



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Inclusive and Sustainable Industrial Development Working Paper Series  
WP 13 | 2015

# FOREIGN AFFILIATES WITH AND WITHOUT INTRA-FIRM TRADE: EVIDENCE FROM SUB-SAHARAN AFRICA

**RESEARCH, STATISTICS AND INDUSTRIAL POLICY BRANCH**

**WORKING PAPER 13/2015**

**Foreign affiliates with and without intra-firm trade:  
Evidence from sub-Saharan Africa**

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**Vienna, 2015**

## **Acknowledgements**

We would like to thank audiences at the UCLouvain IEG seminar, the UCLouvain DW May 2014, the ITSG July 2014, the ETSG 2014, the XIX DEGIT 2014, and the KUL CoE ISS Fall 2014 for their comments and suggestions. Special thanks are extended to Gabor Békés, Rosario Crinò, Giorgia Giovannetti, Amanda Jakobsson, Florian Mayneris, Mathieu Parenti and Lucía Pérez-Villar. Sotiris Blanas gratefully acknowledges financial support from the Fonds de la Recherche Scientifique – FNRS. All errors are ours.

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## **Abstract**

We compare the main characteristics and activities of 2,403 foreign affiliates with and without intra-firm trade in 19 sub-Saharan-African countries in 2010. Affiliates with intra-firm trade are relatively few but larger, more productive and with a higher stock of intangible assets (i.e. intra-firm trade tends to intensify the transfer of intangibles). The latter seems to be a direct outcome of their tendency to be more dependent on their parent in terms of decision making—with the role of middle managers sidelined—receipt of assistance in several areas, acquisition of capital goods and finance of working capital. They are also more likely to abandon or to not even pursue local procurement due to concerns over retention of intellectual property. Their size and productivity advantage seems to explain their higher probability of direct importing, having suppliers in distant and multiple countries/regions, direct exporting to more distant and multiple markets, indirect exporting, importing-exporting, as well as their lower probability of being single- product/service firms. They also seem to face competition mostly from imports and less so from locally-owned firms in the host country. Parents that trade with their affiliate tend to have a network of sister affiliates in the same country, as well as in neighbouring and non-neighbouring countries.

**Keywords:** foreign affiliates, intra-firm trade, complex FDI, sub-Saharan Africa

**JEL Classification:** F14, F23, L21, L23, L24, L25

## 1. Introduction

Multinational companies (hereafter MNCs) are the main drivers in the current process of internationalization of production and markets. This stylized fact has spawned numerous theoretical and empirical studies on different types of FDI and MNC (i.e., horizontal<sup>1</sup>, vertical<sup>2</sup>, and export-platform<sup>3</sup> FDI), as well as combinations of these (Carr et al., 2001; Grossman et al., 2006; Irarrazabal et al., 2013). UNCTAD (1998) is the first to report empirical evidence on such combinations. Furthermore, Feinberg and Keane (2001) review U.S. MNCs with affiliates in Canada and find that only 12 per cent of these are of a purely horizontal type and only 19 percent of a purely vertical. Consequently, terms such as “complex integration strategies” and “complex FDI” have been coined (UNCTAD, 1998; Yeaple, 2003a; Helpman, 2006).

The latest evidence generates a cascade of questions the answers to which could make room for a more realistic approach to determining foreign affiliates’ main features and activities. As foreign affiliates with intra-firm trade are not necessarily of a purely vertical type, the question arises how they differ from those that do not trade with their parent or their sister affiliate(s). Whether there are any differences in terms of key characteristics of firms, their level of dependence on their parent, international and local procurement activities, and local and export market behaviour has, to the best of our knowledge, not yet been addressed.<sup>4</sup> This paper aims to fill this gap in the extant literature.

For this purpose, we use data from the UNIDO Africa Investor Survey 2010 and compare the main characteristics, behaviour and activities of 2,403 foreign affiliates in 2010, with and without intra-firm trade located in 19 countries in sub-Saharan Africa (SSA). Their parent companies are based either in high-income, in non-SSA low/middle-income, or in SSA countries. In contrast to the vast majority of previous theoretical and empirical studies, which only take the manufacturing sector into

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<sup>1</sup> The MNC serves the foreign market by setting up a foreign affiliate rather than through exports. Thereby, the production process of the parent company is *replicated* in the foreign affiliate. Among others, see Caves (1982), Markusen (1984), Brainard (1997), Helpman et al. (2004), Horstmann and Markusen (1992), Markusen and Venables (2000), Ramondo et al. (2013).

<sup>2</sup> The MNC takes advantage of international factor differentials by transferring part of its production process to countries where factor prices are lower (Helpman, 1984; Helpman and Krugman, 1985, Yeaple, 2003b and Yeaple, 2008). In this case, intra-firm trade is created, as has been observed in several recent empirical studies (Hanson et al., 2001; Hanson et al., 2005; Borga and Zeile, 2004; OECD, 2002; Alfaro and Charlton, 2009).

<sup>3</sup> An affiliate located in a foreign country is used as a platform for serving other markets nearby via exports (Ekholm et al., 2007; Badinger and Egger, 2010).

<sup>4</sup> See Hanson et al. (2001) and Ramondo et al. (2011). The former examine imports by foreign affiliates from U.S. parent companies using the variable ‘affiliate size’ while the latter find that “vertical” affiliates are larger in terms of size than “horizontal” ones.

consideration, our study covers all three main sectors of the economy (i.e. the primary, secondary and tertiary sector). This allows us to shed light on a number of dimensions that differentiate the two firm types, and to take a closer look at their very structure and the business purposes they serve.

Africa, and in particular sub-Saharan Africa, continues to lag behind other developing regions like Asia and Latin America in terms of FDI inflows and participation in regional and global value chains (UNCTAD, 2013). As FDI can be an essential source of financing for industrialization, Africa is increasingly tapping into it. According to UNCTAD and UNIDO (2011), Africa's FDI inflows increased from US\$ 2.8 billion to US\$ 58.6 billion between 1990 and 2009, while the share of FDI in gross fixed capital formation increased from 3.2 per cent to 24.1 per cent between 1990 and 2007. Although the majority of FDI inflows are concentrated in mining, significant investment activities also took place in manufacturing between 2003 and 2009. UNCTAD (2010b) reports that 41 per cent of the total number of greenfield investment projects in Africa targeted the manufacturing sector.

Although developed countries account for the bulk of FDI inflows into Africa, non-African developing countries—especially Brazil, China, India and Turkey—are increasingly important sources. Their share in total FDI inflows to Africa increased from an average of 17.7 per cent in the period 1995 to 1999 to 20.8 per cent between 2000 and 2008 (UNCTAD, 2010a). According to the same study, FDI from non-African developing countries is primarily in natural resources, but significant investments have also been made in infrastructure<sup>5</sup>, finance, agriculture and light manufacturing. UNCTAD (2013) reports that there has also been a remarkable increase in intra-African investment over the past decade, with 68 per cent of greenfield investment being accounted for by the services sector.

As regards trade activity, which is very closely linked to FDI, Africa has experienced a significant rise in total merchandise trade, from US\$ 7 billion in 1995 to US\$ 86 billion in 2008. This has been accompanied by increasing trade with other non-African developing countries. Its share of global trade also rose from 2.2 per cent in 2000 to 3.3 per cent in 2008 (UNCTAD, 2010a).

The well-documented rise in MNC activity in Africa and especially in sub-Saharan Africa renders this analysis even more intriguing and relevant in the sense that some of the findings may unearth the

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<sup>5</sup> Between 2001 and 2007, China's infrastructure funding commitment in sub-Saharan Africa rose from US\$ 470 million to US\$ 4.5 billion. Other countries with noteworthy investments in infrastructure include India, Kuwait, Saudi Arabia and the United Arab Emirates (UNCTAD, 2010b; UNCTAD, 2010a).

effects of FDI on host economies, in our case, on sub-Saharan African economies. The identification of differential effects from the presence of foreign affiliates with and without intra-firm trade could be very useful for policy makers in host countries to implement industrial, trade, investment, and development policies that benefit their countries the most.

Aside from studying different types of FDI, this paper contributes to many other streams of literature on MNCs as well as to literature on the boundaries of the firm. The first and most important contribution of our study is the identification of differences in the main characteristics between affiliates with and those without intra-firm trade. We find that there are only few foreign affiliates with intra-firm trade and they tend to be larger and more productive than those without intra-firm trade. These findings are in line with the main finding of Ramondo et al. (2011), who conclude that intra-firm trade is concentrated among a small number of large affiliates, while average affiliates are smaller in size and do not report shipments to their parent but rather direct the bulk of their sales to non-affiliated parties in the host country. Hanson et al. (2001) also find a positive link between intra-firm imports from the parent with the affiliate's size.

We report size and productivity premiums of 31.5 per cent and 25.4 per cent, respectively. We also find a clear sorting pattern of firms in terms of size and productivity. On average, foreign affiliates with both intra-firm imports and exports seem to be the largest and most productive firms; those with only intra-firm exports are generally smaller and less productive. Foreign affiliates with only intra-firm imports are even smaller and less productive, while those with arm's length trade only are bigger and more productive than those without any intra-firm trade, which are the smallest and least productive firms. Documenting these premiums becomes even more important after we show that foreign affiliates with arm's length trade only differ from domestic firms, which engage in international trade in terms of size and productivity. They are larger and more productive at 11.9 per cent and 25.7 per cent, respectively.

Had the analysis focused exclusively on intra-firm activities of foreign affiliates, it would have been incomplete and misleading in the sense that the majority of foreign affiliates in the sample trade at arm's length, including those with intra-firm trade. Even though information on transactions at the firm-product-destination level is not available, it is a noteworthy stylized fact, indicative of the complexity of foreign affiliates' business operations. In turn, it calls for additional and more profound analysis of the boundaries of the firm.



Despite data limitations, we provide some possible explanations based on the property rights theory (PRT). Intra-firm transactions can be interpreted as an effective way for the parent company (i.e. the foreign investor) to have residual rights of control over relationship-specific assets (Antràs and Rossi-Hansberg, 2009; Antràs and Yeaple, 2013) or sophisticated technology (e.g. R&D) (Acemoglu et al., 2010). The parent company effectively increases its ex-post bargaining power. However, the erosion of the second party's ex-post bargaining power discourages investment on its behalf. Therefore, there may be cases in which the foreign affiliate itself, and indirectly the parent company, decide to collaborate with an unaffiliated firm to incentivize the latter to invest. This, for instance, is very likely when the main purpose of collaboration for the foreign affiliate is the procurement of inputs, which are country-specific (e.g. raw materials).

Two more reasons (which are more closely related to the transactions cost approach (TCA)<sup>6</sup>) for the high number of foreign affiliates engaging in arm's length trade may be the thickness of the market for both sellers and buyers. Put differently, a large number of suppliers (e.g. unaffiliated parties) producing the same or very similar inputs and a large number of firms (e.g. foreign affiliates) willing to buy these inputs can mitigate the hold-up problem (McLaren, 2003).

The same stylized fact also raises the question as to why firms opt to set up domestic or foreign affiliates, if not in order to transfer goods and/or services within their boundaries. Ramondo et al. (2011) conclude that given that U.S. affiliates with intra-firm trade are only a small minority, the main reason for their existence is the transfer of intangible assets rather than of goods or services within firm boundaries. This is the main finding of Atalay et al. (2014), who used data of domestic U.S. firms.<sup>7</sup> Bloom et al. (2012) also find that parent companies partially “transplant” their best practices abroad (i.e. in their foreign affiliates). Drawing on information on intangible assets within foreign affiliates, we find that those with intra-firm trade seem to have a greater stock and flow of such assets. This novel finding does not negate those of Atalay et al. (2014) and Bloom et al. (2012). In fact, our finding complements theirs. Even if foreign affiliates exist primarily due to the transfer of intangibles within firm boundaries, the exchange of intermediate or final goods/services intensifies this transfer.

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<sup>6</sup> See Coase (1937), Williamson (1975), Williamson (1985), Antràs and Rossi-Hansberg (2009), Antràs and Yeaple (2013), Spencer (2005).

<sup>7</sup> Various forms of intangible assets are discussed in the literature: capabilities (Atalay et al., 2014), knowledge capital (Markusen, 1984), technology capital (McGrattan and Prescott, 2010), organizational capital (Garicano and Rossi-Hansberg, 2006), core capabilities (Bernard et al., 2012), managerial ability (Bloom and Van Reenen, 2007).

This finding and the explanation provided are reinforced by the following two equally important sets of results. First, foreign affiliates with intra-firm trade are more likely to abandon or to not even pursue local procurement due to concerns over retention of their intellectual property. They are also less likely to consider the development of a closer relationship with their local supplier as the most important factor in favour of local procurement. In line with this result, the probability is lower that their parent's main investment motive is to join a specific partner in the host country.

The second set of results indicates that foreign affiliates with intra-firm trade tend to pay management fees to their parent and have a lower level of autonomy in making decisions on several activities (e.g. product launch and modification, introduction of new production and processing systems, export market entry, pricing policy, marketing strategy, supplier selection, etc.). Similarly, they tend to receive more assistance from their parent in several areas (e.g. use of patents, trademarks and brand names, technology and know-how transfer, global market access, etc.).

With the exception of the transfer of intangible assets, the final set of results suggests a tendency of foreign affiliates with intra-firm trade to be more dependent on their parent. We also find that they are more likely to acquire capital goods from their parent and less so from local and foreign (unaffiliated) distributors. Their parent also seems to be the main source of financing of working capital and fixed assets.

In an attempt to zoom in closer on the decision making process within MNCs, we resort to the knowledge-based hierarchy literature. According to Garicano (2000), a firm's production process is effective when a business model with an optimal knowledge hierarchy is implemented. Specifically, workers specialized in production should be capable of resolving routine problems; if they cannot resolve a problem, they should be able to ask for help from managers or supervisors who have superior knowledge. Likewise, if a manager does not know how to resolve a problem, they request assistance from the top of the hierarchy (i.e. top managers).

Building on Garicano (2000) and other seminal papers (Antràs et al., 2006b; Garicano and Rossi-Hansberg, 2006), Antràs et al. (2006a) develop a 3-layer structure for the parent firm. Production workers are in the bottom layer (layer 1), middle managers in the medium layer (layer 2) and top managers in the top layer (layer 3). The hierarchical structure of foreign affiliates consists of the first two layers only. This hierarchical structure increases the volume of offshoring, especially in countries where communication technology is relatively poor, because it shields top managers in the parent

company from having to deal with the routine problems production workers in the foreign affiliate face.

Adopting the hierarchical structure of this study and that of Caliendo et al. (2014), the data allows us to construct two layers of workers within the foreign affiliate. The bottom layer (layer 1) entails production, manual, clerical and sales workers, while the second layer (layer 2) comprises technical, supervisory and managerial workers. We find that foreign affiliates without intra-firm trade are more likely to employ workers in layer 1.

As the production process in affiliates of this type tend to be detached from that of their parent, they are more likely to employ both layers of workers, with managerial employees (layer 2) shield top managers in the parent company from having to deal with “routine” problems workers in the foreign affiliate face. In a similar fashion, the combination of relatively high coordination requirements between two entities with intra-firm trade and the scarcity of skills in sub-Saharan Africa<sup>8</sup> urges middle and top managers of the parent company to be involved in the decision making process at the foreign affiliate and therefore, to deal with problems its workers face. Consequently, the role of middle managers in such firms is severely subdued.

Another explanation based on the theory of delegation of authority is that since intra-firm trade involves more intense transfers of crucial information from the parent to the foreign affiliate (i.e. information about past and/or current implementation of technologies), middle managers in the foreign affiliate may use this informational advantage in a way that does not serve the interests of the top managers in the parent company (Acemoglu et al., 2007). Hence, the latter opt for centralized control in order to prevent such a misalignment from occurring.

Our argument on the role of middle managers is further underpinned by Marin et al. (2013), who model knowledge-based hierarchies and find that parent firms transplant their organizational form in their foreign affiliates far more often when these are of a “horizontal” type and do not engage in intra-firm trade.<sup>9</sup>

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<sup>8</sup> Skill abundance is an important determinant of FDI and offshoring in general. In 1996, Intel wanted to build a micro-processor plant in Latin America and opted for Costa Rica rather than other countries such as Argentina, Brazil, Chile and Mexico, because of its relative abundance in highly trained labour (i.e. middle managers) (Spar, 1998; Larrain et al.; Antràs et al., 2006a).

<sup>9</sup> Full transplantation of the organizational form implies that all decisions over certain issues are taken at the same hierarchical level in the parent and in the foreign affiliate.

This paper also contributes to the literature on different modes of foreign investment, specifically, the choice between greenfield FDI (i.e. the set-up of a foreign affiliate) and cross-border mergers and acquisitions (M&As) (i.e. the acquisition of an existing firm in the host country). According to a resource-based view of the firm, there is an interplay between a firm's endowments of complementary capabilities or intangible assets (Nocke and Yeaple, 2007; Antràs and Yeaple, 2013). Due to the fact that some capabilities may be imperfectly mobile (e.g. marketing, distribution, country-specific institutional competency), cross-border M&As allow the acquiring firm to complement its intangible technological advantages with a local firm's country-specific capabilities. Firms that engage in greenfield FDI tend to only utilize their own capabilities in the host country. We find that foreign affiliates with intra-firm trade are more likely to be wholly-owned by their parent and to have been created through greenfield FDI. As shown above, since intra-firm trade seems to be very strongly linked to the (exclusive) use of the parent's capabilities abroad, its preferred mode of foreign investment is greenfield FDI. Moreover, the same type of foreign affiliates is more likely to receive tax exemptions and fewer grants for hiring workers as the most critical incentive for investment. Numerous case studies on MNCs report that tax exemption is the most common policy implemented by governments that aim to incentivize foreign companies to build new production facilities in their countries (Hanson, 2001). And, as argued above, since parents of foreign affiliates with whom they trade with are more likely to engage in greenfield FDI, they are also more likely to benefit from tax exemptions on account of their investment.

As regards international and local procurement, foreign affiliates with intra-firm trade are more likely to import inputs directly from multiple and distant markets and to have (backward) linkages with suppliers overseas.<sup>10</sup> As is the case in Bernard et al. (2007), these results are driven by the size and productivity premiums of foreign affiliates with intra-firm trade.

Motivated by the highly influential group of studies on the strong positive association of firm size and productivity with export performance (e.g. Bernard and Jensen, 1994; Bernard and Jensen, 1999; Bernard et al., 2005; Melitz, 2003; Bernard et al., 2007), we study differences between the two firm types in terms of their market orientation, export activities as well as their main source(s) of competition. We find that affiliates with intra-firm trade are more likely to engage in direct exports and face competition for their main product primarily from imports. They are less likely to have sales

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<sup>10</sup> Some of these suppliers may be their sister affiliates, but we cannot see this in the data.

in the domestic market and locally-owned firms in the host country pose a challenge to their main product. In addition, they tend to have direct exports to contiguous markets (i.e. sub-Saharan Africa, South Africa, Middle East and North Africa), more distant ones (i.e. EU, U.S., India, Asia other than China and India and the rest of the world), to a single market as well as to multiple ones. Firms with non-exporter and exporter status are more likely to be those without intra-firm trade, while those with intra-firm trade are more likely to be export-starters, continuing exporters, and importers-exporters.

Due to a lack of information at the firm-product-destination level and the very limited number of products/services per firm (i.e. maximum 3 are reported), this paper cannot make a solid contribution to the literature on multi-product firms, according to which larger exporters not only export more of a given product to a given destination than smaller exporters, but also export more products to more destinations (Bernard et al., 2012).<sup>11</sup> Be that as it may, the finding that foreign affiliates with intra-firm trade have a lower probability of being single product or single service firms is novel and can be linked, as above, to their larger size and higher productivity level, as well as to their greater organizational capabilities (Nocke and Yeaple, 2006; Nocke and Yeaple, 2013; Eckel and Yeaple, 2014).

Finally, parent companies that trade with their foreign affiliates are more likely to own other affiliates either in the same host country, in another sub-Saharan African country or in any country outside sub-Saharan Africa.

The results on main firm characteristics remain unchanged when we limit the sample to manufacturing firms, to majority-owned foreign affiliates (MOFAs) (i.e. the percentage of ownership of the foreign investor is at least 50 per cent) and to a combination of the two. All results in this paper are also robust to alternative estimation techniques (i.e. logistic and linear probability regressions).

The remainder of this paper is as follows. In Section 2, we describe the data and report several stylized facts on the host countries, industries and parent locations of the two types of affiliates as well as on intra-firm flows by sector and parent location. In an attempt to motivate the econometric analysis, we also compute productivity and size premiums of foreign affiliates with intra-firm trade. In

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<sup>11</sup> Implicitly, in Eckel and Neary's model (2010), firm size and productivity are associated with producing more than one product, since it is assumed that the marginal cost of each firm increases as its products shift away from its core competencies.

Section 3, we present the benchmark econometric model and the additional variables. Section 4 discusses the empirical results, while Section 5 concludes.

## **2. Data and stylized facts**

In this section, we describe the data used in the econometric analysis and compare foreign affiliates that trade with their parent (i.e. either intra-firm imports, intra-firm exports or both) and those that do not trade with their parent and look at the host countries in which they are located, the industries in which they operate as well as the origin of their parent company. We also provide some statistics on the percentage of foreign affiliates with different combinations of intra-firm trade flows by industry and parent location. We derive all firm-level data from the UNIDO Africa Investor Survey 2010. The main objective of this survey is to collect information at the firm level directly from business owners and senior managers about their business and their assessment of the current business environment. It includes data on 2,403 foreign affiliates in 19 sub-Saharan African countries for the last financial year (i.e. 2009)<sup>12</sup>.

### **2.1 Foreign affiliates with and without intra-firm trade**

Table 1 presents the 19 countries in sub-Saharan Africa where foreign affiliates with and without intra-firm trade are located. Among firms with intra-firm trade, the highest number are based in Kenya, Uganda, Tanzania, Ghana and Cameroon (17.3 per cent, 16.2 per cent, 8 per cent, 5.9 per cent and 5.7 per cent, respectively.), while the fewest are located in Niger (0.8 per cent), Burundi (1 per cent), Burkina Faso (1.1 per cent), Mali (2.5 per cent) and Malawi (2.7 per cent). Among firms without intra-firm trade, the highest number are based in Uganda (17.1 per cent), Kenya (10.7 per cent), Ghana (8 per cent), Nigeria (6.3 per cent) and Mozambique (6.1 per cent), while the fewest are located in Niger (1 per cent), Burkina Faso (1.2 per cent), Malawi (1.8 per cent), Burundi (2.2 per cent), Lesotho and Rwanda (2.9 per cent each).

To save space, we include two tables in the Online Appendix where the industries of foreign affiliates with and without intra-firm trade are presented. They are aggregated at the 2-digit level (ISIC rev. 3) and cover all three main sectors of the economy (i.e. primary, secondary and tertiary). Firms without intra-firm trade operate in more industries than those with intra-firm trade (56 industries v. 41

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<sup>12</sup> Only a very small number of firms answered the questionnaire in 2009 and provided data for 2008. Each firm corresponds to a single year.

industries). This is mostly driven by the absence of affiliates with intra-firm trade from many services industries.<sup>13</sup> Among affiliates with intra-firm trade, the highest percentages are found in industries with ISIC 15 (11.8 per cent), 25 (8.6 per cent), 1 (8.4 per cent), 24 and 51 (8.2 per cent each), 18 (7.6 per cent), 52 (6.3 per cent) and 45 (5.1 per cent), while the lowest percentages are found in industries with ISIC 2, 33, 41, 63, 71, 72 and 92 (0.2 per cent each). Among affiliates without intra-firm trade, the highest percentages operate in industries with ISIC 15 (8.4 per cent), 51 (6.7 per cent), 74 (5.6 per cent), 45 (5.4 per cent), 25 and 55 (5.2 per cent each), 65 (5.1 per cent) and 28 (4.9 per cent), while the lowest are found in industries with ISIC 12, 30, 73, 85, and 93 (0.1 per cent each).

Table 2 reports the number of firms with and without intra-firm trade by industry and parent location. As regards industries, we consider the entire economy (ISIC between 1 and 99), agriculture (ISIC between 1 and 5), mining (ISIC between 10 and 14), manufacturing (ISIC between 15 and 39), resource-based manufacturing (ISIC: 15, 16, 20, 21, 23, 25, 26, 27), low-tech manufacturing (ISIC: 17, 18, 19, 22, 28, 36), medium-/high-tech manufacturing (ISIC: 24, 29, 30, 31, 32, 33, 34, 35, 37, 38), electricity, gas and water supply (EGW supply) and construction (ISIC 40 and 45, respectively) and services (ISIC between 50 and 99). We distinguish between three different types of parent locations based on the income level of the country in which the parent is located (i.e. high-income countries (HI), low/middle-income countries excluding sub-Saharan African countries (LMI), and those in sub-Saharan Africa (SSA)). To classify each parent location by level of income, we rely on the World Bank Historical Country Classification for the year 2010.<sup>14</sup>

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<sup>13</sup> This finding is in line with Ramondo et al. (2011) who use firm-level data from the U.S. Bureau of Economic Analysis (BEA). The data cover U.S. parents and their foreign affiliates for the year 2004. According to Ramondo et al., intra-firm trade primarily occurs in goods rather than in services, i.e. their analysis focuses on manufacturing only.

<sup>14</sup> For the very few firms that answered the questionnaire in 2009, the classification for the year 2009 applies. Low/middle-income countries are those which the World Bank classifies as either low-income, lower-middle-income or upper-middle-income for the corresponding year.

**Table 1 Locations of foreign affiliates with and without intra-firm trade**

Name	Code	with intra-firm trade		without intra-firm trade	
		# of firms	% of firms	# of firms	% of firms
Burundi	BDI	5	1	41	2.2
Burkina Faso	BFA	6	1.1	23	1.2
Cameroon	CMR	30	5.7	103	5.5
Cape Verde	CPV	22	4.2	82	4.4
Ethiopia	ETH	24	4.6	109	5.8
Ghana	GHA	31	5.9	151	8
Kenya	KEN	91	17.3	200	10.7
Lesotho	LSO	22	4.2	54	2.9
Madagascar	MDG	27	5.1	96	5.1
Mali	MLI	13	2.5	78	4.2
Mozambique	MOZ	16	3	114	6.1
Malawi	MWI	14	2.7	34	1.8
Niger	NER	4	0.8	18	1
Nigeria	NGA	30	5.7	119	6.3
Rwanda	RWA	18	3.4	55	2.9
Senegal	SEN	23	4.4	87	4.6
Tanzania	TZA	42	8	113	6
Uganda	UGA	85	16.2	321	17.1
Zambia	ZMB	23	4.4	79	4.2
<b>Total</b>		<b>526</b>	<b>100</b>	<b>1877</b>	<b>100</b>

*Notes:* Authors' calculations.

*Source:* UNIDO Africa Investor Survey 2010.

In terms of the economy as a whole, parent firms with the highest percentage of affiliates with intra-firm trade are located in high-income countries, those with the second highest percentage in low/middle-income countries, while parent firms with the lowest percentage of affiliates with intra-firm trade are located in sub-Saharan Africa (52.4 per cent, 33.4 per cent and 14.2 per cent, respectively).<sup>15</sup> This is also true for agriculture (74.5 per cent, 12.8 per cent, 12.8 per cent,

<sup>15</sup> As regards other countries, parents with the highest percentage of affiliates with intra-firm trade are located in India (10 per cent), South Africa (9.5 per cent), France and the United Kingdom (8.7 per cent each), Kenya (6.9 per cent), the U.S. (4.8 per cent), China and the Netherlands (4.1 per cent each), Portugal (3.7 per cent), Lebanon and Mauritius (2.5 per cent each), Germany and Switzerland (2.5 per cent each), Hong Kong SAR and Taiwan (ROC) (1.9 per cent), Italy (1.7 per cent), Japan (1.5 per cent), Denmark, Spain and the United Arab Emirates (1.4 per cent each), Belgium, Senegal, Uganda and Tanzania (1 per cent each). Parents with the highest percentage of affiliates without intra-firm trade are located in India (14 per cent), France (9.8 per cent), the United Kingdom (9.7 per cent), South Africa (6.3 per cent), China and Kenya (6 per cent each), Portugal (4.4 per cent), Italy (4 per cent), Lebanon (3.9 per cent), the U.S. (3.6 per cent), the Netherlands



respectively), mining (53.3 per cent, 46.7 per cent, 0 per cent, respectively), manufacturing (50.6 per cent, 36.3 per cent, 13.1 per cent, respectively), resource-based manufacturing (52.3 per cent, 31.5 per cent, 16.1 per cent, respectively), medium-/high-tech manufacturing (66.7 per cent, 22.2 per cent, 11.1 per cent, respectively), EGW supply and construction (50 per cent, 35.7 per cent, 14.3 per cent, respectively) and services (47.9 per cent, 31.3 per cent, 20.8 per cent, respectively). The only exception is the low-tech manufacturing industry in which parents with the highest percentage of foreign affiliates with intra-firm trade are based in low/middle-income countries (36.4 per cent, 53.5 per cent and 10.1 per cent, respectively).

As far as foreign affiliates without intra-firm trade are concerned, the parents of the lowest percentage of these are located in sub-Saharan Africa. This holds for the economy as a whole and for all individual industries examined. The differences in the percentages of affiliates whose parents are located in high- and non-SSA low-/middle-income countries are much lower than before (whole economy: 49.4 per cent v. 37 per cent; manufacturing: 44.9 per cent v. 43.3 per cent; resource-based manufacturing: 43.9 per cent v. 43.4 per cent, medium-/high-tech manufacturing: 47.8 per cent v. 40.8 per cent) or even vanished (low-tech manufacturing: 44.8 per cent v. 44.8 per cent). Industries that still demonstrate a considerable difference are agriculture (60.7 per cent v. 21.3 per cent), mining (58.8 per cent v. 41.2 per cent), EGW supply and construction (56 per cent v. 35.8 per cent) and services (51.5 per cent v. 32.1 per cent).

Panel A in Table 3 shows that intra-firm trade is rare. Only 526 out of the 2,403 foreign affiliates (21.9 per cent of the total number of firms) trade with their parent company (i.e. they either have intra-firm imports or intra-firm exports, or both). The remaining 1,877 (78.1 per cent of the total number of firms) do not have any intra-firm trade flows. Among the firms with intra-firm trade, 77.8 per cent have intra-firm imports (Panel B), 39.4 per cent have intra-firm exports (Panel C), 17.1 per cent have both intra-firm imports and exports (Panel D), 60.6 per cent only have intra-firm imports (Panel E) while 22.2 per cent only have intra-firm exports (Panel F).

The fact that the majority of foreign affiliates in our sample do not engage in intra-firm trade does not mean that they do not trade at all. They do, but at arm's length. We provide such evidence in the Online Appendix. There are 1,743 out of 2,403 foreign affiliates (72.5 per cent of the total) that have

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(2.1 per cent), Switzerland (1.8 per cent), Mauritius (1.7 per cent), Germany (1.6 per cent), Canada (1.2 per cent) and Belgium (0.9 per cent).

any type of trade (i.e. either intra-firm or arm's length), while 1,217 or 50.6 per cent have arm's length trade only. Arm's length trade is also widespread among foreign affiliates with intra-firm trade. Only 177 out of 526 firms have intra-firm trade only, the remaining 349 have a combination of both.

**Table 2 Foreign investors' origin**

	with intra-firm trade		without intra-firm trade	
<b>Whole economy</b>				
Parent location	# of firms	% of firms	# of firms	% of firms
High-income country	265	52.4	871	49.4
Low-/middle-income country	169	33.4	653	37
Sub-Saharan African country	72	14.2	240	13.6
<b>Total</b>	<b>506</b>	<b>100</b>	1764	100
<b>Agriculture</b>				
High-income country	35	74.5	37	60.7
Low/middle-income country	6	12.8	13	21.3
Sub-Saharan African country	6	12.8	11	18
<b>Total</b>	<b>47</b>	<b>100</b>	<b>61</b>	<b>100</b>
<b>Mining</b>				
High-income country	8	53.3	20	58.8
Low/middle-income country	7	46.7	14	41.2
Sub-Saharan African country	0	0	0	0
<b>Total</b>	<b>15</b>	<b>100</b>	<b>34</b>	<b>100</b>
<b>Manufacturing</b>				
High-income country	162	50.6	347	44.9
Low/middle-income country	116	36.3	334	43.3
Sub-Saharan African country	42	13.1	91	11.8
<b>Total</b>	<b>320</b>	<b>100</b>	<b>772</b>	<b>100</b>
<b>Resource-based manufacturing</b>				
High-income country	78	52.3	165	43.9
Low/middle-income country	47	31.5	163	43.4
Sub-Saharan African country	24	16.1	48	12.8
<b>Total</b>	<b>149</b>	<b>100</b>	<b>376</b>	<b>100</b>

<b>Low-tech manufacturing</b>				
High-income country	36	36.4	107	44.8
Low/middle-income country	53	53.5	107	44.8
Sub-Saharan African country	10	10.1	25	10.5
<b>Total</b>	<b>99</b>	<b>100</b>	<b>239</b>	<b>100</b>
<b>Medium-/high-tech manufacturing</b>				
High-income country	48	66.7	75	47.8
Low/middle-income country	16	22.2	64	40.8
Sub-Saharan African country	8	11.1	18	11.5
<b>Total</b>	<b>72</b>	<b>100</b>	<b>157</b>	<b>100</b>
<b>EGW supply/construction</b>				
High-income country	14	50	61	56
Low/middle-income country	10	35.7	39	35.8
sub-Saharan African country	4	14.3	9	8.3
<b>Total</b>	<b>28</b>	<b>100</b>	<b>109</b>	<b>100</b>
<b>Services</b>				
High-income country	46	47.9	406	51.5
Low/middle-income country	30	31.3	253	32.1
sub-Saharan African country	20	20.8	129	16.4
<b>Total</b>	<b>96</b>	<b>100</b>	<b>788</b>	<b>100</b>

*Notes:* Authors' calculations. Firms with intra-firm trade are those with either intra-firm imports, or intra-firm exports or both. Resource-based manufacturing industry codes: 15, 16, 20, 21, 23, 25, 26, 27. Low-tech manufacturing industry codes: 17, 18, 19, 22, 28, 36. Medium-/high-tech manufacturing industry codes: 24, 29, 30, 31, 32, 33, 34, 35, 37, 38. EGW supply: Electricity, gas and water supply (ISIC: 40). SSA: Foreign investors' country of origin is sub-Saharan African. Foreign investors' country of origin is classified as high-income (HI) and non-SSA low-/middle-income (LMI) based on the World Bank's historical country classification for the year 2010, and for the very few firms that answered the questionnaire in 2009, for that specific year. Low-/middle-income countries are those classified by the World Bank for the corresponding year as either low-income, or lower-middle-income, or upper-middle-income.

*Source:* UNIDO Africa Investor Survey 2010.

Among the 1,743 foreign affiliates that have any of the two types of trade, 88.4 per cent of these are importers (i.e. either intra-firm importers, arm's length importers or both), 48.9 per cent are exporters (i.e. either intra-firm exporters, arm's length exporters or both), 37.3 per cent are both importers and exporters, 51.1 per cent are only importers and 11.6 per cent are only exporters. Among the 1,540 importers, 73.4 per cent only import at arm's length, while 9.2 per cent only have intra-firm imports. The remaining 17.4 per cent are both intra-firm and arm's length importers. For the 853 exporters,

75.7 per cent only export at arm's length, while 6.2 per cent only have intra-firm exports. The vast majority of the 650 importers-exporters only trade at arm's length (86.2 per cent). Only 17 per cent of these import and export from and to their parent and/or other affiliated parties.

**Table 3 Foreign affiliates with and without intra-firm trade**

<b>Panel A: With intra-firm trade</b>	<b># of firms</b>	<b>% of firms</b>
No	1877	78.1
Yes	526	21.9
Total	2403	100
<b>Panel B: With intra-firm imports</b>	<b># of firms</b>	<b>% of firms</b>
No	117	22.2
Yes	409	77.8
Total	526	100
<b>Panel C: With intra-firm exports</b>	<b># of firms</b>	<b>% of firms</b>
No	319	60.6
Yes	207	39.4
Total	526	100
<b>Panel D: With both intra-firm imports and exports</b>	<b># of firms</b>	<b>% of firms</b>
No	436	82.9
Yes	90	17.1
Total	526	100
<b>Panel E: With intra-firm imports only</b>	<b># of firms</b>	<b>% of firms</b>
No	207	39.4
Yes	319	60.6
Total	526	100
<b>Panel F: With intra-firm exports only</b>	<b># of firms</b>	<b>% of firms</b>
No	409	77.8
Yes	117	22.2
Total	526	100

*Notes:* Authors' calculations. Firms with intra-firm trade are those with either intra-firm imports or intra-firm exports or both.

*Source:* UNIDO Africa Investor Survey 2010.

All in all, although the majority of foreign affiliates in our sample engage in trade activities, they do so mostly at arm's length. Foreign affiliates with intra-firm trade are relatively few and most also trade at arm's length.

In the Online Appendix, we present data of foreign affiliates with various combinations of intra-firm and arm's length trade. We show that 15.4 per cent of the 1,743 foreign affiliates with trade have both intra-firm and arm's length imports, 8.8 per cent have both intra-firm and arm's length exports, 4.2 per cent have intra-firm and arm's length imports and exports, 6.4 per cent have intra-firm imports and only arm's length exports, 4.6 per cent have intra-firm exports and only arm's length imports, 4.5 per cent have intra-firm and arm's length imports and only arm's length exports, 3.8 per cent have intra-firm and arm's length exports and only arm's length imports, 3.8 per cent have intra-firm and arm's length imports and intra-firm exports, 3.4 per cent have intra-firm and arm's length exports and intra-firm imports, 0.7 per cent have intra-firm and arm's length imports and only intra-firm exports, and finally, 0.4 per cent have intra-firm and arm's length exports and only intra-firm imports.

These stylized facts are indicative of the complex business activities undertaken by foreign affiliates and raise some questions whose explanations lie in theories of the boundaries of the firm. First, if foreign affiliates without intra-firm trade had been of a purely horizontal type, arm's length trade would not have been observed. However, since it has been observed in the majority of such affiliates, the implication is that they have chosen to be involved in international backward and forward linkages with unaffiliated rather than affiliated parties. What factors determined their sourcing mode? For foreign affiliates with both intra-firm and arm's length trade, in which case did their parent choose to trade with them and in which case to permit them to trade with third (unaffiliated) parties? Although data on intra-firm and arm's length transactions at the firm-product-destination level are not available, we provide some possible explanations based mostly on the property rights theory (PRT). Intra-firm transactions can be interpreted as an effective way for the parent company (i.e. foreign investor) to have residual rights of control over relationship-specific assets (Antràs and Rossi-Hansberg, 2009); Antràs and Yeaple, 2013) or sophisticated technology (e.g. R&D) (Acemoglu et al., 2010), which increase its ex-post bargaining power. Nevertheless, the second party experiences an erosion of its ex-post bargaining power, which results in lower investment on its behalf. Therefore, there may be cases in which the foreign affiliate itself, and indirectly the parent company, deem it more important to provide an incentive to the second party to invest more rather than have property rights over relationship-specific assets. One possible case is when the main purpose of the collaboration for the foreign affiliate is the procurement of country-specific inputs (e.g. raw materials).

Other possible explanations, more closely related to the transaction cost approach (TCA)<sup>16</sup>, are based on the thickness of the market for buyers and sellers. The hold-up problem is accentuated when there is only one buyer of an input (monopsonist) or only one seller (monopolist). An increase in the thickness of the market for buyers and sellers implies a greater number of the former demanding a specific input and a greater number of the latter producing this input. Hence, the probability of a match between a sourcing firm and a supplier rises and the hold-up issue is mitigated (McLaren, 2003).

In Table 4, we provide the same statistics as in Table 3 by industry and parent location. In terms of industry, the highest percentage of foreign affiliates with intra-firm trade operate in agriculture (43 per cent), mining (32.7 per cent) and manufacturing (28.8 per cent), while the lowest percentage in services (10.7 per cent) and EGW supply and construction (19.3 per cent). Within manufacturing, the percentage of the same type of affiliates in resource-based industries is slightly lower than for the entire sector (27.7 per cent), the percentage in low-tech industries is almost identical (28.7 per cent), and that in medium-/high-tech industries is slightly higher (31.4 per cent). In Panel A.1, the percentages of foreign affiliates with intra-firm trade whose parents are located in high-income countries are higher than in agriculture (48.6 per cent), manufacturing (31.8 per cent) and in particular in resource-based manufacturing (32.1 per cent) and medium-/high-tech manufacturing (39 per cent). Instead, they are lower in mining (28.6 per cent) and low-tech manufacturing (25.2 per cent), and only slightly smaller in EGW supply and construction (18.7 per cent) and services (10.2 per cent).

The pattern is slightly different for foreign affiliates whose parents are located in non-SSA low-/middle-income countries and in SSA countries (Panel A.2 and Panel A.3). The percentages for the first in comparison to those in Panel A are higher in mining (33.3 per cent), low-tech manufacturing (33.1 per cent) and EGW supply and construction (20.4 per cent), while it is lower or roughly equal in agriculture (31.6 per cent), manufacturing (25.8 per cent), resource-based and medium-/high-tech manufacturing (22.4 per cent and 20 per cent, respectively) and in services (10.6 per cent). The percentages for the second are lower or roughly equal for agriculture (35.3 per cent) and in low-tech and medium-/high-tech manufacturing (28.6 per cent and 30.8 per cent, respectively), while it is higher for manufacturing (31.6 per cent), resource-based manufacturing (33.3 per cent), EGW supply

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<sup>16</sup> See Coase (1937), Williamson (1975), Williamson (1985), Antràs and Rossi-Hansberg (2009), Antràs and Yeaple (2013), Spencer (2005).

and construction (30.8 per cent) and services (13.4 per cent). There are no foreign investors from sub-Saharan Africa with foreign affiliates in mining.

Panel B shows that among firms with intra-firm trade, the highest percentage of those with intra-firm imports operate in services (99 per cent), EGW supply and construction (96.4 per cent), mining (88.2 per cent), low-tech manufacturing (82.5 per cent), medium/high-tech manufacturing (76.3 per cent), manufacturing (73.2 per cent), while the lowest percentage is in agriculture (51 per cent) and resource-based manufacturing (65.4 per cent). Panels B.1 to B.3 reveal that the patterns for foreign affiliates with intra-firm imports whose parents are located in any of the three country types are very similar to the one in Panel B. The main differences are observed in agriculture in which there is a lower percentage of foreign affiliates with intra-firm imports whose parents are located in high-income countries (42.9 per cent), while a higher percentage of those whose parents are located in non-SSA low-/middle-income and SSA countries (66.7 per cent and 83.3 per cent, respectively). In addition, while the percentage of firms with intra-firm imports whose parents are located in non-SSA low-/middle-income countries is higher in medium-/high-tech manufacturing (87.5 per cent), that of firms whose parents are located in SSA countries is much lower (62.5 per cent).

According to Panel C, the highest percentage of foreign affiliates with intra-firm exports are found in agriculture (73.5 per cent), mining (52.9 per cent) and resource-based manufacturing (52.3 per cent), while the lowest are in services (2 per cent) and in EGW supply and construction (7.1 per cent). Panels C.1 to C.3 reveal that the percentage of firms with intra-firm exports whose parents are located in high-income countries is higher than that in Panel C in all industries, except for medium-/high-tech manufacturing (37.5 per cent v. 38.2 per cent) while the percentage of firms whose parents are located in non-SSA low-/middle-income countries and SSA countries are lower in all industries except for low-tech and medium-/high-tech manufacturing (Panel C.2: 50.9 per cent v. 47.6 per cent and 43.8 per cent v. 38.2 per cent, respectively) and for EGW supply and construction (Panel C. 3: 25 per cent v. 7.1 per cent).

Panel D indicates that the highest percentage of foreign affiliates with both intra-firm imports and exports is in mining (41.2 per cent), low-tech manufacturing (30.1 per cent) and agriculture (24.5 per cent), while the lowest percentage is in services (1 per cent) and EGW supply and construction (3.6 per cent). The pattern in Panel D.1 (i.e. for firms whose parents are located in high-income countries) is very similar to that in Panel D. The percentage of affiliates with both intra-firm imports and exports is much higher in mining (62.5 per cent) and resource-based and low-tech manufacturing (24.4 per

cent and 36.1 per cent, respectively). However, the percentage of affiliates in services is zero. Panel D.2 (i.e. foreign affiliates with both intra-firm imports and exports whose parents are located in non-SSA low-/middle-income countries) shows a different pattern. The highest percentage of these types of affiliates belong to agriculture (33.3 per cent) and low-tech and medium-/high-tech manufacturing (32.1 per cent and 31.3 per cent, respectively), while the lowest is in services (3.3 per cent) and resource-based manufacturing (6.4 per cent). EGW supply and construction includes no firms of this type. Panel D.3 (i.e. foreign affiliates with both intra-firm imports and exports whose parents are based in SSA countries) reveals that there are no firms of this type in mining, medium-/high-tech manufacturing, EGW supply and construction and services. Also, their percentages in agriculture and resource-based and low-tech manufacturing are much lower than those in Panel D. Panel E displays the percentages for each sector of foreign affiliates that only have intra-firm imports. The highest percentages are found in services (98 per cent) and EGW supply and construction (92.9 per cent), in manufacturing (52.4 per cent), and in particular in low-tech and medium-/high-tech manufacturing (52.4 per cent and 61.8 per cent, respectively). The lowest ones are found in agriculture (26.5 per cent) and mining (47.1 per cent). Most of these percentages decline in all industries with the exception of services and EGW supply and construction when the parents of these affiliates are based in high-income countries. The percentage of firms whose parents are in non-SSA low-/middle-income countries (Panel E.2) and in SSA countries (Panel E.3) remain as high as in Panel E in services and EGW supply and construction. The percentage of the first firm type is higher in agriculture (33.3 per cent) and in mining (71.4 per cent). There are no differences in manufacturing. The percentage of the second firm type is much higher in agriculture (66.7 per cent) and in low-tech manufacturing (80 per cent).

As Panels F to F.3 are mirror images of Panels E to E.3, they indicate that the lowest percentage of foreign affiliates that have intra-firm exports only is in services (1 per cent) and EGW supply and construction (3.6 per cent), regardless of the parent company's origin. In most industries, the percentage of foreign affiliates whose parents originate from high-income countries is higher than in Panel F. The opposite is true for foreign affiliates whose parents originate from non-SSA low-/middle-income countries and SSA countries (Panels F.2 and F.3). The exceptions are firms in mining (14.3 per cent), resource-based manufacturing (36.2 per cent) and low-tech manufacturing (18.9 per cent) in Panel F.2, as well as firms in manufacturing (31 per cent), and particularly in resource-based manufacturing and medium-/high-tech manufacturing (37.5 per cent each) in Panel F.3.



**Table 4 Foreign affiliates with intra-firm trade by industry and parent location**

	Agriculture	Agriculture	Mining	Mining	Manufacturing	Manufacturing	Resource-based manufacturing	Resource-based manufacturing	Low-tech manufacturing	Low-tech manufacturing	Medium/high-tech manufacturing	Medium/high-tech manufacturing	EGW supply/construction	EGW supply/construction	Services	Services
<b>Panel A: With intra-firm trade</b>	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms
No	65	57	35	67.3	821	71.2	399	72.3	256	71.3	166	68.6	117	80.7	838	89.3
Yes	49	43	17	32.7	332	28.8	153	27.7	103	28.7	76	31.4	28	19.3	100	10.7
Total	114	100	52	100	1,153	100	552	100	359	100	242	100	145	100	938	100
<b>Panel A.1: With intra-firm trade (HI)</b>																
No	37	51.4	20	71.4	347	68.2	165	67.9	107	74.8	75	61	61	81.3	406	89.8
Yes	35	48.6	8	28.6	162	31.8	78	32.1	36	25.2	48	39	14	18.7	46	10.2
Total	72	100	28	100	509	100	243	100	143	100	123	100	75	100	452	100
<b>Panel A.2: With intra-firm trade (LMI)</b>																
No	13	68.4	14	66.7	334	74.2	163	77.6	107	66.9	64	80	39	79.6	253	89.4
Yes	6	31.6	7	33.3	116	25.8	47	22.4	53	33.1	16	20	10	20.4	30	10.6
Total	19	100	21	100	450	100	210	100	160	100	80	100	49	100	283	100
<b>Panel A.3: With intra-firm trade (SSA)</b>																
No	11	64.7	0	0	91	68.4	48	66.7	25	71.4	18	69.2	9	69.2	129	86.6
Yes	6	35.3	0	0	42	31.6	24	33.3	10	28.6	8	30.8	4	30.8	20	13.4
Total	17	100	0	0	133	100	72	100	35	100	26	100	13	100	149	100

<b>Panel B: With intra-firm imports</b>																
No	24	49	2	11.8	89	26.8	53	34.6	18	17.5	18	23.7	1	3.6	1	1
Yes	25	51	15	88.2	243	73.2	100	65.4	85	82.5	58	76.3	27	96.4	99	99
Total	49	100	17	100	332	100	153	100	103	100	76	100	28	100	100	100
<b>Panel B.1: With intra-firm imports (HI)</b>																
No	20	57.1	1	12.5	44	27.2	26	33.3	6	16.7	12	25	0	0	1	2.2
Yes	15	42.9	7	87.5	118	72.8	52	66.7	30	83.3	36	75	14	100	45	97.8
Total	35	100	8	100	162	100	78	100	36	100	48	100	14	100	46	100
<b>Panel B.2: With intra-firm imports (LMI)</b>																
No	2	33.3	1	14.3	29	25	17	36.2	10	18.9	2	12.5	0	0	0	0
Yes	4	66.7	6	85.7	87	75	30	63.8	43	81.1	14	87.5	10	100	30	100
Total	6	100	7	100	116	100	47	100	53	100	16	100	10	100	30	100
<b>Panel B.3: With intra-firm imports (SSA)</b>																
No	1	16.7	0	0	13	31	9	37.5	1	10	3	37.5	1	25	0	0
Yes	5	83.3	0	0	29	69	15	62.5	9	90	5	62.5	3	75	20	100
Total	6	100	0	0	42	100	24	100	10	100	8	100	4	100	20	100
<b>Panel C: With intra-firm exports</b>																
No	13	26.5	8	47.1	174	52.4	73	47.7	54	52.4	47	61.8	26	92.9	98	98
Yes	36	73.5	9	52.9	158	47.6	80	52.3	49	47.6	29	38.2	2	7.1	2	2
Total	49	100	17	100	332	100	153	100	103	100	76	100	28	100	100	100
<b>Panel C.1: With intra-firm exports (HI)</b>																
No	6	17.1	2	25	80	49.4	33	42.3	17	47.2	30	62.5	13	92.9	45	97.8
Yes	29	82.9	6	75	82	50.6	45	57.7	19	52.8	18	37.5	1	7.1	1	2.2

Total	35	100	8	100	162	100	78	100	36	100	48	100	14	100	46	100
<b>Panel C.2: With intra-firm exports (LMI)</b>																
No	2	33.3	5	71.4	62	53.4	27	57.4	26	49.1	9	56.3	10	100	29	96.7
Yes	4	66.7	2	28.6	54	46.6	20	42.6	27	50.9	7	43.8	0	0	1	3.3
Total	6	100	7	100	116	100	47	100	53	100	16	100	10	100	30	100
<b>Panel C.3: With intra-firm exports (SSA)</b>																
No	4	66.7	0	0	25	59.5	12	50	8	80	5	62.5	3	75	20	100
Yes	2	33.3	0	0	17	40.5	12	50	2	20	3	37.5	1	25	0	0
Total	6	100	0	0	42	100	24	100	10	100	8	100	4	100	20	100
<b>Panel D: With both intra-firm imports and exports</b>																
	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms	# of firms	% of firms
No	37	75.5	10	58.8	263	79.2	126	82.4	72	69.9	65	85.5	27	96.4	99	99
Yes	12	24.5	7	41.2	69	20.8	27	17.6	31	30.1	11	14.5	1	3.6	1	1
Total	49	100	17	100	332	100	153	100	103	100	76	100	28	100	100	100
<b>Panel D.1: With both intra-firm imports and exports (HI)</b>																
No	26	74.3	3	37.5	124	76.5	59	75.6	23	63.9	42	87.5	13	92.9	46	100
Yes	9	25.7	5	62.5	38	23.5	19	24.4	13	36.1	6	12.5	1	7.1	0	0
Total	35	100	8	100	162	100	78	100	36	100	48	100	14	100	46	100
<b>Panel D.2: With both intra-firm imports and exports (LMI)</b>																
No	4	66.7	6	85.7	91	78.4	44	93.6	36	67.9	11	68.8	10	100	29	96.7
Yes	2	33.3	1	14.3	25	21.6	3	6.4	17	32.1	5	31.3	0	0	1	3.3

Total	6	100	7	100	116	100	47	100	53	100	16	100	10	100	30	100
<b>Panel D.3: With both intra-firm imports and exports (SSA)</b>																
No	5	83.3	0	0	38	90.5	21	87.5	9	90	8	100	4	100	20	100
Yes	1	16.7	0	0	4	9.5	3	12.5	1	10	0	0	0	0	0	0
Total	6	100	0	0	42	100	24	100	10	100	8	100	4	100	20	100
<b>Panel E: With intra-firm imports only</b>																
No	36	73.5	9	52.9	158	47.6	80	52.3	49	47.6	29	38.2	2	7.1	2	2
Yes	13	26.5	8	47.1	174	52.4	73	47.7	54	52.4	47	61.8	26	92.9	98	98
Total	49	100	17	100	332	100	153	100	103	100	76	100	28	100	100	100
<b>Panel E.1: With intra-firm imports only (HI)</b>																
No	29	82.9	6	75	82	50.6	45	57.7	19	52.8	18	37.5	1	7.1	1	2.2
Yes	6	17.1	2	25	80	49.4	33	42.3	17	47.2	30	62.5	13	92.9	45	97.8
Total	35	100	8	100	162	100	78	100	36	100	48	100	14	100	46	100
<b>Panel E.2: With intra-firm imports only (LMI)</b>																
No	4	66.7	2	28.6	54	46.6	20	42.6	27	50.9	7	43.8	0	0	1	3.3
Yes	2	33.3	5	71.4	62	53.4	27	57.4	26	49.1	9	56.3	10	100	29	96.7
Total	6	100	7	100	116	100	47	100	53	100	16	100	10	100	30	100
<b>Panel E.3: With intra-firm imports only (SSA)</b>																
No	2	33.3	0	0	1	40.5	12	50	2	20	3	37.5	1	25	0	0
Yes	4	66.7	0	0	25	59.5	12	50	8	80	5	62.5	3	75	20	100
Total	6	100	0	0	42	100	24	100	10	100	8	100	4	100	20	100
<b>Panel F: With intra-firm exports only</b>																
No	25	51	15	88.2	243	73.2	100	65.4	85	82.5	58	76.3	27	96.4	99	99

Yes	24	49	2	11.8	89	26.8	53	34.6	18	17.5	18	23.7	1	3.6	1	1
Total	49	100	17	100	332	100	153	100	103	100	76	100	28	100	10	100
<b>Panel F.1: With intra-firm exports only (HI)</b>																
No	15	42.9	7	87.5	118	72.8	52	66.7	30	83.3	36	75	14	100	45	97.8
Yes	20	57.1	1	12.5	44	27.2	26	33.3	6	16.7	12	25	0	0	1	2.2
Total	35	100	8	100	162	100	78	100	36	100	48	100	14	100	46	100
<b>Panel F.2: With intra-firm exports only</b>																
No	4	66.	6	85.	87	75	3	63.8	43	81.	1	87	10	1	3	10
Yes	2	33.	1	14.	2	25	1	36	10	18.	2	12.5	0	0	0	0
Total	6	10	7	100	11	10	4	10	53	10	1	10	10	1	30	10
<b>Panel F.3: With intra-firm exports only (SSA)</b>																
No	5	83.3	0	0	29	69	15	62.5	9	90	5	62.5	3	75	20	100
Yes	1	16.7	0	0	13	31	9	37.5	1	10	3	37.5	1	25	0	0
Total	6	100	0	0	42	100	24	100	10	100	8	100	4	100	20	100

*Notes:* Authors' calculations. Firms with intra-firm trade are those with either intra-firm imports or intra-firm exports or both. Resource-based manufacturing industry codes: 15, 16, 20, 21, 23, 25, 26, 27. Low-tech manufacturing industry codes: 17, 18, 19, 22, 28, 36. Medium-/high-tech manufacturing industry codes: 24, 29, 30, 31, 32, 33, 34, 35, 37, 38. EGW supply: Electricity, gas and water supply (ISIC: 40). SSA: Foreign investors' country of origin is sub-Saharan Africa. Foreign investors' country of origin is classified as high-income (HI) and non-SSA low-/middle-income (LMI) based on the World Bank's historical country classification for the year 2010.

*Source:* UNIDO Africa Investor Survey 2010

Given that foreign affiliates trade mostly at arm's length, we produce the same tables for those with intra-firm and/or arm's length trade, for those that only trade at arm's length, as well as for those that only trade intra-firm. The tables are provided in the Online Appendix and, similar to Table 4, indicate that there is salient heterogeneity by industry and by industry and parent location. In contrast to foreign affiliates with intra-firm trade, those that trade at arm's length are in the majority for nearly all combinations of industries and parent locations.

## **2.2 Selection into intra-firm trade**

Helpman et al. (2004) and Bernard et al. (2007) find that U.S. exporters had a productivity advantage over U.S. non-exporters in 1996 and 1997, respectively. The second study also reports productivity and employment premiums for importers over non-importers, as well as for importers-exporters over those without imports and exports. Employment, sales and productivity premiums of importers over non-importers are also found in Antràs et al. (2014).<sup>17</sup>

In Table 5, we follow suit and quantify the productivity and size advantage of foreign affiliates with intra-firm trade over those without. To this purpose, we regress the log of each proxy for firm productivity and size on a dummy for intra-firm trade in Panel A (i.e. foreign affiliates with either intra-firm imports, exports or both are assigned the value 1) and additional controls such as skill intensity, capital intensity, input intensity, total employment, host-country, parent location and industry dummies.<sup>18</sup> The proxies for firm productivity are the following: ratio of total sales to total employment (column 1), ratio of value added to total employment (column 3) and total factor productivity (column 5). The proxies for firm size are total employment (column 2) and total sales (column 4). We find that the productivity premiums are between 25.4 per cent (column 1) and 30.7 per cent (column 5), while the size premiums are between 31.5 per cent (column 2) and 56.3 per cent (column 4).

In Panel B we regress the same dependent variables on dummies for intra-firm imports only (i.e. firms that have intra-firm imports only are assigned a value of 1), intra-firm exports only (i.e. firms that have intra-firm exports only are assigned a value of 1), for both intra-firm imports and exports (i.e. firms that have both intra-firm imports and exports are assigned a value of 1), and the same

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<sup>17</sup> Given that importing activities may result in an increase in firm productivity (Amiti and Konings, 2007), it is also shown that these premiums existed before these firms began importing. Since we do not have data for any year prior to 2010, we are not able to test this for either imports or exports.

<sup>18</sup> Firm size regressions omit the log of total employment as a covariate.

control variables as in Panel A. Column 1 shows that foreign affiliates with only intra-firm imports, with only intra-firm exports and with both intra-firm imports and exports have a productivity advantage of 21.5 per cent, 24.1 per cent and 41 per cent, respectively, over those without intra-firm trade. The same sorting pattern emerges when we use the other two proxies for firm productivity in columns 3 and 5. As regards size premiums, these are 19.8 per cent for foreign affiliates with intra-firm imports only, 42.3 per cent for foreign affiliates with intra-firm exports only and 56.4 per cent for foreign affiliates with both intra-firm imports and exports (column 2). We obtain the same sorting pattern with even larger premiums with the alternative proxy for firm size in column 4.

**Table 5 Productivity and size premiums of foreign affiliates with intra-firm trade**

<b>Panel A: Foreign affiliates with intra-firm trade</b>					
	(1)	(2)	(3)	(4)	(5)
	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>
<i>Dif t</i>	0.254*** [0.066]	0.315*** [0.066]	0.255* [0.10]	0.563*** [0.090]	0.307*** [0.067]
<i>Obs</i>	1815	1831	1348	1815	1812
<b>Panel B: Foreign affiliates with different intra-firm flows</b>					
	(1)	(2)	(3)	(4)	(5)
	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>
<i>Dif imonly</i>	0.215*** [0.081]	0.198** [0.083]	0.0802 [0.13]	0.406*** [0.11]	0.272*** [0.083]
<i>Dif exonly</i>	0.241** [0.097]	0.423*** [0.11]	0.418*** [0.14]	0.659*** [0.14]	0.285*** [0.10]
<i>Dif imex</i>	0.410*** [0.15]	0.564*** [0.14]	0.470** [0.21]	0.966*** [0.20]	0.461*** [0.15]
<i>Obs</i>	1815	1831	1348	1815	1812

*Notes:* OLS estimations with control variables in both panels and all columns: skill intensity, capital intensity, input intensity, total employment, host country, parent location and industry dummies. Firm size regressions omit the log of total employment as a covariate. Standard errors are clustered at the firm level. Productivity (column 1): log of the ratio of total sales to total employment. Size (column 2): total employment. Productivity (column 3): log of the ratio of value added to total employment. Size (column 4): log of total sales. Productivity (column 5): log of total factor productivity. Panel A: *Dif t*: firm has intra-firm imports or exports, or both (dummy). Panel B: *Dif imonly*: firm has intra-firm imports only (dummy), *Dif exonly*: firm has intra-firm exports only (dummy), *Dif imex*: firm has both intra-firm imports and exports (dummy). Dummies take value 1 if the statement holds, and 0 otherwise. All variables are in logs except for dummies.

In Table 6, we run the same regressions as in Table 5 after controlling for firms with only arm's length trade. We do this by adding a dummy with a value of 1 if the firm has either imports or

exports or both, but only at arm's length (Darmt). We observe the same sorting pattern and even greater size and productivity premiums.

**Table 6 Productivity and size premiums of foreign affiliates with intra-firm trade over those with no trade**

<b>Panel A: Foreign affiliates with intra-firm trade</b>					
	(1)	(2)	(3)	(4)	(5)
	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>
<i>Dif t</i>	0.292*** [0.094]	0.606*** [0.093]	0.334** [0.14]	0.888*** [0.13]	0.376*** [0.096]
<i>Darmt</i>	0.0450 [0.083]	0.348*** [0.079]	0.0958 [0.11]	0.390*** [0.12]	0.0820 [0.084]
<i>Obs</i>	1815	1831	1348	1815	1812
<b>Panel B: Foreign affiliates with different intra-firm flows</b>					
	(1)	(2)	(3)	(4)	(5)
	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>	<b>Size</b>	<b>Productivity</b>
<i>Dif imonly</i>	0.255** [0.10]	0.489*** [0.11]	0.164 [0.16]	0.732*** [0.15]	0.342*** [0.11]
<i>Dif exonly</i>	0.282** [0.12]	0.719*** [0.13]	0.504*** [0.17]	0.992*** [0.17]	0.358*** [0.13]
<i>Dif imex</i>	0.453*** [0.17]	0.869*** [0.15]	0.559** [0.24]	1.308*** [0.23]	0.536*** [0.17]
<i>Darmt</i>	0.0479 [0.083]	0.353*** [0.079]	0.1031 [0.11]	0.397*** [0.12]	0.0848 [0.084]
<i>Obs</i>	1815	1831	1348	1815	1812

*Notes:* OLS estimations with control variables in both panels and all columns: skill intensity, capital intensity, input intensity, total employment, host-country, parent location and industry dummies. Firm size regressions omit the log of total employment as a covariate. Standard errors are clustered at the firm level. Productivity (column 1): log of the ratio of total sales to total employment. Size (column 2): total employment. Productivity (column 3): log of the ratio of value added to total employment. Size (column 4): log of total sales. Productivity (column 5): log of total factor productivity. Panel A: *Dif t*: firm has intra-firm imports or exports, or both (dummy). Panel B *Dif imonly*: firm has intra-firm imports only (dummy). *Dif exonly*: firm has intra-firm exports only (dummy), *Dif imex*: firm has both intra-firm imports and exports (dummy). Panel A and B: *Darmt*: firm with arm's length trade only (i.e. either arm's length imports or exports or both but with no intra-firm trade). Dummies take a value of 1 if the statement holds, and 0 otherwise. All variables are in logs except for dummies.



We check the robustness of these results with the following tests. Firstly, we confine our analysis to firms in manufacturing. The sorting pattern still exists. When we do not control for firms with arm's length trade, the premiums are slightly smaller. When we control for these, they become greater. Secondly, these premiums may have been driven by the fact that foreign affiliates with only arm's length trade have very similar sizes and productivity levels with locally-owned firms that engage in international trade. To this purpose, we compute the size and productivity premiums of these two firm types and find that foreign affiliates with only arm's length trade are different from domestic firms that are engaged in trade. More precisely, they are larger and more productive by 11.9 per cent and 25.7 per cent, respectively. We relegate all tables with robustness checks to the Online Appendix.

According to the results we report in the Online Appendix, foreign affiliates with intra-firm trade seem to have an advantage in terms of input intensity and average wage. This is not the case for skill and capital intensity. Nonetheless, for all four variables we fail to find any clear sorting pattern like the one we find for firm productivity and size. We draw the same conclusions from the estimation of premiums for the restricted sample of manufacturing firms. When controlling of the dummy for firms with only arm's length trade, we find weak evidence for capital intensity premiums and a clear sorting pattern for input intensity. That is, affiliates with both intra-firm imports and exports have the highest input intensity premiums, those with intra-firm imports the second highest, while those with intra-firm exports have the lowest input intensity premiums. The results hold for the whole as well as for the restricted samples.

In sum, foreign affiliates with both intra-firm imports and exports have the highest productivity and employment premiums, those with only intra-firm exports the second highest, while those with only intra-firm imports have the lowest productivity and employment premiums. Interestingly, this sorting pattern is identical to that in Bernard et al. (2007), whose sample, however, includes all importers and exporters (i.e. those that import and export from and to affiliated and non-affiliated parties). In the Online Appendix, we show that foreign affiliates with intra-firm and/or arm's length trade have size but not productivity premiums and that the aforementioned sorting pattern is only found for size and not for productivity. In addition, we find that those foreign affiliates that only trade at arm's length are less productive. We arrive at very similar results when we restrict the sample to manufacturing firms.

From the analysis above, we deduce that intra-firm trade seems to be the main determinant for the size and productivity level of the foreign affiliate, and not their overall or arm's length trade activities. We develop a theoretical framework to describe the sorting pattern in terms of productivity and size. To save space, we only present its main features and relegate a detailed description to the Online Appendix.

In this framework, there are only two countries: the host country in which the foreign affiliate is located (Host) and the home country in which the parent company is located (Home). We consider two activities beyond the headquarter services, which always lie within the parent company. Intermediate-stage activities (I) relate to the production of intermediate materials and/or service inputs, while final-stage activities (F) refer to the production of the final good or service. A final good or service can only be produced through a combination of the two types of activities (Grossman et al., 2006). We also assume that the parent and foreign affiliate have separate variable cost, revenue and profit functions. Labour is the only factor applied. The shipment of intermediate inputs and final output involves melting iceberg trade costs which are symmetric for imports and exports.

The decision to engage in intra-firm trade is primarily driven by fixed costs which can be incurred on the basis of level of productivity of the firm (Melitz, 2003) and secondly by variable costs (i.e. wages and trade costs). Regardless of the location of final stage activities, the home market is always served through the parent company, while the host market is always served through the foreign affiliate. Once it enters a host country and observes its productivity draw, the foreign affiliate has four options. If it decides to produce without engaging in intra-firm trade, it has to bear the fixed costs in each period of producing for the host market,  $fD$ . If the foreign affiliate sells in the domestic market while engaging in intra-firm imports, it has to bear an additional fixed cost  $fM$  ( $fM > fD$ ). In case it serves the host market as well as the home market through intra-firm exports, the foreign affiliate has to bear an additional fixed cost  $fX$  ( $fX > fM$ ). Finally, if it decides to serve both markets while also engaging in intra-firm imports, it has to bear the fixed costs of intra-firm importing and exporting,  $fM + fX$  ( $fM + fX > fX > fM$ ).

### **3 Econometric model**

Since the main focus of this paper is on the potential differences between foreign affiliates with and without intra-firm trade in terms of their main characteristics and activities, we build our

econometric model accordingly. That is, we estimate a probit model that shows which firm characteristics and activities are more likely to be relevant for one of the two firm types.

The benchmark probit model incorporates variables which capture the main firm characteristics. Hence, for firm  $j$  in (host) country  $c$  and industry  $k$ , whose parent company is located in country  $p$ , the estimating benchmark model is as follows:

$$\begin{aligned}
 Dif_{t,jckp} = & \alpha + \beta_1 * skillInt_{jckp} + \beta_2 * capInt_{jckp} + \beta_3 * numEmp_{jckp} + \beta_4 * wageEmp_{jckp} + \\
 & \beta_5 * labProd_{jckp} + \beta_6 * inpInt_{jckp} \\
 & + \beta_7 * D_{trainingjckp} + \beta_c * D_c + \beta_k * D_k + \beta_p * D_p + E_{jckp}
 \end{aligned} \tag{1}$$

where the dependent variable,  $Dif_{t,jckp}$ , is a dummy with a value of 1 if firm  $j$  has any type of intra-firm trade flows (i.e. either intra-firm imports, intra-firm exports, or both), and 0 otherwise;  $skillInt$  is the log of skill intensity (i.e. the share of technical, supervisory and managerial employees in the total number of employees),  $capInt$  is the log of capital intensity (i.e. the ratio of capital stock to the total number of employees),  $numEmp$  is the log of total number of employees as a proxy for firm size,  $wageEmp$  is the log of wage per employee (i.e. the total wage bill over the total number of employees),  $labProd$  is the log of labour productivity (i.e. the ratio of total sales to the total number of employees),  $inpInt$  is the log of input intensity (i.e. the ratio of the value of inputs to the total number of employees),  $D_{training}$  is a dummy which takes a value of 1 if firm  $j$  provides formal internal/external training to its employees (and 0 otherwise),  $D_c$  is a set of host country dummies,  $D_k$  is a set of industry dummies, and  $D_p$  is a set of parent location dummies (i.e. country of origin of the parent company).

The host country dummies control for any unobserved heterogeneity across the countries that receive foreign investment (e.g. cross-country differences in institutional quality and business environment). By adding industry dummies, we control for any unobserved heterogeneity across industries (e.g. technology and knowledge intensity of industries). The parent location dummies account for any unobserved heterogeneity across the countries of origin of investors (e.g. cross-country differences in corporate culture).

The interpretation of the coefficient estimates is as follows. A positive and statistically significant coefficient estimate indicates that foreign affiliates with intra-firm trade are more likely to acquire the respective characteristic as compared to those without intra-firm trade. Likewise, a negative

coefficient estimate implies that the probability of those with intra-firm trade with the respective characteristic is lower.

We augment the benchmark model with variables that capture additional firm characteristics and activities. To determine which characteristics and activities we should focus on, we rely on different strands of literature such as that on firm boundaries and the transfer of intangible assets (Atalay et al., 2014), level of dependence on the parent and knowledge-based hierarchies (Antràs et al., 2006a), mode of investment (i.e. greenfield FDI v. cross-border M&As) (Nocke and Yeaple, 2007), incentives of FDI (Hanson, 2001), firm productivity and import/export activities (Bernard et al., 2007), as well as on multi-product firms (Bernard et al., 2012).

According to Atalay et al. (2014) and Ramondo et al. (2011), the boundaries of the firm are crucial for facilitating the transfer of intangible assets and not necessarily of goods and services. As a complement to this argument, we test any potential differences between foreign affiliates with and without intra-firm trade as regards their stock of intangible assets. In other words, we try to identify whether intra-firm trade has any effect on the stock of intangibles and if so, whether this effect is positive or negative. For this reason, we separately add the log ratios of the stock of intangible assets to total number of employees (*intangAssetsEmp*) and to total sales (*intangAssetsSales*) to the benchmark model.

Other variables that capture the transfer of intangible assets (e.g. organizational and managerial capabilities) and at the same time, the level of dependence of foreign affiliates on their parent, are the following. The first variable is the log of the foreign ownership share at the time of the initial foreign investment (*InitFOwnShare*). The second is the log of a measure of the overall autonomy level of the firm (*autonomyOverall*). It is computed as the average level of decision making power over 9 specific activities if it operates in non-services industries and over 10 activities if it operates in services industries.<sup>19</sup> The third is the log of a measure of the overall assistance provided by the

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<sup>19</sup> The level of autonomy in decision making over all activities ranges between 1 (lowest level of autonomy) and 5 (highest level of autonomy). A value of 1 implies that all decisions relating to the local unit are made at headquarters, a value of 2 that the foreign affiliate plays a minor role in decision making, a value of 3 means that the foreign affiliate and its parent have equal power in decision making, a value of 4 that the foreign affiliate dominates in decision making, and a value of 5 that the foreign affiliate has absolute decision making power. The 8 activities common to all firms—regardless of the industry they belong to—over which decisions are made are the following: 1) introduction/modification of products and services, 2) generating new business in the host country, 3) capital expenditure, including acquisitions, 4) pricing policy, 5) entering new export markets, 6) supplier selection, 7) definition of marketing strategy, 8) recruitment/selection. For firms in non-services industries, the additional activity is: introduction of new production and processing systems. For

parent company (*assParOverall*). Similar to the measure of the autonomy level, it is computed as the average level of assistance provided by the parent in six different areas.<sup>20</sup> The fourth variable is a dummy with a value of 1 if capital goods are directly imported by the firm (*DacqCapImp*), the fifth variable is a dummy with a value of 1 if capital goods are acquired through local distributors (*DacqCapLoc*), while the sixth is a dummy with a value of 1 if capital goods are imported through the parent company (*DacqCapPar*). Two additional proxies for the level of dependence on the parent company are: a dummy with a value of 1 if the foreign affiliate pays fees to the parent under a management contract (*DmanagementFees*), and a dummy with a value of 1 if the foreign affiliate pays fees to the parent under a licence agreement (*DlicenceFees*).

The parent company as a source of finance of working capital can act as an extra proxy for the level of the foreign affiliate's dependence on its parent. There are 7 additional sources. In total, we construct 8 dummies, one dummy per source of finance of working capital. The sources of finance are: 1) internal funds/retained trainings (*DsourWCIntFund*), 2) borrowing from banks in the host country (*DsourWCBorBankIns*), 3) borrowing from banks outside the host country (*DsourWCBorBankOuts*), 4) borrowing from family/friends/individual lenders (*DsourWCBorFam*), 5) borrowing from non-bank financial institutions (e.g. equity funds) (*DsourWCBotNonBank*), 6) purchases on credit from suppliers and advances from customers (*DsourWCPurchCredit*), 7) issued new equity shares or new debt (including commercial paper and debentures) (*DsourWCIssNewEq*), 8) the parent company (*DsourWCParent*). Each dummy takes a value of 1 if the firm makes use of the corresponding source of finance of working capital, and 0 otherwise.

In an attempt to further zoom in on the decision making process within MNCs, we resort to the knowledge-based hierarchy literature. According to Garicano (2000), a firm produces effectively if it implements a business model with an optimal knowledge hierarchy. A knowledge-based hierarchy implies the formation of layers of workers. Specifically, workers specialized in production resolve routine problems (bottom layer) and each time they cannot, they ask for help from managerial workers who are in charge of supervision and have superior knowledge (middle

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firms in the services sector, the additional 2 activities are: retail/wholesale format (e.g. shop design) and introduction of new IT systems (e.g. inventory system).

<sup>20</sup> The importance of assistance from the parent ranges between 0 and 5. A value of 0 indicates that the affiliate received no assistance from the parent, a value of 1 that the assistance received was not important, a value of 2 that it was slightly important, a value of 3 means that the assistance received was important, a value of 4 that it was very important, and a value of 5 that it was crucial. The areas in which the foreign affiliate may be assisted by its parent are the following: 1)

layer). Likewise, each time managerial workers do not know how to resolve a problem, they communicate it to those at the top of the hierarchy (top layer). Accordingly, within an MNC, the role of middle managers in foreign affiliates is crucial since they can act as a shield for top managers in the parent company who will not have to spend time on dealing with routine problems production workers in the foreign affiliate face (Antràs et al., 2006a). However, the relative importance of the role of middle managers in foreign affiliates with and without intra-firm trade remains unexplored.

Following Antràs et al. (2006a) and Caliendo et al. (2014), the data allow us to construct two layers of workers within the foreign affiliate. The bottom layer (layer 1) consists of two sub-layers (layers 1a and 1b). Sub-layer 1a comprises production and manual workers and sub-layer 1b clerical and sales workers. The dummies  $D_{layer1a}$  and  $D_{layer1b}$  take a value of 1 if the firm has a sub-layer 1a and sub-layer 1b, respectively. The layer above (layer 2) comprises technical, supervisory and managerial workers.  $D_{layer2}$  is equal to 1 if the firm has a layer 2. In addition,  $D_{layer1aOR1b}$  takes a value of 1 if the firm has either a sub-layer 1a or sub-layer 1b, while  $D_{layer1aAND1b}$  is equal to 1 if the firm has both of these sub-layers. We also construct a dummy which is equal to 1 if the firm has both layers 1 and 2 ( $D_{layers12}$ ).

In order to study any differences between the two firm types in terms of the mode in which the initial investment took place, we successively incorporate the following variables in the benchmark model: a dummy with a value of 1 if the firm was created as a wholly-owned enterprise through greenfield investment ( $D_{GreenfieldWO}$ ), a dummy with a value of 1 if the firm was created as a joint venture through greenfield FDI ( $D_{GreenfieldJV}$ ), a dummy with a value of 1 if the firm was created through the purchase of pre-existing assets from local private owners ( $D_{AcqTakeovLocPr}$ ), a dummy with a value of 1 if the firm was created through the purchase of pre-existing assets from foreign private owners ( $D_{AcqTakeovForPr}$ ) and a dummy with a value of 1 if the firm was created through the purchase of pre-existing state-owned assets ( $D_{AcqTakeovState}$ ).

The economic intuition is as follows. According to the resource-based view of the firm, there is an interplay between a firm's endowments of complementary capabilities or intangible assets (Nocke and Yeaple, 2007; Antràs and Yeaple, 2013). Due to the fact that some capabilities may be

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use of patents, trademarks and brand names, 2) technology and know-how transfer, 3) upgrading quality of staff, 4) access to finance, 5) access to foreign supplier network, 6) global market access.

imperfectly mobile (e.g. marketing, distribution, country-specific institutional competency), cross-border M&As allow the acquiring firm to complement its intangible technological advantages with a local firm's country-specific capabilities. By contrast, firms that engage in greenfield FDI tend to only utilize their own capabilities in the host country. We therefore want to test whether intra-firm trade is positively linked to the utilization of own capabilities and consequently, to greenfield FDI. The mode of investment can be associated with incentives and motives of FDI. For instance, Hanson (2001) shows that tax exemption is the most common policy implemented by governments that want to incentivize foreign companies to build new production facilities in their countries (i.e. greenfield FDI), followed by capital grants and investment in infrastructure. In addition, if a foreign affiliate aims to obtaining host country-specific resources and inputs or initiates collaboration with a specific company in the host country, it may engage in a joint venture (JV) investment or in the acquisition of an existing firm (i.e. cross-border M&A).

To this purpose, we add five dummies for FDI incentives to the benchmark model. The first dummy is equal to 1 if the most crucial investment incentive came in the form of capital grants (*DIncCapGrants*), the second is equal to 1 if it came in the form of tax exemption (*DIncTaxExempt*), the third is equal to 1 if it came in the form of grants for hiring (*DIncHireGrants*), the fourth is equal to 1 if it came in the form of provision of training for employees (*DIncEmpTrain*) and the fifth is equal to 1 if it came in the form of improvements in infrastructure (*DIncInfrastr*). We also add three dummies for FDI motives. The first dummy takes a value of 1 if the principal motive is to lower production costs (*DMotLowProdCost*), the second takes a value of 1 if the principal motive is to access natural resources and inputs (*DMotAccRes*), while the third takes a value of 1 if the principal motive is to join a specific partner (*DMotJoinPart*).

An important aspect of foreign affiliates' activities is related to their local and international procurement. We add numerous proxies for such kind of activities. We construct a dummy which takes a value of 1 if the firm has backward linkages (i.e. when it receives inputs from supplier(s)) (*DbackLink*), another dummy with a value of 1 if the firm only has domestic backward linkages (i.e. when it receives inputs from domestic supplier(s) only) (*DdomBackLink*), and a third one with a value of 1 if the firm only has international backward linkages (i.e. when it receives inputs from supplier(s) outside the host country only) (*DintBackLink*). Moreover, we create dummies that capture modes of sourcing inputs other than through the parent company. The first dummy takes a value of 1 if the firm imports production inputs (*DimpDirect*), the second dummy takes a value of 1 if the firm sources production inputs through a local importer (i.e. indirect importing) (*DimpLocal*),

and the third dummy takes a value of 1 if the firm sources production inputs which are manufactured locally (*DprodLocal*).

The age of the foreign affiliate (i.e. the number of years since its establishment) could also proxy for local and international procurement. The intuition is that the older an affiliate, the more likely it is to develop backward linkages within or outside the host country and thus, to partly or fully substitute procurement from non-affiliated parties for part of its procurement from the parent and/or sister affiliate(s), if any. We construct one dummy which takes a value of 1 if the firm was set up no more than 5 years ago (*DfAgeLEQ5*), and a second one which takes a value of 1 if the firm was set up more than 5 years ago (*DfAgeGT5*).

The next four dummies capture the availability of suppliers of raw materials, components or finished goods with or without a long-term arrangement within the host country or abroad. The first of the four takes a value of 1 if the firm has domestic suppliers (*DdomSuppliers*), the second takes a value of 1 if it has suppliers abroad (*DoverseasSuppliers*), the third if it has domestic suppliers with a long-term arrangement (*DdomLTsuppliers*) and the fourth if it has suppliers with a long-term arrangement abroad (*DoverseasLTsuppliers*). A fifth dummy is equal to 1 if the firm runs a special department for local sourcing (*DdptLS*) and a sixth is equal to 1 if the firm has a special department for local supplier development (*DdptLSD*).

We also add two more groups of dummies to the benchmark model. The first group comprises nine dummies for factors that promote local procurement, while the second group includes nine dummies for factors that deter local procurement. The nine factors promoting local procurement and their corresponding dummies are: 1) local content is mandated or strongly encouraged by the ultimate customer (*DlocProcCustPref*), 2) improved local market acceptability or local customization of the product (*DlocProcProdCust*), 3) easier logistics or reduced inventory (*DlocProcLogistics*), 4) access to local raw materials (*DlocProcRawMat*), 5) closer supplier relationship (*DlocProcSuppRel*), 6) environmental responsibility (*DlocProcEnvResp*), 7) corporate commitment to local supplier development in the region (*DlocProcCorpCom*), 8) fiscal or tax efficient supply chains (*DlocProcSuppChain*), and 9) reduced tariff costs (*DlocProcRedTar*). The nine factors deterring local procurement and their corresponding dummies are: 1) non-competitive local input prices (*DcancProcLocPr*), 2) unsatisfactory product and/or service quality (*DcancProcProdQual*), 3) concerns over retention of intellectual property (*DcancProcIntProp*), 4) local infrastructure issues (*DcancProcLocInfr*), 5) concerns over labour relations (*DcancProcLabRel*), 6) technical or



management skills issues (*DcancProcMgmSkill*), 7) concerns over age, quality of plant and equipment of suppliers (*DcancProcQualPlant*), 8) concerns over plant or process capacity (*DcancProcPlantCap*) and 9) environmental responsibility (*DcancProcEnvResp*). The dummy for each factor promoting or deterring local procurement takes a value of 1 if it is deemed by the firm as the most important factor, and 0 otherwise.

The data allow us to examine the geographical breakdown of direct imports. To this purpose, we create nine dummies, one dummy per destination. These are South Africa (*DimpSA*), sub-Saharan Africa (*DimpSSA*), the European Union (*DimpEU*), the U.S. (*DimpUS*), China (*DimpChina*), India (*DimpIndia*), Asia other than China and India (*DimpOA*), the Middle East and North Africa (*DimpMENA*) and the rest of the world (*DimpOther*).

To capture the proximity and number of countries and/or regions from which a foreign affiliate imports, we construct four dummy variables. The first takes a value of 1 if the firm imports from contiguous countries/regions such as sub-Saharan Africa (SSA), South Africa (SA) and the Middle East and North Africa (MENA) (*DimpContiguous*). The second takes a value of 1 if the firm imports from more distant countries/regions such as the European Union (EU), the U.S., China, India, Asia other than China and India (OA) and the rest of the world (Other) (*DimpDistant*). The third dummy takes a value of 1 if the firm imports from a single country/region (i.e. only from a country among SSA, SA, MENA, EU, U.S., China, India, OA, Other) (*DimpSingle*). The fourth dummy takes a value of 1 if the firm imports from more than one country or region (i.e. at least from two among SSA, SA, MENA, EU, U.S., China, India, OA, Other) (*DimpMultiple*).

Motivated by the highly influential group of studies on the strongly positive association of firm size and productivity with export performance (e.g. Bernard and Jensen, 1994; Bernard and Jensen, 1999; Bernard et al., 2005; Melitz, 2003; Bernard et al., 2007) and the more recent and much smaller one on intermediate productivity levels and indirect exporting (Ahn et al., 2011), we study differences between the two firm types in terms of their market orientation, export activities as well as their main source(s) of competition. We augment the benchmark model with two groups of dummy variables. In the first group, the first dummy equals 1 if the firm has sales in the domestic (i.e. host country) market (*DsalesDomMarket*), the second equals 1 if the firm has direct sales in an export market (*DsalesExpDirect*), and the third equals 1 if the firm has indirect sales (e.g. through intermediaries) in an export market (*DsalesExpIndirect*). In the second group, the first dummy equals 1 if competition for the main product of the firm comes mostly from imports

(*DsourCompImports*), the second equals 1 if competition comes mostly from locally-owned firms (*DsourCompLocOwnFirms*) and the third equals 1 if competition comes mostly from other foreign-owned firms based in the (host) country (*DsourCompForOwnFirms*).

Focusing exclusively on direct export activities, we construct several additional dummies. Like for imports, the first nine capture the geographical breakdown of direct exports. The 9 available destinations and corresponding dummies are South Africa (*DexpSA*), sub-Saharan Africa (*DexpSSA*), the European Union (*DexpEU*), the U.S. (*DexpUS*), China (*DexpChina*), India (*DexpIndia*), Asia other than China and India (*DexpOA*), the Middle East and North Africa (*DexpMENA*) and the rest of the world (*DexpOther*). Each dummy takes a value of 1 if the firm has export sales to the corresponding country/region. We also construct dummies for the proximity and number of export markets served by foreign affiliates. The first takes a value of 1 if the firm exports to contiguous countries/regions such as sub-Saharan Africa (SSA), South Africa (SA), Middle East and North Africa (MENA) (*DexpContiguous*). The second takes a value of 1 if the firm exports to more distant countries/regions such as the European Union (EU), the U.S., China, India, Asia other than China and India (OA) and the rest of the world (Other) (*DexpDistant*). The third dummy takes a value of 1 if the firm exports to a single country/region (i.e. to only one destination among SSA, SA, MENA, EU, U.S., China, India, OA, Other) (*DexpSingle*). The fourth dummy takes a value of 1 if the firm exports to more than one destination (i.e. to at least two destinations among SSA, SA, MENA, EU, U.S., China, India, OA, Other) (*DexpMultiple*).

Making use of data on direct export sales of firms for the last two financial years, we can capture firms' export status. Specifically, we construct a dummy with a value of 1 if the firm is not an exporter (i.e. no export sales in the last two financial years) (*DnoExporter*), a dummy with a value of 1 if the firm is an export starter (i.e. the firm only had direct export sales during the last financial year, but not for the last two years) (*DexpStarter*), a dummy with a value of 1 if the firm is an export exiter (i.e. the firm had direct export sales over two financial years, but not during the last financial year) (*DexpExiter*) and a dummy with a value of 1 if the firm is a continuing exporter (i.e. the firm had direct export sales over the past two financial years) (*DexpContinue*). The firm's importer-exporter status (i.e. a firm that simultaneously engaged in export and import activities over the last financial year) is captured by an additional dummy (*DimpExp*).

According to the literature on multi-product firms, larger exporters not only export more of a given product to a given destination than smaller exporters, but also export more products to more

destinations in general (Bernard et al., 2012). Larger exporters can also more easily cover increasing marginal costs as their products shift away from their core competencies (Eckel and Neary (2010)). The organizational capabilities of a firm may also determine its ability to produce more than one product or service (Nocke and Yeaple, 2006; Nocke and Yeaple, 2013; Eckel and Yeaple, 2014). Hence, we want to test which of the two firm types is more or less likely to be a single-product/service or a multi-product/service firm based on its size and organizational capabilities advantages.

The dataset provides information on firms' three main products or services which are not linked to trade flows and destinations. Despite this limitation, we use the available information to construct the following dummies. A dummy takes a value of 1 if the firm only sells one product or service (*DsingleProdServ*), a second dummy takes a value of 1 if the firm sells maximum two products or services (*DtwoProdServ*) and a third dummy takes a value of 1 if the firm sells three products or services (*DthreeProdServ*). Finally, we compute the share of the sales of the main product of the firm in total sales as a proxy for product concentration. The higher the share is, the higher the firm's product concentration. In turn, we create a dummy for high product concentration. That is, it takes a value of 1 if the index is equal to or greater than 50 per cent (*DhighProdServConc*).

Finally, in order to examine for which of the two types of affiliates the probability of having a more geographically dispersed network of sister affiliates is higher, we construct three additional dummies. The first dummy is equal to 1 if the parent company of the foreign affiliate examined owns at least one more affiliate in the same host country (*DotherSubInCountry*), the second is equal to 1 if it owns at least one in another sub-Saharan African country (*DotherSubInSSA*), while the third is equal to 1 if it owns at least one in any country outside sub-Saharan Africa (i.e. in the rest of the world) (*DotherSubOutSSA*). All dummy variables in this section are equal to 0 if the relevant statement is not valid.

#### **4 Empirical results**

The results from the probit estimation of equation 1 are presented in column 1 of Table 7. The coefficient estimates of firm size and labour productivity are positive and significant at the level of 1 per cent. The estimated coefficients of skill and capital intensity are negative but not statistically significant. The dummies for average wage, input intensity and for the provision of training to employees are all positive and insignificant.

In column 2, we use a broader definition of parent location. That is, we construct dummies for whether the parent is located in a high-income or non-SSA low-/middle- income or SSA country. The results are very similar to those in column 1. The main difference is that the coefficient estimate of the average wage becomes significant at the level of 5 per cent. In column 3, we use total sales as an alternative proxy for firm size and drop labour productivity in order to avoid collinearity. Its coefficient estimate is still positive and highly significant. In column 4, we run the same probit regression as in column 1, the only difference being that we substitute total factor productivity for labour productivity. By and large, the results are the same with those in column 1. The magnitude of the coefficient estimate of the main proxy for firm size is smaller and significant only at 5 per cent.

In column 5, we re-estimate the benchmark model by using a dummy as a dependent variable that takes a value of 1 if the foreign affiliate has intra-firm exports, and 0 otherwise (Difex). The results are very similar to those in column 1. Affiliates with intra-firm exports seem to be larger in size and more productive than those without intra-firm exports. This first finding is in line with Ramondo et al. (2011) who use the same dependent variable. According to the authors, one key difference between “horizontal” and “vertical” affiliates is their size. They find that only a small number of relatively large affiliates have intra-firm trade. In contrast, median affiliates, which are smaller in terms of size, have no sales to their parent but to unaffiliated parties in the host country.

The same authors use imports of foreign affiliates from their parent as the dependent variable. In the same vein, Hanson et al. (2001) study the flows of intermediate goods from the parent to the foreign affiliate by using affiliate size as a variable. In addition, as already discussed in Section 2, we find that the number of foreign affiliates with intra-firm trade and intra-firm imports is exceptionally high in many industries of the economy (mining, low-tech and medium-/high-tech manufacturing, EGW supply and construction, services). Hence, we estimate the benchmark model with a dummy as the dependent variable, which is equal to 1 if the foreign affiliate has intra-firm imports and 0 otherwise. The results remain unchanged and are shown in column 6.

Using the narrow definition of “vertical” FDI according to which the foreign affiliate has both intra-firm imports and exports, we re-estimate the benchmark model after replacing the dependent variable with a dummy which takes value 1 if the affiliate has both intra-firm flows, and 0 otherwise. The main results still hold and are shown in column 7.

**Table 7 Main characteristics**

	(1) <i>Dif t</i>	(2) <i>Dif t</i>	(3) <i>Dif t</i>	(4) <i>Dif t</i>	(5) <i>Dif ex</i>	(6) <i>Dif im</i>	(7) <i>Dif ime</i>	(8) <i>Dif t</i>	(9) <i>Dif t</i>
<i>skillInt</i>	-0.0153 [0.014]	-0.0122 [0.014]	-0.0198 [0.013]	-0.0169 [0.014]	-0.00840 [0.0086]	-0.00241 [0.012]	-0.00102 [0.0050]	-0.0110 [0.017]	-0.0108 [0.017]
<i>capInt</i>	-0.00580 [0.0077]	-0.00329 [0.0075]	-0.00667 [0.0076]	-0.00113 [0.0075]	-0.00179 [0.0050]	-0.00351 [0.0065]	-0.000100 [0.0029]	-0.0161 [0.011]	-0.0158 [0.011]
<i>numEmp</i>	0.0476*** [0.010]	0.0480*** [0.010]		0.0283** [0.012]	0.0352*** [0.0069]	0.0232*** [0.0087]	0.0146*** [0.0041]	0.0562*** [0.012]	0.0562*** [0.012]
<i>wageEmp</i>	0.0170 [0.012]	0.0217* [0.012]	0.0148 [0.011]	0.0147 [0.012]	0.000245 [0.0075]	0.0178* [0.0100]	0.00267 [0.0044]	0.00943 [0.015]	0.00932 [0.015]
<i>labProd</i>	0.0332*** [0.0099]	0.0310*** [0.0099]			0.0231*** [0.0071]	0.0216** [0.0087]	0.0109** [0.0048]	0.0311** [0.013]	0.0459*** [0.015]
<i>inpInt</i>	0.00442 [0.0080]	0.00463 [0.0078]	0.00132 [0.0075]	0.00278 [0.0079]	-0.00233 [0.0052]	0.00739 [0.0072]	0.00205 [0.0033]	0.00465 [0.010]	0.00471 [0.010]
<i>Dtraining (d)</i>	0.0219 [0.023]	0.0313 [0.022]	0.0241 [0.023]	0.0187 [0.023]	-0.0126 [0.014]	0.0355* [0.019]	-0.00395 [0.0088]	0.0265 [0.028]	0.0266 [0.028]
<i>totSales</i>			0.0403*** [0.0072]						
<i>tfp</i>				0.0394*** [0.010]					
<i>intangStockEmp</i>								0.0153* [0.0081]	
<i>intangStockSales</i>									0.0147* [0.0081]
Obs	1581	1639	1581	1580	1247	1555	940	1135	1135
<i>Pseudo - R<sup>2</sup></i>	0.20	0.14	0.20	0.21	0.28	0.17	0.30	0.22	0.22
<i>Log-likelihood</i>	-730.0	-805.1	-730.5	-728.1	-382.1	-644.2	-194.0	-517.9	-518.1

Notes: Probit estimations with host country, parent location and industry dummies in all columns. Standard errors are clustered at the firm level. In column (2), parent location dummies are replaced with dummies depending on whether the parent is located in a high-income country (HI), in a non-SSA low-/middle-income country (LMI) or in a sub-Saharan African country (SSA). In column (3), total employment is replaced with total sales while dropping labour productivity to avoid multicollinearity. In column (4), labour productivity is replaced with total factor productivity. *Dif t*: the firm has intra-firm imports, exports or both (dummy), *Dif ex*: the firm has intra-firm exports (dummy), *Dif im*: the firm has intra-firm imports (dummy), *Dif imex*: the firm has both intra-firm imports and exports (dummy), *skillInt*: skill intensity, *capInt*: capital intensity, *numEmp*: firm size (total number of employees), *numEmp*: firm size (total sales), *wageEmp*: wage per employee, *labProd*: labour productivity, *tfp*: total factor productivity, *inpInt*: input intensity, *Dtraining*: the firm provides formal internal/external training to its employees (dummy), *intangAssetsEmp*: total value of intangible assets over total employment, *intangAssetsSales*: total value of intangible assets over total sales. Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs except for dummies.

The most important results we have obtained from the data and regression analyses so far are that foreign affiliates with intra-firm trade are relatively few, of larger size and show a higher productivity level. As mentioned above, the first two findings correspond to those of Ramondo et al. (2011). The latter finding, based on Atalay et al. (2014), asserts that the concentration of intra-firm trade among a small number of relatively large foreign affiliates indicates that firms set up affiliates mostly to transfer intangible assets (e.g. organizational and managerial capabilities, etc.), rather than goods and services. To complement previous analysis, we enhance the benchmark model with the ratios of the stock of intangibles in total employment and total sales. Columns 8 and 9 display the results from the two regressions. The coefficient estimate of each of the two variables is only positive and significant at 10 per cent. The results imply that foreign affiliates with intra-firm trade tend to have higher stock of intangibles. Put differently, although firm boundaries generally facilitate the transfer of intangibles, intra-firm trade makes this transfer more intense.

For robustness checks, we estimate all nine equations of Table 7 after restricting the sample to the manufacturing sector—just as Ramondo et al. (2011) do—for the entire economy while only considering majority-owned foreign affiliates (MOFAs) (i.e., those owned at least 50 per cent by their parent), and for MOFAs in the manufacturing sector. We also compute intangible asset intensities by using the flow of intangible assets rather than the stock, and re-estimate the probit regressions in columns 8 and 9. By and large, the regressions pass all these tests unscathed. To save space, these are relegated to the Online Appendix.

In additional tables included in the Online Appendix, we estimate the benchmark model after replacing the average wage for all employees with the average wage by employee type. The wage of each employee type is separately entered in the regression. In total, we construct the average wage for production workers, manual workers, production and manual workers together, clerical and administrative employees, sales employees, clerical and administrative and sales employees together, production, manual, clerical and administrative and sales employees together, and for technical, supervisory and managerial employees. The results show that foreign affiliates with intra-firm trade tend to pay manual workers lower wages.

We conduct the same exercise for the dummy provision of training to employees. That is, we construct a dummy that captures internal training and another that captures external training. We also construct dummies for provision of training to different types of employees (i.e. production workers, manual workers, clerical and administrative employees, sales employees, technical,

supervisory and managerial employees). We find that foreign affiliates with intra-firm trade are more likely to provide training to production and technical, supervisory and managerial workers. Given that the aim of training is human capital development to narrow and eliminate the quality gap, if any, between workers in the parent company and their counterparts in the foreign affiliate, it can be viewed as a transfer of intangibles. Indeed, workers in the foreign affiliate are trained to develop existing skills, acquire new ones and become familiar with the business practices and technical methods of the parent company.

In robustness checks related to firm productivity and performance, we examine any differences in the most important reasons for under-utilization of production capacity under normal circumstances. We find that the probability of foreign affiliates with intra-firm trade to not under-utilize their production capacity under normal circumstances is higher. Motivated by the literature on credit constraints and export performance (e.g. Chor and Manova, 2012) and the vulnerability of SSA to financial crises, mostly due to the disruption of financing of trade channels (Berman and Martin, 2010), we also try to identify any differences in change in their performance after the financial crisis of 2007-2008. We use two different measures. The first is based on the firm's performance compared to overall expectations before the crisis and compared to revised expectations after the crisis. The second is the firm's average level of capacity utilization three years before the crisis and immediately after. There do not seem to be any statistically significant differences in terms of firm performance either before or after the global financial crisis.

In Table 8, we further examine the difference between the two firm types in terms of their intangible assets and, at the same time, the level of dependence on their parent. Foreign affiliates with intra-firm trade tend to have a lower level of autonomy in decision making<sup>21</sup> (column 2) and tend to receive assistance from their parent in several areas<sup>22</sup> (column 3). They are also more likely to pay management fees (column 7). The probability of acquiring capital goods from the parent is higher for the same type of firm (column 6), while the probability of acquiring these through foreign or local (unaffiliated) distributors (columns 4 and 5, respectively) is lower. We do not find

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<sup>21</sup> For robustness checks, in the Online Appendix we show the results from the estimations of the probit model augmented with the measure of the level of autonomy in decision making over each of the 11 activities described in Section 3. We find that foreign affiliates with intra-firm trade tend to have smaller decision making power over 10 out of 11 activities.

<sup>22</sup> For robustness checks, in the Online Appendix we show the results from the estimations of the probit model augmented with the measure of parent assistance in each of the 6 areas described in Section 3. We find that foreign affiliates with intra-firm trade are more likely to be assisted by their parent in 4 out of 6 areas. That is, in the use of patents, trademarks and brand names, in technology and know-how, and in accessing foreign supplier networks and global markets.



any statistically significant differences between the two firm types in terms of their initial share of foreign ownership (column 1) and fees to be paid to the parent under licence agreement (column 8).

**Table 8 Transfer of intangibles and level of dependence on the parent**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>InitFOwnShare</i>	0.0252 [0.028]							
<i>autonomyOverall</i>		-0.315*** [0.033]						
<i>assParOverall</i>			0.139*** [0.036]					
<i>DacqCapImp</i> (d)				-0.105*** [0.027]				
<i>DacqCapLoc</i> (d)					-0.108*** [0.027]			
<i>DacqCapPar</i> (d)						0.499*** [0.055]		
<i>DmanagementFees</i> (d)							0.0771* [0.046]	
<i>DlicenceFees</i> (d)								0.0407 [0.035]
<i>Obs</i>	1544	1558	1538	1581	1581	1581	1574	1574
<i>Pseudo – R2</i>	0.21	0.26	0.21	0.21	0.21	0.26	0.21	0.20
<i>Log-likelihood</i>	-707.1	-670.8	-708.3	-722.3	-725.0	-676.8	-726.7	-728.1

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *InitFOwnShare*: initial foreign ownership share, *autonomyOverall*: overall autonomy level of the firm, *assParOverall*: overall assistance provided by the parent, *DacqCapImp*: capital goods are imported directly by the firm (dummy), *DacqCapLoc*: capital goods are acquired through local distributors (dummy), *DacqCapPar*: capital goods are imported through the parent company (dummy), *DmanagementFees*: fees paid to the parent under management contract (dummy), *DlicenceFees*: fees paid to the parent under license agreement (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs except for dummies.

As regards the level of dependence on the parent, Table 9 reveals that affiliates with intra-firm trade are less likely to finance their working capital through internal funds and retained earnings (column 1) and through borrowing from banks in the host country (column 2). Instead, they are more likely to have the parent company function as a source of finance of working capital (column 8). Given that the coefficient estimates of the relevant dummies in the rest of the columns are not significant,

we do not observe any differences between the two types of affiliates regarding other sources of finance of working capital.<sup>23</sup>

**Table 9 Level of dependence on the parent (source of finance of working capital)**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>DsourWCIntFund</i> (d)	-0.154*** [0.035]							
<i>DsourWCBorBankIns</i> (d)		-0.0397* [0.023]						
<i>DsourWCBorBankOuts</i> (d)			-0.0275 [0.036]					
<i>DsourWCBorFam</i> (d)				-0.0180 [0.043]				
<i>DsourWCBotNonBank</i> (d)					-0.0709 [0.053]			
<i>DsourWCPurchCredit</i> (d)						-0.00711 [0.027]		
<i>DsourWCIssNewEq</i> (d)							0.0939 [0.093]	
<i>DsourWCParent</i> (d)								0.478*** [0.045]
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.27
<i>Log–likelihood</i>	-718.4	-728.6	-729.8	-729.9	-729.2	-730.0	-729.5	-668.3

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *DsourWCIntFund*: internal funds/retained trainings (dummy), *DsourWCBorBankIns*: borrow from banks in the host country (dummy), *DsourWCBorBankOuts*: borrow from banks outside the host country (dummy), *DsourWCBorFam*: borrow from family/friends/individual lenders (dummy), *DsourWCBotNonBank*: borrow from non-bank financial institutions (e.g. equity funds) (dummy), *DsourWCPurchCredit*: through purchases on credit from suppliers and advances from customers (dummy), *DsourWCIssNewEq*: through new equity shares or new debt (including commercial paper and debentures) (dummy), *DsourWCParent*: through the parent company (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

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<sup>23</sup> For robustness checks, we examine any differences regarding sources of finance of fixed assets. The available sources of finance are identical to those of working capital. We find that while foreign affiliates with intra-firm trade are less likely to finance their fixed assets through internal funds and retained earnings, as well as through non-bank financial institutions (e.g. equity funds), they are more likely to have the parent as a source of finance of fixed assets. In additional robustness checks, we show that foreign affiliates with intra-firm trade are more likely to have their parent as the main

In an attempt to shed more light on the decision-making process within the MNC, we adopt the knowledge-based hierarchy approach and add model dummies for different layers of workers to the benchmark. According to Table 10, foreign affiliates with intra-firm trade are less likely to have production and manual workers (sub-layer 1a) (column 1), workers in sub-layers 1a or/and 1b (columns 3 and 4), as well as workers in both layer 1 and layer 2 (column 6). The coefficient estimate of the dummy for a firm having layer 2 is positive, but insignificant (column 5).

The results in column 6 indicate that the probability of foreign affiliates without intra-firm trade having workers in both layers is higher. We give several possible explanations about this result, relying primarily on the knowledge-based hierarchy literature. As affiliates of this type tend to have their production process detached from that of their parent, they are more likely to have both layers of workers, so that managerial workers (layer 2) shield top managers in the parent company from having to deal with “routine” problems faced by workers in the foreign affiliate. In a similar fashion, the combination of relatively high coordination requirements between two entities with intra-firm trade and the scarcity of skills in sub-Saharan Africa urges middle and top managers of the parent company to be involved in the decision-making process within the foreign affiliate and, therefore, to have to deal with problems faced by its workers. Consequently, the role of middle managers in this type of firm is remarkably subdued.

<b>Table 10</b>	<b>Layers of workers</b>						
<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Dlayer1a</i> (d)	-0.168*** [0.058]						
<i>Dlayer1b</i> (d)		-0.105 [0.073]					
<i>Dlayer1aOR1b</i> (d)			-0.379** [0.18]				
<i>Dlayer1aAND1b</i> (d)				-0.134*** [0.047]			
<i>Dlayer2</i> (d)					-0.0570 [0.061]		
<i>Dlayers12</i> (d)						-0.379** [0.18]	
<i>Obs</i>	1581	1581	1581	1581	1663	1581	
<i>Pseudo – R2</i>	0.21	0.21	0.21	0.21	0.20	0.21	
<i>Log-likelihood</i>	-725.1	-728.9	-728.1	-725.3	-762.9	-728.1	

source of information for (new) investment opportunities. See the Online Appendix for the tables with the two groups of robustness checks.

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *Dlayer1a*: production or manual workers (dummy), *Dlayer1b*: clerical/administrative or sales workers (dummy), *Dlayer1aOR1b*: either sub-layer 1a or sub-layer 1b (dummy), *Dlayer1aAND1b*: both sub-layer 1a and sub-layer 1b (dummy), *Dlayer2*: technical, managerial and supervisory workers (dummy), *Dlayers12*: both layer 1 and layer 2 (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

In line with this finding, Marin et al. (2013) model knowledge-based hierarchies and find that parent firms transplant their organizational form<sup>24</sup> significantly more often into their foreign affiliates, when these are of a “horizontal” type and do not engage in intra-firm trade. This might also explain why the same firm types are more likely to provide training to middle managers, as shown above. Within a given time horizon, during which they will have acquired the necessary skills and experience, they will be able to act as a shield for top management in the parent company. Given that the data is cross-sectional—and for this to be tested empirically, the time dimension is of utmost importance—we leave it for future work.

Another possible explanation based on the theory of delegation of authority, is that since intra-firm trade involves more intense transfers of crucial information from the parent to the foreign affiliate (i.e. information about past and/or current implementation of technologies), middle managers in the foreign affiliate may use this informational advantage in a way that does not serve the interests of top managers in the parent company (Acemoglu et al., 2007). Hence, to prevent such a misalignment from occurring, the latter opt for centralized control.

In Table 11, we test whether there are any differences between the two firm types in terms of how the initial investment took place and the most critical incentive and motive for it.

The coefficient estimate of the dummy for the first mode of investment is positive and significant at 5 per cent (column 1). In the next four columns, the coefficient estimates of the dummies, which capture the remaining four modes of investment, are negative but insignificant at all conventional levels. The explanation we provide for the result in column 1 is predicated upon the resource-based view of the firm. According to this view, there is an interplay between a firm’s endowments of complementary capabilities or intangible assets (Nocke and Yeaple, 2007; Antràs and Yeaple, 2013). Cross-border M&As facilitate the acquisition of firms with country-specific—and thus immobile—capabilities which are complementary to those of the acquiring firm. Instead,

firms that engage in greenfield FDI tend to only utilize their own capabilities in the host country. As intra-firm trade implies the (almost exclusive) use of capabilities of parent firms in the host country, they are more likely to set up a wholly-owned affiliate in the host country by engaging in greenfield FDI.

Columns 7 and 8 show that parent companies that trade with their foreign affiliate are more likely to enjoy tax exemptions as the most critical incentive for foreign investment and less so to receive grants for hiring purposes. The result in column 7 could be linked to that in column 1. Numerous case studies on MNCs report that tax exemptions are the most common policy implemented by governments aiming to incentivize foreign companies to build new production facilities in their countries (Hanson, 2001). Since parents of foreign affiliates with which they trade are more likely to set up wholly-owned foreign affiliates, the probability of them benefiting mostly from tax exemptions is higher. The estimated coefficients of the dummies for other critical FDI incentives are statistically insignificant (columns 6, 9 and 10).

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<sup>24</sup> Full transplantation of the organizational form implies that all decisions over certain issues are taken at the same hierarchical level in the parent and in the foreign affiliate.

**Table 11 Mode of investment and most critical incentive and motive for investment**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<i>DGreenfieldW O</i> (d)	0.0470** [0.023]												
<i>DGreenfieldJ V</i> (d)		-0.0143 [0.031]											
<i>DAcqTakeovLocPr</i> (d)			-0.0425 [0.039]										
<i>DAcqTakeovForPr</i> (d)				-0.0533 [0.037]									
<i>DAcqTakeovState</i> (d)					-0.0543 [0.057]								
<i>DIncCapGrants</i> (d)						0.0684 [0.062]							
<i>DIncTaxExempt</i> (d)							0.0902* [0.031]						
<i>DIncHireGrants</i> (d)								-0.180*** [0.025]					
<i>DIncEmpTrain</i> (d)									-0.0611 [0.066]				
<i>DIncInfrastr</i> (d)										-0.0456 [0.047]			
<i>DMotLowProdCost</i> (d)											0.00396 [0.045]		
<i>DMotAccRes</i> (d)												0.0212 [0.047]	
<i>DMotJoinPart</i> (d)													-0.0967** [0.041]
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.20	0.21	0.21
<i>Log–likelihood</i>	-728.0	-729.9	-729.6	-729.3	-729.6	-729.4	-725.1	-729.0	-729.7	-729.7	-730.0	-729.9	-728.0

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *DGreenfieldW O*: creation of a new operation as wholly-owned enterprise (dummy), *DGreenfieldJ V*: creation of a new operation as joint venture (dummy), *DAcqTakeovLocPr*: purchase of pre-existing assets from local private owners (dummy), *DAcqTakeovForPr*: purchase of pre-existing assets from private foreign owners (dummy), *DAcqTakeovState*: purchase of pre-existing state-owned assets (dummy), *DIncCapGrants*: critical incentive: capital grants (dummy), *DIncTaxExempt*: critical incentive: tax exemption (dummy), *DIncHireGrants*: critical incentive: grants for hiring (dummy), *DIncEmpTrain*: critical incentive: training employees (dummy), *DIncInfrastr*: critical incentive: infrastructure (dummy), *DMotLowProdCost*: principal motive: lower production costs (dummy), principal motive: *DMotAccRes*: access natural resources/inputs (dummy), principal motive: *DMotJoinPart*: join a specific partner (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

Regressions in the last three columns include dummies for the principal motive for investment. Their coefficient estimates in columns 11 and 12 are positive and insignificant, while that in column 13 is negative and significant at 5 per cent. The latter indicates that the principal motive for investments by parent companies with intra-firm trade is less likely related to any prospect of collaboration with a specific partner in the host country. This finding can be linked to their greater tendency to transfer intangibles to their affiliates and therefore, to their bigger concerns through diffusion of critical technologies.

In Table 12, we study the differences between the two firm types with respect to their local and international procurement activities. The results indicate that affiliates with intra-firm trade are more likely to have backward linkages (column 1) and, in particular, international backward linkages (column 11). The latter is also verified in columns 13 and 14, according to which these firms tend to have suppliers of raw materials, components or finished goods overseas, as well as suppliers overseas with long-term arrangements. Also, their probability to directly import inputs themselves is higher (column 12). We fail to find any statistically significant differences between the two types of firms regarding domestic backward linkages (columns 2, 4, 7 and 8) and indirect importing (column 3).

Regarding firm age, firms that have existed for up to 5 years are more likely to have intra-firm trade (column 5), while those that have existed for more than 5 years are more likely to be without intra-firm trade (column 6). As already mentioned in Section 3, assuming that firm age can proxy for international and local procurement (i.e. the older a firm, the more integrated it can become into local as well as into international supply chains as an alternative to sourcing from the parent company and/or sister affiliates), affiliates without intra-firm trade are more likely to source inputs from third parties, while affiliates with intra-firm trade are more likely to source inputs from their parent.<sup>25</sup> Finally, we find no statistically significant differences in terms of availability of departments for local sourcing and for local supplier development (columns 9 and 10, respectively).

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<sup>25</sup> Firm age may also capture the level of an affiliate's responsiveness to local and regional sales opportunities (i.e. the older a firm, the more integrated into the local economy it is and the higher the level of responsiveness). Hence, affiliates without intra-firm trade tend to be more responsive to local sales opportunities. Similar findings with better proxies for level of responsiveness of affiliates to local demand are reported in Table 15.



**Table 12 International and local procurement**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<i>Dift</i>														
<i>DbackLink</i> (d)	0.265***													
	[0.020]													
<i>DdomBackLink</i> (d)		0.0294												
		[0.024]												
<i>DimpLocal</i> (d)			0.00410											
			[0.025]											
<i>DprodLocal</i> (d)				-0.0311										
				[0.023]										
<i>DfAgeLEQ5</i> (d)					0.0762*									
					[0.040]									
<i>DfAgeGT 5</i> (d)						-0.0762*								
						[0.040]								
<i>DdomSuppliers</i> (d)							-0.0326							
							[0.032]							
<i>DdomLT suppliers</i>								0.0122						
								[0.027]						
<i>DdptLS</i> (d)									-0.0311					
									[0.031]					
<i>DdptLSD</i> (d)										-0.0399				
										[0.034]				
<i>DintBackLink</i> (d)											0.198***			
											[0.021]			
<i>DimpDirect</i> (d)												0.0815***		
												[0.028]		
<i>DoverseasSupplier</i>													0.130**	
													[0.029]	
<i>DoverseasLT Suppliers</i> (d)														0.159***
														[0.028]
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo - R2</i>	0.24	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.23	0.22	0.22
<i>Log-likelihood</i>	-695.0	-729.3	-730.0	-729.2	-728.1	-728.1	-729.5	-729.9	-729.5	-729.4	-712.7	-703.5	-720.4	-711.8

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *DbackLink*: the firm has backward linkages (dummy), *DdomBackLink*: the firm has domestic backward linkages (dummy), *DimpLocal*: the firm sources production inputs through local importer (dummy), *DprodLocal*: the firm sources production inputs manufactured locally (dummy), *Df AgeLEQ5*: less or equal to 5 years since setup of the firm, *Df AgeGT 5*: more than 5 years since setup of the firm, *DdomSuppliers*: the firm has domestic suppliers of raw materials, components or finished goods (dummy), *DdomLT* suppliers: the firm has domestic suppliers of raw materials, components or finished goods with long-term arrangement (dummy), *DdptLS*: availability of special department for local sourcing (dummy), *DdptLSD*: availability of special department for local supplier development (dummy), *DintBackLink*: the firm has international backward linkages (dummy), *DimpDirect*: the firm imports production inputs (dummy), *DoverseasSuppliers*: the firm has suppliers of raw materials, components or finished goods overseas (dummy), *DoverseasLT Suppliers*: the firm has suppliers of raw materials, components or finished goods overseas with long-term arrangement (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

In Table 13, we study differences regarding the most important factors favouring and deterring local procurement. In Panel A, the coefficient estimates of dummies capturing the factors in favour of local procurement are not statistically significant in all columns, except for columns 5 and 7, which are significant only at 10 per cent. Foreign affiliates with intra-firm trade are less likely to deem the development of closer relationships with local suppliers as the most important factor in favour of local procurement, more so than corporate commitment to local supplier development in the region. The first result is consistent with that in column 13 of Table 11. In Panel B, all coefficient estimates of the dummies that capture deterrent factors for local procurement are statistically insignificant, except for that in column 3. The positive and highly significant coefficient estimate of the relevant dummy in that column implies that firms with intra-firm trade are more likely to cancel or to not enter local procurement due to concerns over retention of intellectual property. The results in columns 5 and 7 of Panel A and in column 3 of Panel B could be associated with the tendency of foreign affiliates with intra-firm trade to have a greater stock of intangibles.

In the Online Appendix, we look into any differences between the two firm types regarding the forms of assistance they provide to local suppliers and sub-contractors with whom they collaborate. In total, there are six different forms of assistance: 1) efficiency upgrade of the supplier's production process, 2) quality upgrade of the supplier's products, 3) improved access of supplier to working capital, finance and equity, 4) quality upgrade of the supplier's workforce, 5) transfer of technology or know-how through designs or process know-how to the supplier, and 6) conduct product design/production development/specification jointly with the supplier. We fail to find any statistically significant differences in this respect.

**Table 13 Most important factor in favour of and against local procurement**

**Panel A: Most important factor in favour of local procurement**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>DlocProcCustPref</i> (d)	0.0190 [0.046]								
<i>DlocProcProdCust</i> (d)		-0.0332 [0.040]							
<i>DlocProcLogistics</i> (d)			0.0569 [0.037]						
<i>DlocProcRawMat</i> (d)				-0.00831 [0.029]					
<i>DlocProcSuppRel</i> (d)					-0.0636* [0.036]				
<i>DlocProcEnvResp</i> (d)						-0.0707 [0.069]			
<i>DlocProcCorpCom</i> (d)							0.161* [0.085]		
<i>DlocProcSuppChain</i> (d)								0.0938 [0.11]	
<i>DlocProcRedTar</i> (d)									-0.0324 [0.043]
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
<i>Log–likelihood</i>	-729.9	-729.7	-728.8	-730.0	-728.8	-729.7	-727.9	-729.6	729.8

**Panel B: Most important factor against local procurement**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>DcancProcLocPr</i> (d)	0.0279 [0.030]								
<i>DcancProcProdQual</i> (d)		-0.00246 [0.026]							
<i>DcancProcIntProp</i> (d)			0.383*** [0.14]						
<i>DcancProcLocInfr</i> (d)				0.0629 [0.061]					
<i>DcancProcLabRel</i> (d)					0.0539 [0.10]				
<i>DcancProcMgmSkill</i> (d)						-0.0690 [0.048]			
<i>DcancProcQualPlant</i> (d)							0.0627 [0.15]		
<i>DcancProcPlantCap</i> (d)								-0.00702 [0.076]	
<i>DcancProcEnvResp</i> (d)									-0.0677 [0.067]
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.21	0.20	0.21	0.21	0.21	0.21	0.21	0.20	0.21
<i>Log–likelihood</i>	-729.6	-730.0	-725.5	-729.4	-729.9	-729.3	-729.9	-730.0	-729.7

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. Panel A: *DlocProcCustPref*: local content is mandated or strongly encouraged by the ultimate customer (dummy), *DlocProcProdCust*: improved local market acceptability or local customization of the product (dummy), *DlocProcLogistics*: easier logistics or reduced inventory (dummy), *DlocProcRawMat*: access to local raw materials sources (dummy), *DlocProcSuppRel*: closer supplier relationship (dummy), *DlocProcEnvResp*: environmental responsibility (dummy), *DlocProcCorpCom*: corporate commitment to local supplier development in the region (dummy), *DlocProcSuppChain*: fiscal or tax efficient supply chain reasons (dummy), *DlocProcRedTar*: reduced tariff costs (dummy). Panel B: *DcancProcLocPr*: local prices not competitive (dummy), *DcancProcProdQual*: product or service quality not satisfactory (dummy), *DcancProcIntProp*: concerns over retention of intellectual property (dummy), *DcancProcLocInfr*: local infrastructure issues (dummy), *DcancProcLabRel*: labour relations issues (dummy), *DcancProcMgmSkill*: technical or management skill issues (dummy), *DcancProcQualPlant*: age, quality of plant and equipment of suppliers (dummy), *DcancProcPlantCap*: plant or process capacity (dummy), *DcancProcEnvResp*: environmental responsibility (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

**Table 14 Imports by geographical breakdown, proximity and number of regional markets**

Dif t	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DimpSA (d)	0.00463 [0.032]											
DimpSSA (d)		0.0708** [0.036]										
DimpEU (d)			0.0287 [0.025]									
DimpUS (d)				0.103** [0.048]								
DimpChina (d)					0.00428 [0.026]							
DimpIndia (d)						0.0429 [0.029]						
DimpOA (d)							0.00914 [0.030]					
DimpOther (d)								-0.0354 [0.032]				
DimpContiguous (d)									0.0262 [0.026]			
DimpDistant (d)										0.0475** [0.023]		
DimpSingle (d)											-0.0833 [0.080]	
DimpMultiple (d)												0.210*** [0.020]
Obs	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581
Pseudo – R2	0.20	0.21	0.21	0.21	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.25
Log-likelihood	-730.0	-727.8	-729.4	-727.4	-730.0	-728.9	-730.0	-729.5	-729.5	-728.1	-729.6	-690.4

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. *DimpSA*: importing from South Africa (dummy), *DimpSSA*: importing from sub-Saharan Africa (dummy), *DimpEU*: importing from the European Union (dummy), *DimpUS*: importing from the United States of America (dummy), *DimpChina*: importing from China (dummy), *DimpIndia*: importing from India (dummy), *DimpOA*: importing from Other Asia (dummy), *DimpOther*: importing from the rest of the world (Other) (dummy), *DimpContiguous*: imports from contiguous countries/regions (i.e. SSA, SA, MENA) (dummy), *DimpDistant*: imports from more distant countries/regions (i.e. EU, U.S., China, India, Other Asia, Other) (dummy), *DimpSingle*: imports from a single country/region (i.e. only from one among SSA, SA, MENA, EU, U.S., China, India, Other Asia, Other) (dummy), *DimpMultiple*: imports from more than one country/region (i.e. at least from two among SSA, SA, MENA, EU, U.S., China, India, Other Asia, Other) (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

In Table 14, we investigate how the two firm types differ with respect to the geography of their imports as well as the proximity and number of regions and countries from which they import. We find that foreign affiliates with intra-firm trade are more likely to import from sub-Saharan Africa (SSA) (column 2) and from the U.S. (column 4). They are also more likely to import from more distant countries and more than one country/region (columns 10 and 12, respectively).

Having identified the differences in international and local procurement activities between foreign affiliates with and without intra-firm trade, we now examine any differences with respect to their behaviour in domestic and export markets, as well as the sources of competition for their main product or service. The coefficient estimates of the corresponding dummy variables in Table 15 indicate that firms with intra-firm trade are more likely to have direct and indirect export sales (columns 2 and 3), while they are less likely to have sales in the domestic market (column 1). They also tend to face competition for their main product, mostly from imports (column 4) and less so from locally-owned firms (column 5). There do not seem to be any differences regarding competition from other foreign-owned firms residing in the host country.<sup>26</sup>

**Table 15 Domestic and export sales, market orientation and source of competition**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)
<i>DsalesDomMarket</i> (d)	-0.173*** [-5.77]					
<i>DsalesExpDirect</i> (d)		0.149*** [5.53]				
<i>DsalesExpIndirect</i> (d)			0.266*** [4.28]			
<i>DsourCompImports</i> (d)				0.0605** [2.11]		
<i>DsourCompLocOwnFirms</i> (d)					-0.0702*** [-3.22]	
<i>DsourCompForOwnFirms</i> (d)						0.0204 [0.85]
<i>Obs</i>	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.23	0.22	0.22	0.21	0.21	0.21
<i>Log–likelihood</i>	-711.5	-714.3	-718.2	-727.6	-725.3	-729.7

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<sup>26</sup> In the Online Appendix, we also show the findings on differences with respect to forward linkages (i.e. the firm undertakes sub-contract work for other companies in the country) and buyer types (i.e. retailers, distributors/wholesalers, manufacturers, government, consumers/end users, NGOs and international agencies). We fail to find any statistically significant differences, except for one. Firms with intra-firm trade are more likely to sell to NGOs and international agencies.



Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. *DsalesDomMarket*: sales in the domestic (host-country) market (dummy), *DsalesExpDirect*: sales in an export market directly (dummy), *DsalesExpIndirect*: sales in an export market indirectly (dummy), *DsourCompImports*: competition for the main product comes mostly from imports (dummy), *DsourCompLocOwnFirms*: competition for the main product comes mostly from locally-owned firms (dummy), *DsourCompForOwnFirms*: competition for the main product comes mostly from other foreign-owned firms based in the country (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

Studying the differences in terms of direct exporting in more depth, Table 16 shows that firms with intra-firm trade are more likely to export to contiguous countries and regions such as sub-Saharan Africa (SSA), South Africa (SA), the Middle East and North Africa (MENA) (columns 1, 2 and 8, respectively), as well as to more distant countries and regions such as the European Union (EU), the U.S., India, Asia excluding China and India (Other Asia), and the rest of the world (Other) (columns 3, 4, 6, 7 and 9, respectively). We fail to find any statistically significant difference in terms of exports to China (column 5). The same conclusions are drawn from columns 10 and 11, in which the coefficient estimates of the dummies for contiguous and distant export markets are both positive and highly significant. Columns 12 and 13 indicate that affiliates with intra-firm trade are also more likely to export to a single and to multiple markets.

Table 17 shows that firms without intra-firm trade are more likely to be non-exporters and export-exiters (columns 1 and 3, respectively). Instead, firms with intra-firm trade are more likely to be export-starters (column 2) and continuing exporters (column 4). Finally, the same type of firm is more likely to engage simultaneously in export and import activities (column 5).

In Table 18, we look into any potential differences with respect to the number of products or services sold by each firm type. Even though the relevant coefficient estimate is only significant at 10 per cent, we argue that the probability for foreign affiliates with intra-firm trade to be single-product or single-service firms is lower (column 1). The coefficient estimates of dummies for multi-product firms in columns 2 and 3 are positive but statistically insignificant at any conventional level. The coefficient estimate of the dummy for high product/service concentration is negative but insignificant (column 4).

We turn to the literature on multi-product firms to provide a plausible explanation for the result in column 1. Bernard et al. (2012) argue that larger exporters not only export more of a given product to a given destination than smaller exporters, but also export more products to more destinations. Moreover, Eckel and Neary (2010) implicitly highlight the importance of firm size and productivity, when they assume increasing marginal costs for a firm in their model whose products shift away from its core competencies. Nocke and Yeaple (2006), Nocke and Yeaple (2013) and Eckel and Yeaple (2014) also highlight the role of organizational capabilities in allowing firms to produce a relatively broad range of products or services.

As shown above, foreign affiliates with intra-firm trade tend to be bigger, more productive and have greater organizational capabilities. These seem to be the main reasons for why their probability of producing a single product or service is lower. Size and productivity premiums also seem to explain the main findings on international and local procurement activities, as well as those on sales activities in domestic and export markets.

**Table 16 Exports with geographical breakdown and by proximity and number of regional markets**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<i>DexpSA</i> (d)	0.208*** [0.059]												
<i>DexpSS</i> (d)		0.111*** [0.031]											
<i>DexpEU</i> (d)			0.228*** [0.050]										
<i>DexpUS</i> (d)				0.0964* [0.055]									
<i>DexpChina</i> (d)					0.0606 [0.069]								
<i>DexpIndia</i> (d)						0.186** [0.074]							
<i>DexpOA</i> (d)							0.157** [0.070]						
<i>DexpMENA</i> (d)								0.119* [0.067]					
<i>DexpOther</i> (d)									0.114** [0.055]				
<i>DexpContiguous</i> (d)										0.152*** [0.030]			
<i>DexpDistant</i> (d)											0.186*** [0.039]		
<i>DexpSingle</i> (d)												0.0825*** [0.029]	
<i>DexpMultiple</i> (d)										0.0927***			[0.03
												2]	
<i>Obs</i>	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.21	0.21	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.21	0.21
<i>Log-likelihood</i>	-722.4	-722.8	-717.0	-728.3	-729.6	-726.2	-727.1	-728.1	-727.4	-715.5	-716.0	-725.3	-725.4

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. *DexpSA*: exporting to South Africa (dummy), *DexpSSA*: exporting to sub-Saharan Africa (dummy), *DexpEU*: exporting to the European Union (dummy), *DexpUS*: exporting to the United States of America (dummy), *DexpChina*: exporting to China (dummy), *DexpIndia*: exporting to India (dummy), *DexpOA*: exporting to Other Asia (dummy), *DexpMENA*: exporting to the Middle East and North Africa (dummy), *DexpOther*: exporting to the rest of the world (Other) (dummy), *DexpContiguous*: exports to contiguous countries/regions (i.e. SSA, SA, MENA) (dummy), *DexpDistant*: exports to more distant countries/regions (i.e. EU, U.S., China, India, Other Asia, Other) (dummy), *DexpSingle*: exports to a single country/region (i.e. only to one among SSA, SA, MENA, EU, U.S., China, India, Other Asia, Other) (dummy), *DexpMultiple*: exports to more than one country/region (i.e. at least to two among SSA, SA, MENA, EU, U.S., China, India, Other Asia, Other) (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

**Table 17 Export status and importer-exporter status**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)
<i>DnoExporter</i> (d)	-0.151*** [-5.70]				
<i>DexpStarter</i> (d)		0.0575 [1.11]			
<i>DexpExiter</i> (d)			-0.0929 [-0.83]		
<i>DexpContinue</i> (d)				0.138*** [5.00]	
<i>DimpExp</i> (d)					0.186*** [6.60]
<i>Obs</i>	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.22	0.21	0.21	0.22	0.23
<i>Log–likelihood</i>	-713.6	-729.3	-729.7	-716.9	-705.6

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing main firm characteristics. *DnoExporter*: no export activities in any of the last two financial years (dummy), *DexpStarter*: no export activities two financial years ago, but export activities during the previous financial year (dummy), *DexpExiter*: export activities two financial years ago, but no export activities during the previous financial year (dummy), *DexpContinue*: export activities two financial years ago and during the last financial year (dummy), *DimpExp*: import and export activities during the previous financial year (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

**Table 18 Foreign affiliates with one product/service or more**

<i>Dif t</i>	(1)	(2)	(3)	(4)	(5)
<i>DsingleProdServ</i> (d)	-0.0423* [0.024]				
<i>DtwoProdServ</i> (d)		0.0270 [0.030]			
<i>DthreeProdServ</i> (d)			0.0161 [0.023]		
<i>DtwoThreeProdServ</i> (d)				0.0398 [0.024]	
<i>DhighProdServConc</i> (d)					-0.00200 [0.024]
<i>Obs</i>	1581	1581	1581	1581	1581
<i>Pseudo – R2</i>	0.21	0.21	0.21	0.21	0.20
<i>Log–likelihood</i>	-728.6	-729.6	-729.8	-728.8	-730.0

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. *DsingleProdServ*: single-product or single-service firm (dummy), *DtwoProdServ*: two-product or two-service firm (dummy), *DthreeProdServ*: three-product or three-service firm (dummy), *DtwoThreeProdServ*: the firm produces at least two goods or services (dummy), *DhighProdServConc*: high product/service concentration of the firm (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

Table 19 is the last table in this section and reports that foreign affiliates with intra-firm trade are more likely to have sister affiliates in the same country (column 1), in another country in sub-Saharan Africa (column 2) as well as outside sub-Saharan Africa (column 3). One possible explanation for these findings is that parent companies with intra-firm trade tend to build a relatively large network of foreign affiliates which is dispersed around the globe.<sup>27</sup>

**Table 19** Sister affiliates within the country, or in SSA, or outside SSA

	(1)	(2)	(3)
<i>DiffDotherSubInCountry</i> (d)	0.328*** [0.074]		
<i>DotherSubInSSA</i> (d)		0.282*** [0.061]	
<i>DotherSubOutSSA</i> (d)			0.384*** [0.041]
<i>Obs</i>	1581	1581	1581
<i>Pseudo – R2</i>	0.22	0.22	0.26
<i>Log-likelihood</i>	-717.7	-716.2	-680.1

Notes: Probit estimations with host-country, parent-location and industry dummies in all columns. Standard errors are clustered at the firm level. See Table 7 for a description of variables capturing the main firm characteristics. *DotherSubInCountry*: other affiliates in the country owned by the same foreign investor (dummy), *DotherSubInSSA*: other affiliates in sub-Saharan Africa owned by the same foreign investor (dummy), *DotherSubOutSSA*: other affiliates in the rest of the world owned by the same foreign investor (dummy). Dummies take a value of 1 if the statement holds, and 0 otherwise. (d): discrete change of dummy variable from 0 to 1. All variables are in logs, except for dummies.

In tables that we relegate to the Online Appendix, we study any differential impact of export barriers within and outside Africa and of Regional Trade Agreements (RTAs) on the two firm types. Foreign affiliates with intra-firm trade are more likely to consider general infrastructure problems, bureaucracy and regulations and the high cost of production for export markets as the most important barriers to starting or expanding their export activities within Africa. They are also more likely to deem general infrastructure problems, tariff and non-tariff barriers, bureaucracy and

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<sup>27</sup> In the Online Appendix, we provide results from estimations of the probit model augmented with dummies capturing expectations for new investment and disinvestment, as well as for expansion in neighbouring and non-neighbouring SSA countries over the next three years. We fail to find any statistically significant differences in terms of expectations for new investment/disinvestment. Instead, we find strong evidence on parents of foreign affiliates with intra-firm trade being

regulations and inadequate export support services as the most important barriers to starting or expanding their export activities outside Africa.

As regards the most important benefits from RTAs, the same firms are more likely to reap the benefits from an RTA in the form of access to finance on better terms, improved transport and communications infrastructure, improved access to raw materials and other inputs, and increased regional investment opportunities. The only dummy whose coefficient estimate is negative, albeit insignificant, is the one according to which the firm reaps no benefits from an RTA. The strong evidence on the differential impact of export barriers and RTAs can be explained by the more advanced export performance of foreign affiliates with intra-firm trade.

Finally, we test the robustness of all results included in this section and in the Online Appendix to alternative estimating models, such as the logistic and linear probability models. The vast majority of results remain unaltered.

## **5. Concluding remarks**

In this paper, we study the differences in the main firm characteristics and activities of foreign affiliates with and without intra-firm trade located in 19 countries in sub-Saharan Africa in 2010.

We find that foreign affiliates with intra-firm trade are relatively few, of larger size and higher productivity level. We report size and productivity premiums of 31.5 per cent and 25.4 per cent, respectively. Further analysis reveals that foreign affiliates self-select into intra-firm and arm's length trade. On average, foreign affiliates with both intra-firm imports and exports seem to be the largest and most productive firms, those with intra-firm exports only seem to be smaller and less productive, those with intra-firm imports only are even smaller and less productive, while those with arm's length trade only are larger and more productive than those without intra-firm trade, which are the smallest and least productive firms.

This paper also makes a contribution to the debate about the reasons why firms set up domestic or foreign affiliates, other than the transfer of goods and services (Atalay et al., 2014; Ramondo et al., 2011). According to these studies, the main reason is the transfer of intangible assets. As a complement to their argumentation, we find that foreign affiliates tend to have a greater stock of

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more likely to have plans for expanding their operations in neighbouring and non-neighbouring SSA countries with a 3-year horizon.

intangible assets. In other words, while firm boundaries facilitate the transfer of intangibles, intra-firm trade of goods and services makes it more intense.

The tendency of these firms to have a larger stock of intangibles seems to be a direct outcome of the following group of results. Foreign affiliates with intra-firm trade tend to be more dependent on their parent in terms of decision-making—with a subdued role for middle managers—reception of assistance in several areas and payment of management fees. They are also more likely to acquire capital goods from their parent and less so from local and foreign unaffiliated distributors. The parent also seems to be their main source of finance of working capital and fixed assets.

In addition, they are more likely to cancel or not enter into local procurement due to concerns over retention of their intellectual property and less likely to enter into local procurement in order to develop a closer relationship with a supplier. Similarly, their parents are less likely to engage in foreign investment to join a specific partner in the host country.

The probability for parents with intra-firm trade to set up wholly-owned foreign affiliates through greenfield FDI is higher, which may be explained by the strong association of this mode of investment with the (almost) exclusive use of their capabilities in the host country. In turn, their higher probability of benefiting from tax exemptions as the main motive for their investment may be explained by their higher probability of engaging in greenfield FDI.

The two main features that seem to distinguish foreign affiliates with intra-firm trade from those without, namely size and productivity, may also explain the differences observed in terms of import activities, market orientation, source of competition and production of single or multiple goods and services. Those with intra-firm trade are more likely to import inputs directly, to import from multiple and distant markets and to have linkages with suppliers overseas.

They are also more likely to engage in direct and indirect exports and less so in sales in the domestic market. More on direct exports, they tend to export to contiguous and more distant markets, as well as to a single and multiple ones. They are less likely to be non-exporters and export-exiters, while they are more likely to be export-starters, continuing exporters and importers-exporters. Regarding the source of competition for their main product, this tends to come mostly from imports and less so from locally-owned firms in the host country. Also, the probability that they are single-product or single-service firms is lower.



A final set of results is that foreign affiliates with intra-firm trade are more likely to have sister affiliates in the same country, in another sub-Saharan-African country or in any country outside sub-Saharan Africa. Put differently, their parents tend to have a geographically dispersed network of foreign affiliates.

Despite the novelty of the results set out above, and the significant contribution to various streams of literature, some intriguing questions remain unexplored or should be studied in more depth. Upon data availability at the firm-product-destination level, one could investigate further the differences between the two affiliate types regarding their international backward and forward linkages, their direct and indirect export activities and their capacity to be multi-product or multi-service firms.

In the data analysis, we show that intra-firm trade is a relatively rare activity, while arm's length trade is very popular among all affiliates, including those with intra-firm trade. In this paper, we made an attempt to provide possible explanations for these thought-provoking stylized facts based on extant theories of the boundaries of the firm, such as the property-rights theory (PRT) and the transaction costs approach (TCA). Nevertheless, such detailed data could allow one to identify more precisely the underlying motives for intra-firm and arm's length trade by product/service and destination, which in turn, can feed back into the existing theories of firm boundaries and contribute to their further improvement.

Other issues that need to be addressed require the time dimension. For instance, do foreign affiliates with and without intra-firm trade need an adjustment period after their set-up until they engage in arm's length import and export activities or in local procurement activities? What is the evolution of the range of their goods and services produced over time? For firms with intra-firm trade, how does the level of dependence on their parent evolve? Does the role of middle managers become more important in the course of time, that is, after a certain training period? Given that our analysis is based on cross-sectional data, we leave these topics for future research.

## References

- Acemoglu, D., Aghion, P., Griffith, R., and Zilibotti, F. (2010). Vertical Integration and Technology: Theory and Evidence. *Journal of the European Economic Association*, 8(5):989–1033.
- Acemoglu, D., Aghion, P., Lelarge, C., Reenen, J. V., and Zilibotti, F. (2007). Technology, Information, and the Decentralization of the Firm. *The Quarterly Journal of Economics*, 122(4):1759–1799.
- Ahn, J., Khandelwal, A. K., and Wei, S.-J. (2011). The Role of Intermediaries in Facilitating Trade. *Journal of International Economics*, Elsevier, 84(1):73–85.
- Alfaro, L. and Charlton, A. (2009). Intra-industry Foreign Direct Investment. *American Economic Review*, 99(5):2096–2119.
- Amiti, M. and Konings, J. (2007). Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia. *The American Economic Review*, 97(5):pp. 1611–1638.
- Antràs, P., Fort, T. C., and Tintelnot, F. (2014). The Margins of Global Sourcing: Theory and Evidence from US firms.
- Antràs, P., Garicano, L., and Rossi-Hansberg, E. (2006a). Offshoring in a Knowledge Economy. *The Quarterly Journal of Economics*, 121(1):31–77.
- Antràs, P., Garicano, L., and Rossi-Hansberg, E. (2006b). Organizing Offshoring: Middle Managers and Communication Costs. NBER Working Paper 12196, National Bureau of Economic Research, Inc.
- Antràs, P. and Rossi-Hansberg, E. (2009). Organizations and Trade. *Annual Review of Economics*, 1(1):43–64.
- Antràs, P. and R. Yeaple, S. (2013). Multinational Firms and the Structure of International Trade. NBER Working Paper 18775, National Bureau of Economic Research, Inc.
- Atalay, E., Hortacsu, A., and Syverson, C. (2014). Vertical Integration and Input Flows. *American Economic Review*, 104(4):1120–48.
- Badinger, H. and Egger, P. (2010). Horizontal vs. Vertical Interdependence in Multinational Activity. *Oxford Bulletin of Economics and Statistics*, 72(6):744–768.
- Berman, N. and Martin, P. (2010). The Vulnerability of Sub-Saharan Africa to the Financial Crisis: The Case of Trade. CEPR Discussion Papers, C.E.P.R. Discussion Papers 7765, C.E.P.R. Discussion Papers.
- Bernard, A. B. and Jensen, B. J. (1994). Exporters, Skill Upgrading and the Wage Gap. Working Papers 94-13, Center for Economic Studies, U.S. Census Bureau.
- Bernard, A. B. and Jensen, J. B. (1999). Exceptional Exporter Performance: Cause, Effect, or Both? *Journal of International Economics*, 47(1):1 – 25.

- Bernard, A. B., Jensen, J. B., Redding, S. J., and Schott, P. K. (2007). Firms in International Trade. *Journal of Economic Perspectives*, American Economic Association, 21(3):105–130.
- Bernard, A. B., Jensen, J. B., Redding, S. J., and Schott, P. K. (2012). The Empirics of Firm Heterogeneity and International Trade. *Annual Review of Economics*, Annual Reviews, 4(1):283–313.
- Bernard, A. B., Jensen, J. B., and Schott, P. K. (2005). Importers, Exporters, and Multinationals: A Portrait of Firms in the U.S. that Trade Goods. NBER Working Papers 11404, National Bureau of Economic Research, Inc.
- Bloom, N., Genakos, C., Sadun, R., and Reenen, J. V. (2012). Management Practices Across Firms and Countries. Working Paper 17850, National Bureau of Economic Research.
- Bloom, N. and Van Reenen, J. (2007). Measuring and Explaining Management Practices Across Firms and Countries. *The Quarterly Journal of Economics*, 122(4):1351–1408.
- Borga, M. and Zeile, W. J. (2004). International fragmentation of production and the intrafirm trade of u.s. multinational companies. BEA Papers 0035, Bureau of Economic Analysis.
- Brainard, S. L. (1997). An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade. *American Economic Review*, 87(4):520– 44.
- Caliendo, L., Monte, F., and Rossi-Hansberg, E. (2014). The Anatomy of French Production Hierarchies. *Forthcoming Journal of Political Economy*.
- Carr, D. L., Markusen, J. R., and Maskus, K. E. (2001). Estimating the Knowledge Capital Model of the Multinational Enterprise. *The American Economic Review*, 91(3):pp. 693–708.
- Caves, R. (1982). *Multinational Enterprise and Economic Analysis*. Cambridge, UK: Cambridge University Press.
- Chor, D. and Manova, K. (2012). Off the Cliff and Back? Credit Conditions and International Trade During the Global Financial Crisis. *Journal of International Economics*, Elsevier, 87(1):117–133.
- Coase, R. (1937). The Nature of the Firm. *Economica*, 4: 386-405.
- Eckel, C. and Neary, J. P. (2010). Multi-product Firms and Flexible Manufacturing in the Global Economy. *The Review of Economic Studies*, 77(1):188–217.
- Ekholm, K., Forslid, R., and Markusen, J. R. (2007). Export-Platform Foreign Direct Investment. *Journal of the European Economic Association*, 5(4):776–795.
- Feinberg, S. E. and Keane, M. P. (2001). U.S.-Canada Trade Liberalization and MNC Production Location. *The Review of Economics and Statistics*, 83(1):118–132.
- Garicano, L. (2000). Hierarchies and the Organization of Knowledge in Production. *Journal of Political Economy*, 108(5):874–904.

- Garicano, L. and Rossi-Hansberg, E. (2006). Organization and Inequality in a Knowledge Economy. *The Quarterly Journal of Economics*, 121(4):1383–1435.
- Grossman, G. M., Helpman, E., and Szeidl, A. (2006). Optimal Integration Strategies for the Multinational Firm. *Journal of International Economics*, 70(1):216–238.
- Hanson, G. H. (2001). Should Countries Promote Foreign Direct Investment? Technical report.
- Hanson, G. H., Mataloni, Raymond J., J., and Slaughter, M. J. (2001). Expansion Strategies of US Multinational Firms. *Brookings Trade Forum*, pages pp. 245–294.
- Hanson, G. H., Mataloni, R. J., and Slaughter, M. J. (2005). Vertical Production Networks in Multinational Firms. *The Review of Economics and Statistics*, 87(4):664– 678.
- Helpman, E. (1984). A Simple Theory of International Trade with Multinational Corporations. *Journal of Political Economy*, 92(3):pp. 451–471.
- Helpman, E. (2006). Trade, FDI, and the Organization of Firms. *Journal of Economic Literature*, *American Economic Association*, 44(3):589–630.
- Helpman, E. and Krugman, P. (1985). *Market Structure and Foreign Trade*. Cambridge, Massachusetts: MIT Press.
- Helpman, E., Melitz, M. J., and Yeaple, S. R. (2004). Export Versus FDI with Heterogeneous Firms. *American Economic Review*, *American Economic Association*, 94(1):300–316.
- Horstmann, I. J. and Markusen, J. R. (1992). Endogenous Market Structures in International Trade (natura facit saltum). *Journal of International Economics*, 32(12):109 – 129.
- Irrazabal, A., Moxnes, A., and Opmolla, L. D. (2013). The Margins of Multinational Production and the Role of Intrafirm Trade. *Journal of Political Economy*, 121(1):74 – 126.
- Larraín, F., López-Calva, L. F., and Rodríguez-Clare, A. Intel: A Case Study of Foreign Direct Investment in Central America. In *Economic Development in Central America*, vol. I: Growth and Internationalization, Chapter 6.
- Marin, D., Rousová, L., and Verdier, T. (2013). Do Multinationals Transplant Their Business Model? CEPR Discussion Papers 9500, C.E.P.R. Discussion Papers.
- Markusen, J. R. (1984). Multinationals, Multi-plant Economies, and the Gains From Trade. *Journal of International Economics*, 16(3-4):205–226.
- Markusen, J. R. and Venables, A. J. (2000). The Theory of Endowment, Intra-industry and Multi-national Trade. *Journal of International Economics*, 52(2):209–234.
- McGrattan, E. R. and Prescott, E. C. (2010). Technology Capital and the US Current Account. *American Economic Review*, 100(4):1493–1522.
- McLaren, J. (2003). Trade and Market Thickness: Effects on Organizations. *Journal of the European Economic Association*, 1(2-3):328–336.

- Melitz, M. J. (2003). The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6):pp. 1695–1725.
- Nocke, V. and Yeaple, S. (2006). Globalization and Endogenous Firm Scope. NBER Working Paper 12322, National Bureau of Economic Research, Inc.
- Nocke, V. and Yeaple, S. (2007). Cross-border Mergers and Acquisitions vs. Greenfield Foreign Direct Investment: The Role of Firm Heterogeneity. *Journal of International Economics*, Elsevier, 72(2):336–365.
- Nocke, V. and Yeaple, S. (2013). Globalization and Multiproduct Firms. Technical report.
- OECD (2002). Intra-industry and Intra-firm Trade and the Internationalisation of Production. *OECD Economic Outlook* 71.
- Ramondo, N., Rappoport, V., and Ruhl, K. J. (2011). Horizontal Vs. Vertical FDI: Revisiting Evidence from U.S. Multinationals. Technical report.
- Ramondo, N., Rappoport, V., and Ruhl, K. J. (2013). The Proximity-concentration Tradeoff Under Uncertainty. *The Review of Economic Studies*, 80(4):1582–1621.
- Spar, D. (1998). Attracting High Technology Investment: Intel’s Costa Rican Plant. Fias occasional paper 11, Washington D.C.: World Bank.
- Spencer, B. (2005). International Outsourcing and Incomplete Contracts. *Canadian Journal of Economics*, 38(4):1107–1135.
- UNCTAD (1998). *World Investment Report 2010. Trends and Determinants*. United Nations Publication, New York and Geneva.
- UNCTAD (2010a). *Economic Development in Africa Report 2010. South-South cooperation: Africa and the New Forms of Development Partnership*. United Nations Publication, New York and Geneva.
- UNCTAD (2010b). *World Investment Report 2010. Investing in a Low Carbon Economy*. United Nations Publication, New York and Geneva.
- UNCTAD (2013). *Economic Development in Africa Report 2013. Intra-African Trade: Unlocking Private Sector Dynamism*. United Nations Publication, New York and Geneva.
- UNCTAD and UNIDO (2011). *Economic Development in Africa Report 2011. Fostering Industrial Development in Africa in the New Global Environment*. United Nations Publication, New York and Geneva.
- Williamson, O. (1975). *Markets, Hierarchies: Analysis, Antitrust Implications*. New York: Free Press.
- Williamson, O. (1985). *The Economic Institutions of Capitalism*. New York: Free Press.

- Yeaple, S. R. (2003a). The Complex Integration Strategies of Multinationals and Cross Country Dependencies in the Structure of Foreign Direct Investment. *Journal of International Economics*, 60(2):293–314.
- Yeaple, S. R. (2003b). The Role of Skill Endowments in the Structure of U.S. Outward Foreign Direct Investment. *The Review of Economics and Statistics*, 85(3):726–734.
- Yeaple, S. R. (2008). *Multinational Enterprise and Economic Analysis*, 3rd edition, Richard Caves. Cambridge University Press (2007). *Journal of International Economics*, 75(2):383 – 385.

**Table 20**      **Description of variables**

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<b>Variable</b>	<b>Description</b>
<i>Dif t</i>	firm has intra-firm trade (imports, exports, or both) (dummy)
<i>Difimonly</i>	firm has only intra-firm imports (dummy)
<i>Difexonly</i>	firm has only intra-firm exports (dummy)
<i>Difimex</i>	firm has both intra-firm imports and exports (dummy)
<i>Darmt</i>	firm has only arm's length trade (dummy)
<i>Difim</i>	firm has intra-firm imports (dummy)
<i>Difex</i>	firm has intra-firm exports (dummy)
<i>skillInt</i>	log of skill intensity
<i>capInt</i>	log of capital intensity
<i>numEmp</i>	log of total number of employees (firm size)
<i>wageEmp</i>	log of wage per employee
<i>labProd</i>	log of labour productivity
<i>tfp</i>	log of total factor productivity
<i>inpInt</i>	log of input intensity
<i>Dtraining</i>	firm provides formal internal/external training to its employees (dummy)
<i>intangStocksEmp</i>	log of stock of intangible assets to total number of employees
<i>intangStockSales</i>	log of stock of intangible assets to total sales
<i>AutonomyOverall</i>	log of overall autonomy level of the firm
<i>AssParOverall</i>	log of overall assistance provided by the parent
<i>DacqCapImp</i>	capital goods are imported directly by the firm (dummy)
<i>DacqCapLoc</i>	capital goods are acquired through local distributors (dummy)
<i>DacqCapPar</i>	capital goods are imported through the parent company (dummy)
<i>DmanagementFees</i>	fees paid to the parent under management contract (dummy)
<i>DlicenceFees</i>	fees paid to the parent under license agreement (dummy)
<i>DsourWCIntFund</i>	source of finance of working capital: internal funds/retained trainings (dummy)
<i>DsourWCBorBankIns</i>	source of finance of working capital: borrow from banks in the host country (dummy)
<i>DsourWCBorBankOuts</i>	source of finance of working capital: borrow from banks outside the host country (dummy)
<i>DsourWCBorFam</i>	source of finance of working capital: borrow from family/friends/individual lenders (dummy)
<i>DsourWCBotNonBank</i>	source of finance of working capital: borrow from non-bank financial institutions (e.g. equity funds) (dummy)

<i>DsourWCPurchCredit</i>	source of finance of working capital: through purchases on credit from suppliers and advances from customers (dummy)
<i>DsourWCIssNewEq</i>	source of finance of working capital: through new equity shares or new debt (including commercial paper and debentures) (dummy)
<i>DsourWCParent</i>	source of finance of working capital: parent company (dummy)
<i>Dlayer1a</i>	firm has production or manual workers (dummy)
<i>Dlayer1b</i>	firm has clerical/administrative or sales workers (dummy)
<i>Dlayer1aOR1b</i>	firm has either sub-layer 1a or sub-layer 1b (dummy)
<i>Dlayer1aAND1b</i>	firm has both sub-layer 1a and sub-layer 1b (dummy)
<i>Dlayer2</i>	firm has technical, managerial and supervisory workers (dummy)
<i>Dlayers12</i>	firm has both layer 1 and layer 2 (dummy)
<i>DGreenfieldWO</i>	setup of the firm as wholly-owned enterprise (dummy)
<i>DGreenfieldJV</i>	setup of the firm as a joint venture (dummy)
<i>DAcqTakeovLocPr</i>	setup of the firm through purchase of pre-existing assets from local private owners (dummy)
<i>DAcqTakeovForPr</i>	setup of the firm through purchase of pre-existing assets from private foreign owners (dummy)
<i>DAcqTakeovStates</i>	setup of the firm through purchase of pre-existing state-owned assets (dummy)
<i>DMotLowProdCost</i>	principal motive to invest: lower production costs (dummy)
<i>DMotAccRes</i>	principal motive to invest: access natural resources/inputs (dummy)
<i>DMotJoinPart</i>	principal motive to invest: join a specific partner (dummy)
<i>DIncCapGrants</i>	most critical motive to invest: capital grants (dummy)
<i>DIncTaxExempt</i>	most critical motive to invest: tax exemption (dummy)
<i>DIncHireGrants</i>	most critical motive to invest: grants for hiring (dummy)
<i>DIncEmpTrain</i>	most critical motive to invest: training employees (dummy)
<i>DIncInfrastr</i>	most critical motive to invest: infrastructure (dummy)
<i>DbackLink</i>	the firm has backward linkages (dummy)
<i>DdomBackLink</i>	the firm has domestic backward linkages (dummy)
<i>DintBackLink</i>	the firm has international backward linkages (dummy)
<i>DimpDirect</i>	the firm imports itself production inputs (dummy)
<i>DimpLocal</i>	the firm sources production inputs from local importer (dummy)
<i>DprodLocal</i>	the firm sources production inputs manufactured locally (dummy)
<i>DfAgeLEQ5</i>	less or equal to 5 years since setup of the firm
<i>DfAgeGT 5</i>	more than 5 years since setup of the firm
<i>DdomSuppliers</i>	the firm has domestic suppliers of raw materials, components or finished goods (dummy)



<i>DoverseasSuppliers</i>	the firm has suppliers of raw materials, components or finished goods overseas (dummy)
<i>DdomLT</i>	suppliers the firm has domestic suppliers of raw materials, components or finished goods with long-term arrangement (dummy)
<i>DoverseasLT Suppliers</i>	the firm has suppliers of raw materials, components or finished goods overseas with long-term arrangement (dummy)
<i>DdptLS</i>	availability of special department for local sourcing (dummy)
<i>DdptLSD</i>	availability of special department for local supplier development (dummy)
<i>DlocProcCustPref</i>	most important factor favouring local procurement: local content is mandated or q strongly encouraged by the ultimate customer (dummy)
<i>DlocProcProdCust</i>	most important factor favouring local procurement: improved local market acceptability or local customization of the product (dummy)
<i>DlocProcLogistics</i>	most important factor favouring local procurement: easier logistics or reduced inventory (dummy)
<i>DlocProcRawMat</i>	most important factor favouring local procurement: access to local raw materials sources (dummy)
<i>DlocProcSuppRel</i>	most important factor favouring local procurement: closer supplier relationship (dummy)
<i>DlocProcEnvResp</i>	most important factor favouring local procurement: environmental responsibility (dummy)
<i>DlocProcCorpCom</i>	most important factor favouring local procurement: corporate commitment to local supplier development in the region (dummy)
<i>DlocProcSuppChain</i>	most important factor favouring local procurement: fiscal or tax efficient supply chain reasons (dummy)
<i>DlocProcRedTar</i>	most important factor favouring local procurement: reduced tariff costs (dummy)
<i>DcancProcLocPr</i>	most important factor deterring local procurement: local prices not competitive (dummy)
<i>DcancProcProdQual</i>	most important factor deterring local procurement: product or service quality not satisfactory (dummy)
<i>DcancProcIntProp</i>	most important factor deterring local procurement: concerns over retention of intellectual property (dummy)
<i>DcancProcLocInfr</i>	most important factor deterring local procurement: local infrastructure issues (dummy)
<i>DcancProcLabRel</i>	most important factor deterring local procurement: labour relations issues (dummy)
<i>DcancProcMgmSkill</i>	most important factor deterring local procurement: technical or management skill issues (dummy)
<i>DcancProcQualPlant</i>	most important factor deterring local procurement: age, quality of plant and equipment of suppliers (dummy)
<i>DcancProcPlantCap</i>	most important factor deterring local procurement: plant or process capacity (dummy)
<i>DcancProcEnvResp</i>	most important factor deterring local procurement: environmental responsibility (dummy)

<i>DimpSA</i>	firm imports from South Africa (dummy)
<i>DimpSSA</i>	firm imports from sub-Saharan Africa (dummy)
<i>DimpEU</i>	firm imports from the European Union (dummy)
<i>DimpUS</i>	firm imports from the United States of America (dummy)
<i>DimpChina</i>	the firm imports from China (dummy)
<i>DimpIndia</i>	the firm imports from India (dummy)
<i>DimpOA</i>	the firm imports from Other Asia (dummy)
<i>DimpMENA</i>	the firm imports from Middle East and North Africa (dummy)
<i>DimpOther</i>	the firm imports from the rest of the world (Other) (dummy)
<i>DimpContiguous</i>	the firm imports from contiguous countries/regions (i.e. SSA, SA, MENA) (dummy)
<i>DimpDistant</i>	the firm imports from more distant countries/regions (i.e. EU, U.S., China, India, Other Asia, Other) (dummy)
<i>DimpSingle</i>	the firm imports from a single country/region (dummy)
<i>DimpMultiple</i>	the firm imports from more than one country/region (dummy)
<i>DsalesDomMarket</i>	sales in the domestic market (dummy)
<i>DsalesExpDirect</i>	sales in an export market directly (dummy)
<i>DsalesExpIndirect</i>	sales in an export market indirectly (dummy)
<i>DsourCompImports</i>	competition for the main product of the firm comes mostly from imports (dummy)
<i>DsourCompLocOwnFirms</i>	competition for the main product of the firm comes mostly from locally-owned firms (dummy)
<i>DsourCompForOwnFirms</i>	competition for the main product of the firm comes mostly from other foreign-owned firms based in the country (dummy)
<i>DexpSA</i>	firm exports to South Africa (dummy)
<i>DexpSSA</i>	firm exports to sub-Saharan Africa (dummy)
<i>DexpEU</i>	firm exports to the European Union (dummy)
<i>DexpUS</i>	firm exports to the United States of America (dummy)
<i>DexpChina</i>	firm exports to China (dummy)
<i>DexpIndia</i>	firm exports to India (dummy)
<i>DexpOA</i>	firm exports to Other Asia (dummy)
<i>DexpMENA</i>	firm exports to Middle East and North Africa (dummy)
<i>DexpOther</i>	firm exports to the rest of the world (Other) (dummy)
<i>DexpContiguous</i>	firm exports to contiguous countries/regions (i.e. SSA, SA, MENA) (dummy)
<i>DexpDistant</i>	firm exports to more distant countries/regions (i.e. EU, U.S., China, India, Other Asia, Other) (dummy)
<i>DexpSingle</i>	firm exports to a single country/region (dummy)
<i>DexpMultiple</i>	firm exports to more than one country/region (dummy)

<i>DnoExporter</i>	firm had no exports in the last two financial years (dummy)
<i>DexpStarter</i>	firm had exports during the last financial year but not two financial years ago (dummy)
<i>DexpExiter</i>	firm had exports two financial years ago, but not during the previous financial year (dummy)
<i>DexpContinue</i>	firm had exports during the previous two financial years (dummy)
<i>DimpExp</i>	firm had both imports and exports during the previous financial year (dummy)
<i>DsingleProdServ</i>	single-product or single-service firm (dummy)
<i>DtwoProdServ</i>	two-product or two-service firm (dummy)
<i>DthreeProdServ</i>	three-product or three-service firm (dummy)
<i>DtwoThreeProdServ</i>	firm produces at least two goods or services (dummy)
<i>DhighProdServConc</i>	high product/service concentration of the firm (dummy)
<i>DotherSubInCountry</i>	other affiliates in the country owned by the same foreign investor (dummy)
<i>DotherSubInSSA</i>	other affiliates in sub-Saharan Africa owned by the same foreign investor (dummy)
<i>DotherSubOutSSA</i>	other affiliates in the rest of the world owned by the same foreign investor (dummy)

Notes: Authors' notation. Each dummy takes a value of 1 if the statement holds, and 0 otherwise.



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