

Foreign direct investments and economic growth: Evidence of firm-level productivity spillovers in the Philippines

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Abstract

Can developing countries really benefit from foreign direct investment? This study provides empirical evidence on the FDI – growth nexus at the microeconomic level by assessing the impact of foreign investments on the productivity of local manufacturing firms in the Philippines. While existing literature on spillover effects generally rely on case studies of specific FDI projects and country cases or industry level analyses, this research examines the existence of different spillover mechanisms using firm level data from the 2015 World Bank Enterprise Surveys which cover several aspects of business environment along with measures of firm performance.

Empirical estimates indicate that horizontal linkages, which capture the extent of foreign presence in one sector, are strongest in the electronics, precision instruments, and furniture subsectors, while forward linkages, which proxy for the potential forward spillover effect from foreign presence in a producer industry's suppliers, are strongest in transport machines and machinery and equipment. Finally, the strongest backward linkages are found in the basic metals and refined petroleum products subsectors. Regression results show that the level of firm equity owned by foreign investors (foreign share) has a positive and significant impact on local firm productivity while all proxies for spillover effects are insignificant in all model specifications. This may indicate that spillovers remain limited in the country because of the presence of economic and regulatory constraints: local firms may lack the necessary absorptive capacity to capitalize on beneficial knowledge transfers even as constitutional and

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other legal restrictions on foreign participation in certain key sectors continue to hamper foreign investment inflows.

Keywords: Philippine manufacturing, Foreign direct investment, Spillover effects, Firm productivity

JEL Classification: L60, O12, F21, F23

1 Introduction

Do host economies really benefit from foreign direct investments? Despite the vast literature on the FDI-growth nexus, the nature and the extent of the relationship is far from settled [Balasubramanyam et al (1996); de Mello (1997); Li and Liu (2004); Ali (2010)]. Theoretically, the link seems fairly straightforward but empirically, the evidence is mixed at best.

Neoclassical growth models of the Solow (1956) and Swan (1956) variety posit a positive but limited role of FDI for growth, given diminishing returns to capital. In this traditional framework, the expected impact of FDI is confined to the short run, with investment able to affect the level of income but leaving the long-run growth rate unchanged (de Mello, 1997). Growth in the long run is expected to result from technological progress, which is assumed to be exogenous.

However, the advent of newer models under the aegis of endogenous growth theory has significantly expanded the potential growth-enhancing role of foreign investment. Addressing the criticism levelled at the neoclassical tradition, the more recent models assume that growth determinants are endogenous. If FDI is regarded as a composite bundle of capital stocks, know-how, and technology (Balasubramanyam et al., 1996) then the channels through which it can affect growth are manifold. Several studies suggest that FDI can accelerate growth by augmenting domestic savings and investment, facilitating technology transfers, increasing competition in the domestic market, increasing exports and earning foreign exchange, and enabling positive externalities and spillovers (Ram and Zhang, 2002: 295). Through capital accumulation, FDI benefits the host economy by the incorporation of new inputs and technology in the domestic production function (de Mello, 1997).

It is generally assumed that foreign firms possess some technology and resources considered to be superior to domestic firms (Lipsey and Sjöholm, 2005:23). These resources can come in the form of “nontangible productive assets, such as technological know-how, marketing and managing skills, export contacts, coordinated relationships with suppliers and customers, and reputation” (Aitken and Harrison, 1999: 607). Thus, aside from capital accumulation, another avenue by which FDI can influence growth in the host economy is through spillovers. Many studies conducted at the firm level focus on assessing these effects. Some studies, however, fail to distinguish between actual spillovers and mere transfers.

Smeets (2008) notes an important distinction between knowledge spillovers and knowledge transfers. He defines knowledge spillovers as “knowledge created by one firm (a multinational enterprise) that is used by a second firm (a host-country firm) for which the host-country firm does not (fully) compensate the multinational enterprise” (Smeets, 2008:109). While a spillover can be the potential source of positive externalities, a knowledge transfer is “the purposeful or intended diffusion of knowledge from one firm to the other, which creates no externality (Smeets, 2008:109).

Based on existing literature, there are three broad channels along which knowledge may spill over. These include vertical or inter-industry linkages and horizontal or intra-industry effects, worker mobility and demonstration effects (Smeets, 2008). Many studies focus on the first channel, especially on backward linkages where domestic firms supply foreign companies with raw materials or intermediate goods.

The general aim of this study is to examine the empirical evidence on the FDI – growth nexus at the microeconomic level by assessing the impact of foreign investments on the productivity of local manufacturing firms in the Philippines. While existing literature on spillover effects generally rely on case studies of specific FDI projects and country cases or industry level analyses, this research examines the existence of different spillover mechanisms using firm level data from the 2015 World Bank Enterprise Surveys which cover several aspects of business environment along with measures of firm performance.

2 Literature review

Studies at the industry or firm levels usually focus on assessing the existence of spillovers brought about by the presence of foreign firms. Early attempts include a theoretical study by Rodriguez-Clare (1996) on the impact of foreign entry on the demand for intermediate inputs. Assuming that the intermediate goods sector is monopolistically competitive, he shows that the entry of multinational enterprises increases the demand for intermediate inputs, thus establishing a backward linkage. Moreover, the presence of MNEs can also lead to a rise in the variety of inputs which benefits the final goods producers. Hence, a forward linkage is also created (Rodriguez-Clare, 1996).

Several empirical studies also validate the existence of positive spillovers from the presence of FDI. Javorcik (2004) examines 4,000 firms in Lithuania from 1996 to 2000 while Kugler (2006) studies manufacturing plants in Colombia from 1974 to 1998. They both find that positive effects occur through backward linkages, while no significant effects were detected through forward linkages. On the other hand, Schoors and van der Tol (2001) sample 1,084 firms in Hungary for the period 1997 - 1998 and show that while positive effects exist through backward linkages, forward linkages can actually produce negative effects.

A widely cited study by Aitken and Harrison (1999) uses annual census data from 1976 to 1989 on more than 4,000 firms in Venezuela to answer two basic questions. First, they analyze the extent of the difference in productivity between domestic firms and foreign-owned subsidiaries. Then, they explore the evidence on spillovers from foreign companies to their domestic counterparts. Aitken and Harrison develop an econometric model relating the variation in plant output to several explanatory variables including a vector of inputs (skilled and unskilled labor, materials, and capital) and two measures of foreign ownership: the share of foreign equity participation at the plant level (measured in percentage) and a measure of the presence of foreign ownership in an industry. This latter measure is operationalized as foreign equity participation averaged over all plants in the sector, weighted by each plant's share in sectoral employment (Aitken and Harrison, 1999). An interaction term between the two indicators of foreign ownership is also included in the model. Using

OLS and Weighted Least Squares (WLS), they report a significantly positive coefficient for foreign ownership at the plant level. This suggests that individual plants benefit from foreign investment through large productivity gains. In contrast, they estimate a significantly negative coefficient for the indicator on sectoral foreign ownership, suggesting that “domestic plants in sectors with more foreign ownership are significantly less productive than those in sectors with a smaller foreign presence” (Aitken and Harrison, 1999:610). This, they argue, can be interpreted as a “market-stealing effect.” This result contradicts previous studies which generally found positive spillovers. Finally, their interaction term is positive and statistically significant, implying not only that firms with a significant foreign presence reap positive spillovers, but that these firms also enjoy benefits from increased foreign participation in other plants within the same sector.

Differentiating between small and large firms, however, shows that the positive plant-only effect is only present in smaller plants, defined as those with 50 employees or less. The effect is no longer robust for larger firms when plant-specific effects are controlled for. This indicates that foreign investors in Venezuela give preference to plants that are already productive (Aitken and Harrison, 1999). To further test the robustness of their results and to control for fixed effects, they also re-estimate the basic equations using first-difference and long-difference transformations. With a maximum of four-year differences, the authors show that the coefficient for sector-level FDI remains significantly negative, implying that the negative impact of foreign competition on domestic productivity actually rises over time (Aitken and Harrison, 1999). The plant-level effect of FDI, on the other hand, is shown to be diminishing over time, further boosting the claim that foreign firms simply invest in the most productive plants and locate in the more productive industries. Overall, they show that the net impact of FDI to manufacturing plants in Venezuela is positive but small in magnitude if WLS is used but it is negative when OLS or plant-level within estimates are utilized (Aitken and Harrison, 1999:616).

Other studies focus on assessing spillovers resulting from worker mobility. Multinational firms are “likely to provide some host-country workers with better training, education and work experience than the average local firm does” (Smeets, 2008:114). Again, the assumption is that foreign firms possess better technology and more resources than their local

counterparts. Thus, when trained workers move to local firms or build their own companies, they can utilize the knowledge they acquired without additional compensation to the multinational enterprise. This also constitutes a knowledge spillover. Gorg and Strobl (cited in Smeets, 2008) use a panel of 228 Ghanaian manufacturing firms to confirm that the productivity of local firms may benefit from the owners' previous experience with a foreign firm, but only if they are in the same sector as the multinational enterprise.

Moreover, this mobility may lead to wage spillovers. Poole (2007) investigates the case of formal sector workers in Brazil and concludes that an increase in the presence of foreign workers leads to an increase in wage levels. Lipsey and Sjöholm (2005) note that foreign firms consistently pay higher wages than domestic companies both in developed and developing countries, even after controlling for firm-specific effects. While some argue that this may be due to the penchant of foreign companies to take over domestic firms that already pay higher wages, the authors show that this is not the case. Using a 25-year panel of Indonesian manufacturing firms, Lipsey and Sjöholm (2005) illustrate that the selective takeovers alone cannot account for the wage gap between foreign and domestic firms. Instead, they demonstrate that when a foreign company takes over a locally owned plant, "both blue-collar and white-collar wages rose strongly, in absolute terms and relative to their industries" (Lipsey and Sjöholm, 2005:26). Domestic takeovers of foreign owned plants, meanwhile, produce the opposite effect and lead to an overall decline in wages.

Aldaba and Aldaba (2010) provide an econometric analysis of the spillover effects of FDI to domestic firms in the manufacturing sector in the Philippines. Spillovers are divided into horizontal and vertical linkages, with the latter further subdivided into backward linkages and forward linkages. Employing data from the 1988 and 1998 Census of Manufacturing Establishments, they show that horizontal linkages are strong in manufacturing subsectors where foreign presence is significant including dairy products, hardboard and particle board, petroleum refineries, stationers, artists and office supplies, TV and communication, among others. They also demonstrate that backward linkages are highly significant in textile spinning; weaving, texturizing and finishing; milk-processing; and basic industrial chemicals; while the strongest forward linkages are found in asphalt, lubricants and miscellaneous

products; products of petroleum and coal; butter and cheese manufacturing; ice cream and sherbets; carpets and rugs; rubber and tire manufacturing; and pesticides and insecticides.

Aldaba and Aldaba (2010) then extend their analysis by quantifying the impact of these spillovers on the productivity of the Philippine manufacturing industry using labor productivity and employment level as indicators. Data from the 1988 and the 1998 Annual Census and Survey of Establishments supplemented by information from the 1994 and the 2000 Input-Output Tables are utilized. Value added per worker and employment levels are used as productivity variables with capital per worker, four-firm concentration ratio and total revenue as controls. The horizontal, forward, and backward linkages serve as FDI spillover proxies. Two datasets are utilized: one at the five-digit industry level and the other at the firm level. Panel regression is used to analyze sectoral level data while pooled OLS is also employed to examine firm level values. For labor productivity, estimation results show that horizontal linkages have a positive and significant effect, while forward and backward linkages are positive but have trivial effects. These results may indicate that domestic firms can observe and imitate new technologies introduced by foreign firms or that highly skilled employees can move from foreign companies to domestic firms, thus boosting productivity. On the other hand, the weak backward and forward linkages lend support to the claim that vertical spillovers remain limited in the Philippine manufacturing sector “especially between small and medium domestic enterprises and large domestic enterprises and multinational corporations” (Aldaba and Aldaba, 2010: 30). With employment as the dependent variable, their estimates show that all three linkages have positive but insignificant effects for all models tested. Doing the same analysis but this time using pooled OLS, the authors obtain mixed results for the three spillover types; either the coefficients for horizontal, forward and backward linkages have the wrong sign (negative) or the effect of each indicator is actually negligible. These results prompt the authors to recommend that in order to fully reap the benefits of FDI, existing linkages must be deepened, and domestic firms must strengthen their absorptive capacity (Aldaba and Aldaba, 2010: 33).

3 The model

The study adopts a modified version of the model proposed by Javorcik (2004). To examine the correlation between total firm productivity and FDI in the same sector and in other subsectors, we estimate the following equation:

$$\ln Y_{ij} = \beta_0 + \beta_1 \ln K_{ij} + \beta_2 \ln L_{ij} + \beta_3 \ln M_{ij} + \beta_4 \text{ForeignShare}_{ij} + \beta_5 \text{Horizontal}_j + \beta_5 \text{Backward}_j + \beta_5 \text{Forward}_j + \varepsilon_{ij} \quad (1)$$

Output of firm i operating in sector j is represented by Y_{ij} . K_{ij} measures the level of capital, defined as the net book value of total assets in the present year, including all machineries and equipment as well as land, buildings and other fixed assets. The total number of laborers (both skilled and unskilled) is given by L_{ij} while the total value of material inputs and supplies is given by M_{ij} . Finally, ForeignShare_{ij} measures the share of a firm's total equity owned by foreign investors.

Three measures will be used to proxy for spillover effects. Horizontal_j captures the extent of foreign presence in sector j and measures the presence and extent of horizontal linkages in that sector. This is operationally defined as the average percentage of foreign ownership in the sector weighted by each firm's contribution to sector output and is calculated as follows:

$$\text{Horizontal}_j = \sum_i \text{ForeignShare}_{ij} * \frac{Y_i}{\sum_i Y_i} \quad (2)$$

The value of this index increases with a rise in total foreign equity and with the contribution of foreign firms to total output in that sector.

Backward_j proxies for backward linkages by measuring foreign presence in the industries that are being supplied by sector j . This captures the extent of potential contacts between domestic suppliers and multinational customers and is calculated as:

$$\text{Backward}_j = \sum_{k \text{ if } k \neq j} \gamma_{jk} * \text{Horizontal}_k \quad (3)$$

where γ_{jk} is the proportion of sector j 's output supplied to sector k . The

values are taken from the 2006 Input-Output matrix produced by the Philippine Statistics Authority.

Finally, $Forward_j$ measures the **forward linkage** which serves as proxy for the potential forward spillover effect from foreign presence in a producer industry's suppliers, calculated as the proportion of a sector's intermediate consumption supplied by foreign firms:

$$Forward_j = \sum_{m \text{ if } m \neq j} \delta_{jk} * Horizontal_m \quad (4)$$

where δ_{jk} is the share of inputs purchased by industry j from industry m in total inputs sourced by sector j . Again, coefficients from the 2006 Input-Output table will be used.

4 Data: enterprise survey

Since the focus is on capturing firm-level dynamics, we utilize the data from the Enterprise Survey by the World Bank. This survey is administered to a representative sample of firms (stratified by industry, firm size, and geographic region) in the non-agricultural, formal, private economy and is conducted across many countries. The primary interests are the manufacturing and services sectors. Target respondents are usually business owners and top managers, while company accountants and human resource managers also answer questions relating to actual firm operations (WB, 2015).

As of 2015, the Survey covers 155,000 firms in 148 countries and examines several aspects of business environment along with measures of firm performance. Individual country data sets and survey documentation are all publicly accessible from their online database. While firm surveys have been administered in several countries since the 1990s, the Enterprise Survey has only been recently centralized, and all data collection strategies standardized. In the case of the Philippines, the Survey has only been carried out twice, first in 2009 and the next round in 2015. The latter is the latest available data set for the country.

The 2015 Implementation Report shows that 1,335 firms have been covered in this round of the Philippine Enterprise Survey. Out of these,

1,037 firms are in the manufacturing sector; distributed across 19 subsectors, while 298 are classified under the services sector. Sectors are classified according to the International Standard Industrial Classification of All Economic Activities (ISIC Rev 3.1) and are segmented at the two-digit level. The actual distribution is shown in Table 1.

Table 1. Distribution of surveyed firms by sector

Sector	Number of Firms
Manufacturing	1,335
Chemicals and Chemical Products	149
Fabricated Metal Products	154
Garments	151
Rubber & Plastics Products	161
Electronics	122
Food	159
Other Manufacturing	141
Services	298
Retail	146
Other Services	152
TOTAL	1,335

Since the main focus of the study is on manufacturing firms, all observations for the services sector are dropped. Moreover, since the available data set is in its raw form, extensive data cleaning is required. After dropping observations with missing values and those that do not meet the criteria for subsequent analysis, only 532 firms remain. These establishments are distributed across 18 manufacturing subsectors as shown in Table 2. Firms are also classified according to ownership. Based on standard OECD and IMF definitions, a firm is classified as domestic when the share of foreign investors in total firm equity is less than 10%. On the other hand, substantial foreign ownership implies that at least 10% of firm equity is held by foreign investors.

Table 2. Distribution of firms by sector and equity share

ISIC Code	Sector	Domestic Firms	Firms with foreign capital	Total
15	Food	79	12	91
16	Tobacco	1	0	1
17	Textiles	1	0	1
18	Garments	41	23	64
19	Leather	2	1	3
20	Wood	2	0	2
21	Paper	1	0	1
22	Publishing, printing, recorded media	10	1	11
23	Refined petroleum products	1	0	1
24	Chemicals	70	16	86
25	Plastics and Rubber	70	26	96
26	Nonmetallic mineral products	7	4	11
27	Basic Metals	1	1	2
28	Fabricated metal products	46	26	72
29	Machinery and equipment	6	2	8
31	Electronics	34	34	68
33	Precision instruments	0	2	2
34	Transport machines	2	1	3
36	Furniture	4	5	9
TOTAL		378	154	532

Source: Author's calculations based on 2015 Enterprise Survey dataset.

5 Results

Domestic vs. foreign firms

The Enterprise Survey provides a substantive documentation on several key aspects of production and business performance for covered firms. Before proceeding to the actual regression results, we examine some key differences between domestic and foreign-owned firms based on the channels that can give rise to linkages and potential spillovers.

In terms of the origin of material inputs, Table 3 illustrates that domestic firms acquire most (around 71%) of their production materials

from domestic suppliers, while the remaining 29% are foreign in origin. This is much higher than the values for foreign firms with less than half of their inputs coming from local suppliers, and the rest sourced from foreign partners.

Table 3. Material inputs by origin

	Domestic Firms	Firms with foreign capital	All firms
Material inputs of domestic origin (%)	71.11	42.62	63.02
Foreign origin (%)	28.89	57.38	36.98
TOTAL	100	100	100

*Author's calculations based on 2015 Enterprise Survey dataset.

Aside from the origin of their inputs, another key difference between domestic and foreign firms is in terms of the primary market for their main output. As shown in Table 4 below, most of the output produced by domestic firms covered by the survey are aimed at domestic consumers, with 24.05% going to local markets while around 65% is geared towards the national market. Only 11% is targeted for export. Foreign firms, meanwhile, divide their output nearly equally between domestic and international markets. The average for all firms shows that production is mainly for local consumption.

Table 4. Primary market for main output

	Domestic Firms (%)	Firms with foreign capital (%)	All firms (%)
Local (municipality)	24.05	15.07	21.51
National	64.86	34.25	56.20
International	11.08	50.68	22.29
TOTAL	100	100	100

*Author's calculations based on 2015 Enterprise Survey dataset.

Spillovers may also occur via technology transfers from foreign partners. Table 5 demonstrates that domestic and foreign firms also differ in terms of their usage of foreign-owned technology, but not substantially. Less

than 20% of firms classified as foreign make use of technology from foreign companies while the comparative figure for domestic firms is around 15%. This implies that foreign technologies have not substantially penetrated local production, at least during the time that the survey was conducted.

Table 5. Use of technology licensed from Foreign-Owned Company

	Domestic Firms (%)	Firms with foreign capital (%)
Yes	15.36	19.29
No	84.64	80.71
TOTAL	100	100

*Author's calculations based on 2015 Enterprise Survey dataset.

Finally, we can also compare firms based on their potential productivity, which is indicated by capacity utilization. This is calculated by examining the output produced as a proportion of the maximum output possible if all the resources available were fully utilized. In this aspect, foreign and domestic firms do not vary substantially as shown in Table 6.

Table 6. Capacity utilization

	Domestic Firms (%)	Firms with foreign capital (%)	All Firms (%)
Output produced as a proportion of the maximum output possible if using all the resources available	83.49	82.34	83.18

*Author's calculations based on 2015 Enterprise Survey dataset.

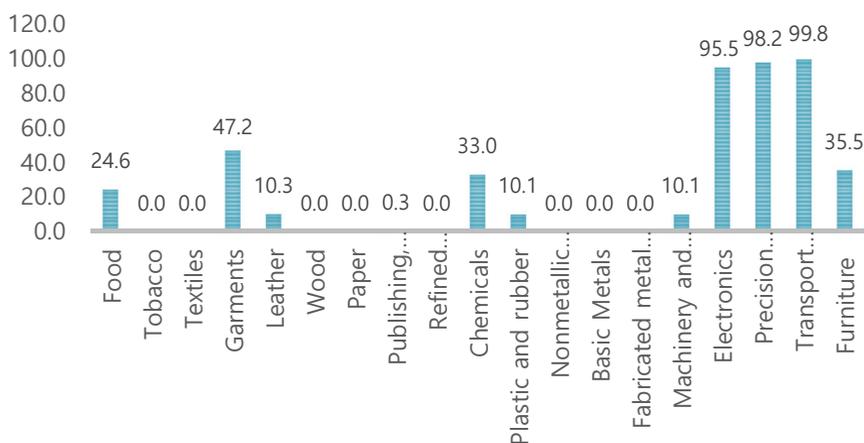
Horizontal and vertical linkages by sector

To measure the spillover effects of FDI to domestic firms in the Philippine manufacturing sector, proxy measures representing intra-industry and interindustry linkages are utilized. These are divided into horizontal and vertical linkages, with the latter further subdivided into backward linkages (where foreign investors source raw materials and intermediate goods from domestic firms) and forward linkages (domestic

firms purchasing intermediate inputs from foreign firms). The calculated values range from 0 to 100, with higher values indicating stronger linkages.

Horizontal linkages quantify the effects of foreign presence on domestic firms in the same industry resulting in potentially beneficial spillovers for firms producing the same output. Results shown in Figure 1 indicate that horizontal linkages are strongest in the transport machines subsector (99.8%), followed by precision instruments (98.2%), and the electronics subsector (95.5). These are the subsectors which are heavily dominated by foreign firms in terms of total equity share and/or individual firm contribution to total output in that industry. Meanwhile, linkages do not exist in 8 subsectors. This can be attributed either to lack of foreign presence in that sector (i.e. no foreign shares greater than 10%) or to minimal share of foreign firms in sectoral output.

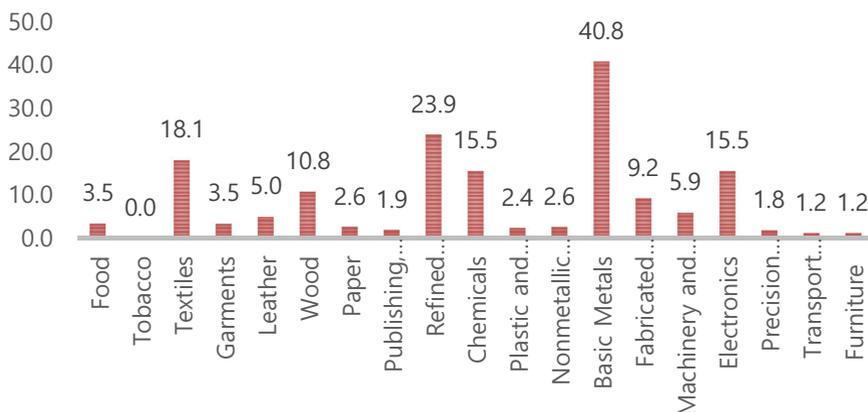
Figure 1. Horizontal linkages by sector



On the other hand, a backward linkage is a proxy for foreign presence in the industries that are being supplied by sector j . It aims to capture the extent of potential contacts between domestic suppliers and their multinational customers. This is calculated by multiplying the values for the horizontal linkages by the proportion of sector j 's output supplied to another sector k using the coefficients from the 2006 Input-Output matrix. Estimation results show that backward linkages are strongest in the basic

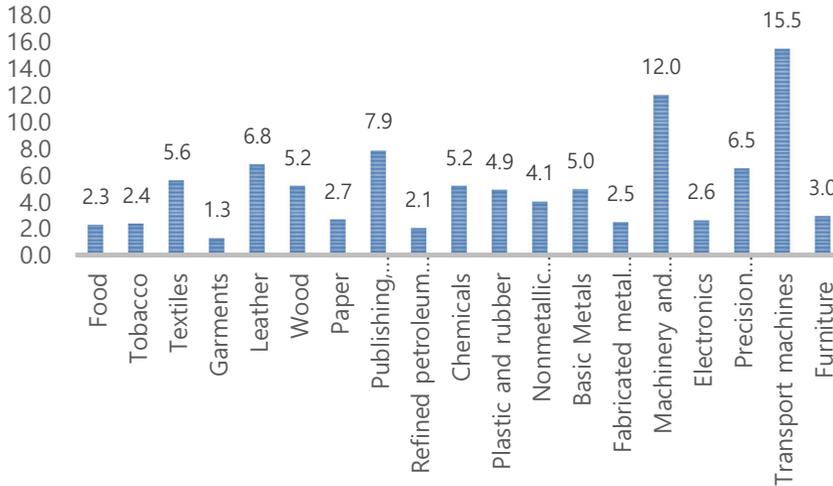
metals subsector (40.8%), followed by refined petroleum products (23.9%). Other subsectors demonstrate very weak to moderately weak backward linkages as shown in Figure 2.

Figure 2. Backward linkages by sector



Finally, a forward linkage serves as a proxy for the potential forward spillover effect from foreign presence in a producer industry’s suppliers, computed as the proportion of a sector’s intermediate consumption supplied by foreign firms. This is calculated by multiplying the horizontal linkage index by the proportion of inputs purchased by sector j from sector m (with foreign presence) using the 2006 IO Matrix. Results show that the strongest forward linkage is found in transport machines (15.5%) and other machinery and equipment (12.0%). These values, however, are comparatively lower than for backward linkages, indicating weaker potential spillovers between foreign suppliers and their domestic customers.

Figure 3. Forward linkages by sector



Regression results

To measure the effects of FDI spillovers on individual firm productivity, we perform an Ordinary Least Squares (OLS) regression on the given model. All the data for the variables comes from the 2015 Enterprise Survey. This is supplemented by the 2006 Input Output Table from PSA. Total output is not directly given in the dataset and is represented instead by total sales, following the suggestion by Khatri, Leruth, and Piesse (2002) who argue that sales, revenue or turnover can represent firm output and

Table 7. Summary statistics

	Variable Name	Observations	Mean	SD
ln Y_{ij}	Total sales of firm <i>i</i>	532	18.12	2.19
ln K_{ij}	Value of fixed assets	527	16.47	2.40
ln L_{ij}	Total number of workers	532	3.57	1.36
ln M_{ij}	Material inputs	532	17.03	2.53
FS_{ij}	Share of equity owned by foreign investors	532	23.50	39.90
HL_j	Horizontal linkages	532	41.23	28.74
BL_j	Backward linkages	532	7.69	5.99
FL_j	Forward linkages	532	3.64	2.08

Kim (2003) who suggests using either gross income or total sales. Table 7 provides some summary statistics for all the variables used.

Regression results presented in Table 8 show that all the input variables are positive and highly significant. Capital (total fixed assets), labor, and material inputs all significantly contribute to firm sales. More importantly, the share of equity owned by foreign investors is also positive and significant. The coefficient indicates that for every 1% increase in foreign share, total firm sales is expected to increase by 0.22% on average. All the proxy variables for spillover effects are shown to be positive in the model containing all firms in the sample. However, they are all insignificant.

Table 8. Regression results (All firms vs domestic firms)

	Variable	All firms	Domestic Firms
ln K_{ij}	<i>Value of fixed assets</i>	.1463*** (.0204)	.1375*** (.0207)
ln L_{ij}	<i>Total number of workers</i>	.2368*** (.0355)	.1890*** (.0369)
ln M_{ij}	<i>Material inputs</i>	.6316*** (.0232)	.6578*** (.0215)
FS_{ij}	<i>Share of equity owned by foreign investors</i>	.0022*** (.0008)	-----
HL_j	<i>Horizontal linkages</i>	.0008 (.0015)	-.00035 (.0017)
BL_j	<i>Backward linkages</i>	.0026 (.0062)	-.0002 (.0073)
FL_j	<i>Forward linkages</i>	.0160 (.0191)	.0142 (.0196)
	constant	3.9899*** (.2836)	3.8911 (.3225)
	R ²	0.8981	0.8916
	F	496.42***	503.08***
	Observations	527	374

* Significant at the 10-percent level; ** Significant at the 5-percent level;

*** Significant at the 1-percent level.

The same estimation procedure is performed this time only for domestic firms in the sample, i.e. those with less than 10% foreign ownership. The last column in Table 8 shows that the results are largely similar when it comes to the input variables which are still positive and significant. On the other hand, horizontal and backward linkages are now negative while forward linkages remain positive. However, all spillover proxies are still insignificant. Collectively, the included independent variables account for around 89% of the variation in firm sales.

Table 9. Regression results: Large vs. small firms

Variable		Large firms (>50 employees)	Small Firms (50 employees or less)
ln K_{ij}	<i>Value of fixed assets</i>	.2102*** (.0345)	.1189*** (.0204)
ln L_{ij}	<i>Total number of workers</i>	.2219*** (.0687)	.2146*** (.0506)
ln M_{ij}	<i>Material inputs</i>	.5765*** (.0298)	.6639*** (.0216)
FS_{ij}	<i>Share of equity owned by foreign investors</i>	.0024* (.0013)	.0018* (.0011)
HL_j	<i>Horizontal linkages</i>	-.0005 (.0021)	.0016 (.0018)
BL_j	<i>Backward linkages</i>	-.0061 (.0089)	-.0014 (.0081)
FL_j	<i>Forward linkages</i>	.0046 (.0334)	.0249 (.0189)
	Constant	4.062*** (.5733)	3.8830*** (.3202)
	R ²	0.8331	0.8827
	F	137.59***	341.76***
	Observations	201	326

The effects of spillovers on firm productivity may also vary depending on the size of the firm. Here a distinction is made between small firms (those with 50 employees or less) and large firms (employing more than 50 workers). Out of the total sample, 201 firms are classified as large while the remaining 326 firms are considered as small. Estimation results presented in Table 9 show that input variables are significantly positive for both small and large firms in the sample. Moreover, foreign share is also positive and significant for both. For large firms, a percentage increase in foreign ownership increases total sales by an estimated 0.24%. The same percentage increase in foreign equity is expected to yield a lower 0.18% increase in sales for small firms. The spillover proxies now vary in signs depending on firm size. Horizontal linkages remain positive for small firms while the coefficient is now negative for large firms. Backward linkages are negative for both firm types, while forward linkages are positive for both.

6 Conclusions

Do domestic firms really benefit from foreign direct investment? This study set out to examine the potential growth-enhancing effects of FDI at

the microeconomic level by measuring the level of spillovers across subsectors in the Philippine manufacturing sector and assessing their impacts on firm productivity. Empirical estimates indicate that horizontal linkages, which capture the extent of foreign presence in one sector, are strongest in the electronics, precision instruments, and furniture subsectors, while forward linkages, which proxy for the potential forward spillover effect from foreign presence in a producer industry's suppliers, are strongest in transport machines and machinery and equipment. Finally, the strongest backward linkages are found in the basic metals and refined petroleum products subsectors. On the average, horizontal linkages are much stronger than forward and backward linkages.

Regression results show that the level of firm equity owned by foreign investors (foreign share) has a positive and significant impact on local firm productivity while all proxies for spillover effects are insignificant in all model specifications. This may indicate that spillovers remain limited in the country because of the presence of economic and regulatory constraints: local firms may lack the necessary absorptive capacity to capitalize on beneficial knowledge transfers even as constitutional and other legal restrictions on foreign participation in certain key sectors continue to hamper foreign investment inflows.

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