

**FDI, DOMESTIC FIRMS' PRODUCTIVITY AND WAGE PREMIUM OF
SKILLED WORKERS: EVIDENCE FROM PERU ***

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This study investigates the impact of foreign direct investment (FDI) on the productivity of domestic firms using Peruvian firm-level data from the World Bank Enterprise Surveys. While previous studies have examined the mobility of workers from multinational enterprises (MNEs) to domestic firms, this study explores the opposite turnover which MNEs attract skilled workers from domestic firms. We find that the positive FDI spillover is significantly reduced for domestic firms that employ a higher share of skilled workers but pay lower wages, and some of them are even exposed to negative FDI spillover. These results suggest that the wage gap between MNEs and domestic firms can hinder human capital transfers to domestic firms, instead causing MNEs to absorb skilled workers from the domestic market. However, the wage gap effect hindering FDI spillover is less pronounced for domestic firms that license technology from foreign MNEs.

Keywords: Foreign Direct Investment, Labor Productivity, Skilled Labor, Human Capital, Peruvian Manufacturing Firm, Wage Premium

JEL Classification: F21, J24, O19

1. INTRODUCTION

According to the World Investment Report (2018) on investment and new industrial policies at the 2018 United Nations Conference on Trade and Development, foreign direct investment (FDI) accounted for 39% of the external financing sources in emerging market economies. Peru, an emerging Latin American market, reported a sharp spike in FDI,

* This paper is based on the Master's thesis of Rebeca Ester Caritas Castro at Korea University Business School. All authors listed have made equal contributions.

which reached USD 3.1 billion in the second quarter of 2019 -a 108% year-on-year increase from USD 1.5 billion (Noticias, 2019)¹. Peru has eliminated strict investment regulations and offered foreign investors special benefits, such as import duty exemptions, income tax holidays, and infrastructure subsidies, to attract FDI. For instance, under a government program called the *Micro y Pequeñas empresas* (Micro and Small Enterprises), multinational enterprises (MNEs) are allowed to delay tax payments for up to three consecutive months if they are closed. They are also not subject to penalties for such delays, but may instead be exempted or forgiven.²

The economic rationale for these subsidies is based on the assumption that foreign capital inflows generate technology spillover effects by diffusing advanced technological and managerial knowledge to the host economy. However, evidence regarding the effects of FDI at the *firm* level remains contentious. In international business literature, the effect of FDI at the firm level is considered to be influenced by complex interactions of firm-specific and environmental characteristics (e.g., Meyer and Sinani, 2009; Tian, 2007).³ Furthermore, among many factors that influence FDI spillovers between firms, human capital is a crucial factor that enhances FDI spillovers (Borensztein et al., 1998; Li and Liu, 2005). Skilled employees, serving as a proxy for rich human capital, have been found to augment the knowledge stock of domestic firms. This human capital mobility carrying advanced technological and managerial knowledge *from* MNE subsidiaries *to* domestic firms is one of the most cited channels for enabling the spillover effect (Fosfuri et al., 2001; Balsvik 2011; Poole 2013).

However, previous literature overlooks the possibility that incoming MNEs attract skilled employees from domestic firms. Indeed, this possibility is related to the negative consequences of MNEs' presence in host countries, such as wage inequality (e.g., Girma et al., 2019; Taylor and Driffield, 2005), as the wage difference between MNEs and domestic firms has widened in response to increased FDI. In emerging market countries, the wage premium of MNEs has been empirically detected (Hijzen et al., 2013; Lipsey and Sjöholm, 2004). Thus, MNEs may prevent their employees from moving to domestic competitors and block positive knowledge spillover by offering wage premiums.

On the other hand, labor mobility from domestic firms to MNEs can be influenced by domestic firms' business relations with MNEs. Previous studies have emphasized the beneficial effects of collaborating with foreign firms such as technology licensing (e.g., Alvarez et al., 2002). This licensing relation can protect domestic firms from skilled

¹ Noticias, A., 2019. <https://www.americatv.com.pe/noticias/actualidad/bcr-inversion-extranjera-directa-peru-crecio-108-ultimo-trimestre-n394594>.

² The Spanish telecommunication company owes USD 1,300 million (4,000 million soles) in taxes that has accumulated over 22 years (RPP noticias, 2016), but they continue to work in Peru without any significant issues. <https://rpp.pe/politica/estado/estas-son-las-empresas-que-mas-dinero-le-deben-al-peru-noticia-982764>

³ García et al. (2013) find that FDI inflows at both the industry and firm levels have negative effects on the ex-post innovation of domestic firms (despite a positive FDI effect on productivity). Recent studies benefitted from a more detailed firm or plant level data, and also examine this issue (e.g., Hayakawa et al., 2016).

worker attrition to MNEs, because MNEs can utilize these licensed firms instead of establishing their own subsidiaries.

This study aims to fill the gap in the literature by examining the issue of skilled workers' attrition in domestic firms and how these firms can retain their employees using internal wage premiums and external business links with foreign MNEs through technology licensing. The study specifically focuses on the role of wage premiums and technology licensing in moderating the impact of FDI on the labor productivity of Peruvian domestic firms that have a high proportion of skilled workers. Peru is an ideal emerging market for this study, as it aggressively employs policies to attract foreign capital. While positive FDI spillover to emerging markets like Peru is considered significantly pronounced, most Peruvian firms are small and medium-sized and vulnerable to competition from foreign entry. A detailed database of Peruvian firms for 2005, 2009, and 2016 was accessed using the periodic World Bank Enterprise Surveys.

This study finds the positive FDI spillover is less pronounced for domestic firms with a higher share of skilled workers. However, among domestic firms with a higher share of skilled workers, those that pay higher wages have greater FDI spillover effects on labor productivity. Another finding is that this wage premium effect was less noticeable for firms that acquired technology licensing from foreign MNEs. The study's findings suggest that some domestic firms struggle to retain skilled workers, rather than benefitting from MNEs' spillover via human capital transfer, because they offer lower wages than MNEs. As foreign competitors are likely to attract highly qualified workers by paying higher wages, domestic firms requiring skilled workers but paying lower wages will likely experience human capital attrition, resulting in decreased labor productivity in response to foreign MNEs' presence.

A novel feature of this study is that while previous studies have examined the mobility of skilled workers from MNEs to domestic firms, this study delves into the possibility of MNEs assimilating skilled workers from domestic firms. To capture this reverse mobility of skilled workers from domestic firms to MNEs, it investigates how a wage premium determines the impact of industry FDI on the labor productivity of domestic firms with a high share of skilled employees. We argue that the incentive to attract human capital, proxied by wage level, is crucial for FDI spillover effects. Although domestic firms' human capital can contribute to positive FDI spillovers, those that cannot retain skilled workers may encounter adverse performance.

Our work is related to Sinani and Meyer (2004) in that they find that FDI spillovers harm small firms with a significant share of skilled labor because of the possible reverse migration of skilled workers from domestic firms to MNEs. Although they document limited FDI spillovers encountered by domestic firms with a high share of skilled employment (see their footnote 6), they do not provide empirical evidence on the potential micro mechanism regarding these muted spillovers for domestic firms with a high share of skilled employment. However, given that MNEs' higher wages could be the primary reason why skilled workers do not move from MNEs to domestic firms, this study highlights how domestic firms' lower wages negatively affect domestic firms as

they struggle to retain or hire qualified workers. In addition to considering wage level, this study suggests a remedial strategy for domestic firms to benefit from FDI by utilizing technology licensing contracts.

The remainder of this paper is organized as follows. Section 2 summarizes the existing literature on the effects of FDI on domestic firms and proposes hypotheses. Section 3 provides the empirical methodology and data. The results are presented in Section 4. Finally, the conclusions are presented in Section 5.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Background: FDI Effect on Domestic Firms

Previous research indicates that two contrasting views exist regarding the impact of foreign MNEs, and empirical evidence remains inconclusive (see Blomström and Kokko, 1998). On the one hand, domestic firms may benefit from the productivity spillover effects of inward FDI, as MNEs' valuable intangible assets can be transmitted to domestic firms through human capital flows. Knowledge spillovers can occur when former MNE employees with technological know-how are hired by domestic firms (Fosfuri et al., 2001). Domestic firms may also benefit from their linkages with foreign suppliers by accessing technology support and high-quality, low-cost intermediate inputs (Newman et al., 2015). When domestic firms serve as suppliers of intermediate goods for foreign customers, the linkage effect is to pressure domestic suppliers to upgrade the quality of their products to meet the higher quality standards required by foreign enterprises (Suyanto et al., 2014). Moreover, domestic firms may benefit from the demonstration effect of MNEs through imitation-induced innovation (Crespo and Fontoura, 2007). On the other hand, MNEs may harm the productivity of domestic firms, referred to as the market-stealing effect (Aitken and Harrison, 1999). Foreign competitors are better endowed with technical and managerial skills, enabling them to supply higher-quality products and services at lower prices, thereby eroding domestic firms' market share. Consequently, domestic firms may be forced to produce at lower levels.

There have been mixed empirical findings on the impact of FDI on the productivity of domestic firms. Haskel, Pereira, and Slaughter (2007) find that an increase in foreign presence in a UK industry raises plant-level productivity, while Lipsey (2003) suggests that positive spillovers of FDI are not strong. Similarly, Haddad and Harrison (1993) and Aitken and Harrison (1999) find that FDI hurts the productivity of manufacturing plants in Morocco and Venezuelan domestic firms, respectively.⁴

⁴ Konings (2001) find similar negative results using data for Romania, Bulgaria, and Poland, suggesting that the crowding-out effect of competition driven by FDI outweighs the positive impact of technology transfer. Kathuria (2000) shows that domestic Indian firms do not benefit from foreign entry.

Given these competing theoretical views and inconclusive empirical findings, it is important to consider contextual determinants that dictate the prevalence of either positive productivity spillover or detrimental market-stealing effect.⁵ In emerging markets, as MNE subsidiaries intensify competition in the input and output markets in the host country, some firms may gain advantages from this competition. However, other firms may be less likely to benefit from technology spillovers because they lack the necessary absorptive capacity to imitate or learn from foreign competitors or partners. Hence, it is important to examine whether FDI has positive spillover effects on domestic firms, as well as to identify which firms have benefited from or been negatively impacted by FDI.

2.2. Foreign Presence and Skilled Employment

To capture the aforementioned exposure of domestic firms to FDI, we pay attention to their employment structure. Blalock and Gertler (2009) find that the ratio of university-educated employees increases the productivity gains of inward FDI for Indonesian domestic manufacturing firms. This implies that skilled employment helps domestic firms efficiently absorb foreign knowledge. However, Sinani and Meyer (2004) find that domestic firms in Estonia, with a higher average labor cost (or a high share of skilled employees: human capital), did not receive a positive spillover from FDI. As foreign firms offer higher wages than domestic firms, they are more appealing to skilled workers. Hence, domestic firms with skilled employees often lose them to foreign competitors and do not enjoy positive spillovers in response to inward FDI.⁶

Indeed, Peruvian firms highly dependent on a skilled labor force are likely to fail to retain their qualified workers due to the presence of MNEs. These firms also face challenges in hiring new, highly qualified employees due to the lack of availability of professionals in the job market. It is estimated that 11% of companies lack competent workers, and 47% indicate that it is exceedingly difficult to secure qualified personnel owing to the country's low education level. In 2017, only 19.7% of young people graduated from a university (National Bureau of Statistics), which is low compared with the average number of educated people in developed countries (43%).⁷ Thus, the rise in

⁵ Using firm-level data from the Czech Republic, Djankov and Hoekman (2000) find a significant positive effect of FDI on the sales growth of the total sample, including domestic and foreign-owned firms. However, spillovers negatively affect the sales of domestic firms. This implies that, while sales growth occurred for foreign-owned firms due to inward FDI, small and low-technology domestic firms failed to utilize FDI or absorb new knowledge. Choi and Pyun (2017) show that industry FDI has heterogeneous effects on plant productivity and its distribution regarding industry concentration and capital intensity using Korean data.

⁶ MNEs also face the liability of foreignness when entering new territories (Zaheer, 1995). Hence, they may rely on a domestic skilled workforce familiar with the domestic environment and regulations. Given MNEs' limited knowledge of the domestic market, they put much effort into collecting valuable domestic resources and workers. They also compete with domestic firms to identify and attract skilled workers.

⁷ RPP noticias 2019/04/06, <https://rpp.pe/economia/economia/empleo-juvenil-casi-la-mitad-de-empresas->

labor costs caused by the high wages foreign firms offer to attract skilled employees would add a considerable burden to the financial difficulties already experienced by domestic firms. A survey of Peruvian companies revealed that they lose 30% of their employees annually and face difficulty retaining their talented workforce (gestion.pe- El Comercio⁸).

According to Peruvian law,⁹ firms must distribute between 5% and 10% of the profits generated in the previous year to their employees, depending on their economic activity (e.g., industrial firms must distribute 10% and mining companies 8%). By contrast, firms with fewer than 20 employees are not required to pay extra economic profits to their workers (62% of the firms have fewer than 20 employees in our sample)¹⁰. Even though domestic firms paid their employees an average industry salary in line with foreign firms, many domestic workers preferred joining foreign firms due to the additional benefits. This preference is evident in the ranking of the top 50 best workplaces in Peru in 2014, where most companies listed were foreign MNEs (e.g., Kimberly-Clark; Microsoft¹¹). Furthermore, foreign MNEs seem better equipped to comply with workers' preferences than domestic firms.¹² Thus, MNEs have become more attractive workplaces for skilled employees than domestic firms in Peru. In sum, (potential) skilled employees migrating from domestic firms to MNEs may hinder positive spillovers from MNEs. Thus, we propose the following hypothesis:

H1: Industry FDI spillovers on labor productivity are less pronounced for domestic firms that employ higher shares of skilled employment.

2.3. The Buffering Role of the Wage Premium (Firm's Internal Attraction)

If the labor market is perfectly competitive, foreign firms should pay a wage level similar to domestic workers with comparable job qualifications and characteristics

peruanas-sufre-para-conseguir-trabajadores-competentes-brecha-talento-noticia-1190224

⁸ Updated on 26/04/2017 <https://gestion.pe/tendencias/management-empleo/empresas-peruanas-pierden-30-empleados-anualmente-133824-noticia/>

⁹ <https://www.gob.pe/1044-que-son-las-utilidades>

¹⁰ The economic significance of small and medium-sized enterprises in emerging markets, such as Peru, is noteworthy. According to Peruvian Enterprise Statistics, 96.2% of formal firms are micro-enterprises, 3.2% are small, and 0.1% are medium-sized. Although these small and micro-enterprises represent 24% of the Peruvian gross domestic product (GDP), they contribute 85% of the country's employment.

¹¹ Company name and base country are reported with the preference rank (in parenthesis) as follows: Kimberly-Clark-US (1), Accor-France (2), Microsoft-US (3), McDonald's-US (4), Belcorp-Colombia (5), Telefónica-Spain (8) Marriott-US (10), BBVA-Spain (17), Grupo Falabella-Chile (18) and Atento-Spain (20).

¹² A worker's preference may depend on rewards (salary, benefits), work (flexible working hours), organization of the firm, and opportunities (professional growth and personal development).

compared to their domestic competitors. However, in the incomplete market setting, wage differences between foreign and domestic firms can exist for workers even with similar jobs. Several theoretical perspectives explain why foreign firms pay higher wages than their domestic counterparts. First, search frictions induce foreign firms to offer a wage premium (Hijzen et al., 2013). MNEs are expected to face more obstacles to employer-jobseeker matching than domestic firms due to their limited domestic networks. As a result, MNEs offer higher wages to attract qualified workers. Secondly, MNEs competing with their firm-specific advantage are aware of the risk of technology leakage, which arises when workers who have acquired knowledge from MNEs through training move to domestic firms. Therefore, MNEs pay higher wages to prevent this unfavorable employee migration (Girma et al., 2019; Lipsey and Sjöholm, 2004). Overall, MNEs are inclined to pay higher wages than domestic firms. This foreign wage premium implies the possibility of the migration of skilled workers from domestic firms to MNEs, leading to a lower level of labor productivity in domestic firms.

The foreign wage premium can harm domestic firms. If foreign firms hire skilled workers at their regular wage level, which is likely higher than the domestic wages, domestic firms are left with only lower-quality workers. Since MNEs tend to pay higher salaries, domestic firms must also increase their compensation to retain qualified workers proportionally. This practice results in higher labor costs for domestic firms, leading to lower profitability. Using 25-year panel data for Indonesian manufacturing firms, Sjöholm and Lipsey (2006) demonstrate that foreign firms acquiring domestic plants resulted in higher wages than domestically owned plants. The positive wage effects were more significant for white-collar employees than for blue-collar ones.¹³

Given that MNEs have a productivity advantage over domestic firms, their higher performance enables them to pay higher wages to their employees than domestic firms. Although higher wage levels for MNEs seem common in both developed and developing countries, they appear more distinct in developing countries. Given the significantly widened wage gap, domestic people are likely to prefer working for MNEs over domestic firms. A survey of the labor market in Peru (Andina, 2017¹⁴) revealed that 67% of young people prefer to work in large companies or MNEs, considering economic benefits as well as a better work environment. When examining Peruvian firm data, we also observe that domestic firms are at a disadvantage regarding wage levels in the presence of foreign MNEs. Table 1 presents industry-specific average wages (Panel A) and a significant wage disparity between domestic and foreign firms (Panel B).

The primary reason for labor migration is the wage premium offered by foreign firms. Domestic firms can reduce the risk of losing their employees to competitors by offering

¹³ They also find that domestic takeovers target relatively small foreign-owned plants while foreign firms tend to take over large domestic plants. Interestingly, positive wage effects of takeovers are observed only for foreign takeovers.

¹⁴ <https://andina.pe/agencia/noticia-siete-cada-diez-jovenes-peruanos-prefieren-trabajar-una-gran-empresa-687786.aspx>.

competitive wages. However, domestic firms that fail to match the salaries offered by foreign firms cannot prevent the loss of skilled employees. Therefore, we propose the following hypothesis:

H2a: Higher wages paid by domestic firms preserve the FDI spillover effect on the labor productivity of domestic firms with higher skilled employment shares.

Table 1. Sample Characteristics

Panel A. Industry average wage				
SIC code	Industry	N	Only domestic	Average wage (PEN, nuevos soles), 1USD= 3.36 PEN
15	Food	462	368	20242.45
17	Textiles	142	123	30275.07
18	Garments	322	319	15573.7
19	Leather	37	35	21305.58
20	Wood	7	6	14870.97
21	Paper	14	12	27582.42
22	Publishing, printing & Recorded media	44	42	21935.29
24	Chemicals	223	197	28245.74
25	Plastics & rubber	74	59	28862
26	Non-metallic mineral products	31	26	40051.28
27	Basic metals	16	11	31387.56
28	Fabricated metal products	182	169	21698.5
29	Machinery and equipment	39	36	31202.59
31	Electronics	22	16	22967.74
33	Precision instruments	6	5	17836.63
34	Transport machines	20	15	22190.86
35	Other transport	4	4	32620.1
36	Furniture	27	26	18262.03
Panel B. Average wage: Domestic vs Foreign Firms				
			Domestic	Foreign
Average wages (PEN, nuevos soles), 1USD = 3.36 PEN			21608.33	45070.1
Observations			1,159	162

Source: World Bank Enterprise Survey

2.4. Foreign Linkage with a License (Firm's External Buffer)

The wage level offered by domestic firms can be an internal factor in attracting skilled workers. However, it is also important to consider the external linkage that domestic firms

have with foreign MNEs such as licensing. MNEs tend to absorb local talent to overcome the liability of foreignness, particularly from domestic competitors. However, MNEs' supply or technology linkage with domestic firms could lead to cooperation with domestic counterparts, hindering them from aggressively recruiting local workers from the firms they have a relationship with. Also, MNEs can utilize these licensed firms instead of establishing their own subsidiaries.

Previous research based on firm-level data emphasizes that the connection between domestic and foreign firms can enhance domestic firm performance. For instance, prior studies find a positive correlation between licensing and some measures of firm performance, such as size (e.g., Vishwasrao and Bosshardt, 2001) and productivity (e.g., Yasar and Paul, 2007). Thanks to the connection between domestic firms and MNEs, these domestic firms are not required to protect themselves against MNEs' search for their employees, so our mechanism for attracting workers through a firm's wage premium would not work for firms with licensing agreements with MNEs. We hypothesize that firms with a higher skilled workforce, but receiving technology licenses, can protect their turnover and mute the channel that wage premium buffers the negative FDI effects on labor productivity of domestic firms with a high share of skilled workers.

H2b: Technology licensing weakens the link through which higher-skilled domestic firms' wage premiums maintain FDI spillover effects on their labor productivity.

3. DATA AND METHODOLOGY

3.1. Data and Sample

This study uses two datasets. The first was obtained from the World Bank Enterprise Survey, a firm-level survey conducted using a standard methodology. This extensive panel dataset involves over 160,000 micro, small, medium, and large firms from 139 countries. Indicators created from this pool of information allow for a better understanding of the private sector in each country. Each survey covers a cross-section of firms for a single year in a given country, with firms selected using stratified random sampling. It also contains information on firms' characteristics, such as sales, output, labor, wages, training costs, investment, ownership, infrastructure, competition, and crime indicators. We choose data for Peruvian firms (an average of about 400 firms per year, a total of 1,200 firms) in the manufacturing sector for 2006, 2010, and 2017, representing the information of the previous fiscal years 2005, 2009, and 2016, respectively. Note that firms that had participated in the survey for all three years accounted for less than 15% of total firms. Therefore, this study focuses on firms' cross-sectional variations including industry and year fixed effects, rather than firms' within time-series variations.

If foreign affiliates of MNEs generate externalities to local firms by pooling highly skilled technicians in an industry, we expect that domestic firm's productivity would be correlated with measures of foreign presence in that industry. To measure FDI, we focus on human capital hired by foreign MNEs (Keller and Yeaple, 2009). Therefore, we introduce the following measure in industry j where MNEs and local firms are interacting.

$$FDI_{jt} = \frac{\text{foreign affiliates' employment}_{jt}}{\text{foreign affiliates' employment}_{jt} + \text{domestic firm's employment}_{jt}}$$

Foreign affiliates are those whose foreign ownership shares are greater than or equal to 50%. As a robustness check, we also introduce an alternative FDI measure, considering firms with foreign ownership greater than zero. To focus on FDI spillover, we select only domestic firms whose foreign capital share is zero. According to Peruvian National Statistics, in 2015, micro-, small-, and medium-sized enterprises accounted for approximately 85% of the existing firms in the market, while the remainder were large firms. Table 2 summarizes the data in detail. Overall, we construct 1,106 observations for pure domestic firms, of which 85% are small and medium enterprises, suggesting that our sample highly represents the Peruvian economy.

Table 2. Peruvian Firm Data: Industry and Firm Size

		N	Shares
Industry	Textile	332	0.30
	Food	306	0.28
	Chemical	197	0.16
	Metallurgic	131	0.12
	Machinery and equipment	58	0.05
	Other manufacturing	82	0.07
Firm type	Micro (0 to 10)	242	0.22
	Small (11 to 50)	432	0.39
	Medium (51 to 250)	269	0.24
	Big (More than 250)	163	0.15
	Total	1,106	100

Source: World Bank Enterprise Survey

3.2. Empirical Specification

This study sets up the following empirical model as follows:

$$\begin{aligned}
LP_{ij,t} = & \alpha + \beta_1 FDI_{j,t} + \beta_2 HSE_{ij,t} + \beta_3 Wage_{ij,t} + \beta_4 FDI_{j,t} \times HSE_{ij,t} \\
& + \beta_5 FDI_{j,t} \times Wage_{ij,t} + \beta_6 FDI_{j,t} \times HSE_{ij,t} \times Wage_{ij,t} \\
& + X_{ij,t} \delta + e_{ij,t},
\end{aligned} \tag{1}$$

where i is a firm, j stands for an industry to which the firm belongs, and t indicates year. This study used (log of) labor productivity ($LP_{ij,t}$) as the dependent variable, which is the ratio of total sales revenue to the total number of full-time employees working in an establishment within the same fiscal year. This captures a worker's average performance (productivity) within a firm and how it is affected by incoming industry FDI. One may argue that total factor productivity is a better indicator, but our dataset does not contain the necessary information to calculate it. Industry FDI is the main independent variable. Haskel et al. (2007) also use the share of employment that foreign plants hire within the region and industry, not the share of capital flows, as a proxy for FDI because they focus on FDI's spillover through human capital. Indeed, this measure would be more valid when accurately capturing FDI spillover via human capital transfer from MNEs to domestic firms and vice versa.

We also focus on the role of skilled employment ($HSE_{ij,t}$) and wage levels ($Wage_{ij,t}$) in shaping the effects of FDI on labor productivity. Two types of measures are introduced for skilled workers, which are available in the dataset of manufacturing firms. First, the baseline measure employs only the number of full-time highly skilled production workers divided by the total number of full-time employees in a given year and then multiplies by 100 to scale it as a percentage. To ensure the robustness of the results, we calculate the alternative skilled worker measure by subtracting the number of unskilled production workers from that of full-time employees. Firm's average wage is obtained by the ratio of total labor costs to the total number of employees for an individual firm within a year.

To examine the role of domestic firm's skilled employment share in the effect of FDI on domestic firm's labor productivity, we interact $FDI_{j,t}$ with $HSE_{ij,t}$. Thus, this interaction term captures the effect of industry FDI on labor productivity is a function of the share of domestic firm's skilled employment. For example, given positive FDI spillover, a negative (positive) estimated coefficient for this interaction term indicates that a firm with a higher skilled employment share will reduce (amplify) the FDI spillover effect on productivity. Furthermore, we take into account domestic firm's wage to compete against MNEs, so we introduce triple interaction term such as $FDI_{j,t} \times HSE_{ij,t} \times Wage_{ij,t}$. To check whether this mechanism is working regarding technology licensing from foreign firms, we introduce a variable for the use of foreign technology, the answer for the question, "Does the establishment use technology licensed from a foreign-owned company?" To clarify our empirical results, we implement sub-sample regression and quantify our results clearly.

In line with the previous literature, other control variables ($X_{ij,t}$) that possibly influence the labor productivity of firms in Peru are included. A dummy variable is

generated for firms with direct exports greater than zero. The log of the total number of employees is included as a proxy for firm size. Research and development (*R&D*) is a dummy variable that takes the value 1 for firms that invest in *R&D* and 0 otherwise. Correspondingly, there are variables that measure the experience of the firm in the industry (or efficient management given its age) and management experience, respectively. The remaining control variables include the ratio of temporary workers and other dummy variables, such as training programs and whether the firm has an internationally recognized quality certification.

All measurements of variables and their correlations are presented in Table 3. Labor productivity shows a positive correlation with industry FDI. Table 3 also suggests that larger, exporting and *R&D* firms are likely to have higher labor productivity, while these positive correlations do not indicate causality. Our sample also reports that 39% of firms are exporters, 50% are engaged in *R&D* activities, and 70% have an employee training program.

Table 3. Descriptive Statistics and Cross-Correlations

Variable	Mean	Std. Dev.	Min	Max
Labor Productivity	4.50	1.11	0.06	8.29
FDI	0.26	0.16	0.00	1
FDI (alternative)	0.32	0.17	0.02	1
Skilled Employment(%)	39.39	24.79	0	100
Average wage	9.70	0.91	6.68	12.86
Foreign technology	0.13	0.33	0	1
Size	4.05	1.46	0.69	9.21
Exporter	0.39	0.49	0	1
<i>R&D</i>	0.50	0.50	0	1
Intl. quality certification	0.26	0.44	0	1
Temporary workers	0.17	0.20	0	0.98
Manager experience	2.95	0.66	0	4.17
Training program	0.70	0.46	0	1
Total observations				1,138

Table 3. Descriptive Statistics and Cross-Correlations (cont')

Variable	Prod.	FDI	FDI (altm.)	Skilled Emp.	Average wage	Foreign tech.	Size	Exporter	R&D	Intl. Quality	Temp. workers	Man. exp.	Training program
Labor Productivity	1												
FDI	0.273	1											
FDI (alternative)	0.256	0.886	1										
Skilled Employment (%)	-0.141	-0.170	-0.132	1									
Average wage	0.581	0.179	0.163	-0.040	1								
Foreign technology	0.155	0.020	0.048	-0.032	0.129	1							
Size	0.309	0.023	0.041	-0.051	0.307	0.226	1						
Exporter	0.328	0.015	0.027	-0.044	0.314	0.162	0.488	1					
R&D	0.151	0.092	0.096	-0.095	0.102	0.129	0.260	0.210	1				
Intl. quality certification	0.323	0.160	0.133	-0.038	0.295	0.193	0.461	0.349	0.241	1			
Temporary workers	-0.323	-0.068	-0.074	0.061	0.006	-0.095	-0.063	-0.133	-0.025	-0.081	1		
Manager experience	0.028	-0.055	-0.062	0.018	0.063	-0.036	-0.022	0.004	0.009	-0.017	-0.074	1	
Training program	0.245	0.153	0.153	-0.050	0.208	0.149	0.348	0.209	0.289	0.305	-0.066	0.005	1

4. EMPIRICAL RESULTS

Table 4 presents the results for the sample of domestic firms with industry and year fixed effects. Since about 80% of firms are single-year firms, this study focuses on cross-firm variations using industry-fixed effects rather than firm-fixed effects. In Column (1), the estimated coefficient of industry FDI is significant and positive at the 10% level ($= 0.555$), suggesting that FDI positively affects Peruvian firms' labor productivity. Column (2) includes the interaction term of FDI and skilled employment shares. The baseline skilled employment share accounts for only high-skilled production workers. While the coefficient on FDI is positive and statistically significant at the 1% level ($= 0.962$) with a greater magnitude, the coefficient of the interaction term with skilled employment shares is negative and significant at the 10% level ($= -0.008$). This suggests that firms with a higher ratio of skilled workers receive fewer benefits from FDI positive spillovers when MNEs enter the domestic industry, supporting the first hypothesis (H1).

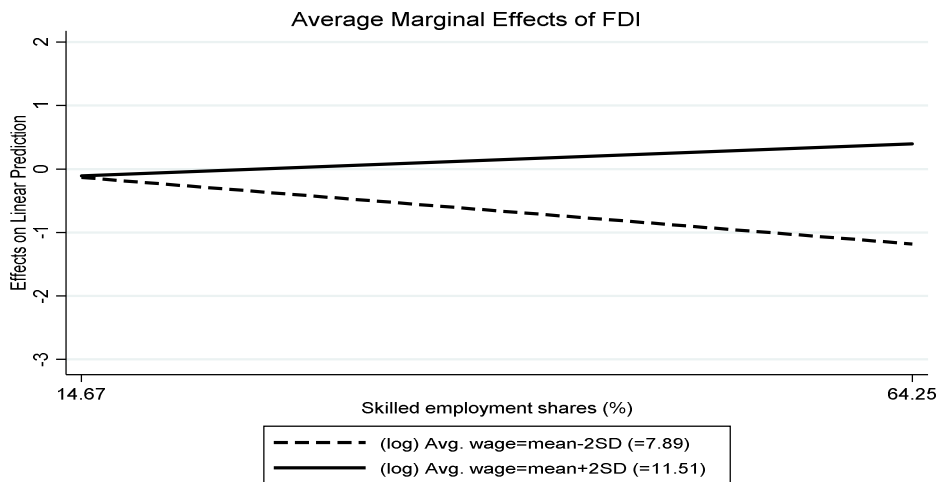
H2a also discusses the role of wages in shaping the FDI effects. Since foreign firms offer higher wages than domestic firms, domestic skilled workers are more likely to move to foreign firms. Simultaneously, other domestic firms would be forced to increase their wages to retain their skilled workers to maintain their growth rates and compete against their rivals. To investigate the impact of wage premiums on the FDI effect on labor productivity for domestic firms with higher-skilled employment shares, Columns (3) and (4) contain a triple interaction term with average wage (in logs). Column (3) includes only year fixed effects, and Column (4) adds both industry and year fixed effects. Interestingly, when the average wage is added to the interaction term of FDI and skilled employment shares, the coefficients of the triple interaction terms are significant and positive in Columns (3) and (4).

However, the interaction term of skilled employment share and FDI turns out to be more negative and significant at the 1% level. Although domestic firms with more skilled employees benefitted less from FDI, those offering high wages to their employees enjoyed greater FDI spillovers. This implies that high-wage domestic firms may reduce the chances of skilled employees joining their competitors, thus overcoming potential turnover. Column (5) presents the results with firm fixed effects. Our triannual survey does not track all firms, so including firm fixed effects reduces the number of firms to 177 from 768. However, the results in column (5) are consistent with those in columns (3) and (4).

The results in Table 4 also demonstrate that larger firms and exporters are likely to have higher labor productivity, as expected. It is also important to note that international quality certifications and training programs remain strongly significant in all the regressions except for Column (5). Obtaining an internationally certified quality level for their products gives firms a high chance of survival in a competitive environment with improved sales performance and labor productivity. The size of the temporary workforce is negatively correlated with labor productivity. Additionally, a training program is likely

to help better prepare workers and promote a high level of satisfaction and achievement within the firm.

To better understand the main results in Column (4), Figure 1 investigates the marginal effect of FDI with respect to skilled employment shares and average wages. First, we evaluate the marginal effects of FDI at plus and minus two standard deviations from the mean of the (log) average wage. The dashed line indicates the marginal effect of industry FDI for firms with (log) average wages two standard deviations below the mean. The solid line indicates the marginal effect of FDI for firms with (log) average wages at two standard deviations higher than the mean. We then plot the changes in the marginal effect according to variations in skilled employment shares. The mean skilled employment share was 39.39%, and the standard deviation was 24.79. We set up a range of skilled employment share on the x-axis, with plus and minus one standard deviation from the mean. For firms with a high wage level (solid line), the marginal effects of FDI are overall positive and gradually increase over the entire range of skilled employment shares (note that the coefficients are statistically insignificant). However, for firms with a low wage level (dotted line), negative FDI effects on labor productivity are detected across all ranges, and are more pronounced with higher-skilled employment shares.



Note: This figure computes the marginal effect of industry FDI on labor productivity using column (4) of Table 4. The mean of skilled employment is 0.749 and its standard deviation is 0.243. We show plus and minus one standard deviation (SD) of skilled employment in x-axis. Solid line indicates marginal effect of industry inward FDI for firms with (log) average wage is one standard deviation below the mean. Dash line indicates the marginal effect of the FDI for firms with (log) average wage is one standard deviation higher than the mean.

Figure 1. Marginal Effects of FDI on Labor Productivity: The Role of Domestic Firm's Skilled Employment Share and Average Wage

Table 4. FDI Effect on Domestic Firms' Productivity

Dependent variable	Labor Productivity (in logs)				
	(1)	(2)	(3)	(4)	(5)
FDI	0.555* (0.306)	0.962*** (0.239)	2.704 (4.006)	1.120 (4.520)	1.088 (5.263)
FDI × Skilled employment		-0.008* (0.004)	-0.092*** (0.026)	-0.089*** (0.023)	-0.070** (0.030)
FDI × Skilled employment × Average wage			0.009*** (0.003)	0.009*** (0.002)	0.008* (0.004)
FDI × Average wage			-0.177 (0.405)	-0.119 (0.423)	-0.215 (0.567)
Skilled employment		-0.002 (0.001)	-0.002** (0.001)	-0.001 (0.001)	-0.004 (0.004)
Average wage			0.574*** (0.079)	0.540*** (0.082)	0.258* (0.119)
Foreign technology	0.021 (0.066)	0.012 (0.063)	0.022 (0.055)	0.006 (0.057)	0.216 (0.142)
Firm size	0.101*** (0.032)	0.096*** (0.032)	0.049 (0.031)	0.057* (0.032)	-0.365*** (0.090)
Exporting firm	0.399*** (0.126)	0.393** (0.133)	0.124* (0.060)	0.173*** (0.055)	-0.037 (0.247)
R&D	-0.024 (0.104)	-0.029 (0.098)	0.031 (0.058)	0.012 (0.062)	0.116 (0.085)
Intl quality certification	0.319*** (0.077)	0.329*** (0.081)	0.189*** (0.043)	0.156*** (0.048)	0.063 (0.199)
Temporary workers	-1.146*** (0.119)	-1.137*** (0.123)	-1.588*** (0.181)	-1.535*** (0.181)	-0.241 (0.154)
Manager experience	0.061 (0.044)	0.058 (0.043)	0.007 (0.033)	0.016 (0.032)	-0.109** (0.039)
Training program	0.151** (0.069)	0.149* (0.073)	0.089 (0.053)	0.099* (0.056)	0.096 (0.097)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	No	Yes	Yes
Firm fixed effects					Yes
Observations	1,154	1,154	975	975	380
# of firms	901	901	768	768	177
R-squared	0.296	0.303	0.482	0.500	0.909

Note: This table shows the results with the sample of only domestic firms. The dependent variable is (log) labor productivity. FDI is the ratio of foreign firms' employees in an industry divided by the total industry employees. Skilled employment indicates a ratio of skilled workers to the total number of employees. Constant term is included but not reported. Clustered robust standard errors at the industry level are reported. * $p < .1$; ** $p < .05$; *** $p < .01$

Table 5. Robustness Check with Alternative Measures

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Labor Productivity (in logs)				
FDI	2.382 (4.010)	1.437 (4.012)	11.022* (5.247)	9.394 (5.779)	-0.519 (1.559)
FDI × Skilled employment	-0.088** (0.031)	-0.086*** (0.026)	-0.140*** (0.028)	-0.141*** (0.028)	-0.058*** (0.013)
FDI × Skilled employment × Average wage	0.008** (0.003)	0.008*** (0.003)	0.013*** (0.003)	0.014*** (0.003)	0.004*** (0.001)
FDI × Average wage	-0.139 (0.405)	-0.085 (0.397)	-0.972 (0.560)	-0.942 (0.581)	0.108 (0.109)
Skilled employment	-0.002 (0.002)	-0.000 (0.002)	0.002 (0.001)	0.002* (0.001)	-0.003*** (0.001)
Average wage	0.560*** (0.090)	0.517*** (0.092)	0.601*** (0.085)	0.562*** (0.086)	0.554*** (0.066)
Foreign technology	0.026 (0.055)	0.017 (0.058)	0.045 (0.058)	0.025 (0.059)	0.035 (0.058)
Firm size	0.045 (0.030)	0.056* (0.032)	0.053* (0.030)	0.062* (0.030)	-0.563*** (0.080)
Exporting firm	0.116* (0.060)	0.172*** (0.054)	0.131** (0.051)	0.181*** (0.046)	0.120* (0.063)
R&D	0.040 (0.058)	0.018 (0.059)	0.034 (0.059)	0.013 (0.059)	0.022 (0.055)
Intl quality certification	0.206*** (0.040)	0.158*** (0.049)	0.193*** (0.043)	0.156*** (0.050)	0.171*** (0.047)
Temporary workers	-1.595*** (0.184)	-1.542*** (0.182)	-1.600*** (0.197)	-1.539*** (0.197)	-0.621** (0.257)
Manager experience	0.002 (0.032)	0.012 (0.032)	0.010 (0.035)	0.021 (0.033)	0.011 (0.034)
Training program	0.090 (0.052)	0.093 (0.054)	0.086 (0.052)	0.096* (0.055)	0.103** (0.046)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No
Firm fixed effects	983	983	968	968	975
Observations	777	777	764	764	769
# of firms	0.482	0.501	0.480	0.500	0.494
R-squared	2.382	1.437	11.022*	9.394	-0.519

Note: This table shows the results with the sample of only domestic firms. The dependent variable is (log) labor productivity. FDI is the ratio of foreign firms' employees in an industry divided by the total industry employees. Alternative FDI considers foreign firms whose capital shares are greater than zero. Alternative skilled employment shares measure subtracts the number of unskilled production workers from that of full-time employees. Alternative average wage refers to total labor costs. Constant term is included but not reported. Clustered robust standard errors at the industry level are reported. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 6. Foreign Technology License

Dependent variable Sub-sample	(1)	(2)	(3)	(4)
	Labor Productivity (in logs)			
	Foreign tech licensing		No foreign tech licensing	
FDI	4.120 (4.439)	7.277 (5.956)	-2.383 (4.436)	0.406 (4.990)
FDI × Skilled employment	0.017 (0.018)	-0.109 (0.158)	-0.003 (0.002)	-0.082** (0.030)
FDI × Skilled employment × Average wage		0.013 (0.017)		0.008** (0.003)
FDI × Average wage	-0.387 (0.307)	-0.647 (0.450)	0.240 (0.414)	-0.042 (0.473)
Skilled employment	-0.005 (0.005)	-0.005 (0.006)	-0.002** (0.001)	-0.002* (0.001)
Average wage	0.619*** (0.092)	0.591*** (0.110)	0.534*** (0.092)	0.535*** (0.092)
Firm size	0.016 (0.055)	0.019 (0.057)	0.058 (0.033)	0.057 (0.033)
Exporting firm	0.212 (0.127)	0.213 (0.123)	0.176*** (0.059)	0.176*** (0.059)
R&D	-0.161 (0.114)	-0.173 (0.116)	0.031 (0.070)	0.025 (0.067)
Intl quality certification	0.278* (0.145)	0.254 (0.154)	0.148** (0.054)	0.143** (0.054)
Temporary workers	-2.182*** (0.412)	-2.176*** (0.419)	-1.506*** (0.198)	-1.517*** (0.203)
Manager experience	0.065 (0.101)	0.071 (0.107)	0.007 (0.033)	0.008 (0.033)
Training program	0.177 (0.152)	0.164 (0.129)	0.107* (0.056)	0.106* (0.057)
Year fixed effects	Yes	Yes	Yes	Yes
Industry Fixed effects	Yes	Yes	Yes	Yes
Observations	93	93	882	882
# of firms	86	86	708	708
R-squared	0.627	0.630	0.494	0.496

Note: This table presents results from a sample of domestic firms, categorizing them into those that engage in technology licensing and those that do not. The dependent variable is (log) labor productivity. FDI is the ratio of foreign firms' employees in an industry divided by the total industry employees. Skilled employment indicates a ratio of skilled workers to the total number of employees. Constant term is included but not reported. Clustered robust standard errors at the industry level are reported. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 5 demonstrates the robustness of the results. Columns (1) and (2) introduce another measure for FDI, considering firms with foreign ownership greater than zero. Columns (3) and (4) use an alternative skilled employment share that considers unskilled production workers available in the survey. This measure is calculated by subtracting the number of unskilled production workers from the number of full-time employees and then dividing by the total number of employees. Columns (5) and (6) replace average wage with the total labor cost. The coefficients of the interaction term of FDI and skilled employment shares are significant and negative in all columns, and those of the triple interaction terms are significant and positive. These results support Hypotheses 2a by showing that higher wages help domestic firms with a higher share of skilled employees to preserve FDI spillovers on productivity.

In Table 6, we conducted a test (H2b) regarding the impact of technology licensing. We divided the entire sample into subgroups based on their technology licensing status. Using the complete specification in Columns (4) and (5) of Table 4, Table 6 presents a sub-sample analysis and demonstrates that our main findings are influenced by domestic firms that do not have any connections with foreign firms. The key findings, such as the negative coefficient on the interaction term of FDI and skilled employment shares, and the positive triple interaction term of FDI, skilled employment shares, and wages, are only evident in the subgroup of firms without technology licensing, as shown in Columns (3) and (4). These results indicate that firms involved in technology licensing, with a high share of skilled workers but lower wages, were not exposed to labor productivity losses in response to industry FDI.

5. CONCLUSION

This study examines the effect of industry FDI on the labor productivity of Peruvian firms. Previous studies have debated whether MNEs are a “blessing” to a country, helping boost its economy (Narula and Dunning, 2010). While emerging market countries have focused on attracting more FDI into domestic markets, it is essential to analyze the specific conditions that promote positive spillovers from MNEs. We find that while industry inward FDI positively affects domestic firms' labor productivity in Peru's manufacturing sector, this spillover effect is hindered for domestic firms with higher-skilled employees and lower wages. These firms may lose skilled employees to their foreign counterparts, MNEs, who offer higher wages and attract skilled workers. Interestingly, the effect of wage differentials is less noticeable for firms that acquired technology licensing from foreign MNEs.

The findings of this study have several implications. First, policymakers in Peru should focus on attracting more foreign investment into the country, while also considering its potential impact on domestic firms. Since emerging market firms are generally small and medium-sized enterprises, as in the Peruvian case, more productive MNEs quickly grab domestic market shares, and the traditional “market stealing effect” of

FDI can hinder domestic firms' growth. While policymakers promote fair competition in the domestic market, they also need to help (potentially promising) domestic firms survive foreign competition.

This study also raises awareness among managers of the threats posed by MNEs and encourages them to consider effective ways to reduce MNEs' negative spillovers. Domestic firms need to devise strategies to gain competitiveness against MNEs by attracting qualified human capital in the domestic market. While this study focuses on financial compensation as an incentive to attract skilled employees, managers can also invent non-pecuniary incentives or welfare measures to attract human capital from MNEs. Finally, managers should develop a firm's existing attributes to increase its absorptive capacity and take advantage of the positive spillovers that FDI might bring.

Future research is needed to identify which industries would retain higher benefits or suffer more significant losses from FDI. Given the low number and uneven distribution of observations per industry, the study does not include industry-level analysis. Additionally, the results demonstrate the effect of FDI on Peruvian reality. It would be interesting to examine whether these findings are relevant to other emerging markets and analyze other factors that cause Peruvian firms to miss out on fully leveraging the benefits of FDI spillovers.

APPENDIX

TableA1. Variables Description

Variables	Contents	Measurement	Note	Source
<i>Dependent Variable</i>	Labor Productivity	ln(total annual sales revenue/ full-time employees)	What were this establishment's total annual sales in the last fiscal year? Divided by the total number of full-time employees within the same fiscal year.	World Bank Enterprise Survey (W.B.E.S)
<i>Independent Variables</i>	Industry FDI	The number of foreign firms' employment in an industry divided by the number of total employees in an industry	Ratio of Incoming FDI flows within each industry divided by the GDP of each industry	W.B.E.S
<i>Moderator Variables</i>	Skilled employment	The number of skilled workers/total employees ($\times 100$)	1) Ratio of full-time skilled production workers to total full employment in a fiscal year 2) (The number of full employees – the number of full-time unskilled production workers) divided by the total number of employees	W.B.E.S W.B.E.S

TableA1. Variables Description (cont')

Variables	Contents	Measurement	Note	Source
<i>Moderator Variables</i>	Average wage	ln(average wage)	Total labor costs in a fiscal year divided by the total number of employees	W.B.E.S
	Foreign technology	Dummy variable	Does the establishment use technology licensed from a foreign-owned company?	W.B.E.S
<i>Control Variables</i>	R&D	Dummy variable	Whether the company registered any R&D spending during the fiscal year	W.B.E.S
	Export	Dummy variable	Whether the firm registered Direct Exports	W.B.E.S
	Firm size	ln(number of full-time workers)	The number of permanent, full-time employees working at the end of the last fiscal year	W.B.E.S
	Intl Quality certification	Dummy variable	Does the establishment have an internationally-recognized quality certification?	W.B.E.S
	Temporary workers	ln(part-time workers)	Number of temporary employees at end of last fiscal year.	W.B.E.S
	Manager Experience	ln(manager's years of experience)	Top manager's years of experience in the sector	W.B.E.S
	Training Program	Dummy variable	Formal training programs for full-time employees for the last fiscal year	W.B.E.S

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