries, including India, Indonesia, Mexico, Uruguay and Venezuela. The reason for this small country coverage seems to be limited data availability, as firm-level data are rarely existent in developing countries, especially smaller ones. The findings are therefore not suited to be generalized, but can be used to be compared against each other. Before reviewing the relevant empirical literature, we summarize the various transmission channels through which FDI spillovers can materialize.[7]

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.

Spillovers through GVCs 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). Or there could be the case – as modelled in the theoretical literature above – that the variety of local inputs in upstream sectors increases due to multinational entry, which indirectly benefits domestic producers in downstream sectors. 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 our empirical analysis.

Foreign Investor Characteristics

The degree of *foreign ownership* affects local firms' potential to absorb FDI spillovers in developing and emerging countries. 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

[7] While some of the transmission channels and mediating factors have already been identified in the theoretical models above, the aim of this section is to give a more comprehensive picture following the conceptual framework by Farole, Staritz, and Winkler (2014).

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confirmed by an empirical study for 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 in Hungary (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, especially in emerging economies. 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, Javorcik (2004) for Lithuania and Javorcik and Spatareanu (2008) for Romania 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 firm 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 which has been studied in the context of China. 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, Hong Kong, and Macau which they relate to the higher technology intensity in Western-owned affiliates. Analogously, Lin, Liub, and Zhanga (2009) confirm the positive horizontal and vertical spillovers on Chinese firms for FDI from other countries, while FDI from Taiwan, Hong-Kong, 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, Hong-Kong, 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. Buckley, Clegg, and Wang (2007), for instance, confirm a curvilinear spillover effect in China from multinationals from overseas Chinese Kong, Macau and Taiwan, but not from Western multinationals which is more strongly pronounced in low-tech industries. 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

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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 (e.g. Javorcik and Spatareanu 2011 for Romania).

Different *motivations* for undertaking FDI are likely to mediate spillover potential. Dunning's famous OLI (Ownership, Location, and Internationalization) framework discusses different motives which determine where multinationals locate, including market-seeking, efficiency-seeking, resource-seeking, and asset-seeking (Dunning 1977).[8] 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. Moreover, FDI can encompass several motives simultaneously, as shown in the taxonomy by Driffield and Love (2007). Multinationals may seek to source foreign technology abroad (resource-seeking) not because they are technologically inferior, but because technology may be cheaper (efficiency-seeking).

Absorptive Capacities

The *technology gap* of domestic firms has been identified as one of the most important mediating factors for FDI spillovers[9] in developing countries. Views on the role of the technology gap for FDI spillovers conflict. Some studies argue 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 find that local firms might not be able to absorb positive FDI spillovers if the technology gap between the multinational and local firms is too big or too small (e.g. Kokko 1994 for Mexico; Kokko, Tansini, and Zejan 1996 for Uruguay; Blalock and Gertler 2009 for Indonesia).

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

[8] Dunning acknowledges that his distinction was borrowed from Behrman (1972) and extended (see, e.g., Dunning and Lundan 2008).

[9] 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).

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(Blalock and Gertler 2009) among others. 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 for Poland.

A domestic firm's ability to absorb foreign technology might also be positively related to its share of *skilled labor* which could be particularly relevant in a developing country context. 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. By 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.

Views on the role of *firm size* differ. Firm size has been positively related to a domestic firm's capacity to absorb FDI spillovers in developing countries (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 on emerging countries 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. Sinani and Meyer 2004 for Estonia). Gentile-Lüdecke and Giroud (2012) also find evidence for 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. Several studies find evidence for lower productivity gains for exporters (e.g. Blomström and Sjöholm 1999 for Indonesia, Ponomareva 2000 for Russia, Sinai and Meyer 2004 for Estonia, Abraham et al. 2010 and Du, Harrison, and Jefferson 2011 for China). In contrast, some studies find that the gains from FDI are larger for exporting firms (e.g., Schoors and van der Tol 2002 for Hungary, Lin at al. 2009 for China, Jordaan 2011 for Mexico).

Several aspects of domestic firm *location* have shown to be important for the extent of productivity spillovers from FDI. The co-location of foreign and domestic firms in the same region in developing and emerging countries can reduce the benefits from FDI on domestic firms. For example, Sjöholm (1999) confirms positive spillover effects when FDI is measured at the country-sector level in Indonesia, but finds negative spillovers when foreign presence is measured at the region-sector level. Aitken and Harrison (1999) find similar results for Venezuela and Yudaeva, Kozlov, Malentieva, and Ponomareva (2003) for Russia.

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Besides agglomerations, studies 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 (e.g. Abraham et al. 2010 for China). More regional development seems to have a positive effect (e.g. Ponomareva 2000 for Russia, Torlak 2004 for the Czech Republic).

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 the 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.

3.1. 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 GVCs. 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).

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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 the differences between foreign investors and domestic producers in terms of their potential to generate positive spillover effects for domestic suppliers. Foreign firms tend to make greater use of skills, know-how, capital and technology which is a major driver for developing countries to attract foreign investors (specifically from industrialized countries) as a means to participate in GVCs (Taglioni and Winkler 2016). 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 A.

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.

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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*** (0.000)	2.1162*** (0.000)
ln*age*	Number of years since firm has started operations in natural logarithms	-0.1429 (0.389)	-0.2192 (0.233)
ln*emp*	Firm's number of employees in natural logarithms	0.3410 (0.270)	n.a n.a.
ln*labprod*	Firm's sales per number of employees (USD) in natural logarithms	1.9528*** (0.000)	2.1162*** (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*** (0.003)	-0.6094*** (0.000)
emp_ter	Percentage of workers with tertiary education in the firm's workforce	6.5680 (0.262)	8.9122 (0.106)
emp_sec	Percentage of workers with secondary education in the firm's workforce	-6.7298 (0.315)	-7.8271 (0.225)
export	Dummy taking the value of 1 if a firm exports, and 0 otherwise	0.6418** (0.025)	0.5233* (0.083)
expsh_dir	Percentage of direct exports of firm's total sales	35.7146*** (0.000)	33.3476*** (0.000)
expsh_ind	Percentage of indirect exports of firm's total sales	-1.6483 (0.681)	-4.8535 (0.206)

Note: Variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

In sum, we find that foreign investors tend to outperform domestic producers in terms of sales, firm size, productivity, technology gap, exporting behaviour, and direct export share. This finding implies a higher knowledge and productivity spillover potential of foreign investors compared to domestic firms which has served as justification for investment promotion measures in developing countries to enter GVCs.

Linkages with the Local Economy

In order for foreign investors to contribute to sustained economic development, however, they have to be linked to the rest of the 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 2.2). 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 B.

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

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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. The reason could be that many developing countries have established "competitive spaces"—enclave locations such as special economic zones and export processing zones, where the rules of business are different from those that prevail in the national territory and the costs of factors of production are lower. The problem is that, by their nature, they resist such links for several reasons.[10] Most studies of the backward links of firms in such spaces find the links to be minimal, with domestic trade remaining very low and technology spillovers rare (e.g., Milberg and Winkler 2013). 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	Additional controls for ln*emp*
		(1)	(2)
Inputs			
inp_dom	Percentage of inputs sourced from domestic suppliers in the firm's total inputs	-16.0734*** (0.008)	-12.4843** (0.043)
inp_dom_mat	Percentage of raw materials from domestic firms of firm's total input purchases from domestic firms	-16.1221*** (0.002)	-12.4158** (0.029)
inp_dom_comp	Percentage of parts and components from domestic firms of firm's total input purchases from domestic firms	-0.1020 (0.938)	-0.3504 (0.807)
inp_dom_pack	Percentage of packaging from domestic firms of firm's total input purchases from domestic firms	3.7895 (0.331)	5.6411 (0.201)
inp_dom_equip	Percentage of equipment and machinery from domestic firms of firm's total input purchases from domestic firms	-5.0125** (0.025)	-5.0252** (0.041)
inp_dom_bus	Percentage of business services from domestic firms of firm's total input purchases from domestic firms	0.7942 (0.693)	-0.1636 (0.940)

[10] Many foreign firms may follow a co-sourcing strategy, relying on imported inputs from established suppliers abroad, or they may follow co-location strategies that require established foreign input suppliers to enter the country as well.

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Variable	Definition	Difference	Additional controls for ln*emp*
		(1)	(2)
inp_dom_tech	Percentage of technical services from domestic firms of firm's total input purchases from domestic firms	3.7713** (0.018)	3.7013** (0.031)
inp_dom_oth	Percentage of transport, security, cleaning, catering, and other services from domestic firms of firm's total input purchases from domestic firms	13.9780*** (0.000)	9.5439*** (0.001)
Labor			
emp_dom	Percentage of domestic workers in the firm's total workforce	-4.0758*** (0.002)	-4.4249*** (0.002)
emp_ter_dom	Percentage of domestic workers with tertiary education in the firm's workforce	2.8700 (0.613)	4.1928 (0.445)
emp_sec_dom	Percentage of domestic workers with secondary education in	-7.6005 (0.261)	-8.0573 (0.225)
emp_oth_dom	Percentage of other domestic workers in the firm's workforce	-0.1145 (0.986)	-0.7786 (0.906)
man_dom	Percentage of domestic managers of firm's total managers	-15.5842*** (0.000)	-16.4872*** (0.000)
super_dom	Percentage of domestic supervisors of firm's total supervisors	-6.6335 (0.181)	-8.5360 (0.100)
tech_dom	Percentage of technical positions of firm's total technical positions	-5.9357 (0.159)	-5.8431 (0.185)
Output			
market	Percentage of sales to domestic market of firm's total sales	-34.0663*** (0.000)	-28.4941*** (0.001)

Note: Variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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 2.2). 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 don't 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 C.

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*).

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

Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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In sum, foreign investors outperform domestic producers in terms of sales, firm size, productivity, exporting behaviour, 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.

3.3. Premia by Foreign Investor Characteristics

The analysis in the previous section treated foreign firms as homogenous. The literature survey in section 2, however, showed that certain types of FDI seem to be more beneficial than others since actual FDI spillovers also depend on foreign firm characteristics. It is possible that certain types of foreign investors are more likely to build linkages with the local economy or offer supplier assistance which has important implications for policy makers. 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 fulfils a certain characteristic, and 0 otherwise. *potential* is our measure of FDI spillover potential. Building on the theoretical discussion in section 2.1 and empiricial findings in section 2.2, we include the foreign investor characteristics shown in Table 5. The summary statistics are presented in Appendix D.

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.

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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"

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). This confirms the hypothesis that a higher share of foreign ownership correlates positively with the parent firm's incentive to transfer knowledge (e.g., Taaki 2005). 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). The results seem to suggest that the likelihood of supplier assistance and employment of local workers is higher for older firms, while the extent of local sourcing intensity is smaller.

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). This confirms the positive role of a technology gap between the multinational and local firms which is not too big nor too small (e.g. Kokko 1994; Kokko, Tansini, and Zejan 1996; Blalock and Gertler 2009).

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Table 6.
Premia by Foreign Investor Characteristics

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

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.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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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 how 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 positively 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).

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). The results confirm the negative spillover potential of resource-seeking FDI, while the negative effect of cost-oriented FDI is somewhat unexpected, but could be explained by the sectoral composition of our data sample including two non-manufacturing sectors (agribusiness and mining).

4. WHICH ABSORPTIVE CAPACITIES FACILITATE FDI LINKAGES?

This section focuses on the role of domestic supplier characteristics for FDI linkages. Economic upgrading in GVCs can be achieved by improving the capacity of firms to internalize productivity spillovers. A firm's absorptive capacity includes the skill intensity and know-how of the workforce[11], technological capacity of the capital stock, and productivity in existing GVC tasks. Upgrading skills, capital, and process, thus, equip local firms to maximize the gains from FDI (Taglioni and Winkler 2016).

In section 4.1, we present the data, while section 4.2 introduces the empirical model where we relate absorptive capacities with FDI linkages. While the data are not suited to measure actual FDI spillovers, the extent of FDI linkages seems to be a good proxy for local suppliers' potential to absorb FDI spillovers. 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.

[11] Studies on the food and vegetable and apparel value chains suggest that workfoce development contains a high potential for countries to maintain and upgrade their positions in the GVCs (see, e.g., Gereffi 1999; Fernandez-Stark, Bamber, and Gereffi 2011; Fernandez-Stark, Frederick, and Gereffi 2011).

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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:

$$linkage_{isc} = \alpha_0 + AC_{isc} + D_{cs} + \varepsilon_{isc} \tag{2}$$

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 and empirical discussion in section 2, we include the following absorptive capacities, as defined in Table 8:

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

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.

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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 E.

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. The somewhat unexpected result is likely related to the choice of our dependent variable – the percentage of a supplier's output to foreign customers. While skills play a major role for economic upgrading in GVCs, i.e. productivity and value added gains, they seem to matter less strongly for the extent of GVC linkages.

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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)

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.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

Firm size also has an influence on the extent of 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

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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.

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. 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

Note: All variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. p*<0.1, p**<0.05, p***<0.01 (p-values in parentheses).

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Results for Established Suppliers

It is likely that firms with a longer supplier experience show 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).

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 (0.341)								-3.4042 (0.412)
$soph_{isc}$	6.9340* (0.055)								6.8075 (0.102)
emp_ter_{isc}		-0.2337* (0.067)							-0.2822 (0.105)
emp_sec_{isc}			0.1797 (0.179)						-0.0169 (0.911)
ln$exper_{isc}$				-2.2745 (0.709)					-0.0370 (0.996)
man_educ_{isc}					-14.2539** (0.048)				-13.6016 (0.176)
man_exper_{isc}					5.5674 (0.469)				10.0019 (0.265)
lnemp_{isc}						-2.3064 (0.302)			-4.5781 (0.200)
$export_{isc}$							10.8120 (0.114)		7.7413 (0.414)
ln$dist_{isc}$								-3.7772** (0.025)	-2.5183* (0.097)
$constant_{isc}$	49.5283** (0.015)	67.6262*** (0.001)	50.7481*** (0.008)	65.6000** (0.014)	95.1645*** (0.000)	66.2781*** (0.000)	56.0470*** (0.001)	68.6250*** (0.000)	113.8197*** (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	1092	100	100	102	105	100	103	99	87

Note: All variables refer to FY 2012. All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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

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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.

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 than suppliers that don't. Table 12 shows the supplier premia by transmission channel (see Appendix E for summary statistics). 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.

Table 12.
Supplier Premia by Factors within Transmission Channel

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

Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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.

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

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

impr captures demand effects in GVCs, while *audit*, *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 *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. In the combined sample (column 6), we can confirm the significantly positive effects of technical audits (*audit*) and assistance by foreign customers (*assist*). Interestingly, requirements to improve (*impr*) do not have any impact.

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** (0.049)					0.9166* (0.071)
$impr_{isc}$		0.3366 (0.468)				-0.1203 (0.827)
$assist_{isc}$			1.3256*** (0.008)			1.4075*** (0.008)
dev_{isc}				1.2506*** (0.006)		0.8537 (0.138)
$license_{isc}$					1.2387** (0.014)	0.8975 (0.105)
$constant_{isc}$	-6.9418*** (0.000)	-6.4233*** (0.000)	-6.0867*** (0.000)	-7.3373*** (0.000)	-6.0867*** (0.000)	-7.7367*** (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

[1)] McFadden's adjusted pseudo R2.

Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^* < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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In sum, we find evidence for the existence of positive assistance effects (including technical audits, joint product development, and technology licensing) in GVCs, while demand effects (measured as requirements to improve) do not have any impact.

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. Using the specification of equation (4), we substitute 13 sub-indicators[12] for *impr* which take the value of 1 if the foreign customer required the supplier to make improvements before or after signing the contract, and 0 otherwise. Of the 13 sub-indicators of *impr*, none shows a significant impact (results available upon request). In sum, the regression results give evidence of strong assistance effects in GVCs, 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 12 shows the definitions of the different sub-indicators of *assist* available in the dataset, while Appendix F 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. Tables 14 and 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.

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 GVCs for FDI spillovers.

[12] These include requirements to reorganize the product lines, to invest in new equipment and/or technology, to improve product quality, quality control, productivity, timeliness of delivery, inventory management, business management, health, safety, environmental, and/or social conditions, to increase volume of production, to cut waste, to acquire ISO 9000 or 14000, and to train employees.

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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

[1)] McFadden's adjusted pseudo R2.

Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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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)							
$assist\_orga_{isc}$			0.8546						
			(0.286)						
$assist\_qual_{isc}$				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

[1)] McFadden's adjusted pseudo R2.

Note: All regressions control for country-sector fixed effects. Standard errors are robust to heteroscedasticity.

Source: Own calculations. $p^{*} < 0.1$, $p^{**} < 0.05$, $p^{***} < 0.01$ (p-values in parentheses).

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6. SUMMARY AND CONCLUSIONS

6.1. Summary of Results

Developing countries can now industrialize by joining GVCs without the need to build their own value chain from scratch (Baldwin 2012). That enables developing countries to focus on specific tasks in the value chain rather than producing the entire product, thereby lowering the threshold and costs for industrial development. Countries can join GVCs either by facilitating domestic firms' entry or by attracting foreign investors. The FDI option includes more direct access to foreign know-how and technology via productivity spillovers (Taglioni and Winkler 2016). In this context, many developing countries devote considerable attention and resources to attracting foreign investment from GVC lead firms as a means to enter GVCs and benefit from productivity spillovers. However, not all FDI generates the same potential for spillovers. Similarly, not all domestic firms benefit from FDI spillovers to the same extent. Finally, it is important to understand the functioning of the transmission channels through which knowledge and productivity gains spill-over from multinationals to domestic firms.

Using newly collected survey data on direct supplier-multinational linkages in Chile, Ghana, Kenya, Lesotho, Mozambique, Swaziland, and Vietnam, this paper evaluated how 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 behaviour, 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

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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 for the existence of positive assistance effects (including technical audits, joint product development, and technology licensing) in GVCs, 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 GVCs 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.

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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

A. 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

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B. 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

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C. 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

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D. 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

E. 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

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F. 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

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