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Abstract

The local sourcing of intermediate products is one the main channels for foreign direct investment (FDI) spillovers. This paper investigates whether and how participation and positioning in the global value chains (GVCs) of host countries is associated to local sourcing by foreign investors. Matching two firm-level data sets of 19 Sub-Saharan African countries and Vietnam to country-sector level measures of GVC involvement, we find that more intense GVC participation and upstream specialization are associated to a higher share of inputs sourced locally by foreign investors. These effects are larger in countries with stronger rule of law and better education.

JEL Classification Numbers: G01; G21; J23; J63

Keywords: Foreign Direct Investment; Global Value Chains; Local Sourcing; Africa; Vietnam

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1. Introduction

Since 2000, interest in developing countries has centered on two main phenomena: the upsurge of foreign capital inflows, and their increasing participation in the fragmentation of production. Developing economies are the main beneficiaries of the global rise in foreign direct investments (FDI): on average, FDI toward developing countries grew by 16.4 percent per year between 2001 and 2016, more than twice the level of investment toward advanced economies (UNCTAD, 2017). Through participation in global value chains (GVCs), firms in developing countries have become full and qualified participants in the global market, specializing in specific stages of the production process, and exploiting their comparative advantage without the need to develop all of the capabilities encompassed by the whole production chain (IMF, 2013; Kowalski et al., 2015; Taglioni and Winkler, 2016). The opportunity to become part of the production chain through participation in one or a few specific stages is of particular relevance for countries with a limited manufacturing base such as many Sub-Saharan African (SSA) countries for which participation in the global market through GVC involvement can be a "*golden opportunity*" (IMF, 2015: 56).

In developing countries, one of the main motivations for attracting FDI is the possibility to take advantage of spillovers arising from the superior technology owned by foreign enterprises which can be transmitted to local developing country firms (Rodriguez-Clare, 1996). Since the pioneering work of Caves (1974), the effect of spillovers on local economic development in the recipient countries has been quite thoroughly investigated, and has produced mixed results (for reviews, see Crespo and Fontoura, 2007, and Görg and Greenway, 2004). Some more recent work focuses on the channels through which domestic firms can benefit from FDI spillovers, and on the factors that determine their existence, sign and magnitude (Farole and Winkler, 2014). One channel which can increase the spillover potential of FDI is local sourcing of different inputs and intermediate products by foreign investors (Newman et al., 2015). In

this case, the generation of spillover effects depends on demand for local supply of more and better inputs, and the assistance that foreign firms offer to their local providers to improve and adapt domestic supply to the requirements of the global market (Rodriguez-Clare, 1996).

We contribute to this literature by adding a novel dimension to the determinants of local sourcing by foreign investors: the host country's involvement in GVCs. We use two measures of engagement in GVCs, calculated from internationally comparable input/output (I/O) tables retrieved from the Eora Multi Region Input-Output (MRIO) database (Lenzen et al., 2012) and computed at the country-sector pair level: a) an index of GVC participation summarizing the importance of global production chains in country (and sector) exports; and b) an index of the GVC position which assesses countries' (and sectors') specialization in the upstream (i.e. production of intermediates used by other countries) and downstream (i.e. use of intermediates produced by other countries to manufacture final goods for exports) stages of the GVC. Intensive participation in GVCs exposes local firms to the requirements of international markets, to more sophisticated demand, and to learning opportunities—thanks to knowledge and technology transfer within the value chain from global leaders to local suppliers. In addition, upstream participation in GVCs implies local specialization in the production of intermediate inputs, available for foreign investors to purchase. Conversely, in developing countries, downstream specialization frequently corresponds to concentration in the assembly phase of imported inputs, exploiting mainly the low-cost local labor force, with no direct impact on the local supply of intermediate inputs.

The empirical analysis is based on two firm-level data sets—the Africa Investor Survey (AIS) of 19 SSA countries, and the Vietnam Investor Survey (VIS)—which were administrated by UNIDO and collect detailed information on foreign investors' choices related to local sourcing and the transfer of knowledge and other key resources to local suppliers. Because of the cross-sectional nature of the data, we control for confounding factors using firm-level characteristics

and we include a set of fixed effects to absorb unobserved heterogeneity at the country and sector levels. In our preferred specification, we control also for more granular host country-industry fixed effects and estimate the differential effect of GVC involvement across firm characteristics.

Joint analysis of SSA countries and Vietnam is particularly pertinent in the context of our research since it allows comparison of a region relatively less attractive for foreign manufacturing investments, with a country that has recently assumed a central role in the rapid expansion of global fragmentation of production. Since its access to the World Trade Organization (WTO) in 2007, Vietnam has received large FDI inflows, based mainly on efficiency seeking motivations. Between 2005 and 2015, the stock of inward FDI in Vietnam increased from US$22,400 million to US$102,790 million.[2] Foreign investment has played a key role in Vietnam's economic transformation, represents a large share of output and employment, roughly 20 percent of GDP and half of the total exports (UNIDO, 2012b). Thanks to strong GVC involvement, Vietnam has emerged as one of Asia's main manufacturing powerhouses (Hollweg at al., 2017). In contrast, the contribution of FDI to African development remains marginal although it has increased (by 9.6 times on average between 2005 and 2015). Infrastructure gaps, political instability and relatively low levels of industrialization and economic diversification are a deterrent to FDI (World Bank, 2015) and participation in GVCs (OECD and AfDB, 2014; IMF, 2015).

Our results show that the degree and modalities of involvement in GVCs matter for the local sourcing of intermediate products by foreign investors. In countries and sectors heavily involved in GVCs, foreign investors are more likely to source their inputs locally. This applies also to countries specialized in more upstream stages of the GVC where higher local sourcing

[2] FDI data are from http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics.aspx.

is accompanied by a higher likelihood that local suppliers will receive support from their foreign buyers. We find also that these results are not driven by Vietnam since in SSA countries the relevance of GVC participation, albeit weaker, remains significant. Furthermore, the relationship between GVC involvement and local sourcing is stronger in countries with stronger rule of law and higher spending on education.

The remaining of the paper is organized as follows. Section 2 provides a brief discussion of the literature on FDI spillovers and GVCs. Section 3 presents some descriptive evidence on GVC involvement and investors' characteristics. Section 4 describes the empirical framework, and Section 5 discusses the main results. Section 6 concludes.

2. FDI, local sourcing and GVC involvement

Among the main channels of transmission of FDI spillovers, backward linkages with local suppliers have a positive and significant impact on the host country (Blomstrom and Kokko, 1998). This relies on two - possibly connected - mechanisms: the demand effect and the assistance effect (Farole and Winkler, 2014). The first refers to increased demand for specific intermediate products, quality improvements and increased variety of local supply, since multinationals require their local suppliers to satisfy the requirements of global markets. The assistance effect is the result of the intentional transfer of knowledge and technological and managerial capabilities by multinationals which assist their local suppliers in order to ensure that their requirements are met. Multinationals can also contribute by providing training for the local labor force, offering local suppliers advance payments and, in some cases, helping them to obtain international certifications.

The literature identifies investor characteristics as determinants of the foreign investor's decision to buy inputs and intermediate products from local companies, and includes the degree

of domestic participation in the foreign investing company, past experience in the host country, mode of and motivations for investment, and the global sourcing strategy (Amendolagine et al., 2013; Jordaan, 2011; Nunnekamp and Spatz, 2004; Paus and Gallagher, 2008). Host country characteristics matter also for the local sourcing strategies of foreign investors. The institutional framework is especially important and can influence contract enforceability (Alfaro et al., 2004; Hsiao and Shen, 2003), and the level of human capital which refers to local suppliers' skills and absorptive capacities (Borensztein et al., 1998).

Involvement in GVCs is another dimension that can affect the local sourcing decision (Taglioni and Winkler, 2016). FDI has been identified as the most common way to link developing countries to GVCs (Taglioni and Winkler, 2016), because multinational corporations are responsible directly (i.e. intra-firm) or indirectly (through contracts), for a large share of trade in value added (UNCTAD, 2013). A few studies highlight that integration in GVCs can affect FDI spillovers, including those connected to local sourcing (Paus and Gallagher, 2008; Farole and Winkler, 2014). These works argue that the country's degree and mode of participation in GVCs can affect the local pattern of production and skills content of local firms (Farole and Winkler, 2014).

On the one hand, higher involvement in GVCs (through both higher imports and exports of intermediate inputs) can improve the capabilities of local firms, since it exposes them to stronger competition, more intense information flows and greater production complexity. Also, since participation in GVCs implies compliance with international quality standards in order to trade in customized inputs, it also implies the selection of high-productivity firms to join GVCs (Del Prete et al., 2017).[3] On the other hand, GVCs can be a barrier to spillovers if the

[3] The nexus between GVC participation and domestic productivity has been investigated recently at both the macro (industry) and micro levels. At the macro level, Formai and Vergara Cifarelli (2016) and Constantinescu et al. (2017) show that industries with high levels of GVC participation report higher productivity. At the firm

(continued…)

country's involvement in GVCs is based mostly on the exploitation of unskilled, low-cost labor or natural resources, or due to preferential treatment in international trade agreements. This type of GVC involvement often results in low levels of upgrading and linkages to local actors (Morris and Staritz, 2016).[4] In addition, although compliance with international standards can foster local firms' performance, in some industries proliferation within GVCs of private standards and certifications can result in high barriers for domestic suppliers due to the high costs of adaptation, forcing foreign investors to source most of their inputs from abroad, and thus, reducing opportunities for local sourcing (Farole and Winkler, 2014).

3. Data and descriptive analysis

3.1 Foreign investments in Sub-Saharan Africa and Vietnam

We use firm-level data from two original surveys, collected by UNIDO: the African Investor Survey, undertaken in 19 Sub-Saharan countries, and the Vietnam Investor Survey.[5] They provide detailed information on the general characteristics of foreign investors, including ownership structure, country of origin, motivation for investing, location determinants, and linkages to local producers.[6]

level, both Del Prete et al. (2017) for North African firms, and Montalbano et al. (2017) for Latin American firms find a positive nexus between GVC participation and domestic firms' productivity.

[4] For instance, in the case of Lesotho, the strong attraction of foreign assembly plants (mostly for Asian investors) in the apparel global value chain is explained by the opportunity for foreign investors to take advantage of the African Growth and Opportunity Act (AGOA), and secure preferential access to the US market (Morris and Staritz, 2016).

[5] For a detailed description of the surveys, see Africa Investor Report (UNIDO, 202015) and Vietnam Industrial Investment Report 2011 (UNIDO, 2012b). Additional information on the surveys is available from the UNIDO Investment Monitoring Platform at http://investment.unido.org/imp/.

[6] Both surveys follow a rigorous methodology in terms of stratified sampling (on 3 dimensions: sector, size and ownership) and interview techniques (face-to-face interviews with top-level managers of foreign- and domestic-owned firms). Notwithstanding the similarities between the two surveys, merging of the two dataset required some manual harmonization.

(continued…)

Similar to other empirical studies on local sourcing by foreign investors, we focus on the manufacturing industry (Belderbos et al., 2001; Kiyota et al., 2008; Görg et al., 2011; Giroud et al., 2012; Amendolagine et al., 2013).[7] The total sample includes 1,915 foreign investors, 42 percent of which are based in Vietnam. Among SSA countries, Kenya (10.1 percent), Uganda (7.2 percent), Nigeria (5.6 percent) and Ghana (4.9 percent) are the most represented in the sample (Table 1).[8]

The majority of foreign investors are specialized in three sectors: Petroleum and Chemical Products (24.5 percent), particularly in Ghana, Mali, Malawi and Nigeria; Textiles and Wearing Apparel (16.5 percent), attracting FDI in Vietnam as well as several SSA countries including Lesotho and Madagascar where it represents the large majority of investments (respectively 72.9 and 57.4 percent of total investments); and Food and Beverage (14.7 percent, especially in Kenya, Rwanda, Uganda and Zambia, see Table 1).[9] Consistent with its more advanced pattern of industrialization and higher diversification, Vietnam attracts large amounts of FDI in sectors that are underrepresented in most of the SSA countries, such as Electrical Products and Machinery and Transport Equipment.

[7] We include ISIC revision 3 categories C and exclude industries such as construction and utilities (representing together 40 percent of the observations) which are less likely to participate in GVCs. We also exclude the service sector since it is available only in the AIS, but not in the VIS.

[8] In both surveys, each investor corresponds to one investment, specifically the initial investment in the country. Appendix Table A1 presents foreign investor characteristics. Vietnam is overrepresented in the dataset since it is obtained by merging a multi-country survey in SSA with a survey of Vietnam. We deal with the overrepresentation by adding destination-country fixed effects to the econometric analysis. In addition, our results are robust to the exclusion of Vietnam (see Section 4).

[9] The sectoral classification was adapted to that used in the Eora MRIO database. It includes 26 sectors, matched to the ISIC Rev. 3 classification (2-digit) in the UNIDO surveys as follows (ISIC codes in parentheses): Food & Beverages (15 and 16); Textiles and Wearing Apparel (17, 18, 19); Wood and Paper (20, 21, 22); Petroleum, Chemical, and Non-Metallic Mineral Products (23, 24, 25, 26); Metal Products (27 and 28); Electrical and Machinery (29, 30, 31); Transport Equipment (34 and 35); Other Manufacturing (36 and 38).

Table 1. Foreign investors by country and sector (number and percentage, by country)

	All sectors	Food & Beverage	Textiles & Wearing Apparel	Wood & Paper	Petroleum & Chemicals	Metal products	Electrical & Machinery	Transport Equipment	Other manufacturing
Vietnam	805 (42.0)	49 (6.1)	162 (20.1)	81 (10.1)	133 (16.5)	89 (11.1)	129 (16.0)	53 (6.6)	109 (13.5)
Burkina Faso	15 (0.8)	4 (26.7)	1 (6.7)	1 (6.7)	3 (20.0)	4 (26.7)	0 (0.0)	0 (0.0)	2 (13.3)
Burundi	13 (0.7)	5 (38.5)	0 (0.0)	1 (7.7)	5 (38.5)	1 (7.7)	0 (0.0)	0 (0.0)	1 (7.7)
Cameroon	39 (2.0)	10(25.6)	0 (0.0)	7 (17.9)	9 (23.1)	6 (15.4)	2 (5.1)	1 (2.6)	4 (10.3)
Cape Verde	22 (1.1)	5 (22.7)	3 (13.6)	3 (13.6)	8 (36.4)	2 (9.1)	0 (0.0)	0 (0.0)	1 (4.5)
Ethiopia	83 (4.3)	15 (18.1)	13 (15.7)	10 (12.0)	24 (28.9)	10 (12.1)	6 (7.2)	0 (0.0)	5 (6.0)
Ghana	93 (4.9)	11 (11.8)	3 (3.2)	12 (12.9)	40 (43.0)	19 (20.4)	4 (4.30)	0 (0.0)	4 (4.3)
Kenya	194 (10.1)	44 (22.7)	25 (12.9)	12 (6.2)	65 (33.5)	24 (12.4)	9 (4.6)	6 (3.1)	9 (4.6)
Lesotho	48 (2.5)	3 (6.2)	35 (72.9)	2 (4.2)	5 (10.4)	0 (0.0)	2 (4.2)	0 (0.0)	1 (2.1)
Madagascar	47 (2.4)	6 (12.8)	27 (57.4)	2 (4.3)	9 (19.1)	0 (0.0)	0 (0.0)	1 (2.1)	2 (4.3)
Malawi	20 (1.0)	1 (5.0)	1 (5.0)	1 (5.0)	8 (40.0)	5 (25.0)	1 (5.0)	1 (5.0)	2 (10.0)
Mali	30 (1.6)	4 (13.3)	3 (10.0)	0 (0.0)	13 (43.3)	5 (16.7)	4 (13.3)	0 (0.0)	1 (3.3)
Mozambique	66 (3.4)	13 (19.7)	7 (10.6)	7 (16.7)	11 (28.8)	19 (28.8)	6 (9.1)	0 (0.0)	3 (4.5)
Niger	9 (0.5)	2 (22.2)	0 (0.0)	1 (11.1)	3 (33.3)	1 (11.1)	0 (0.0)	0 (0.0)	2 (22.2)
Nigeria	108 (5.6)	20 (18.5)	11 (10.2)	7 (6.5)	43 (39.8)	14 (13.0)	7 (6.5)	4 (3.7)	2 (1.8)
Rwanda	24 (1.2)	10 (41.7)	2 (8.3)	0 (0.0)	6 (25.0)	3 (12.5)	1 (4.2)	0 (0.0)	2 (8.3)
Senegal	30 (1.6)	6 (20.0)	3 (10.0)	4 (13.3)	11 (36.7)	5 (16.7)	0 (0.0)	1 (3.3)	0 (0.0)
Tanzania	91 (4.7)	19 (20.9)	9 (9.9)	15 (16.5)	16 (17.6)	13 (14.3)	7 (7.7)	2 (2.2)	10 (11.0)
Uganda	137 (7.1)	43 (31.4)	8 (5.8)	14 (10.2)	46 (33.6)	13 (9.5)	5 (3.6)	3 (2.2)	5 (3.6)
Zambia	41 (2.1)	12 (29.3)	2 (4.9)	4 (9.7)	11 (26.8)	9 (21.9)	1 (2.4)	0 (0.0)	2 (4.9)
Total	1915 (100)	282 (14.7)	315 (16.4)	184 (9.6)	469 (24.5)	242 (12.6)	184 (9.6)	72 (3.8)	167 (8.7)

Notes: The numbers in parentheses refer to the percentage of investments received by each country (in column 1) and to the percentage of investments received by each sector in the country (in the remaining columns).
Source: AIS and VIS.

The average share of inputs that are sourced locally by foreign investors is highly heterogeneous across countries and sectors (Table 2). The countries with a higher number of linkages are Kenya (43 percent), Zambia (25 percent), Tanzania and Ethiopia (23 percent), Uganda and Nigeria (21 percent). In Vietnam, the average share of local sourcing is 18 percent. Considering the average values in different industries, except for Food and Beverage and Wood and Papers which show higher levels of local sourcing compared to other industries, there are no large differences. However, aggregate statistics disguise significant heterogeneities across countries. For instance, in Ethiopia, foreign investors buy 62 percent of their inputs in the local market in labor intensive industries such as Food and Beverage, and 32 percent in Textile and Apparel. High shares of local sourcing in Textiles are found also in Kenya (39 percent) and Uganda (38 percent). In contrast, Lesotho and Madagascar report shares of local sourcing below 10 percent since they act as assembly platforms for Asian multinationals exporting to the US market under the AGOA (African Growth and Opportunity Act) preferential treatments (Morris and Staritz, 2016).

Table 2. Share of local inputs sourced by foreign investors

	All sectors	Food & Beverage	Textiles & Wearing Apparel	Wood & Paper	Petroleum & Chemicals	Metal products	Electrical & Machinery	Transport Equipment	Other manufacturing
Vietnam	0.18	0.25	0.18	0.24	0.19	0.13	0.11	0.17	0.22
Burk. Faso	0.11	0.33	0	No obs.	0	0.07	No obs.	No obs.	0
Burundi	0.11	0.2	No obs.	0	0	0.2	No obs.	No obs.	No obs.
Cameroon	0.21	0.15	No obs.	0.25	0.27	0.33	0	0.3	0.11
Cape Verde	0.13	0.06	0	0.33	0.18	0	No obs.	No obs.	0
Ethiopia	0.23	0.62	0.32	0.12	0.11	0.04	0	No obs.	0.24
Ghana	0.09	0.08	0.03	0.29	0.02	0.11	0	No obs.	0.23
Kenya	0.43	0.4	0.39	0.6	0.41	0.64	0.46	0.3	0.39
Lesotho	0.07	0	0.04	0.5	0.14	No obs.	0.05	No obs.	0
Madagascar	0.17	0.54	0.09	0.3	0.2	No obs.	No obs.	0	0
Malawi	0.14	0.02	0	0.1	0.14	0.25	0	0.3	0
Mali	0.07	0	0.17	No obs.	0.1	0	0.07	No obs.	0
Mozambique	0.12	0.12	0.15	0.34	0.04	0.02	0.12	No obs.	0.5
Niger	0.12	0	No obs.	0.05	0.2	0.3	No obs.	No obs.	0
Nigeria	0.21	0.28	0.38	0.39	0.19	0.15	0.08	0.03	0.05
Rwanda	0.04	0.01	0	No obs.	0	0.25	0	No obs.	0
Senegal	0.12	0.15	0	0.35	0.11	0	No obs.	0	No obs.
Tanzania	0.23	0.28	0.21	0.25	0.23	0.17	0.32	0	0.2
Uganda	0.21	0.23	0.29	0.21	0.17	0.36	0.18	0.13	0.04
Zambia	0.25	0.3	0	0.23	0.24	0.3	0	No obs.	0.33

Source: AIS and VIS.

3.2. Measuring the participation and the position in the GVCs

We calculate two indicators of GVC participation and host country and sector position, based on the Eora Multi Region Input-Output database, which provides information on value added trade for 189 countries and 26 sectors from 1990 to 2012 (Lenzen et al., 2012). Eora is the only IO database that provides information on Sub-Saharan African countries; thus, despite some well-known concerns about missing data filled through optimization procedures, following OECD and AfDB (2014) and IMF (2015, 2016) we use it to measure GVC involvement in the region.[10]

The two GVC indicators are constructed at the country-sector pair level following Koopman et al. (2011) who decompose gross exports into two main components: 1) the *foreign value added* content of intermediate imports embodied in gross exports, and 2) the *domestic value added* which is the value of domestically produced exports. This latter is further decomposed into: 1) *direct domestic value added*—that is, the value added embodied in exports of final goods and intermediates, absorbed by direct importers; 2) *indirect domestic value added*—that is, the value added embodied in intermediates re-exported to third countries; and 3) *re-imported domestic value added*—that is, the value added from exported intermediates that are reimported.

The GVC indicator measuring the participation of each sector *j* in a given country *n* in the cross-national trade of intermediate goods is defined as:

$$GVC\ PARTICIPATION_{jn} = FVA_{jn} + IVA_{jn}\ , \qquad (1)$$

[10] The IMF (2015: 60) includes the following caveat: *"While this extended coverage makes the database invaluable for the analysis conducted here, it should be remembered that some missing data in the IO tables are filled through optimization procedures using as a basis existing national and global statistics; this means that our results should not be taken as exact and precise measures, although we believe the gist of the results to be robust*."

(continued…)

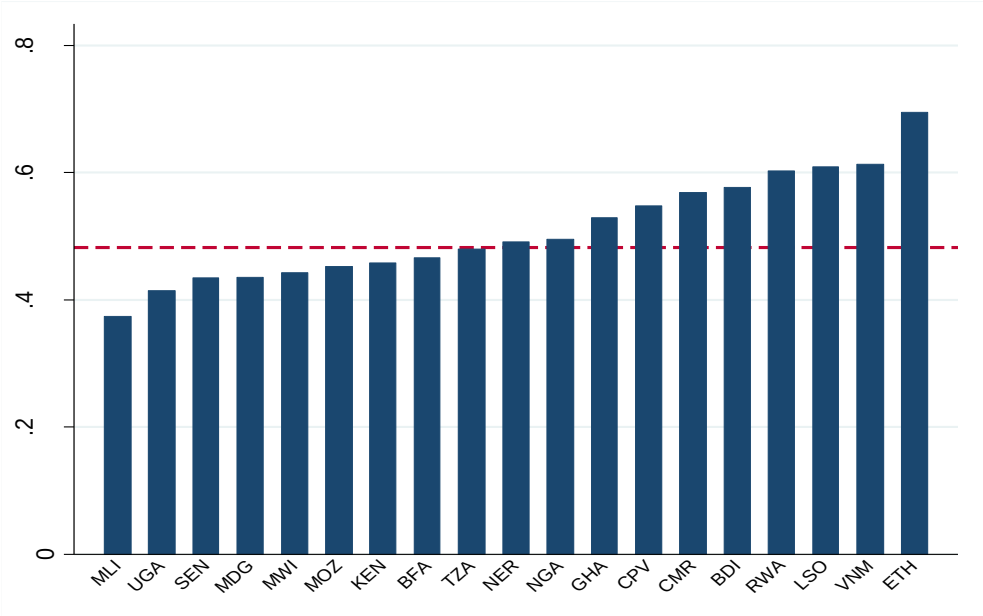
where FVA_{jn} is the foreign value added and IVA_{jn} is the indirect domestic value added in both sector *j* and country *n*, divided by total sector-country exports.

Figure 1 depicts the average level of GVC participation in the countries included in our sample.[11] The countries with the highest levels of participation are Rwanda, Lesotho, Vietnam and Ethiopia, where at least 60 percent of the exported value added consists of intermediates either imported by other countries, or exploited by foreign countries in their exports. The absolute values of both foreign and indirect value added are much smaller in SSA countries compared to Vietnam, confirming that the former are generally still at the beginning of their process of integration into GVCs (IMF, 2016). For instance, while Ethiopia and Vietnam report similar relative levels of participation, the total valued added of the intermediates exported from Vietnam (equal to US$14.6 billion) is more than 16 times that of Ethiopia (US$900 million).

Figure 2 reports the level of GVC participation in the six countries with the highest GVC involvement in each sector. Textile and Apparel is the industry with the highest GVC participation in Lesotho, Vietnam and Ethiopia. Other industries with important GVC participation are Food and Beverages in Senegal, Vietnam and Kenya, Wood and Paper in Ghana and Cameroon, and Chemicals in Niger.

[11] Due to poor data quality, we cannot calculate GVC participation or a position index for Zambia which therefore, is excluded from the following econometric analysis.

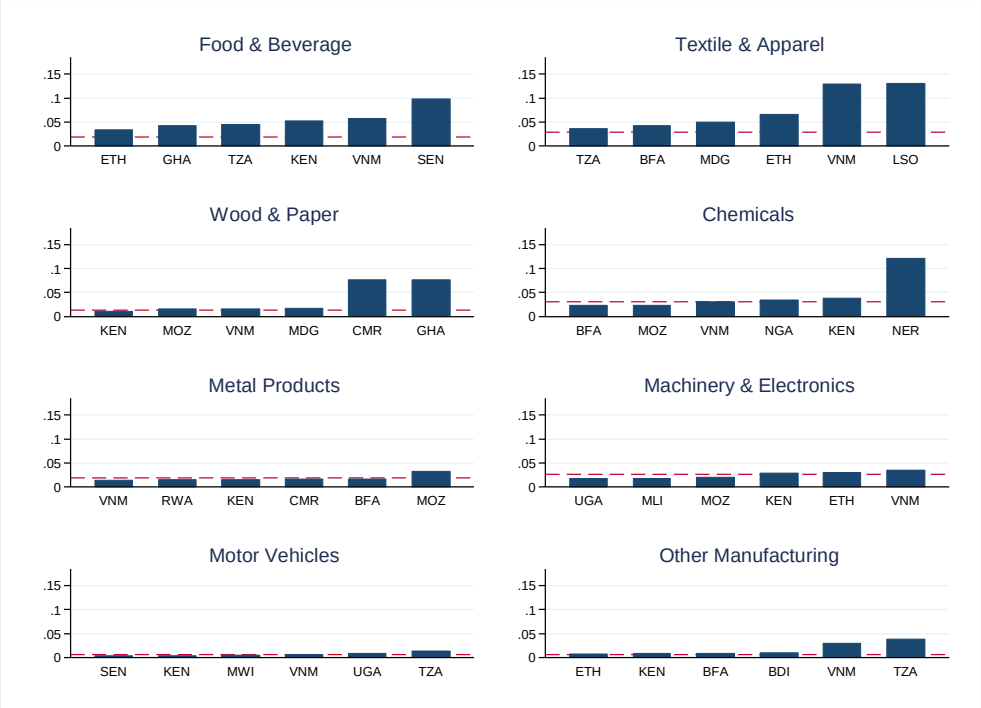
Figure 1. GVC participation at country level (2010)



Notes: The red line represents the average value in developing countries, defined by the World Bank as low income and lower-middle income countries.

Source: authors' elaborations based on the Eora MRIO database.

Figure 2. GVC participation at sector level (2010)



Notes: The red lines represent the average value in developing countries, defined by the World Bank as low income and the lower-middle income countries.

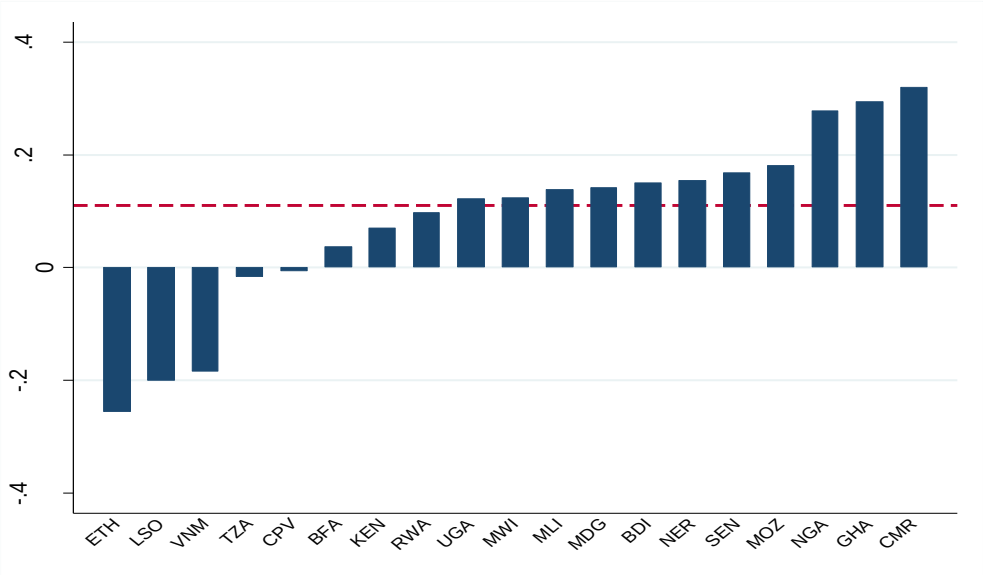
Source: authors' elaborations based on the Eora MRIO database.

The second indicator measures the relative position of sector *j* in country *n* within the GVCs, calculated as the log-difference between the upstream (*IVA*) and the downstream components (*FVA*) of the GVC participation index (as in Koopman et al., 2011):

$$GVC\ POSITION_{jn} = Ln(1 + IVA_{jn}) - Ln(1 + FVA_{jn}) \quad (2)$$

Thus, positive values indicate upstream specialization in the GVC phases of the production process which are remote from final demand (e.g. production of intermediates products used by other countries in their exports), while negative values denote downstream specialization in phases close to final demand (e.g. use of intermediates to produce final goods for exports). Figure 3 depicts the values of the GVC position index across countries. SSA countries are concentrated in upstream activities, confirming their specialization in manufacturing activities linked to the primary sector which is dominant in many of these countries (Foster-McGregor et al., 2015). Furthermore, several SSA countries also have upstream specialization and relatively low levels of GVC participation, since they undertake the very initial stages of the manufacturing transformation of inputs that are exported for further processing. In contrast, countries with relatively high participation in GVCs (e.g. Ethiopia, Lesotho and Vietnam) are generally characterized by a more downstream position.

Figure 3. GVC position at country level (2010)



Notes: The red line represents the average value in developing countries, defined by the World Bank as low income and the lower-middle income countries.

Source: authors' elaboration based on the Eora MRIO database.

Figure 4. GVC position at sector level (2010)

Notes: The red lines represent the average value in developing countries, defined by the World Bank as low income and the lower-middle income countries.

Source: authors' elaborations based on the Eora MRIO database.

For each sector, Figure 4 reports the GVC position for the three most downstream (on the left side) and upstream (on the right side) countries. Overall, the sectors characterized by an upstream GVC position are Wood and Paper, Chemicals, and Metal Products. In Wood and Paper, Ghana and Cameroon are ranked among the top three countries for GVC position, which is thanks to their rich resource endowments. Textile and Apparel and Food and Beverages, two industries characterized by long chains including transformation and assembly of intermediate products, are more downstream in terms of GVC participation. Vietnam has strong downstream involvement in the GVCs in both industries. Ethiopia has downstream positions in Food and Beverages, Wood and Paper and Metal Products which is consistent with evidence showing high shares of imported inputs by manufacturing firms in Ethiopia. It has an upstream position in Textiles and Apparel, confirming wide use of local cotton as an input for production in GVCs (OECD and AfDB, 2014).

4. Empirical analysis

To assess whether and how the participation and position in GVCs are associated to the amount of inputs bought locally by foreign investors, we augment a model widely used to investigate the determinants of local sourcing by the two measures of GVC involvement:

$$Y_{ijn} = GVC\ PARTICIPATION_{jn} + GVC\ POSITION_{jn} + \sum X_{ijn} + \delta_x + \lambda_n + \gamma_j + \varepsilon_i. \quad (3)$$

The dependent variable Y_{ijn} measures the local sourcing intensity as the share of inputs that are sourced domestically by foreign investors *i* in industry *j* and country *n*. Following other studies on the determinants of linkages (Amendolagine et al., 2013; Belberdos et al., 2001; Kiyota et al., 2008; Giroud et al., 2012), the set of control variables (X_{ijn}) includes investor and investment characteristics. Firm specific characteristics include local experience of foreign firms, measured as the log of years since the first investment (*AGE*); foreign share

in the ownership of investors (*FOREIGN OWNERSHIP)*; size of investors, measured by the log of the number of employees (*SIZE*); labor productivity, measured as the log of sales on employees *(LABOR PRODUCTIVITY*); exporter status, measured by a dummy variable identifying foreign investors that export (*EXPORT*). Finally, we control for entry mode and motivation for investment using two dummy variables that take the value 1 if it is a greenfield investment and zero if it is an acquisition (*GREENFIELD*), and 1 if the main reason to invest is market-seeking and zero for any other reason (*MARTKET SEEKING*). Definition, sources, and summary statistics of all the variables are presented in Appendix Table A2.

We include fixed effects for the origin and destination countries of the foreign investor i (δ_x and λ_n, respectively) and for the destination industry j (γ_j), to absorb unobserved heterogeneity which could affect both the degree of GVC participation and the firm propensity to undertake local sourcing. Standard errors are clustered at the destination country-industry pair level to allow for serial correlation among investments in the same industry and the same country.

5. Discussion of the main findings

5.1 Local sourcing of intermediate inputs

The results are reported in Table 3 and show the presence of a positive and statistically significant relation between participation in and position in GVCs, and the extent of local sourcing from foreign investors.

Table 3. Global Value Chain, Local Sourcing and Support to Local Suppliers

Dep. Variable:	LOCAL SOURCING		ANY SUPPORT
Sample:	SSA & Vietnam	SSA	SSA & Vietnam
	(1)	(2)	(3)
AGE	0.017***	0.043***	-0.111
	(0.002)	(0.005)	(0.096)
FOREIGN OWNERSHIP	-0.130***	-0.160***	0.36
	(0.006)	(0.015)	(0.229)
SIZE	-0.031***	-0.061***	0.137**
	(0.001)	(0.003)	(0.067)
LABOR PRODUCTIVITY	-0.013***	-0.027***	0.078**
	(0.001)	(0.001)	(0.035)
EXPORT	0.027***	0.105***	0.195
	(0.004)	(0.012)	(0.151)
GREENFIELD	0.009	-0.030**	0.04
	(0.006)	(0.014)	(0.134)
MARKET SEEKING	-0.022***	-0.082***	0.277***
	(0.006)	(0.012)	(0.077)
GVC PARTICIPATION	2.049***	0.697**	2.295
	(0.074)	(0.327)	(3.02)
GVC POSITION	2.191***	2.501***	5.585*
	(0.074)	(0.398)	(2.93)
LOCAL SOURCING			1.047**
			(0.531)
LOCAL SOURCING^2			-1.139**
			(0.566)
Origin Country Fixed Effects	Yes	Yes	Yes
Host Country Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Number of observations	1,655	923	978

Notes: Columns 1 and 2 report the estimated coefficients of equation (3), obtained with a Tobit Estimator. The dependent variable is the share of inputs sourced domestically by foreign investors (LOCAL SOURCING). Column 3 reports the estimated coefficient of a probit model in which the dependent variable is a dummy equal to 1 if the foreign investor provided any form of support to local suppliers, and zero otherwise (ANY SUPPORT). Results reported in columns 1 and 3 refer to the full sample; results in column 2 refer to the sub-sample of SSA countries. The definitions of all the explanatory variables are provided in Appendix Table A2. Robust standard errors, clustered by investment destination country-industry pair, are reported in parentheses *<0.1, **<0.05, ***<0.01.

The marginal effects retrieved from the estimated coefficient reported in Column 1 indicate that moving from a very low level of GVC participation in a country such as Mali (0.004) to the levels of participation recorded in Vietnam (0.057), the share of intermediate products bought locally increases by 6.4 percentage points, a quite significant change considering that the average share of local sourcing is around 20 percent.[12] Existing evidence from SSA countries and Vietnam—discussed by Farole and Winkler (2014)—confirms that GVC involvement fosters the development of a local supply base, for example, in the mining industry (e.g. in Ghana) or the agro-food buyer driven chain (e.g. in Vietnam, Kenya and Mozambique). In addition, Taglioni and Winkler (2016) show that in similar industries, context specific conditions may explain heterogeneous patterns. For instance, in the food sector, findings from a survey of foreign multinationals in Ghana, Kenya, Mozambique, and Vietnam suggest that linkages to local suppliers are much higher in Vietnam (76 percent) than in African countries (50 percent or less), and that Vietnamese suppliers enjoy higher spillover effects than their African counterparts (Taglioni and Winkler, 2016), notwithstanding similar levels of GVC involvement (see Figure 2).

In addition to GVC participation, our results show that the position in GVCs matters. Countries and industries with upstream specialization in phases of the production process far from the final demand, such as production of intermediate products used in exports by other countries, report higher shares of local sourcing from foreign investors. This result might seem obvious. The more upstream the industry, the more it produces intermediate goods which can be bought by foreign investors. However, this result is of particular interest for SSA countries, whose involvement in GVCs so far has been confined to the export of primary inputs or basic manufacturing products which are transformed elsewhere

[12] It is important to bear in mind that given the cross-sectional nature of the data, the results cannot be interpreted in a causal way.

(Foster McGregor et al., 2015). While the literature on GVCs usually associates a more upstream specialization to lower value added and less structural transformation, we show that this pattern of integration in value chains still offers opportunities to attract FDI with high local content. The experience of upstream sectors such as the agro industry or mining, where both FDI and recourse to higher local sourcing of inputs by foreign firms are increasing, is broadly in line with our findings. Two examples are the Ahafo Linkage program in Ghana in the gold industry reported by Farole and Winkler (2014), and the Government of Tanzania's local content program following the discovery of gas (Sutton, 2014).[13]

These results are not driven exclusively by the relatively high participation of Vietnam in GVCs (Column 2). Nevertheless, it is worth noting that in Column 2 the coefficient of GVC participation is smaller and less precisely estimated if the sample is limited to SSA countries. The relatively low levels of GVC participation in several SSA countries might explain the weaker but still positive relation to the share of local sourcing.

5.1.1 Control variables

The estimated coefficients of the control variables are generally in line with the literature, and confirm the importance of foreign investors' characteristics as mediating factors in the extent of local sourcing (Giroud et al., 2012; Winkler, 2013). Higher levels of sourcing are correlated positively to the experience of foreign investors and their export status,

[13] The Ahafo Linkage Program was established in Ghana in 2007 by Newmont and the International Financial Corporation with the objective of promoting the involvement of local firms in the supply chain of foreign investors in gold mining, where Ghana has an upstream specialization (Farole and Winkler, 2014). Following the discovery of gas reserves, the Government of Tanzania established local content units with the objective of fostering the involvement of domestic firms as suppliers of foreign multinationals investing in the country (Sutton, 2014).

consistent with the view that searching and finding reliable local sources of inputs and establishing local linkages with domestic firms take time (Amendolagine et al., 2013).

In contrast, foreign ownership, firm size, and labor productivity are associated negatively to local sourcing. The result for foreign ownership suggests that foreign investors with strong domestic participation in their capital who are more familiar with the context and are more embedded are more inclined to source locally (Sànchez-Martìn et al., 2015). The findings for firm size and productivity are in line with the tendency of larger and more productive firms to establish global networks of suppliers or to produce intermediate products internally (Winkler, 2013). Finally, the negative relation between market seeking motives and local sourcing, although it contradicts some previous findings (Amendolagine et al., 2013; Giroud et al., 2012) is in line with Winkler (2013) which shows that efficiency seeking labor-intensive investments are more likely to result in higher demand for local inputs.

5.2. Support from foreign investors and GVC involvement

To shed further light on the way that participation and position in the GVC could affect local economies, we estimate equation (3) introducing a new dependent variable, based on the information available about the assistance that foreign investors offer to their local suppliers which can be considered a proxy for *intentional* transfer of resources (Giroud and Scott-Kennel, 2009; Giroud et al., 2012).

The AIS and VIS surveys include information on six different forms of assistance: a) upgrading product quality; b) improving access to working capital/finance/equity; c) upgrading workforce skills; d) transferring technology or know-how; e) collaborating over product design or product development; and f) upgrading the efficiency of production

processes. Supporting product quality upgrading and production process efficiency are the most frequent forms of assistance (respectively in 46.6 and 30.7 percent of cases), followed by collaboration (22.8 percent), training (15.7 percent), access to capital (12.7 percent), and technology transfer (11.6 percent).[14] We construct a synthetic indicator that takes the value 1 if the foreign investor provided at least one form of support to its supplier and zero otherwise (*ANY SUPPORT*).[15] In our sample, 57 percent of foreign investors offer at least one form of assistance after establishing a linkage to a local supplier.

We run a standard probit regression including the same set of explanatory variables used in the baseline model, but adding the share of local linkages (*LOCAL SOURCING*) and its squared term to check for a potential non-linear relation between linkage size and provision of assistance (Giroud et al., 2012). The model includes a large set of home and host country as well as industry fixed effects.

The results are reported in Table 3, Column 3. While the coefficient of GVC participation is no longer significant, the coefficient of GVC position remains positive and significant. Foreign investors involved in more upstream sectors in the value chains seem more likely to assist their suppliers in the early phases of the production process. This might be explained by the fact that in the production chain, the more upstream stages have a higher risk of failing—especially in less advanced economies, and local suppliers require more assistance in these activities compared to downstream activities (Costinot et al., 2013). This interpretation is supported by cross-country evidence on local suppliers based in low

[14] The number of observations for forms of assistance drops to around 61 percent of the total sample since this information is available only for foreign investors that buy some of their intermediates from domestic suppliers.

[15] The results are robust to a different definition of the dependent variable that accounts for more technical forms of assistance (product quality upgrading, production process sectors, technology transfer and training).

income countries (including Ghana, Kenya, Lesotho and Vietnam) which shows that producers of basic inputs in the agro-food and textile value chains receive more support from their foreign buyers (Farole and Winkler, 2014).

The control variables generally have the expected signs. We observe decreasing returns for transfer of resources to the local supply level. In line with Saliola and Zanfei (2009), we find a weaker probability of assistance for higher levels of local linkages. More local linkages may imply specialization among local suppliers in low value added functions, or local industry reliance mainly on standardized production. Investor size matters since larger firms are likely to handle more resources, and therefore to invest more in assisting their suppliers (Joordaan, 2011).

5.3 Heterogeneity

To investigate how heterogeneity in host country conditions and foreign investors' characteristics might affect the impact of GVC on local sourcing, we interact the two measures of GVC involvement with macro and firm-level variables (Table 4).

First, when considering our measure of rule of law (*RULE LAW*) as a proxy for local institutional quality, our results indicate that the effect of GVC involvement is higher in countries with stronger institutions. This finding supports the view that a good institutional environment is important to attract foreign investors. This applies especially if the aim is to create local linkages with domestic suppliers since well-functioning institutions are key to guaranteeing foreign investors enforceability of contracts with local partners (Dollar and Kidder, 2017).

Table 4. Heterogeneity

Dep. Var.: LOCAL SOURCING	(1)	(2)	(3)	(4)
AGE	0.017***	0.003	0.012***	0.012***
	(0.002)	(0.002)	(0.002)	(0.002)
FOREIGN OWNERSHIP	-0.129***	-0.179***	-0.068***	-0.071***
	(0.006)	(0.005)	(0.006)	(0.005)
SIZE	-0.031***	-0.024***	-0.027***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
LABOR PRODUCTIVITY	-0.013***	-0.012***	-0.008***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
EXPORT	0.027***	0.037***	0.041***	0.012***
	(0.005)	(0.004)	(0.004)	(0.004)
GREENFIELD	0.008	0.024***	0.003	0
	(0.006)	(0.005)	(0.005)	(0.005)
MARKET SEEKING	-0.022***	-0.020***	-0.029***	-0.028***
	(0.006)	(0.005)	(0.005)	(0.005)
GVC PARTICIPATION	2.549***	-14.409***		
	(0.085)	(0.079)		
GVC POSITION	2.670***	-18.834***		
	(0.089)	(0.087)		
RULE LAW x GVC PARTICIPATION	0.852***			
	(0.158)			
RULE LAW x GVC POSITION	0.767***			
	(0.171)			
EDUCATION x GVC PARTICIPATION		0.719***		
		(0.004)		
EDUCATION x GVC POSITION		0.901***		
		(0.004)		
EXPORT x GVC PARTICIPATION			-1.754***	
			(0.069)	
EXPORT x GVC POSITION			-1.317***	
			(0.07)	
SIZE x GVC PARTICIPATION				-0.958***
				(0.011)
SIZE x GVC POSITION				-1.062***
				(0.011)
Origin Country Fixed Effects	Yes	Yes	Yes	Yes
Host Country Fixed Effects	Yes	Yes	-	-
Industry Fixed Effects	Yes	Yes	-	-
Host Country x Industry Fixed Effects	No	No	Yes	Yes
Number of observations	1,655	1,593	1,655	1,655

Notes: The table reports the estimated coefficients of equation (3), obtained with a Tobit Estimator. The dependent variable is the share of inputs sourced domestically by foreign investors (LOCAL SOURCING). The definition of all explanatory variables is listed in Appendix Table A2. Robust standard errors, clustered by investment destination country-industry pair, are reported in parentheses *<0.1, **<0.05, ***<0.01.

Second, we consider the share of expenditure on education in GDP (*EDUCATION*)[16] as a proxy for the level of absorptive capacity needed to satisfy foreign investors' demand for sophisticated intermediates (Borensztein et al., 1998). The positive and significant coefficients of the interaction terms imply that high education spending reinforces the positive relationship between GVC participation/upstream position and local sourcing.

In a further step, we interact the GVC indicators with some investor characteristics to allow for firm heterogeneity in the relation between GVC involvement and local sourcing. This strategy allows us to include more granular country-industry fixed effects to account for unobserved factors at the host country-sector level (including e.g., industrial policies, trade agreements, and technological changes) which might shape the relationship between GVC and local sourcing. In this case, we cannot estimate the local level effect of the GVC variables but only the differential effects across firm characteristics.

When we introduce a dummy for exporting firms, the coefficients of both interaction terms are significant and negative, indicating that export-oriented foreign investors are relatively less likely to buy their inputs locally if their country/industry is more involved in GVCs. This result is consistent with the export platform type of investments which are typical in sectors highly integrated in GVCs, such as the clothing industry, where foreign firms move to locations where it is easier (i.e. because of trade agreements) to import and re-export parts and components to third markets. These types of investments are often characterized by low levels of local linkages (Farole and Winkler, 2014). For instance, some SSA countries—such as Madagascar and Lesotho—have benefitted from trade arrangements such as AGOA to attract export-oriented investors from Asia. Since these investors obtain most of their inputs (including fabrics) from their home countries or globally, the degree of integration with local firms is limited (Morris and Staritz, 2016). Vietnam recently signed preferential trade agreements with the EU and Japan and has a number of agreements within the ASEAN

[16] Estimating the same model with the human capital indicator provided by the Penn World Tables provides consistent results.

(continued…)

countries; at the same time, it has increased its involvement in GVCs mostly as an assembler of low value added outputs which are re-exported by the foreign investors based in the country.[17] This finding supports the discussion in Hollweg et al. (2017) on how the involvement of Vietnam in some GVCs (i.e. electronics) hampers upgrading and diversification from low value added tasks (such as assembly), and reduces the opportunities for links between domestic and foreign firms.

Finally, we interact the two measures of GVC involvement with firm size (*SIZE*); the coefficients of the interaction terms are negative and significant. This suggests that the pattern of sourcing by larger firms is stronger if they produce in sectors and countries less integrated into GVCs, and more concentrated in more downstream activities. Among the latter type firms, in countries and industries more specialized in downstream stages of the value chain larger foreign investors may find a larger variety of good quality inputs including those imported (and processed locally), to satisfy their needs.

5.4 Domestic skilled workers as an alternative definition of linkages

We test the robustness of our main results by using a different definition of local linkages based on the share of domestic skilled workers in foreign firms' total skilled employees. As in the case of intermediate goods, foreign firms have to decide whether (and especially in the case of skilled employment) to use local or foreign workers to perform different tasks (Farole and Winkler, 2014). Given that in less developed countries foreign investors compared to domestic firms are usually producing more complex goods, they will require better qualified workers (Rodriguez-Clare, 1996).[18]

In line with existing evidence from other developing countries (Farole and Winkler, 2014), in our sample domestic workers outweigh unskilled employment in foreign firms (on average, more than 90

[17] In our sample, about 90 percent of foreign investors based in Vietnam are exporters (in the case of SSA, this share drops to 51 percent).

[18] Existing evidence is consistent in showing that the entry of foreign firms increases demand for skilled workers (Hale and Xu, 2016).

percent of unskilled employees are domestic). In contrast, the share of domestic employees among skilled workers (including technical, supervisory and managerial employees) is much lower but is mostly heterogeneous across countries: less than 60 percent in Uganda and Tanzania and more than 90 percent in Niger and Burkina Faso.

Appendix Table A3 presents the results of our main empirical specifications (Table 3 Columns 1 and 2) with share of domestic skilled employees in total foreign investor skilled employees as the dependent variable. Overall, the results are consistent with those reported in Table 3. Higher rates of participation in GVCs are correlated to higher shares of local skilled workers at the firm level. The main results are confirmed also in the case of upstream integration in GVCs which boosts local linkages through the employment of local skilled workers. These latter results are confirmed also if we exclude Vietnam from the sample.

6. Conclusions

The increasing involvement of developing countries in GVCs could have positive effect on local economies by enhancing FDI spillovers via an increase in demand for local inputs (so-called demand effect) and the transfer of knowledge from foreign investors to local suppliers (the assistance effect). We test this hypothesis by combining data from two surveys on the role of foreign investors in 19 SSA countries and in Vietnam, with data on internationally comparable I/O tables and calculated two indicators of GVC involvement at the country-industry level.

Our results show that countries and industries with greater participation in GVCs are those where foreign investors generally report higher levels of local sourcing. We find that also the position in the GVC matters; countries specializing in more upstream stages of production attract foreign investors with both higher sourcing potential and a greater willingness to offer support to local suppliers. These results are especially relevant for countries—including most SSA countries—specialized in low-value added phases that are positioned more upstream in the GVC. Our findings support recent policy

efforts in some SSA countries aimed at encouraging foreign investors' use of local inputs by removing constraints related to information asymmetries and improving the quality of the local supplier base. This applies, for instance, to Ghana, Nigeria, Mozambique, Ethiopia and Rwanda, which are investing more in quality standards in order to be able to satisfy more sophisticated demand from foreign investors in more globally integrated industries (especially agro-food and resource processing, but also apparel, cement and motor vehicles).[19] In the Ethiopian case, the state investment commission is supporting upgrading of local firms involved in the GVCs of large international buyers and other multinational companies (Sutton, 2014). The development of industrial parks in the apparel sector is another policy instrument designed to attract foreign investors' interest in local suppliers specialized in more upstream phases of production (Staritz and Whitfield, 2017).

The relation between GVC involvement and FDI is mediated by host country and investor characteristics. At the macro level, the positive relation between the GVC indicators and local sourcing is stronger in countries reporting higher spending on education and stronger rule of law. At the firm level, the relation between GVC and local sourcing is weaker for large and export-oriented foreign investors. In particular, more export-oriented investors tend to invest in assembly platforms which requires only limited local content.

Our study contributes to the growing literature that emphasizes the benefits of GVC involvement, especially for low-income countries (Taglioni and Winkler, 2016; Costantinescu et al., 2017). Our study proposes an additional channel through which the benefits from participation in GVCs can spread through the local economy: attracting foreign investors to establish local sourcing links. Greater involvement in GVCs can improve the business ecosystem in which foreign investors decide to produce, and enhance local capabilities, production quality and knowledge about foreign demand. An improved business ecosystem would encourage foreign investors to rely more on local inputs which would increase domestic demand and potential transmission of positive spillovers to domestic

[19] For related evidence, see https://www.theigc.org/person/john-sutton/), and McCulloch et al. (2017) for Nigeria.

suppliers. Our results show a high degree of complementarity between GVCs and FDI (UNCTAD, 2013; Farole and Winkler, 2014; Taglioni and Winkler, 2016), and suggest that policies to support entry to and upgrading of countries in GVCs could maximize the potential spillovers from FDI.

Our findings have some interesting policy implications. Well-functioning institutions and higher skilled local actors greatly increases the positive relation between GVC involvement and FDI spillovers. However, achieving high levels of GVC involvement does not guarantee FDI with high sourcing potential. Countries and sectors with high GVC involvement might still attract investments with low levels of local links; it is necessary to be able to offer foreign investors low cost inputs and other facilities. Some SSA countries attract investments that require only low level local links; for instance, Lesotho, which is specialized in textiles, and Vietnam, which is heavily involved in the labor intensive stages of production. Policies supporting stronger interactions with local suppliers, upgrading and production quality improvements are needed.

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Appendix

Table A1. Main characteristics of foreign investors

Host country	% of foreign ownership	Top countries of origin (number of investments)	Market seeking (%)*	Efficiency seeking (%)*	Natural resource seeking (%)*	Greenfield (%)	Number of years since the first investment
Vietnam	96.5	China (162), Japan (150)	41.7	43.8	2.4	87.3	9
Burkina Faso	68.7	Lebanon (3)	63.6	18.2	0	70	19.6
Burundi	82.8	Belgium, Rwanda, Netherlands (2)	53.8	7.7	15.4	84.6	28.9
Cameroon	69.3	France (16), Switzerland (5)	67.5	10	10	87.5	26.6
Cape Verde	85.1	Portugal (12), Spain (4)	59.1	13.6	0	71.4	9.7
Ethiopia	82.2	India (11), China (9)	66.3	3.6	12	89.2	9
Ghana	85	India (18), UK (14)	75.3	6.4	6.4	87.2	16.9
Kenya	77.4	UK (60), India (46)	80.1	3	4	92.5	24.1
Lesotho	98	South Africa (17), China (14)	33.3	33.3	2.1	91.7	9.4
Madagascar	89.7	France (18), Mauritius (16)	33.3	27.1	6.2	83	15.8
Malawi	63.3	India & South Africa (3)	73.7	0	5.3	73.7	19
Mali	86.7	France (7), Senegal (6)	80	3.3	3.3	82.8	13.7
Mozambique	86.1	Portugal (27), South Africa (17)	90.8	1.5	0	90.6	18.4
Niger	78.7	Ghana (2)	50	0	0	88.9	14.7
Nigeria	60.6	India (20), Lebanon (14)	71.6	2.7	0.9	88.7	29.3
Rwanda	86.6	Kenya (6), Belgium (3)	83.3	4.2	0	91.7	11.1
Senegal	72.5	France (8), Lebanon, Cote d'Ivoire (3)	66.7	8.3	4.2	92.3	33
Tanzania	81.8	India (25), Kenya (10)	72.5	7.7	4.4	72.5	12.7
Uganda	93.8	India (48), Kenya (37)	64.2	10.2	14.6	86.1	16.1
Zambia	86.1	South Africa, India (6)	76.3	7.9	10.5	68.4	14.8

Notes: Each investor corresponds to the first investment in that country. * The total share of the three motivations does not sum to 100%, because the questionnaire includes other motivations. All the remaining motivations are marginal, and therefore are not reported in the table. Source: AIS and VIS.

Table A2: Variables description, sources and summary statistics

Variable	Definition	Source	Mean	St. Dev.	Min.	Max.	Number of Obs.
LOCAL SOURCING	Share of inputs sourced domestically by foreign investors	AIS and VIS	0.2	0.27	0	1	1,655
ANY SUPPORT	Dummy equal to one if the foreign investor provided any form of support to local suppliers, and zero	AIS and VIS	0.58	0.49	0	1	978
GVC PARTICIPATION	GVC participation index (Koopman et al. 2011)	EORA MRIO	0.04	0.04	0	0.13	1,655
GVC POSITION	GVC position index (Koopman et al. 2011)	EORA MRIO	-0.02	0.03	-0.11	0.03	1,655
DOMESTIC SKILLED	Share of domestic skilled employees on total foreign investor skilled employees	AIS and VIS	0.73	0.28	0	1	1,595
AGE	Logarithm of the number of years since the first	AIS and VIS	2.43	0.74	0	4.72	1,655
FOREIGN OWNERSHIP	Share of foreign ownership	AIS and VIS	0.89	0.23	0	1	1,655
LABOR PRODUCTIVITY	Logarithm of the ratio of sales per employee	AIS and VIS	10.16	1.6	-0.38	20.88	1,655
SIZE	Logarithm of the number of employees	AIS and VIS	5.09	1.4	0	9.83	1,655
RULE LAW	Rule of Law Index (it ranges from -2.5 to 2.5)	World Governance Indicators	-0.57	0.28	-1.19	0.42	1,655
EDUCATION	Education expenditures, in percentage of total government expenditure	World Bank	19.88	3.75	9.38	26.3	1,593
GREENFIELD	Dummy equal to one for greenfield investment, and zero for the other entry	AIS and VIS	0.87	0.34	0	1	1,655
MARKET SEEKING	Dummy equal to one if the investment is market seeking, and zero	AIS and VIS	0.58	0.49	0	1	1,655
EXPORT	Dummy equal to one if the foreign investor exports, and zero otherwise	AIS and VIS	0.68	0.46	0	1	1,655

Table A3. Domestic skilled workers as an alternative definition of linkages

Dep. Variable: DOMESTIC SKILLED	All sample	SSA
	(1)	(2)
AGE	0.028***	0.019***
	(0.001)	(0.002)
FOREIGN OWNERSHIP	-0.295***	-0.297***
	(0.004)	(0.007)
SIZE	0.033***	0.029***
	(0.001)	(0.001)
LABOR PRODUCTIVITY	-0.003***	0.001
	(0.001)	(0.001)
EXPORT	0.025***	0.028***
	(0.003)	(0.006)
GREENFIELD	-0.013***	0.004
	(0.004)	(0.006)
MARKET SEEKING	-0.050***	-0.068***
	(0.003)	(0.006)
GVC PARTICIPATION	0.387***	0.311***
	(0.052)	(0.113)
GVC POSITION	1.056***	0.507***
	(0.054)	(0.104)
Origin Country FE	Yes	Yes
Host Country FE	Yes	Yes
Industry FE	Yes	Yes
Host Country-Industry FE	No	No
Observations	1,595	880

Notes: The table reports the estimated coefficients of equation (3), obtained with a Tobit estimator. The dependent variable is the share of domestic skilled employees in total foreign investor skilled employees (DOMESTIC SKILLED). The results in column 1 are estimated on the full sample; results in Column 2 refer to the sub-sample of SSA countries. Robust standard errors clustered by investment destination country-industry pair, are reported in parentheses. *<0.1, **<0.05, ***<0.01.