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A Review of the Literature on Productivity Impacts of Global Value Chains and Foreign Direct Investment: Toward an Integrated Approach

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Abstract

Information spillovers from multinational enterprises to local firms in developing countries are examined in the literature on global value chains and foreign direct investment. However, both global value chain and foreign direct investment studies are carried out independently and separately. While global value chain studies describe an important mechanism that underlies the productivity improvements of local firms in developing countries, most foreign direct investment studies attempt to assess econometrically the impacts on the productivity of local firms. This literature review concludes that an integrated approach of incorporating the insightful perspective of global value chain studies into the empirical approach of foreign direct investment studies will likely lead to more meaningful empirical findings that may reveal, in greater depth, the nature of information spillovers leading to the productivity improvements of local firms in developing countries.

JEL classification numbers: F21, F23, F63, O33

Keywords: foreign direct investment, global value chains, information spillovers, absorptive capacity, backward linkages, integrated approach

1. Introduction

Information or knowledge spillovers from internationally dispersed activities of multinational enterprises (MNEs) to domestic enterprises are an important source of technological progress in developing countries. For example, the World Bank (2012) considers foreign direct investment (FDI) as an important element in job creation in developing countries through information spillovers on productivity improvements. UNCTAD (2013) discusses the extent to which local enterprises in developing countries benefit from participating in global value chains (GVCs) in terms of increases in value added, employment, income, and exports. Indeed, a majority of developing countries have attempted to attract FDI by establishing investment promotion agencies (Harding and Javorcik, 2011); moreover, developing countries are beginning to attract and absorb more global FDI flows than developed countries.[1]

The main focus of both FDI and GVC studies is to examine the impact of MNEs' dispersed activities on productivity improvement of local firms in developing countries. The main interest of FDI studies is to econometrically elucidate the impacts of knowledge spillovers from FDI on the productivity of domestic firms in host countries and identify factors that affect the strength of such spillover effects.[2] Robust findings of FDI studies are that backward spillovers (typically from foreign enterprises engaged in assembly to

local parts suppliers) are significant and economically important, whereas horizontal spillovers (typically from foreign assemblers to local assemblers) are insignificant or even negative. GVC studies on productivity impacts take for granted that the important relationship between foreign and local enterprises is vertical. They are largely conceptual and descriptive, mainly exploring why domestic firms have specific types of relationships with lead firms, termed as "GVC governance" (Gereffi, Humphrey & Sturgeon, 2005), and whether certain types of GVC governance are associated with particular types of upgrading (that is, increase in value-added activities; Humphrey & Schmitz, 2002; Giuliani, Pietrobelli & Rabellotti, 2005).[3] GVC studies commonly find that high productivity capacity of local enterprises and difficulty of codifying the production system are the decisive factors affecting the choice of trust-based "relational" contracts with local producers rather than "captive" contracts.

However, these studies are carried out independently or separately. For example, none of the representative empirical studies analyzing the impacts of FDI inflows on the productivity of domestic firms in developing countries, such as Aitken and Harrison (1999), Javorcik (2004), Javorcik and Spatareanu (2008), and Lu, Tao and Zhu (2017) refer to seminal GVC studies such as Humphrey and Schmitz (2002) and Gereffi Humphrey and Sturgeon (2005). In contrast, GVC studies focus on the role of global

buyers rather than MNEs directly investing in developing countries, even though both global buyers and MNEs are potential sources of new useful knowledge. Nonetheless, shifting production bases from developed to developing countries can be achieved by either relocating a production base from a parent company to its foreign affiliates (that is, FDI) or outsourcing the production of goods and services to local suppliers or third-party providers by creating GVCs. Considering this, both GVC and FDI studies are bound to have common interests. Note that while a number of empirical studies including Tomiura (2007), Nunn and Trefler (2008, 2013), Tomiura, Banri and Ryuhei (2011), Corcos et al. (2013) and others analyze MNEs' organisational choice of GVCs (that is, FDI versus foreign outsourcing) based on the theoretical models proposed by Antràs (2003) and Antràs and Helpman (2004), they do not analyze the productivity impacts of MNEs on local parts suppliers.

Based on a review of the literature on the productivity impact of GVCs and FDI, this study finds that these two strands of research are commonly interested not only in technological and managerial information spillovers but also in the absorptive capacity of domestic firms and the backward linkages between foreign and domestic firms. Specifically, while FDI studies are interested in the impact of the FDI presence on the productivity of local firms, particularly local parts suppliers, GVC studies are interested

in the mechanism that changes the status of local parts suppliers from “captive” to “relational” because such a change is associated with increased technology transfer from foreign firms to local suppliers. This change will be reflected in the growth of the total factor productivity (TFP) of local firms, which is the focus of FDI studies. Therefore, an integration of the two strands of studies, in which governance type is determined in the first stage and TFP is determined by governance type and other covariates in the second stage, is expected to enrich empirical studies by revealing the mechanisms through which spillovers take place from foreign to local firms.

The rest of this paper is organized as follows. Section 2 discusses the major contributions and limitations of GVC studies from the comparative viewpoint of FDI studies. Section 3 reviews the major findings of existing studies of the channels of knowledge spillovers from FDI and their impacts on productivity as well as the determinants of FDI spillovers in developing countries. Section 4 makes suggestions for enriching FDI studies by incorporating the insightful perspective of GVC studies. The final section concludes and suggests new areas of research useful for facilitating industrial development policies in developing countries.

2. Research on GVCs

2-1. Topics of GVC studies

GVCs are defined as “fragmented supply chains, with internationally dispersed tasks and activities coordinated by a lead firm” (UNCTAD, 2013: 125). Typically, GVC studies aim to explore 1) the types of local firms’ relationships with lead firms (that is, GVC governance), and 2) the relationships between GVC governance and the type of upgrading. Specifically, upgrading is defined as “making better products, making them more efficiently, or moving into more skilled activities” (Giuliani, Pietrobelli & Rabellotti, 2005: 552).

Gereffi, Humphrey and Sturgeon (2005) argue that GVC governance is determined by three factors: complexity of transactions, ability to codify transactions, and supply-base capabilities. We assume that the complexity of transactions is closely associated with transaction costs, the ability to codify transactions refers primarily to the ability to codify production systems, and supply base capabilities encompass those of production and management. Thus, if transaction costs are high, codification of the production system is difficult, and local producers are incapable of production and management activities, the lead firm internalizes its production activities by setting up its own affiliates. That is, FDI is considered as one type of GVC governance. Gereffi, Humphrey and Sturgeon (2005) label this governance type “hierarchy” (see Table 1).

However, transactions between the foreign affiliates and local firms are not their main concern (Morris & Staritz, 2017). Thus, the arrows indicating the directions of order and information do not appear in the case of hierarchy in Figure 1. In contrast, information spillovers, especially through the supply of intermediate inputs to foreign firms (backward linkages), have been one of the key issues in FDI studies since Javorcik's (2004) path-breaking findings. In other words, FDI studies usually consider lead firms as foreign affiliates that are engaged in production activities using subcontracts with local parts suppliers in developing countries, whereas GVC studies, especially those interested in buyer-driven value chains, consider them as global buyers that are located in developed countries and control or coordinate the value chains without directly engaging in production activities or procuring any inputs from local firms (Morris & Staritz, 2017).[4]

[Table 1 here]

[Figure 1 here]

If transaction costs are high and codification of the production system is difficult, but local producers are capable of production and management activities, the lead firm outsources its activities to local producers, with the aim of seeking mutually dependent and beneficial relationships. The development of a good reputation, higher trust created by repeated transactions, and family and ethnic ties between the lead firm and local

producers enable such relationships to flourish. Gereffi, Humphrey and Sturgeon (2005) label this governance type “relational” (see Table 1). Conversely, if transaction costs are high and local producers are incapable, but codification of the production system is easy, the lead firm outsources its activities to local producers and monitors and controls them tightly. In this case, local firms passively receive materials and production instructions from the lead firm. Gereffi, Humphrey and Sturgeon (2005) label this governance type “captive” (see Table 1). Importantly, information flow is bidirectional in a relational value chain, whereas it is unidirectional in a captive value chain (see Figure 1). Gereffi, Humphrey and Sturgeon (2005) also consider market-based relationships, which arise when transaction costs are low, codification of the production system is easy, and local producers are capable.[5] From the perspective of FDI studies, the distinction between captive and relational suppliers is important, because the scope for productivity improvements of local suppliers is clearly different between these two types.

In addition to the typology of the relationships between the lead firm and local firms, GVC studies discuss the relationships between the different types of GVC governance (for example, captive or relational) and different types of upgrading. They usually define functional upgrading as a shift to higher value-added activities within a given value chain such as design, marketing and branding, while defining product

upgrading as a shift to more sophisticated product lines with higher unit values, and process upgrading as a more efficient transformation of inputs into outputs by reorganizing the production system or introducing superior technology within a given type of output (Humphrey & Schmitz; 2002; Giuliani, Pietrobelli & Rabellotti, 2005; UNIDO, 2004). In contrast, FDI studies capture upgrading as productivity improvement, irrespective of the types of upgrading.

Integration into value chains in which local firms have symmetric relationships with the lead firm (for example, relational value chains) offers favorable opportunities for functional upgrading because local producers that are capable of management activities and have relatively strong bargaining powers vis-à-vis the lead firm can negotiate their assigned tasks in the value chains (Humphrey & Schmitz, 2002; Giuliani, Pietrobelli & Rabellotti, 2005; Morrison, Pietrobelli & Rabellotti, 2008; Pietrobelli & Rabellotti, 2011). In fact, many case studies find that large-sized, first-tier, or foreign-owned relational parts suppliers have succeeded in extending their tasks toward pre-assembly and post-assembly stages including some management activities in developing countries, including Bair and Gereffi (2001) in the apparel industry in Mexico; Dolan and Humphrey (2004) for the fresh vegetable industry in Kenya and Zimbabwe; Ponte et al. (2014) for the aquaculture industry in Thailand; and Morris and Staritz (2017) for the apparel industry in Lesotho.

In contrast, integration into value chains in which local firms are in captive relationships with lead firms offers unfavorable conditions for such functional upgrading (Humphrey & Schmitz, 2002; Giuliani, Pietrobelli & Rabellotti, 2005; Schmitz, 2006; Pietrobelli & Rabellotti, 2011). This case confines local producers to simple tasks and discourages them from engaging in value-added activities such as production design and marketing because of their low-level management abilities. In fact, many case studies find limited possibilities of functional upgrading of small-sized, lower-tier or domestically-owned captive parts suppliers in developing countries, including Dolan and Humphrey (2000, 2004) for the fresh vegetable industry in Kenya and Zimbabwe; Schmitz and Knorringa (2000) for the footwear industry in Brazil, China, and India; Bair and Gereffi (2001) for the apparel industry in Mexico; and Navas-Alemán (2011) for the footwear and furniture industry in Brazil.

Both relational and captive suppliers are interested in upgrading the quality of their products and production processes by learning from their production experience (Humphrey & Schmitz, 2002; Pietrobelli & Rabellotti, 2011). However, captive suppliers have particularly favorable opportunities to learn process and product upgrading from lead firms, because they have incentives to instruct local firms to produce high-quality inputs (Humphrey & Schmitz, 2002; Giuliani, Pietrobelli & Rabellotti, 2005; Schmitz,

2006; Altenburg, Schmitz & Stamm 2008; Pietrobelli and Rabellotti, 2011). In fact, some case studies such as Ivarsson and Alvstam (2011), Navas-Alemán (2011), Rossi (2013), and Ponte et al. (2014) find that captive suppliers are likely to achieve process and product upgrading.

2-2. Contributions of GVC studies

Lead firms usually discourage local firms from participating in value-added pre-production and post-production activities because they consider such activities as their core competencies and the major source of their profit (Schmitz & Knorringa, 2000; Bair & Gereffi, 2001; Humphrey & Schmitz, 2002; Schmitz, 2006; Altenburg, Schmitz & Stamm, 2008; Morrison, Pietrobelli & Rabellotti, 2008; Schmitz & Strambach, 2009). Indeed, many case studies find that local suppliers in developing countries often achieve process and product upgrading but face difficulties in functional upgrading (Schmitz & Knorringa, 2000; Navas-Alemán, 2011; Rossi 2013; Ponte et al., 2014). Moreover, functional upgrading requires local suppliers to have advanced technological capabilities that most of them do not have (Martinez-Covarrubias, Lenihan and Hart, 2017). Yet, a recent survey of the GVC literature by Choksy, Sinkovics and Sinkovics (2017) concludes that functional upgrading is a key determinant of increased profit margins for suppliers in

developing countries.

Sato and Fujita (2009) argue that once local firms obtain higher capabilities as suppliers of parts to MNEs, they try to participate in relational value chains, instead of captive value chains. This evolution of local firms' relationships with MNEs extends their functions toward high value-generating tasks related to pre-production and post-production activities. In fact, such evolutionary processes indeed occur in developing countries, as reported by Poon (2004) for the IT industry in Taiwan; Ivarsson and Alvstam (2011) for the furniture industry in China; and Contreras, Carrillo and Alonso (2012) for the automotive industry in Mexico. Importantly, local suppliers' productivity and the governance type choice analyzed by GVC studies are endogenous and mutually dependent. In contrast, FDI studies basically consider that FDI presence is exogenously determined, as will be discussed in the review of FDI studies.

The distinction between captive and relational contracts is similar to the distinction between contracts with "drawings supplied" and "drawings approved" by core firms in the automobile industry in Japan. According to Asanuma (1989) and Sturgeon, Van Biesebroeck, and Gereffi (2008), "drawings approved" have become more common over time, replacing "drawings supplied." Thus, how local producers transform themselves from captive to relational suppliers is a major development issue. This

argument is consistent with the recent findings in the field of development economics that emphasize the role of management practices and managerial human capital in improving the performances of manufacturing firms in developing countries (Bruhn, Karlan & Schoar, 2010; Bloom et al., 2013; Sonobe & Otsuka, 2014). In a study of the productivity improvements of acquired plants in Indonesia from 1983 to 2001, Arnold and Javorcik (2009) suggest that foreign firms employ organizational and managerial systems that make the production process more efficient.

To illustrate the distinction between captive and relational suppliers, Figure 2 shows how total value added is distributed to the local parts supplier and the MNE. We assume that total value added consists of payments to labor and capital (designated by areas KL) and profit (π) accrued to management activities, including technology choice, production design, and marketing. In this framework, when the management improves without changing the employment of capital and labor, π as well as total value added will increase, which will be reflected in increases in TFP.

[Figure 2 here]

In a captive governance system, a local firm receives only area KL, whereas an

MNE receives the whole of π. This is reasonable, because captive suppliers are assigned simple tasks in production activities, and the MNE discourages them from engaging in value-added activities. In contrast, if the local firm is highly capable of management activities and is independent, it receives the major part or even the whole area of π. This is consistent with the view of Dedrick, Kraemer and Linden (2010), who point out that functional upgrading of parts suppliers increases the share of profit accrued to these suppliers. We believe that such a shift from being a captive supplier to a relational supplier is crucial to the industrial development process. However, the production function approach, which FDI studies use exclusively, simply captures this shift as technological improvement.

Further, it is necessary to point out that GVC studies made useful observations on FDI, which are not recognized in FDI studies. First, Hobday and Rush (2007) observe that foreign subsidiaries also improve productivities over time through learning and adaptation. Thus, the productivity of foreign firms may not be wholly exogenous. Second, Sturgeon, Van Biesebroeck, and Gereffi (2008) point out that in the automobile industries, first-tier suppliers in advanced countries initiate production in developing countries after automobile companies relocate their production bases. This indicates that vertical linkages between foreign firms and their first-tier suppliers are not created in developing

countries but are transferred from advanced to developing countries to some extent. Third, Bair and Gereffi (2001) and Dolan and Humphrey (2004) find that small-sized lower-tier suppliers are especially inactive in functional upgrading because first-tier local suppliers as well as foreign firms exert tight control on their incapable subcontractors, especially confining them to simple assembly tasks.

2-3. Limitations of GVC studies

The mechanism underlying the productivity improvements of local firms that GVC studies suggest closely relates to the inter-industry spillover effects of FDI through the supply of parts and components to MNEs (backward linkages), which have been empirically analyzed by a number of FDI studies such as Javorcik (2004) and Javorcik and Spatareanu (2008). However, rigorous quantitative analysis of this mechanism is not the main concern of seminal GVC studies such as Humphrey and Schmitz (2002) and Gereffi, Humphrey and Sturgeon (2005). Indeed, Schmitz and Knorringa (2000), Dolan and Humphrey (2000, 2004), Bair and Gereffi (2001), Navas-Alemán (2011), and Rossi (2013) consider foreign firms to be global buyers such as branded marketers, retailers, and branded manufactures located in developed countries, while they consider local suppliers to be exporters located in developing countries.

It is worth noting that recent GVC studies such as Morrison, Pietrobelli and Rabellotti (2008), Sato and Fujita (2009), Kawakami and Sturgeon (2011), and Lema, Quadros and Schmitz (2015) have pointed out that local suppliers' capabilities are not exogenous. Thus, new GVC studies attempt to develop their own analytical frameworks to analyze the endogenous process and mechanism of local suppliers' capability development and innovation such as "capability matrix" (Sato and Fujita, 2009) and "organizational decomposition of the innovation process" (Schmitz & Strambach, 2009; Lema, Quadros & Schmitz, 2015).

Several econometric studies are carried out on the relationship between the types of GVC governance and the productivity of local firms. For example, Pietrobelli and Saliola (2008) empirically analyzed the impacts of different types of GVC governance on the productivity of local firms in Thailand from 2001 to 2003. Similarly, Simona and Axèle (2012) empirically analyzed the impacts of different types of GVC governance on the knowledge transfer from foreign firms to local suppliers in the Polish automotive industry and find that long-term and trust-based relationships promote knowledge transfer. Saliola and Zanfei (2009) empirically analyzed the impacts of the technological capabilities of local firms as well as the presence and characteristics of foreign firms on the different types of GVC governance in Thailand, using the same cross-sectional data

used by Pietrobelli and Saliola (2008). Although the choice of GVC governance types and technological capabilities of local firms are apparently endogenous, as GVC studies themselves argue, these authors do not deal with the endogeneity issue. We discuss how to deal with this endogeneity issue in Section 4.

3. Research on FDI

3-1. Channels of knowledge spillovers from FDI

In general, there are four major spillover effects: demonstration, labor turnover, competition (that is, the effect of entry of MNEs on market demand for products produced by competing local firms), and vertical linkage (that is, the externalities derived from the backward and forward linkages between MNEs and domestic firms). Review articles by Saggi (2002), Crespo and Fontoura (2007), Smeets (2008), and Rojec and Knell (2018) assume that the demonstration and imitation effects are identical. We wonder, however, if we should separate, at least conceptually, free copying, which corresponds to the demonstration effect, from resource-using activities, which correspond to the imitation effect. The absorptive capacity of domestic firms is particularly relevant in the case of imitation. Further, although studies such as Saggi (2002), Görg and Strobl (2005), Crespo and Fontoura (2007), Smeets (2008), Hamida (2013), Javorcik (2014), and Demena and

Murshed (2018) consider the labor turnover effect in addition to the demonstration and imitation effects, we would like to argue that labor turnover from foreign to domestic firms is one way of imitation, as it must incur the cost of recruiting and employing new workers.

The major problem with the classifications in existing studies, except for Javorcik (2014), is that they do not differentiate between pure and pecuniary externality effects. Since competition and vertical linkage effects undoubtedly occur through market mechanisms (market competition and transaction), we argue that we should treat these effects separately from pure externality effects. The vertical linkage effects could also occur through technological support including training for workers in local firms by foreign affiliates (Ivarsson & Alvstam, 2011; Jordaan, 2011, 2017; Amendolagine et al., 2019). Additionally, the vertical linkage effect could accompany pure externality effects if parts suppliers learn from foreign firms through demonstration and imitation. Therefore, we argue that demonstration, imitation, and some sort of vertical linkage are the pure externality effects of FDI, which should be separated from the pecuniary externality effects (effects of competition effects and training) arising from market mechanisms.

The literature assumes that the effects of demonstration, imitation, and backward linkage on the productivity of domestic firms are positive (Crespo & Fontoura, 2007).

However, the competition effect can have both positive and negative impacts on productivity (see Table 2). On the one hand, if intensified competition with MNEs induces domestic firms to use existing resources more efficiently, it would improve their productivity (Crespo & Fontoura, 2007; Demena & Murshed 2018). On the other hand, if this intensified competition causes domestic firms to lose their market share, it would decrease their productivity (Crespo & Fontoura, 2007; Javorcik, 2014; Demena & Murshed, 2018; Rojec & Knell, 2018).

[Table 2 here]

3-2. Empirical assessment of knowledge spillovers from FDI

As Smeets (2008) and Irsova and Havranek (2013) summarize, the literature commonly analyzes information spillover effects from FDI by estimating the following function:

(1)

$$\ln Y_{ijt} = \beta_0 + \beta_K \ln K_{ijt} + \beta_L \ln L_{ijt} + \beta_1 Horizontal_{jt} + \beta_2 Backward_{jt} + \beta_3 Forward_{jt} + \mathbf{X}'_{ijt}\boldsymbol{\beta}_4 + \mathbf{Z}'_{jt}\boldsymbol{\beta}_5 + \alpha_i + \alpha_j + \alpha_t + \varepsilon_{ijt},$$

where *i* indexes the firm; *j* indexes the industry; *t* indexes time; *Y* is the value added of a domestic firm; *K* is capital; *L* is labor; β_k and β_l are the production elasticities of capital and labor, respectively; *Horizontal* is a measure of the presence of FDI in industry *j*, which is usually measured by the foreign firms' share of total output, employment or

capital, where a "foreign" firm is commonly defined by having more than a threshold level of foreign equity share in the given firm);[6] *Backward* is a measure of the presence of FDI in downstream industries to which industry *j* supplies inputs; *Forward* is a measure of the presence of FDI in upstream industries from which industry *j* purchases inputs; *X* is a vector of the firm-level control variables that are assumed to affect productivity such as the ratio of R&D expenditure and the level of workers' human capital; *Z* is a vector of the industry-level control variables such as the degree of market concentration and export orientation; α_i is a time-invariant firm fixed effect; α_j is a time-invariant industry fixed effect; α_t is a time effect; and ε is an error term.

We usually measure *Backward* and *Forward* by using the following formulas, respectively:

(2)

$$Backward_{jt} = \sum_{k \neq j} (a_{jkt} \cdot Horizontal_{kt}),$$

(3)

$$Forward_{jt} = \sum_{m \neq j} (\sigma_{jmt} \cdot Horizontal_{mt}),$$

where *a* is the proportion of the output of sector *j* supplied to industry *k*. In other words, *Backward* is greater if the FDI presence in industry *k* is larger and it purchases a larger amount of intermediate products from industry *j*. σ is the proportion of the input of

sector *m* purchased by industry *j*.[7] In other words, *Forward* is greater if the FDI presence in industry *m* is larger and it supplies a larger amount of intermediate products to industry *j*. Note that *Backward* or *Forward* is specific to the industry in this specification, implying that this variable captures the effect of inter-industry variations in backward or forward linkages, but not the effect of firm-specific backward or forward linkages. In equation (1), it is assumed that β_1 captures the intra-industry (horizontal) effect, while β_2 and β_3 capture the inter-industry (vertical) effects.

The FDI studies commonly estimate equation (1) or its first-differences by using firm-level panel data in a variety of industries. The representative examples are Aitken and Harrison (1999), Castellani and Zanfei (2003), Javorcik (2004), Bwalya (2006), Haskel, Pereira and Slaughter (2007), Blalock and Gertler (2008), Barrios, Görg and Strobl (2011), Gorodnichenko, Svejnar and Terrell (2014), Kinuthia (2016), and Ebghaei and Wigley (2018). Rather than or in addition to estimating equation (1) directly, Liu (2008), Javorcik and Spatareanu (2008), Blalock and Gertler (2009), Keller and Yeaple (2009), Barrios, Görg and Strobl (2011), Javorcik and Spatareanu (2011), Monastiriotis and Alegria (2011), Fernandes and Paunov (2012), Merlevede, Schoors and Spatareanu (2014), Newman et al. (2015), Fatima (2016), Hong, Sun and Huang (2016), Thang, Pham and Barnes (2016), Lu, Tao and Zhu (2017), Ebghaei and Wigley (2018), and Njikam and

Leudjou (2019) estimate TFP first,[8] and then regress it on FDI spillovers and other control variables in equation (1), using either level or first-difference.

However, this frequently used estimation implicitly adopts the following restrictive assumptions. First, this specification assumes that knowledge spillovers, which are flows, affect the level of productivity, which is determined by the accumulated stock of useful knowledge. Additionally, according to equation (1), FDI does not contribute to the domestic firm's productivity growth, if FDI share is constant, even though FDI presence in the absolute values increases due to the entry of new foreign firms (Todo & Miyamoto, 2006). Note, however, that Haddad and Harrison (1993), Sjöholm (1999), Chung, Mitchell and Yeung (2003), Girma (2005), Todo and Miyamoto (2006), and Hamida and Gugler (2009) use estimation equations where the dependent variable is changed so that knowledge spillovers affect productivity *changes* rather than *levels*.

Second, the spillover effect captured by β_1 is only a demonstration effect because this term captures the effects that arise without any conscious effort by local firms to learn, implying that it does not capture the spillover effects derived from imitation (Hamida, 2013; Demena & Murshed, 2018). Third, the measurement of backward and forward linkages shown in equations (2) and (3) employs assumptions for example, foreign affiliates, regardless of their nationality, have the same input-sourcing behavior

as domestic firms, as Barrios, Görg and Strobl (2011) point out. Indeed, Javorcik and Spatareanu (2011), and Njikam and Leudjou (2019) find that spillovers from backward linkages substantially differ by FDI nationalities. Fourth, the spillover effects of FDI are identical across all industries, namely, β_1, β_2, and β_3 are identical, which enables the use of firm-level data in different industries to identify the spillover effects. Fifth, different industries have the same production function parameters, namely, β_k and β_l are identical. However, some studies using the two-stage estimation method, such as Haddad and Harrison (1993), Todo and Miyamoto (2006), Javorcik and Spatareanu (2008), Blalock and Gertler (2009), Javorcik and Spatareanu (2011), Fernandes and Paunov (2012), Merlevede, Schoors and Spatareanu (2014), Newman et al. (2015), Fatima (2016), Thang, Pham and Barnes (2016), and Lu, Tao and Zhu (2017) separately estimate the production function in each industry in the first stage. In sum, these restrictive assumptions are likely to lead to biased or imprecise estimations of the regression parameters.

In this regard, a specification of the estimation equation proposed by Griffith, Redding and Van Reenen (2004) is highly relevant. The authors analyze the determinants of the industry-level productivity growth of 12 OECD countries from 1974 to 1994. Although their original units of analysis are country and industry, it is possible to change

the units of analysis from country to industry and from industry to firm in our discussion. Their specification has several advantages. First, Griffith, Redding and Van Reenen (2004) assume that knowledge spillovers affect *changes* in productivity, but not the productivity *level*. Second, their specification predicts that the share of R&D expenditure in the firm, technological distance of this firm from the frontier firm in the same industry, and the interaction term between the two affect productivity growth. They also measure the technological distance by using the difference in TFP. In other words, this specification separates the spillover effect automatically derived from the technological distance (i.e., the demonstration effect) from the spillover effect derived from the resource-using activities, measured by R&D expenditure (i.e., the imitation effect). Third, the use of each firm's technological distance from the frontier firm within the same industry allows each industry to have different horizontal spillover effects. Fourth, the authors use the superlative index number approach of Caves, Christensen and Diewert (1982), which allows us to estimate TFP by using flexible production function parameters.[9] Although the specification proposed by Griffith, Redding and Van Reenen (2004) is relevant for FDI research, they focus on the spillover channels between firms in the same industry without considering any spillovers between firms in different industries (that is, the backward and forward linkage effects). To address such problems, we must

revise and extend the specification of their equation.

3-3. Horizontal (intra-industry) spillovers

Based on the meta-analysis, Wooster and Diebel (2010), Havranek and Irsova (2011), and Irsova and Havranek (2013) conclude that horizontal spillovers are insignificant and the occurrence of the positive effects may be derived from model misspecification or depends on specific characteristics of domestic economies and foreign investors. Indeed, a few studies find robust positive intra-industry effects mostly using data from Asian countries (Wooster & Diebel, 2010); for example, for MNEs in Korea (Choi & Pyun, 2017), Malaysia (Khalifah & Adam, 2009), and Turkey (Ebghaei & Wigley, 2018), and for R&D-performing MNEs in Indonesia (Todo & Miyamoto, 2006) and Malaysia (Kinuthia, 2016).

In contrast, many studies that estimate equation (1) or its modified forms in developing countries find negative intra-industry spillover effects. The major examples are Aitken and Harrison (1999) for Venezuela, Bwalya (2006) for Zambia, Javorcik and Spatareanu (2008) for Romania, Kee (2015) for Bangladesh, Fatima (2016) for Turkey, Hong, Sun and Huang (2016) for China, Thang, Pham and Barnes (2016) for Vietnam, and Lu, Tao and Zhu (2017) for China.

Additionally, Javorcik and Spatareanu (2008) and Monastiriotis and Alegria

(2011) found that the negative impacts are larger in wholly owned foreign affiliates than in partially owned foreign affiliates (joint ventures), because domestic firms are likely to have difficulties in accessing sophisticated technologies of fully foreign-owned affiliates or they are likely to protect their technological advantages. Based on meta-analysis, Irsova and Havranek (2013) provide the same finding. Interestingly, Liu (2008) and Merlevede, Schoors and Spatareanu (2014) finds that horizontal spillovers are initially negative but they end up positive in the longer term, thereby indicating that the spillover effect is likely to arise from imitation, requiring resource-using and time-consuming R&D activities.

Therefore, the major findings in the literature indicate that the negative impacts of the competition effect dominate the positive knowledge spillover effects (demonstration and imitation) in the short term in most developing countries (Javorcik and Spatareanu, 2008; Javorcik, 2014). Thus, the presence of foreign firms in most developing countries does not unconditionally generate positive horizontal externality effects. In other words, what matters could be the imitation effect but not the demonstration effect, implying that the absorptive capacity of domestic firms is likely to play a role.

Since these studies reviewed in this sub-subsection typically apply equation (1)

or its modified forms, the estimation results are likely to suffer from the misspecification of the functional relationships. Especially since these studies assume identical horizontal spillover effects across all industries, they could estimate some sort of average effects across them. Thus, it is possible that some industries have positive horizontal effects, while many others have negative horizontal effects.

3-4. Vertical (inter-industry) spillovers

Since Javorcik's (2004) path-breaking study, many studies have found positive backward linkage effects based on equation (1) and its modified forms, including Bwalya (2006) for Zambia, Blalock and Gertler (2008) for Indonesia, Javorcik and Spatareanu (2008) for Romania, Javorcik and Spatareanu (2011) for Romania, Gorodnichenko, Svejnar and Terrell (2014) for 17 transition market economies, Kee (2015) for Bangladesh, Newman et al. (2015) for Vietnam, Fatima (2016) for Turkey, Thang, Pham and Barnes (2016) for Vietnam, Lu, Tao and Zhu (2017) for China, and Ebghaei and Wigley (2018) for Turkey. Recent survey articles including Havranek and Irsova (2011), Javorcik (2014), and Rojec and Knell (2018) also conclude that inter-industry effects are clearer than intra-industry effects.

Although some studies such as Javorcik (2004), Liu (2008), Merlevede, Schoors

and Spatareanu (2014), Barrios, Görg and Strobl (2011), Gorodnichenko, Svejnar and Terrell (2014), and Thang, Pham and Barnes (2016) include the term capturing the effects of forward linkages in addition to backward linkages as shown in equation (1), they find that there is no robust evidence of spillovers occurring through forward linkages. This finding is attributable to the fact that local firms are typically engaged in upstream activities such as parts-supplying, whereas MNEs are mostly engaged in downstream activities. Only a few recent studies such as Fernandes and Paunov (2012), Newman et al. (2015), Fatima (2016), Lu, Tao and Zhu (2017), and Ebghaei and Wigley (2018) find positive forward linkage effects. Recent survey articles including Havranek and Irsova (2011) and Rojec and Knell (2018) conclude that forward spillovers are smaller or less likely to occur than backward spillovers.

The finding that the backward linkage effect is the major channel for positive spillovers indicates that subcontracting relationships between local firms in upstream industries and MNEs in downstream industries are crucial for improving the productivity of local firms. Thus, the findings of FDI studies strongly relate to the argument of GVC research concerned with inter-firm governance issues, as discussed in the review of GVC studies. Indeed, several FDI studies analyze the determinants of local sourcing by foreign firms (Belderbos, Capannelli & Fukao, 2001; Jordaan, 2011; Giroud, Jindra & Marek,

2012; Amendolagine et al. 2013; Amendolagine et al. 2019) or the provision of technology support from foreign firms to local suppliers (Jordaan 2011, 2017; Giroud, Jindra & Marek, 2012; Amendolagine et al. 2019). However, they do not consider variables related to local suppliers' relational status with foreign firms; thus, we believe that we need to fulfil this gap between GVC and FDI studies.

4. Toward an integration of FDI and GVC studies

In this section, we suggest ways in which to incorporate the perspectives of GVC studies into the framework of FDI studies. From the perspective of development of local firms and industries, analyzing how and under what conditions captive suppliers transform into relational suppliers is crucial. The important question is to identify the determinants of the shift from captive to relational suppliers. Estimating a multinomial logit function to identify the determinants of the governance types, Saliola and Zanfei (2009) found that technological competence of local firms relates positively with the choice of knowledge-intensive value chains. A recent survey of the descriptive GVC studies by Choksy, Sinkovics and Sinkovics (2017) also suggests that functional upgrading is more likely to occur in the case of privileged suppliers, which are larger, possess more resources, and have a stronger industrial position than non-privileged suppliers.

Since the governance types of the contract between foreign and local firms affect the division of the value added between foreign and local firms, as illustrated in Figure 2, measured TFP is supposedly affected by the governance types. Thus, we propose to include the governance type as an explanatory variable in the revised TFP change function. The challenges of this new estimation are how to identify the governance type and how to deal with the endogeneity of such variables.

While we cannot determine the best proxy variable for the relational contract a priori, we can suggest several possibilities. The first group of variables refer to the suppliers' position in a given value chain. First-tier suppliers are likely to have relational contracts with foreign firms, as suggested by Bair and Gereffi (2001), Dolan and Humphrey (2004) and Blažek (2016). The second group pertains to the independence of the decision-making authority of the supplier, such as the number of contracting foreign firms and the sales share of the dominant contracting foreign firm. This is because the diversification of customers and markets suggests the symmetric and independent relationships that local suppliers have with foreign firms, indicating relational contractual relationships, as suggested by Dolan and Humphrey (2004). Schmitz (2006) also concludes that the diversification of markets and customers facilitates the functional upgrading of local suppliers. The third group of variables may relate to the nature of the

contract between the supplier and foreign firm, such as its length and the extent of division of labor in preparing drawings or blueprints. A long-term contract with large involvement of a supplier in the preparation of drawings would imply closer relational contracting, as suggested by Asanuma (1989), Sturgeon, Van Biesebroeck, and Gereffi (2008), and Simona and Axèle (2012). The fourth group refers to the composition of workers, including non-production workers engaged in pre-production and post-production activities, as suggested by Gereffi (1999) and Sato and Fujita (2009).

Since the choice of relational contract is endogenous, we need instruments in the new estimation. According to the original ideas of the GVC study by Gereffi, Humphrey and Sturgeon (2005), the variables that represent transaction costs of contracts, codification of production systems, and innate capability of local suppliers are those affecting the choice between captive and relational contracts. Transaction costs are often measured by asset specificity and many studies have analyzed the impacts of asset specificity on buyer-supplier relationships (David & Han, 2004; De Vita, Tekaya & Wang, 2011). However, since Gereffi, Humphrey and Sturgeon (2005) consider that transaction costs are high in both relational and captive contracts, we cannot use this variable for the identification of the contract choice. Since the capability of local suppliers is directly correlated with TFP, we cannot use it for the instrumental variable, either. Thus,

codification of production systems is the only possible variable that potentially serves as the instrument. That is, local suppliers are likely to have relational contracts if codification of the production system is difficult. The codifiability is likely to be related to the nature of transacted parts and components. If transacted parts are standard ones, for example, steel plate, the codifiability will be high. In contrast, if parts are nonstandard and specific to the contractual transaction, the codifiability is likely to be low. Captive contract will be chosen in the former case, whereas relational contract will be chosen in the latter case.

We argue that although it is difficult to identify the nature of transacted parts, some variables representing the nature of transaction are closely related. For example, Dyer (1996a; 1996b) and Artz (1999) use delivery frequency as the operational indicators for nonstandard parts, because they are difficult to obtain from arm's length transactions, and hence, are more likely to be required just-in-time. Based on the classification of Rauch (1999), Nunn and Trefler (2008), Antràs and Chor (2013), and Corcos et al. (2013) use the share of inputs not sold at organized exchanges or reference prices as the variable indicating transactions of the nonstandard or differentiated products and affecting the choice of input suppliers. Note that although this stream of research analyzes global buyers' international sourcing strategy (that is, imports from their own affiliates or independent foreign suppliers), we are concerned with the choice of contract between

foreign affiliates and local suppliers located in the same country. We consider that the idea developed for the international sourcing can be applied to the analysis of the contract choice of local suppliers.

We consider that the delivery frequency of inputs and the share of inputs not sold at organized exchanges or reference prices are possibly appropriate instruments, because they are not necessarily correlated with the suppliers' productivity. In any case, we must further consider the careful selection of appropriate variables for the instruments. We believe that by integrating the analysis of productivity-focused FDI studies with the analysis of contract-focused GVC studies, our understanding of the role of FDI in improving the efficiency of local firms will be deepened further.

5. Conclusions

Given the rapid increase in the volume of FDI flows over the past several decades coupled with its potential role in transferring advanced technology and management practices from developed to developing countries, increasing scholarly attention has been paid to the productivity impacts of FDI on local firms in developing countries. This study reviewed the literature on the productivity impacts of GVCs and FDI, both of which are interested in the transfer of useful knowledge for the development of local firms in

developing nations. Nonetheless, cross-references between GVC and FDI studies on the productivity impacts on local firms are severely lacking.

We first found that the literature on GVCs provides useful insights into the relationships between foreign and local firms, which depend on transaction costs, codifiability of production systems, and production and managerial capability of local firms as well as the ways in which functions, products, and production processes are upgraded. Although GVC studies explore an important mechanism underlying the productivity improvements of local firms, they remain largely conceptual and descriptive. Second, we found that FDI studies have made several significant findings, particularly the importance of the backward linkages between foreign firms in downstream industries and domestic firms in upstream industries rather than the horizontal linkages between firms in the same industry. Such a vertical relationship is the central issue addressed by GVC studies. However, we revealed that the specification of the estimation functions in FDI research suffers from several restrictive assumptions: for example, a common assumption of the existence of identical productivity effects of the presence of FDI across different industries. Furthermore, most FDI studies have failed to explore how useful knowledge is transferred from foreign to local enterprises in practice and, consequently, how the management behavior of local enterprises changes.

To overcome the limitations of existing studies, this study has made several recommendations. First, it has suggested a possible way to avoid the limitations of the estimation methods of the impact of FDI by extending the model of productivity improvement, originally developed by Griffith, Redding and Van Reenen (2004) to examine the effect of the technology gap between the frontier firm and other firms. Second, given that both GVC and FDI research are interested in knowledge transfer, this study has suggested several ways to enrich the latter by incorporating the insights of GVC research. In particular, we proposed the integrated approach, in which the choice of relational contract is determined in the first stage and the changes in local firm's productivity are affected by this choice in the second stage. We provided some suggestions on how to address the endogeneity issue in this new estimation strategy. Further elaboration of estimation methods are called for in order to deepen our understanding of the impact of FDI on the development of local enterprises and industries.

Notes

1. The value of FDI inflows to developing countries surpassed those to developed countries in 2012, for the first time (UNCTAD, 2013).
2. For representative surveys of the empirical literature, see Crespo and Fontoura (2007),

Smeets (2008), Javorcik (2014), and Rojec and Knell (2018).

3. Note that the GVC studies we are interested in must be distinguished from those which attempt to explore a comprehensive and detailed picture of the dynamic network structure of the global economy using multi-country input-output tables. For a comprehensive overview of these GVC studies, see Inomata (2017).
4. In contrast, in the case of producer-driven chains, which are observed in capital-intensive and technology-intensive industries such as automobiles, lead firms are usually considered to engage in production activities, creating multi-layered production systems. Indeed, a few GVC studies analyzing the automotive industry, such as Ivarsson and Alvstam (2005) and Simona and Axèle (2012), focus on the knowledge transfer from foreign affiliates to local parts suppliers.
5. Additionally, Gereffi, Humphrey and Sturgeon (2005) also consider modular relationships, in which local suppliers become “turn-key” suppliers, who mediate between the lead firm and other local suppliers. However, we do not discuss this governance type, because FDI studies usually consider only foreign and local enterprises and do not consider such intermediate firms.
6. An alternative measurement of the presence of FDI is the absolute value of employment (for example, the number of workers employed by foreign firms), as

suggested by Castellani and Zanfei (2003). If we assume that the demonstration effect is the main channel, the use of the absolute value seems plausible because we can treat the existence of FDI like that of public goods.

7. Note that since only intermediate products that foreign firms supply in the domestic market are relevant for forward linkages shown in equation (3), exports are often excluded from output in industry *m* for the measure of the foreign firms' share in industry *m*, as in Javorcik (2004), Barrios, Görg and Strobl (2011), Fatima (2016), and Lu, Tao and Zhu (2017).

8. Conceptually, this amounts to subtracting contributions of labor and capital from value added in equation (1). In order to address the potential endogeneity of factor inputs, these studies use the techniques of Olley and Pakes (1996), Levinsohn and Petrin (2003) or Ackerberg, Caves and Frazer (2015) for estimating TFP in the first stage.

9. See Aw, Chen and Roberts (2001) for an extension of the superlative-index-number approach to the case of combined cross-sectional and time-series data and Arnold and Javorcik (2009) for the application of this approach to estimate TFP.

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Table 1

Three determinants of GVC governance

Governance type	Complexity of transactions	Ability to codify transactions	Supply base capabilities
Market	Low	High	High
Relational	High	Low	High
Captive	High	High	Low
Hierarchy	High	Low	Low

Source: Table 1 in Gereffi, Humphrey and Sturgeon (2005: 87) with authors' own modifications.

Table 2

Impacts of the four channels of knowledge spillovers from FDI on local firms' productivity

	Pure externality	Pecuniary externality
Demonstration	+	
Imitation (Labour turnover)	+	
Competition		−or +
Vertical linkage	+	+

Source: Authors' own elaboration.

Notes: + and −indicate that the channel theoretically has positive and negative impacts, respectively, on domestic firms' productivity.

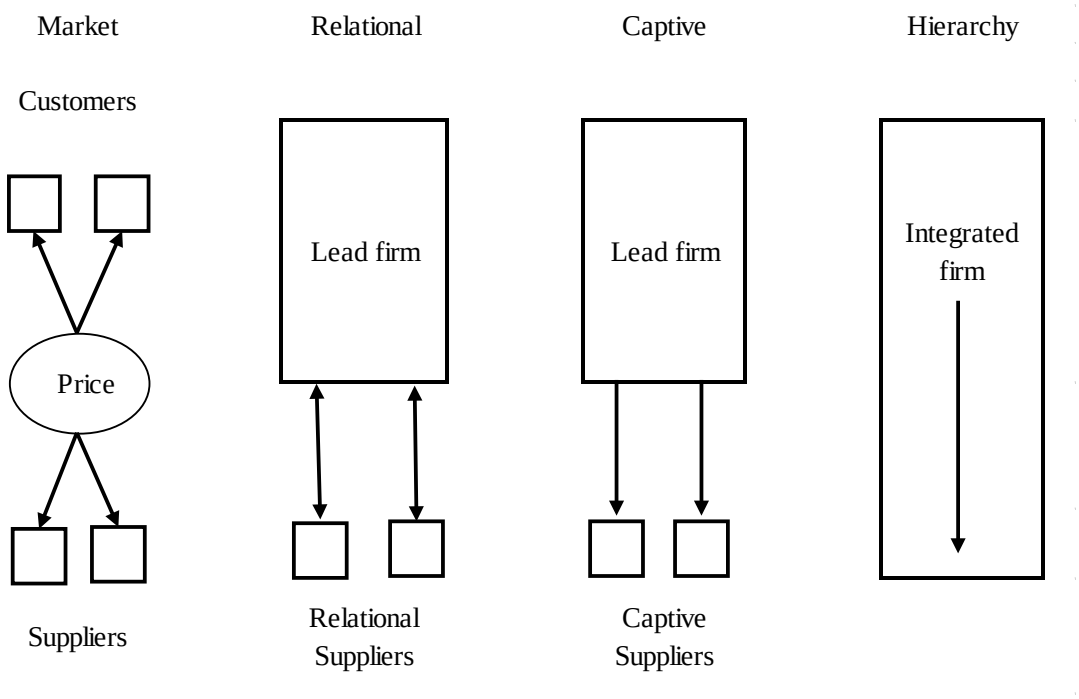

Figure 1. Four types of GVC governance.

Source: Authors' own drawing, based on Figure 1 in Gereffi, Humphrey and Sturgeon (2005: 89).

Note: Arrows show the directions of order and information. Quadrangles show the boundaries of each organization.

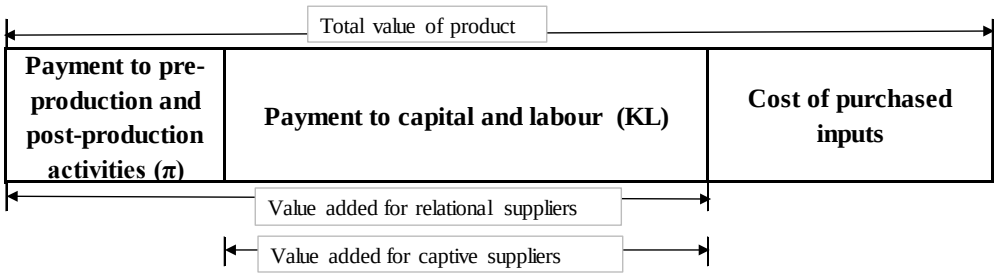

Figure 2. Components of the value added in captive and relational suppliers.

Source: Authors' own elaboration.