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Wage Spillovers from Foreign Direct Investment in Kenya's Manufacturing Sector

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Abstract

The objective of this paper is to investigate the effect of foreign direct investment on average wages paid by domestic manufacturing firms in Kenya. Specifically, the paper aims at identifying the transmission channels through which wage spillovers from foreign direct investment occur as well as the impact of technology gap and firm size on the behaviour of the spillover transmission channels. Employing panel data obtained from the World Bank Enterprise Surveys covering the period 2007–2018 and using fixed effects and Two-Step System GMM, we analyzed both horizontal and vertical spillover channels for wage spillovers. Findings from estimations based on all domestic firms indicated that there were no significant wage spillovers from FDI. However, when the technology gap was considered, domestic firms with low technology gaps with foreign-owned firms showed statistically significant positive wage spillovers via backward linkage, demonstration effects, and labour mobility channels and statistically significant negative spillovers via the competition effects channel. Finally, the results showed that firm size had no impact on the behaviour of various wage spillover transmission channels examined.

Keywords: foreign direct investment, manufacturing, wages, spillovers, competition, technology gap, Kenya

1. Introduction

The importance of foreign direct investment (FDI) in various aspects of the host country's economy, particularly in labour markets cannot be overemphasized (Nguyen et al., 2019). FDI is considered to be particularly important to emerging and developing economies since it is a potential channel via which domestic and international convergence in living standards could be achieved (Girma et al., 2019). In particular, FDI may have positive effects on the labour market, such as employment effects (creation of jobs for domestic workers either directly or indirectly), enhancement of labour productivity among the host country's workers, and raising wages paid by domestic firms (Nguyen et al., 2019). Direct wage effects occur when Multinational Enterprises (MNEs) pay relatively higher wages than those paid by locally-owned firms belonging to the same industry or sector, thus raising the host economy's average wages (Girma et al., 2019). Indirect wage effects or wage spillovers, which is the focus of our study occur via positive or negative effects of FDI on average wages paid by locally-owned firms.

Theoretical literature on wage spillovers distinguishes between two broad groups of FDI spillovers: horizontal or intra-industry spillovers (which occur when MNEs and domestically-owned firms operating within a given industry come into contact) and vertical or inter-industry spillovers (which occur when MNEs transfer technology to domestic firms - as suppliers or/and customers - via forward, and backward linkages) (Hoi and Pomfret, 2010). The two groups of spillovers highlighted above form the basis of the four wage spillover transmission channels analyzed in this study; labour mobility, demonstration effects, competition effects and backward linkage channels.

Numerous empirical studies have investigated FDI-induced productivity spillovers compared to those that have examined other FDI-induced spillovers, such as wage spillovers (Girma et al., 2019). Findings from the few studies that have focused on wage spillovers reveal mixed and inconclusive results, an issue that has continued to generate a lot of debate in FDI spillover literature. While some research studies find positive wage spillover effects from FDI (Abouelfarag and Abed, 2018; Driffield and Girma, 2003; Elliott and Zhou, 2015; Girma et al., 2019; Hale and Long, 2011; Lipsey and Sjöholm, 2004; Pamukcu and Taymaz, 2009; Poole, 2013), others reveal negative or no wage spillovers (Barry et al., 2005; Majid, 2004; Nguyen et al., 2019; Onaran and Stockhammer, 2008; Pittiglio et al., 2015; Vijaya and Kaltani, 2007; Yasin et al., 2022).

The objective of this study is to investigate channels through which inward FDI impacts the wages paid by domestic manufacturing firms in Kenya. It also examines the impact of firm size and the technology gap between foreign firms and domestic firms on the behaviour of various wage spillover transmission channels. The study contributes to the existing empirical literature on FDI-induced wage spillovers in several ways. Firstly, the study is the first to explicitly examine the effect of foreign presence on domestic wages in Kenya using a recent panel dataset for the period 2007-2018. The study, therefore fills this gap in wage spillover literature not only in Kenya but also in the sub-Saharan Africa region and Africa in general. Secondly, unlike previous studies which use a single proxy for foreign presence (Hoi and Pomfret, 2010; Nguyen et al., 2019; Pittiglio et al., 2012) or explore horizontal spillovers only, this study not only disaggregates horizontal spillovers into three different horizontal spillover channels, but also explores vertical spillovers via the backward linkage channel. Thirdly, this research endeavours to address possible endogeneity concerns related to foreign direct investment that may have biased estimates in many previous studies by applying a dynamic panel analysis using the Two-Step System GMM technique. Finally, this study takes into account firm-level heterogeneity in spillover analysis by investigating the impact of the technology gap, - measured by Total Factor Productivity (TFP) differences - between foreign and domestic firms and differences in firm size on the occurrence of and the size of wage spillovers.

The rest of this research is organized as follows. Section two provides an overview of trends in foreign direct investment and manufacturing wages in Kenya. Section three provides a summary of the theoretical as well as the empirical literature and section four discusses the theoretical framework and the empirical approach used. Section five provides the data source and descriptive statistics. A discussion of the results from various estimations is provided in section six, while section seven concludes.

1.1 Trends in Foreign Direct Investment in Kenya between 2000 and 2018

The growth in net FDI inflows into Kenya has fluctuated over the years. Net FDI inflows declined from US$111 million to US$5.4 million from the year 2000 to 2001 due to the uncertainty in the political environment occasioned by the political environment in the run-up to the 2002 general elections. However, this trend was reversed with FDI inflows reaching US$81.8 million in 2003. In 2004, the Government established the Kenya Investment Authority (KenInvest), whose priority role was to undertake policy reforms aimed at attracting FDI. This may have resulted in increased net FDI inflows between 2005 and 2006. From 2006 to 2007, net FDI inflows to Kenya increased rapidly from US$51 million to US$1.11 billion (see Figure 1). This may have been occasioned by large privatizations and joint ventures, especially in the telecommunications industry (Telkom Kenya and Safaricom) and increased investment in railway infrastructure between the year 2005. However, net FDI inflows declined to US$488 due to uncertainty and violence in the period before and after the 2007 general elections. Figure 1 illustrates the trends in net inflows of FDI into the Kenyan economy between the years 2000 and 2018.

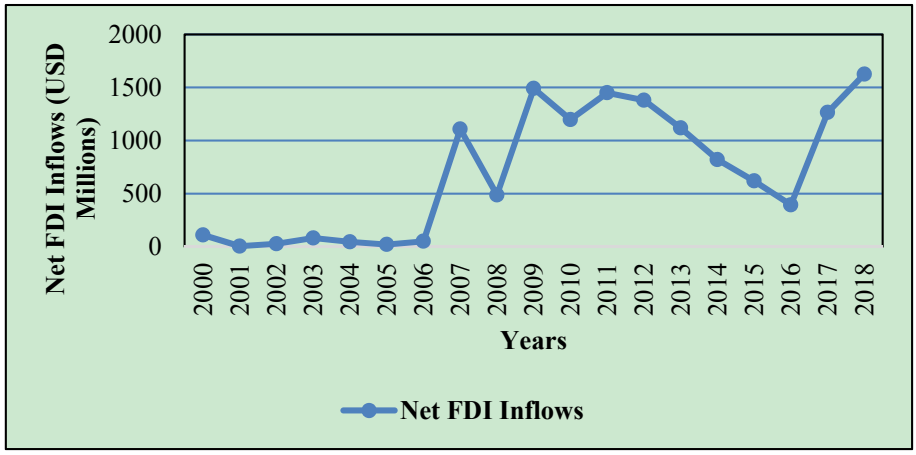

Figure 1. Trends in net FDI inflows between 2000 and 2018

In 2008, the government launched Vision 2030, an initiative aimed at attracting FDI and promoting the industrialization process (UNCTAD, 2008). The renewed efforts to attract FDI may have led to an increase in net FDI inflows from US$488 million in 2008 to US$1.49 billion in 2009. However, there was a decline in net FDI inflows to US$1.2 billion in 2010, largely due to political uncertainty and violence experienced after the 2007 general elections (UNCTAD, 2010). From the year 2011, net FDI flows declined steadily from US$1.45 billion to US$394 million in 2016 due to a global decline in FDI flows. From the year 2016 to 2018, net FDI inflows

increased rapidly, partly due to the global upward trends in FDI flows. The United Kingdom, China, India, Netherlands, USA, South Africa, Mauritius, Israel, Japan, and France are the leading sources of foreign direct investment into Kenya (KNBS, 2020).

2. Literature Review

2.1 Theory on Foreign Direct Investment and Wage Spillovers

Theory on the effect of inward FDI on host economies postulates that foreign firms act as agents in the transfer of advanced technology and expanding the production capabilities of domestic firms, which positively impacts their employment creation, labour productivity, and wages (Saucedo et al., 2020). FDI-induced spillovers may also negatively affect average wages paid by local firms if productivity spillovers from MNEs are negative. This implies that positive employment and wage effects from FDI ought to be weighed against negative effects, including the crowding-out of some non-competitive local firms, the introduction of labour-displacing technologies, and reduction in employment (job losses) resulting from MNEs that choose to operate via mergers and acquisitions (Coniglio et al., 2015).

Literature on FDI spillovers identifies several channels through which foreign presence may influence wages paid by local firms. Increased domestic employment triggered by the entry of MNEs may impact the equilibrium in the domestic labour market. Given the upward-sloping labour supply curve, a shift in labour demand curve leads to an increase in both the quantity of labour employed and the wage rate (OECD, 2008; Pittiglio et al., 2012).

The channels for FDI-induced wage spillovers are categorized into two broad types, that is, horizontal or intra-industry spillovers, which occur when there is contact between MNEs and domestically owned firms operating within a given industry, and vertical or inter-industry spillovers, which occur when MNEs transfer technology to domestic firms as suppliers or/and customers via forward and backward linkages (Hoi and Pomfret, 2010). There are several horizontal channels via which wage spillovers from MNEs may affect the activities of domestic firms. Firstly, MNEs may increase domestic firm productivity via demonstration effects. For instance, domestic firms may receive indirect benefits by imitating the technological innovations introduced by MNEs, thus improving their productive efficiency (Ben Hamida and Gugler, 2009; Javorcik, 2004). The new technology and knowledge transferred by foreign-owned firms may contribute to increasing wages paid by locally-owned firms by positively influencing the marginal productivity of their workers (Ben Hamida and Gugler, 2009).

Secondly, there is the competition effects channel. Theory on wage spillovers asserts that the wage bill of domestic firms increases as foreign presence increases due to wage differentials between domestic firms and MNEs (Pittiglio et al., 2015). This triggers domestic firms to increase their wages to address equity concerns, in addition to countering the loss of workers to their foreign counterparts. The competition posed by foreign firms may compel domestic firms to adopt cost-cutting measures that enable them to utilize the available technology much more efficiently, thus yielding productivity gains (Demena and Murshed, 2018).

Thirdly, there is the labour mobility or labour turnover channel. Wage spillovers may also occur when workers who are trained by or working for MNEs move to local firms or even establish their firms and transfer the firm-specific knowledge they acquired to these firms (Smeets, 2008). If well utilized, the knowledge may boost the performance of these firms. This is based on the assumption that MNEs provide domestic workers with more quality education and training than an average domestic firm (Smeets, 2008).

On the other hand, vertical or inter-industry spillovers occur via backward and forward linkages between foreign and domestic firms. Forward linkages occur through contact between MNEs supplying intermediate inputs and/or goods and their domestic customers in upstream sectors while backward linkages take place when domestic firms supplying intermediate inputs and/or goods and their MNEs clients in downstream sectors come into contact (Pittiglio et al., 2015). MNEs are known to produce sophisticated products and therefore require diverse and complex inputs. By establishing domestic suppliers, the demand for sophisticated intermediate inputs enhances domestic production and demand for such inputs, besides increasing the employment, and productivity of workers (Pittiglio et al., 2015). Through backward linkages, MNEs transfer knowledge to domestic suppliers, thus helping them to improve their managerial and technological capacities, which enhances their productivity and wages.

2.2 Spillover Channels and Firm-Level Heterogeneity

FDI spillovers are associated with the technology gap, absorption capacity and size of a domestically-owned firm, which implies that spillovers may not accrue evenly across all domestic firms. Literature on FDI spillovers propounds that the differentials in technological levels between MNEs and domestic firms is one of the main mediating variables for productivity spillovers (Girma, 2005). There are conflicting theories on the importance of the technological gap between domestic and foreign firms in influencing spillovers. On one hand, some empirical

studies which put up the catch-up hypothesis theorize that a high technological gap (or low technological level in the host country) raises the probability of domestic firms benefitting from spillovers by increasing their potential for catching up (Hoi and Pomfret, 2010; Smeets, 2008). On the other hand, other studies theorize that a low technology gap (high technology level in the host economy) raises the potential for spillover benefits from FDI. Moreover, there is yet another school of thought which asserts that too low or too high a technology gap between foreign and domestic producers might deter local firms from absorbing positive spillovers (Farole and Winkler, 2012).

Theoretical studies also identify firm size as one of the main factors that determine the ability of domestic firms to reap spillover benefits from FDI (Feng, 2020; Yasin et al., 2022). Theorists argue that large domestic firms may possess huge stocks of resources, internal capabilities and knowledge that may be harnessed to complement and enhance the adoption of foreign technologies, and ensure full exploitation of FDI-induced spillovers (Zhang et al., 2010). Conversely, theory postulates that small firms may have fairly flexible structures that may enable them to make quick adjustments in the face of changing market situations (Audretsch, 2003). Owing to their non-hierarchical and more flexible structures, the firms may also enjoy productive efficiency (Audretsch, 2003).

2.3 Empirical Literature Review

A few studies have evaluated FDI-generated wage spillovers, especially in developing nations. Moreover, the majority of existing empirical studies on wage spillovers employ one measure of foreign presence as a proxy for the spillover variable or aggregate different channels into one proxy for horizontal spillovers (Abouelfarag and Abed, 2018; Hoi and Pomfret, 2010; Nguyen et al., 2019; Pittiglio et al., 2012). To have a more nuanced picture of FDI-induced wage spillovers, our study not only disaggregates horizontal spillovers into three measures of foreign presence, which act as proxies for various wage spillover transmission channels but also explores vertical spillovers via backward linkages. Our approach, therefore allows wage spillovers to vary with wage spillover transmission channels.

Empirical evidence from studies that have examined wage spillovers from both horizontal and vertical spillover perspectives remain mixed and inconclusive because of differences in econometric methodology, differences in levels of aggregation (industry or firm-level studies), and the nature of data used (Görg and Greenaway, 2004). Results from studies on wage spillovers show that foreign firms may have positive, negative, or no effect on wages.

Positive spillovers are mostly evident in many developed countries and just a few developing ones. For instance, Driffield and Girma (2003) employed data from the electronics industry in the UK and found that increased foreign presence had positive spillover effects on the wages of domestic firms via labour demand. Moreover, wage spillovers appeared to be more significant in the case of skilled workers as opposed to unskilled ones, which could be a reflection of the relative scarcity of skilled workers. In a study that investigated wage spillovers in developing and developed countries separately, Majid (2004) found that FDI had a small negative effect on wages in developed economies. In developing economies, the labour market would initially experience negative effects from increasing FDI, though the negative effect was only temporary.

Results of positive wage spillovers were also evidenced from a study by Lipsey and Sjohölm (2004) which employed worker-level data for manufacturing firms in Indonesia. Their findings revealed that inward FDI had positive horizontal wage spillover effects on the average wage levels of domestically-owned firms. Positive spillovers were also revealed in a study by Pamukcu and Taymaz (2009), who employed data from Turkish firms between 1987 and 2001. Similar results were found from firm-level studies in China and Spain by Hale and Long (2011) and Muñoz-Bullón and Sánchez-Bueno (2013) respectively. In a study employing matched employer-employee data for Brazilian firms, Poole (2013) provided evidence of significant positive wage spillovers on domestically-owned firms via worker mobility. In the same vein, Elliott and Zhou (2015) found positive wage spillovers from FDI for Chinese industrial enterprises. Similar findings were obtained from a study by Abouelfarag and Abed (2018) which examined the effect of inward FDI on real wages in Egypt. In a more recent study employing firm-level panel data for the period 2003-2006, Girma et al. (2019) analyzed horizontal wage spillovers on average wages paid by locally-owned firms in the Chinese manufacturing sector and found positive wage spillovers, which varied with the level of foreign presence.

On the other hand, some empirical studies have revealed evidence of insignificant or negative FDI-induced wage externalities on wages paid by locally-owned firms. For instance, Barry et al. (2005) found negative wage spillovers from foreign presence on domestic firms in Ireland. Another study by Vijaya and Kaltani (2007) using data for the manufacturing sectors in 19 countries covering the period between 1987 to 2001 provided evidence that inward FDI had a negative effect on overall wages paid by domestic firms in the manufacturing sector and this impact was stronger for female wages. Similar findings were obtained from a study by Onaran and

Stockhammer (2008), based on a panel data set for manufacturing industries in the Czech Republic, Poland, Hungary, Slovenia, and Slovakia, for the period 2000-2004. In a study examining FDI-induced wage spillovers on Italian firms via vertical and horizontal channels, and using panel data for the period 2002-2007, Pittiglio et al. (2015) fail to find evidence of wage spillovers via both channels. In yet another study based on a panel dataset for firms in the Vietnamese manufacturing sector for the period 2009-2013 and using a single proxy for foreign presence, Nguyen et al. (2019) found negative wage spillovers from FDI on average wages paid by locally-owned firms. Results from a more recent study by Yasin et al. (2022), using data for the Indonesian manufacturing sector over the period from 2011 to 2015, indicated that inward FDI depressed wages in the recipient provinces.

In Africa, there is a paucity of research on wage spillovers from FDI. There are two notable studies on wage spillovers in the African context. In a study based on panel data for Tunisian firms for the period 1970-2009, Ben Salha (2013) investigated the effect of FDI on real wage levels. The study had two main findings: first, there was no evidence of a long-run association between foreign presence and the annual average wage; second, foreign presence was positively associated with real wages only in the more exportable industries, that is, textile, clothing, and leather industries. In another study, Abouelfarag and Abed (2018) examined the effect of FDI on real wages in Egypt and found that FDI had a positive and significant impact on domestic firms' real wages.

3. Theoretical Framework and Empirical Model

3.1 Theoretical Framework

The theoretical foundation for wage spillovers is anchored on the Neoclassical Theory of Wages. Following Pittiglio (2015) and Nguyen et al. (2019), we derive labour demand and labour supply functions and based on the neoclassical equilibrium condition under a monopolistic competition labour market, we derive the wage function which forms the basis of our analysis.

The Labour demand

In product markets under monopolistic competition, firms hire workers from the domestic labour market. The representative consumer in the product market has a constant elasticity of substitution (CES) utility function given as;

$$U = \left[\int_{\omega\in\Omega} q(\omega)^{\rho} d\omega\right]^{\frac{1}{\rho}} \tag{1}$$

where ω denotes products, Ω denotes the set of products available and q indexes the quantity consumed. All the available products are assumed to be substitutes for each other, $(0 < \rho < 1)$, and with a constant elasticity of substitution of $\frac{1}{1-\rho}$. Maximizing the consumer's utility function subject to his/her budget constraint, we obtain a demand function which is stated as:

$$q = \Phi p^{\frac{1}{1-\rho}} \tag{2}$$

where p indexes price; $\Phi = \frac{Y}{\int_{\omega\in\Omega} q(\omega)^{\frac{\rho}{\rho-1}} d\omega}$ is a measure of the aggregate demand level; and Y indexes the income of the consumer. Each representative firm takes the aggregate demand level (Φ) as given since all firms are small in size relative to the entire industry in which they operate. Therefore, a change in the output of an individual firm has a negligible impact on the industry's Φ.

On the supply or production side, a representative industry comprises both local and foreign firms. When a firm enters a given industry, it has to pay a fixed entry cost (cost of registering the business and conducting market research). Upon entry, the firm must pay a fixed cost of production (f), and then employ only one unit of the labour resource in producing *s* units of a given product.

The production function of the representative firm is then given as; $F(l) = sl$, with l denoting labour employed

and s denoting labour productivity, whereby (s) is determined by observed firm-specific characteristics (η), (including, age, capital intensity size) and the unobserved capability endowment denoted by (θ). The θ of the firm is drawn randomly from the Pareto distribution when the firm enters the industry, with the probability density function stated as:

$$g(\theta) = \begin{cases} \dfrac{\mu\theta^{\mu}}{\theta^{\mu+1}}, \theta \geq \underline{\theta} \\ 0, \theta < \underline{0} \end{cases} \tag{3}$$

where μ indexes the shape parameter while $\underline{\theta}$ denotes the minimum possible value of θ.

The entry of MNEs possessing advantageous intangible assets (including superior technology, managerial and marketing skills) may cause productivity spillovers which affect the domestic firms' labour productivity (Javorcik, 2004; Newman et al., 2015). Thus, firm *i*'s labour productivity is dependent on firm-specific characteristics (η), its capability endowment (θ), and the level of foreign presence (γ):

$$s = \eta\,\theta\, e^{\alpha\gamma}$$

where α captures the sign and size of productivity externalities from FDI. If the value of α is positive, it implies that the presence of MNEs enhances domestic firm productivity while a negative value implies that MNEs adversely affect their productivity.

Since $\frac{1}{s}$ labour units are utilized in producing one unit of the product, then the marginal cost (MC) of production for a representative domestically-owned firm *i* can be stated as:

$$MC = \frac{w}{s} = \frac{w}{\eta\theta e^{\alpha\gamma}}$$

where w is the firm's wage offer and γ denotes the foreign penetration level in industry *j* and region *r* $(0 \leq \gamma \leq 1)$. A positive productivity spillover implies that increased foreign presence or penetration reduces firm *i*'s marginal cost of production, other conditions being held constant. Given the marginal cost, firm *i*'s profit function can be stated as;

$$\pi = \left(p - \frac{w}{\eta\theta e^{\alpha\gamma}} \right) q - f \tag{4}$$

We obtain the first-order conditions for firm *i*'s profit maximization problem as:

$$p^{*} = \frac{w}{\rho\eta\theta e^{\alpha\gamma}}$$

The above condition is substituted into the domestic firm's profit function to obtain its optimal profit as follows:

$$\pi^{*} = \frac{1-\rho}{\rho^{\frac{\rho}{\rho-1}}} \Phi \left(\frac{w}{\eta\theta e^{\alpha\gamma}} \right)^{\frac{\rho}{\rho-1}} - f \quad . \tag{5}$$

Firm *i* will join the industry only if it makes a nonnegative profit $(\pi^{*} \geq 0)$. The condition $\pi^{*} = 0$ is the cut-off capability (θ^{*}) for firm *i,* which can be stated as:

$$\theta^{*} = \frac{1}{\rho(1-\rho)^{\frac{1-\rho}{\rho}}} \Phi^{\frac{\rho-1}{\rho}} w\eta^{-1} e^{-\alpha\gamma} f^{\frac{1-\rho}{\rho}} \tag{6}$$

The implication of equation (6) is that if the impact of productivity spillover is positive $(\alpha > 0)$, increased foreign penetration/presence reduces the cut-off capability of domestically-owned firms, implying that more firms will enter industry *j*. Given firm *i*'s demand function and its optimal pricing, its optimal output can be obtained as below:

$$q^* = \Phi\left(\frac{w}{\rho\eta\theta e^{\alpha\gamma}}\right)^{\frac{1}{\rho-1}}$$

Using the domestic firm's production function stated earlier $(F(l) = sl)$, we can derive its labour demand function (l^d) as follows:

$$l^d = \Phi\rho^{\frac{1}{1-\rho}} w^{\frac{1}{\rho-1}} \eta^{\frac{\rho}{1-\rho}} \theta^{\frac{\rho}{1-\rho}} e^{\left(\frac{\rho}{1-\rho}\right)\alpha\gamma}$$

Therefore, the firm's aggregate demand function can be written as:

$$L^d(w) = \frac{\mu\theta^{\mu}}{\mu - \frac{\rho}{1-\rho}} \rho^{\mu}(1-\rho)^{\frac{1-\rho}{\rho}\mu-1} \Phi^{\frac{1-\rho}{\rho}\mu} w^{-1-\mu} e^{\alpha\mu\gamma} f^{1-\frac{1-\rho}{\rho}\mu} \int \eta^{\mu} g(\eta) d\eta \tag{7}$$

where $\tilde{g}(\eta)$ denotes the probability density function of η; and $\mu > \frac{\rho}{1-\rho}$.

The Labour supply

Firms in each region give job offers to workers. A potential worker who rejects a job offer will have to enjoy leisure. The value the worker attaches to leisure is his/her reservation wage (w^r), and the worker will only take up the job offer if its wage rate is higher than his/her reservation wage. If a region has a high unemployment rate, job seekers in the region may have lower reservation wages due to unfavorable conditions. It is assumed that there is an exogenous distribution of the reservation wage, with the distribution function given as $g(w^r)$, while labour endowment in each region is $\overline{L}$. Further, it is assumed that a worker will decide on accepting a job offer on first–come–first– accept basis, that is, he/she shall be willing to take up a given job, as long as the job's wage offer is higher than his/her reservation wage, and shall not put on hold any acceptable job offers (he/she makes quick decisions on employment) in anticipation of better job offer. Firms, therefore face an aggregate labour supply which is given by the labour endowment in a given region ($\overline{L}$) multiplied by the probability that a worker will accept the firm's job offer, as stated below:

$$L^s(w) = \overline{L}\,\mathrm{Prob}(w \geq w^r) = \overline{L}\int_0^w g(w^r)dw^r \tag{8}$$

Assuming a uniform distribution of w^r over reservation wage interval $\left[0, \overline{w^r}\right]$, where w^r denotes the upper bound level of the reservation wage prevailing in region *r*, the domestic firm i faces a labour supply function which can be written as below:

$$L^S(w) = \overline{L}\frac{w}{w^r} \tag{9}$$

where the term $\frac{\overline{L}}{w^r}$ is assumed to be region-specific and is invariant across firms.

The equilibrium labour demand and supply

The equilibrium wage rate (w^*) is obtained by equating the aggregate demand for labour (L^d) to the aggregate supply of labour (L^s) as follows:

$$w^* = \left[\frac{\mu \underline{\theta}^{\eta}}{\mu - \frac{\rho}{1-\rho}} \rho^{\mu} (1-\rho)^{\frac{1-\rho}{\rho}\mu - 1} f^{1-\frac{1-\rho}{\rho}\mu} \frac{\overline{w^r}}{\overline{L}} \int \eta^{\mu} \tilde{g}(\eta) d\eta \right]^{\frac{1}{2+\mu}} \Phi^{\frac{1-\rho}{\rho}\frac{\mu}{2+\mu}} e^{\frac{\mu}{2+\mu}\alpha\gamma} \tag{10}$$

Since in our analysis, the equilibrium wage rate (w^*) is unobserved and instead, our data has the firms' average wage, we can specify the average wage function, based on the equilibrium wage rate function in equation (10), as below:

$$\ln \overline{w} = \tilde{\beta}_0 + \tilde{\beta}_1 \ln \Phi + \tilde{\beta}_2 \frac{\overline{w^r}}{\overline{L}} + \tilde{\beta}_3 \ln \eta + \tilde{\beta}_4 \gamma + \tilde{\beta}_5 \ln \theta \tag{11}$$

where $\overline{w}$ denotes the average wage of firm *i* and $\tilde{\beta}_s$ are the coefficients. The derived wage function in equation (10) includes region, industry and time effects while firm *i*'s average wage includes firm, region, industry, and time effects. Firm-level characteristics and capability endowment were added to equation (11) to account for firm-level variations in the data. The term Φ indexes the aggregate demand level, η denotes firm *i*'s characteristics and θ denotes firm *i*'s cut-off capability.

3.2 Empirical Model

Based on the theoretical framework explained above, in addition to the works of Pittiglio et al. (2012) and Nguyen at al. (2019), we develop an empirical model to measure wage spillovers from FDI. The variable γ (FDI presence) is disaggregated into four spillover variables to test the various channels for wage spillovers. Industry-specific variables, firm-specific variables, and other fixed effects are incorporated into the model as control variables.

Specifically, our interest is testing the effect of increased FDI on the average wages of domestically-owned firms via four spillover channels. Based on equation (11), we derive the following econometric model for use in our estimations:

$$\begin{aligned} \ln(W)_{ijrt} = {} & \beta_0 + \beta_1 BackSpill_{jt} + \beta_2 CompSpill_{jt} + \beta_3 LabMobility_{jt} + \beta_4 DemoSpill_{jt} \\ & + \beta_5 TechGap_{ijrt} + \beta_6 AbsCap_{ijrt} + \beta_7 \ln Size_{ijrt} + \beta_8 Age_{ijrt} + \beta_9 \ln CapInt_{ijrt} \\ & + \beta_{10} HHI_{jt} + d_j + d_r + d_t + \varepsilon_{ijrt} \end{aligned} \tag{12}$$

Subscripts *i, j, r,* and *t* index the firm, industry, region, and time respectively. The error term $\varepsilon_{ijrt} \sim N(0, \sigma^2)$ accounts for firm-level stochastic shocks which may impact the dependent variable. The time dummy (d_t) is incorporated to account for possible economic and regional trends. Moreover, the industry fixed effects (d_j) are included to account for the unobservable time-invariant factors that may influence wages. Regional fixed effects (d_r) are also incorporated to account for possible unobservable time-invariant regional heterogeneity, such as advanced infrastructure which may make a particular region attractive. The time dummy, industry, and regional fixed effects are incorporated to address the econometric concerns regarding omitted unobservable variables which may affect the exogeneity condition, a critical condition for achieving consistent and unbiased estimates.

3.2.1 Definition and Measurement of Variables

In this study, the measure of foreign presence is disaggregated into four spillover channels, that is, the demonstration effects channel ($DemoSpill_{jt}$), backward linkage channel ($BackSpill_{jt}$), labour mobility channel ($LabMobility_{jt}$), and the competition effects channel ($CompSpill_{jt}$) as shown in equation (12). Firstly, the demonstration effect channel (*DemoSpill*) captures the knowledge of the host country's local firms about product or process-related innovations of MNEs in the host country. Empirical literature has suggested three proxies for spillovers via demonstration effects, namely, the share of sales by foreign firms in aggregate industry sales, the share of employment by foreign firms, and the share of foreign equity in a given industry (Demena and Murshed, 2018). According to Lu et al., (2017), there is consensus that the foreign share of industry sales is considered the most widely used indicator in FDI spillover literature. In addition to this, most of the empirical studies we reviewed (Ben Hamida, 2013; Pittiglio et al., 2015) indicate that sales captures productivity spillovers better via the demonstration effects channel. Following Hoi and Pomfret (2010) and Pittiglio et al. (2015), the demonstration channel is measured as;

$$DemoSpill_{jt} = \frac{\sum_{i \text{ for all i}\in\text{j}} F_{ijrt} * S_{ijrt}}{\sum_{i \text{ for all i}\in\text{j}} S_{ijrt}} \tag{13}$$

where S_{ijrt} indexes sales by firm *i* in year *t*. F_{ijrt} indexes the share of foreign ownership in firm *i* in year *t*. $DemoSpill_{jt}$ is industry *j*'s share of sales accounted by foreign firms.

Secondly, there is the labour mobility (*LabMobility*) channel, which measures the combined effect of foreign penetration or presence in a given industry and the level of domestic firm employment on average wages paid by local firms (Ben Hamida, 2013; Demena and Murshed, 2018). Foreign penetration is measured by the importance of MNEs in industry *j*'s total employment at time *t*.

$$ForEmp_{jt} = \frac{Emp^{f}_{jt}}{Emp_{jt}} \tag{14}$$

where Emp^{f}_{jt} denotes total employment by MNEs operating in industry *j* in year *t*. The term Emp_{jt} indexes the total employment in industry *j* in year *t*. $ForEmp_{jt}$ indexes the share of employment by MNEs in industry *j* in year *t*. We then combine the two variables to derive the variable *LabMobility*, as shown below;

$$LabMobility_{jt} = ForEmp_{jt} * Size_{ijrt} \tag{15}$$

where $Size_{ijrt}$ indexes the number of permanent workers in a domestic firm in year *t*.

Thirdly, there is the backward linkage channel, which occurs when domestic firms supplying inputs and their MNEs' clients in downstream sectors come into contact (Kinuthia, 2017). This channel is measured using the ratio of the cost of raw material inputs used by foreign-owned firms that are supplied by domestic firms to the total cost of raw materials used by all firms in industry *j*.

$$BackSpill_{jt} = \frac{M_{jt}^{f}}{M_{jt}} \tag{16}$$

where M_{jt}^{f} is the cost of raw materials used by foreign firms operating in industry j at time t sourced domestically and M_{jt} is the total cost of raw materials used in industry j, in year t.

Lastly, the competition effects channel is measured by the price mark-up of the firm (Demena and Murshed, 2018). To construct the proxy for the competition channel at the firm level, we follow Ben Hamida (2013) and compute the price mark-up as ratio of the difference between the total sales of firm i and its total costs to total sales. If its price mark-up is close to 1 (high mark-up), industry-level competition is assumed to be low and if it is less than or close to 0 (low mark-up), competition is high. This follows that a negative coefficient of the proxy for competition channel implies a reduction in price mark-up (or increased competition), which increases the productivity of domestic firms (Ben Hamida, 2013).

$$CompSpill_{jt} = \frac{S_{ijrt} - C_{ijrt}}{S_{ijrt}} \tag{17}$$

where S_{ijrt} indexes sales of firm i, in year t while C_{ijrt} is the firm's total cost. Firm i's total cost was obtained from the survey data by summing the annual cost of labour, the cost of raw materials, the cost of intermediate goods, and the annual cost of electricity.

We also construct the Herfindahl–Hirschman Index (HHI), a measure of the level of market concentration in the industry in year t (Nguyen et al., 2019). The HHI is the sum of squares of market shares for all firms in the representative industry. A high value of the HHI means market concentration in industry j is high, implying less competition in the market and vice versa. The HHI is stated as;

$$HHH_{jt} = \sum_{i=1}^{N}\left[\frac{S_{ijrt}}{S_{jt}}\right]^{2} \tag{18}$$

where S_{ijrt} indexes firm i's sales in year t, while S_{jt} indexes total sales in industry j.

We also generate the variable, $TechGap_{ijrt}$, the percentage difference between the average TFP of foreign-owned firms and TFP of domestic firm i, operating in industry j, region r, in time t, (Nguyen et al., 2019; Pittiglio et al., 2015). Total Factor Productivity (TFP) at the firm level was estimated using the Levinsohn and Petrin (2003) method.

$$TechGap_{ijrt} = (AvrTFP_{jt}^{f} - TFP_{ijrt}^{d}) / TFP_{ijrt}^{d} \tag{19}$$

where $AvrTFP_{jt}^{f}$ is the average TFP of foreign-owned firms in the industry in year t, and TFP_{ijrt}^{d} denotes the TFP of a domestically-owned firm in industry j, region r and in year t. A negative value for $TechGap_{ijrt}$ implies that a domestic firm has a higher productivity level than an average foreign-owned firm, while a positive value implies that the firm has a lower productivity level than an average foreign-owned firm. Other variables used in Equation 12 are explained in Table 1. The unobserved error term is disaggregated into four components, that is, the time-

invariant industry-specific effects (d_j), the time-invariant region-specific effects (d_r), the time-fixed effects (d_t), and the idiosyncratic error term (ε_{ijrt}).

Table 1. Definition and measurement of variables

Variable	Description
lnW	This is the logarithm of firm *i*'s average wage. It is measured by firm *i*'s total cost of labour (wages, salaries, bonuses etc.) per worker (Lipsey and Sjöholm, 2004; Nguyen et al. 2019)
lnSize	This is the logarithm of firm size. Firms are categorized into small-size firms (5-19 employees), medium size firms (20-99 employees), and large-size firms (above 100 employees); (Pittiglio et al. 2015; Nguyen et al. 2019)
TechGap	This is the percentage difference between the TFP of an average foreign firm and the TFP of a domestic firm in the same region and industry at time *t* (Pittiglio et al. 2015; Nguyen et al. 2019)
Age	The difference between the year the firm was surveyed and the firm's year of establishment (Pittiglio et al. 2015; Girma et al. 2019; Nguyen et al. 2019)
AbsCap	This is the absorption capacity of firm *i*. It is given by a dummy variable, that takes the value of 1 if the firm offers formal training to its workers and 0 otherwise (Demena Murshed, 2018; Negash, 2020)
lnCapInt	The logarithm of firm *i*'s total expenditure on machinery, equipment, and vehicles per employee (Nguyen et al. 2019)
DemoSpill	This is the share of sales by foreign firms in total industry sales. It is used as a proxy for demonstration effects (Jarvorcik, 2004; Pittiglio et al. 2015)
LabMobility	This is the combined impact of foreign presence and the firm's employment (Ben Hamida, 2013; Demena and Murshed, 2018))
CompSpill	This is the firm's price mark-up. It is measured by the difference between total sales and costs of a firm divided by total sales (Ben Hamida, 2013; Demena and Murshed, 2018)
Backspill	This is the backward linkage spillover effect. It is measured by the amount of intermediate inputs supplied to foreign-owned firms by domestic firms (Hoi and Pomfret 2010; Pittiglio et al. 2015)
HHI	This is the Herfindahl-Hirschsman index. The HHI is a measure of the level of market concentration in industry *j* (Hoi and Pomfret, 2010; Nguyen et al. 2019)

3.2.2 Econometric Issues

Given the three-wave panel data, we conducted econometric tests to address several econometric issues in order to obtain consistent and unbiased estimates. Firstly, we applied the Hausman test, whose results showed that the fixed effects estimator was more efficient than the random effects estimator. Secondly, on the problem of multicollinearity, we examined the pairwise correlation of all independent variables to see if one or more variables had a strong correlation with other variables using a correlation matrix. The results are illustrated in Table 2. The coefficients for all variables showed no pairwise correlation between the variables in excess of −/+0.6, implying the absence of severe multicollinearity. The low correlation among the four spillover variables permitted us to estimate the spillovers jointly.

Thirdly, on the issue of omission of unobserved variables, we included industry fixed effects (d_j), a time dummy (d_t), the regional fixed effects (d_r), in addition to time-variant firm-level variables. On the possibility of having

cross- sectional dependence of residuals in the fixed effects model, we performed the Cross-Sectional Dependence (xtcd2) test, a test for panel data as outlined in Pesaran (2015). Under the null hypothesis, the residuals or variables are weakly cross-sectional dependent. The results indicated the absence of cross-sectional dependence meaning the fixed effects model was more appropriate for estimation. Fourthly, there is the issue of endogeneity of foreign direct investment. The FDI variable (the measure for foreign presence) may be endogenous owing to the possibility of bi-directional (reverse) causality. We address the endogeneity problem by using the Two-Step System Generalized Method of Moments (GMM) estimator. Finally, we used alternative specifications to test for the role of firm-level heterogeneity. Our empirical techniques enable us to address various econometric issues which may have contributed to biased estimates in previous empirical research.

Table 2. Matrix of correlations for key variables

Variables	lnW	Back-Spill	Demo-Spill	Lab-Mobility	Comp-Spill	Tech-Gap	lnSize	AbsCap	lnCap-Int	Age	HHI
lnW	1										
BackSpill	0.03	1									
DemoSpill	-0.12	0.18	1								
LabMobility	0.01	0.04	0.11	1							
CompSpill	-0.17	-0.03	0.03	0.00	1						
TechGap	-0.06	0.05	0.10	0.01	-0.46	1					
lnSize	0.06	-0.06	-0.07	0.54	0.02	-0.09	1				
AbsCap	0.08	0.00	-0.05	0.11	0.03	-0.09	0.28	1			
lnCapInt	0.32	-0.07	-0.08	0.00	-0.01	0.05	0.08	0.04	1		
Age	0.08	0.10	0.03	0.09	0.02	-0.06	0.22	0.14	-0.02	1	
HHI	0.06	0.31	0.36	0.11	-0.08	0.06	0.05	-0.02	0.04	-0.01	1

Source: Authors' compilation based on WBES data

4. Data and Descriptive Statistics

This study employed an unbalanced firm-level panel data set for foreign and domestic manufacturing firms resident in Kenya for the period 2007 to 2018, sourced from the World Bank database. The surveys covered firms from five regions in Kenya: Mombasa, Nairobi, Nyanza, Nakuru, and Central Kenya. The detailed longitudinal data was collected in three surveys by administering questionnaires to a representative sample of firms selected using stratified random sampling methodology in the non-agricultural formal private economy (World Bank, 2020). The Surveys use standard sampling methodologies and survey tools across all industrial sectors in all countries based on three main levels of firm stratification, that is, firm size, sector, and region. The sectors are classified based on the International Standard Industrial Classification (ISIC) Rev.3.12-digit classification.

The unbalanced data set constructed by the World Bank for the 1221 firms was collected in three surveys; 331 firms in 2007, 324 firms in 2013 and 359 firms in 2018. About 83% of the panel sample constituted domestic firms while 17% were foreign firms. There were a total of 1014 domestic firms and 207 foreign firms. Table 3 provides descriptive statistics for variables used in our analysis. From Table 3, it can be observed that common stylized facts on FDI spillovers as documented in spillover literature were confirmed in our data sample. We observed that foreign firms are more productive, and had higher capital intensity, higher industry sales intensity, relatively higher sales, and higher labour productivity and absorption capacities compared to domestic firms. Moreover, an average foreign-owned firm had a relatively higher output level, sales, and number of workers and compensated its employees better compared to an average domestically-owned firm.

Table 3. Summary statistics for key variables

	Domestic firms		Foreign firms		
Variable	Mean	Standard deviation	Mean	Standard deviation	*t* test for two sample mean difference
lnCapInt	13.48	2.557	14.09	2.937	-2.79**
Age	25.44	17.66	28.03	19.50	-1.77
HHI	0.183	0.195	0.207	0.227	-1.43
AbsCap	0.408	0.492	0.517	0.501	-2.85**
BackSpill	0.478	0.162	0.442	0.142	3.32**
LabMobility	31.89	146.3	80.39	383.0	-2.68**
CompSpill	-0.996	34.75	0.348	0.947	-1.23
TechGap	27.18	110.9	12.37	34.78	3.49**
DemoSpill	0.270	0.209	0.269	0.206	0.18
lnW	12.05	1.358	12.46	1.510	-3.58**
lnSize	3.635	1.339	4.319	1.349	-6.66**

Source: Authors' compilation based on WBES data

5. Empirical Results and Discussion

In this section, we discuss results from various estimation techniques. The baseline estimation involves the estimation of equation (12) using OLS and the random effects estimation. We estimate equation (12) using fixed effects and the two-step system GMM to test our first objective. All equations and estimations use domestic firms only, given that our overall objective is to investigate the effect of FDI on the average wages of domestic firms.

5.1 Results for Transmission Channels for Wage Spillovers

In this sub-section, we discuss results for wage spillover transmission channels. Table 4 provides the results obtained using various estimation techniques. Columns 1 and 2 provide results from estimations using OLS and random effects techniques respectively. However, given the results of the Hausman test and the possibility of endogeneity of FDI as noted in sub-section 3.2.2, we focus on results obtained from fixed effects and two-step system GMM presented in columns 3 and 4, respectively.

Table 4. Regression results using various estimation techniques

Variables	OLS	Random Effects	Fixed Effects	Two-Step System GMM
Lag lnW				-0.256
				(0.671)
BackSpill	0.154	0.154	0.796	2.690
	(0.221)	(0.221)	(0.577)	(2.250)
DemoSpill	-0.696*	-0.696*	-2.081*	-15.32
	(0.399)	(0.399)	(1.255)	(15.80)
LabMobility	0.000133	0.000133	0.00192	0.00452
	(0.000608)	(0.000608)	(0.00235)	(0.00437)
CompSpill	-0.00914***	-0.00914***	-0.000118	-0.000232
	(0.00126)	(0.00126)	(0.00505)	(0.0116)
TechGap	-0.00223***	-0.00223***	0.00222	0.00206
	(0.000409)	(0.000409)	(0.00337)	(0.00936)
lnSize	-0.0217	-0.0217	-0.450**	-0.710***
	(0.0375)	(0.0375)	(0.200)	(0.267)
lnCapInt	0.159***	0.159***	0.114**	0.196
	(0.0155)	(0.0155)	(0.0486)	(0.143)
AbsCap	0.123	0.123	-0.144	-0.00969
	(0.0832)	(0.0832)	(0.268)	(0.522)
Age	0.00670***	0.00670***	0.0127	0.00602
	(0.00231)	(0.00231)	(0.00907)	(0.0178)
HHI	-0.00389	-0.00389	0.364	0.451
	(0.264)	(0.264)	(0.682)	(3.153)
Region	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Constant	9.764***	9.764***	11.51***	11.42
	(0.265)	(0.265)	(1.444)	(4.434)
Observations	1,014	1,014	1,014	145
Number of panelid		867	867	132
R-squared	0.202		0.282	
Prob > chi2	0.00			

Notes: The hausman test is chi2(16)=28.74, significant at the 1 percent level Prob>chi2= 0.0258

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

From Table 4, results from fixed effects estimation show that the coefficients of proxies for labour mobility and backward linkage channels are positive though not statistically significant, while that of proxies for labour mobility and competition effects channels are negative, but not statistically significant. The findings suggest that inward FDI does not affect average wages paid by domestically-owned firms, implying that the effects of inward foreign investment are completely internalized within each firm. The results are consistent with those obtained by Faggio (2003) for Bulgarian and Romanian firms, Hale and Long (2011) for state-owned enterprises in China, Feliciano and Lipsey (2006) for manufacturing firms in the USA, Muñoz-Bullón and Sánchez -Bueno (2013) for Spanish firms, Pittiglio et al., (2015) for Italian firms and Yasin et al., 2022 for Indonesian firms. Overall, the size of

coefficients for proxies for labour mobility and competition channels show that the coefficients are not economically significant, while those for proxies for backward linkage and demonstration effects channels are economically but not statistically significant.

When endogeneity concerns are accounted for and the estimation of equation (12) is done using a two-step system GMM, the coefficients of the proxies for backward linkages and labour mobility channels are still positive and not statistically significant. The magnitude is however larger when endogeneity is accounted for. Finally, the coefficient for demonstration effects and competition effects channels are still negative and not statistically significant but larger than those obtained from fixed effects estimation. Unlike the fixed effects estimator, GMM uses internal instruments (lagged dependent/independent variables) to estimate the dynamic panel data models. Any variable that is lagged will be dropped leading to a reduction in the observations used for estimation.

In the next subsection, we examine the role played by firm heterogeneity on wage spillovers. Specifically, we evaluate the effect of the technology gap and firm size on the magnitude and sign of wage spillovers.

5.2 Wage Spillovers and the Technology Gap

To evaluate the impact of the technology gap on the workings of wage spillover channels, we split the data sample into two groups, that is, high and low technology gap groups using a dummy variable that took a value of 1 if the TFP of a domestic firm was below the TFP of an average foreign-owned firm and 0 otherwise (Hoi and Pomfret, 2010; Ben Hamida, 2013; Pittiglio et al., 2015). We conduct separate regressions for firms in both technology gap groups. Table 5 provides results for the two groups.

When estimations are done using fixed effects, our findings suggest that the coefficients for the backward linkages and labour mobility channels are positive and larger for firms in the low technology gap group, though statistically not significant. For the competition effects channel, the coefficient is still negative but larger for firms with low technology gaps than that of firms in the high technology gap group, though it is not statistically significant in both cases. On the demonstration effects channel, low technology gap firms have a positive and larger (but not statistically significant) coefficient.

When endogeneity is accounted for and estimations conducted using a two-step system GMM, the findings suggest that domestically-owned firms with high technological levels (those with low technology gaps with foreign firms) seem to enjoy larger and statistically significant wage spillovers from across all channels. Specifically, the results show that domestic firms in the low technology gap group experience positive and statistically significant wage spillovers via the backward linkage, labour mobility, and demonstration effects channels. The findings show that low- gap firms can meet the set quality standards and therefore take advantage of technological opportunities accruing from FDI, thus improving their productivity and wages. This evidence is consistent with that obtained by Hoi and Pomfret (2010) for Vietnamese manufacturing firms and Paweenawat (2019) for manufacturing firms in Thailand.

Table 5. Results for spillover transmission channels and the technological gap

	High Gap		Low Gap	
Variable	Fixed Effects	Two-Step System GMM	Fixed Effects	Two-Step System GMM
Lag lnW		-0.342		0.614***
		(1.197)		(0.0744)
BackSpill	0.407	-1.168	-4.757	10.00***
	(0.668)	(3.070)	(14.30)	(0.847)
DemoSpill	-3.231	-0.478	2.844	0.328***
	(1.949)	(0.395)	(16.09)	(0.126)
LabMobility	-0.000472	-0.0112	0.00725	0.00834***
	(0.00533)	(0.00789)	(0.0174)	(0.000627)
CompSpill	-0.000665	-0.000332	-5.660	-6.306***
	(0.00569)	(0.00553)	(5.660)	(0.903)
TechGap	0.00107	0.00302	-0.486	0.908***
	(0.00392)	(0.00403)	(1.763)	(0.268)
lnSize	-0.408	0.0451	0.252	-1.128***
	(0.292)	(0.366)	(1.891)	(0.107)
lnCapInt	0.182**	0.271*	0.539	0.516***
	(0.0691)	(0.154)	(1.356)	(0.0671)
AbsCap	-0.241	-0.307	-0.0844	3.389***
	(0.350)	(0.816)	(3.877)	(0.344)
Age	0.00881	-0.0104	-0.0613	0.0292**
	(0.0120)	(0.0327)	(0.178)	(0.0120)
HHI	1.472	2.901	6.433	(0.0207)
	(0.998)	(5.047)	(14.99)	1.738
Region	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Constant	11.02***	7.987**	8.480	0.962
	(1.686)	(3.993)	(13.10)	(1.767)
Observations	734	81	280	15
Number of panelid	652	76	264	15
R-squared	0.45		0.608	

Notes: Results are from fixed effects and Two-Step System GMM estimates. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The results also indicate that domestic firms in the low gap group suffer negative and significant wage spillover effects via the competition effects channel. This can be explained by the theoretical findings by Görg and Greenaway (2004), on horizontal spillovers which assert that the negative spillovers from the competition channel can outweigh the positive spillovers via the demonstration channel. Negative wage spillovers may be attributed to the 'crowding out' effect on domestic labour markets, where foreign-owned firms attract skilled and experienced workers away from locally-owned firms by paying higher wages. On the other hand, firms in the high technology gap group (those belonging to industries with low technological levels) experience positive but not statistically significant wage spillovers through demonstration effects and labour mobility channels and negative but not

statistically wage spillovers through the backward linkage and competition effects channels.

5.3 Wage Spillovers and Firm Size

To evaluate the impact of firm size on the magnitude and sign of FDI-induced wage spillovers, we categorize our sample into two groups based on the number of permanent employees, that is, small and medium-size firms (firms with 5-99 employees) and large size firms (firms with over 100 employees). We then conduct separate regressions for firms in the two groups. The results are presented in Table 6.

Table 6. Results for spillover transmission channels and firm size

	Small and Medium firms		Large firms	
Variable	Fixed Effects	Two-Step System GMM	Fixed Effects	Two-Step System GMM
Lag lnW		0.106		-0.459
		(0.644)		(0.870)
BackSpill	0.779	2.551	2.956	28.58
	(0.771)	(3.703)	(2.624)	(65.15)
DemoSpill	-3.037	-1.316	-2.729	0.715
	(1.886)	-1.598	(4.339)	(2.568)
LabMobility	-0.0452	0.0513	0.00719	0.0986
	(0.0307)	(0.165)	(0.00488)	(0.198)
CompSpill	0.00342	0.00361	-0.981	-5.194
	(0.00568)	(0.00854)	(1.147)	(9.028)
TechGap	0.00459	0.00339	-0.0215	-0.184
	(0.00378)	(0.00658)	(0.0429)	(0.292)
lnSize	-0.108	-1.199	-1.413	-23.78
	(0.430)	(1.419)	(0.958)	(49.67)
lnCapInt	0.128**	0.346**	0.363*	1.476
	(0.0595)	(0.151)	(0.206)	(2.867)
AbsCap	-0.0614	-0.428	-1.076	7.551
	(0.358)	(0.769)	(0.965)	(14.01)
Age	0.00786	0.0184	0.0296	0.0162
	(0.0131)	(0.0153)	(0.0288)	(0.181)
HHI	0.718	-8.640	-0.809	-13.47
	(0.889)	(9.289)	(3.541)	(32.96)
Region	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Constant	10.92***	8.372	14.33***	112.5
	(1.894)	(10.20)	(4.743)	(194.0)
Observations	757	91	257	30
Number of panelid	665	84	226	28
R-squared	0.325		0.532	

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the logarithm of average wages of domestic firms.

Overall, the findings show that firm size has no significant impact on wages, though the sign and magnitude of spillovers vary with firm size. Specifically, the results from fixed effects estimations provide evidence of positive but not statistically significant wage spillovers for firms in both groups via the backward linkage channel and negative but not statistically significant spillovers through the demonstration effects channel. Large firms suffer negative wage externalities via the backward linkage channel and enjoy positive spillovers via the labour mobility channel. On the other hand, small and medium firms experience positive wage spillovers via the competition effects channel and suffer negative wage spillovers via the labour mobility channel.

The results from the two-step system GMM estimation reveal that firms in both groups experience positive spillovers via backward linkages and demonstration channels, though the magnitudes of the coefficients are larger for large-size firms. This can be an indication that large firms may not necessarily possess the requisite absorption capacity and technology to attract significant wage benefits from foreign presence. Further, firms in both categories experience negative wage spillovers via labour mobility channels though small and medium firms have a higher coefficient than large firms.

Finally, on the competition effects channel, small and medium firms experience positive and statistically significant spillovers while large firms experience negative spillovers, though the coefficient is not statistically significant. We, therefore, conclude that large firms experience relatively higher domestic competition from MNEs compared to small and medium-size firms. Overall, the results are consistent with the theoretical argument that larger firms may be operating at levels that lack the necessary capacity and knowledge to reap higher spillover benefits from FDI (Feng, 2020).

6. Conclusions and Policy Implications

Foreign direct investment inflows to a host country may impact domestic labour markets by improving working conditions and wages of domestic firms. Extant literature on FDI and wages has mainly focused on measuring the direct effects of FDI presence on wages using a single or aggregated proxy for foreign presence. Indirect effects (spillover effects) and disaggregation of spillover channels are therefore largely ignored.

To bring out a more nuanced picture of FDI-induced wage spillovers, our study allows us to investigate wage spillovers on domestic firms in terms of various transmission channels. In addition, our study disaggregates domestically-owned firms according to their sizes and technological levels. Overall, in the full data sample, the results show FDI presence does not generate significant wage spillovers on domestically-owned firms' wages. However, in the sub-sample of low and high technology gap groups, the results revealed that domestically-owned firms with higher technological levels (those with small technological gaps with foreign firms) benefitted from significant positive wage spillovers via backward linkage, demonstration effects, and labour mobility channels and suffered significant negative wage spillovers competition effects channels. On the other hand, domestically-owned firms in the high technology gap group experienced no significant wage spillovers across all channels. In addition, the results indicate that firm size does not affect the behavior of wage spillover transmission channels.

The findings from this study portend several implications for policymaking. There is a need for policymakers to identify each spillover transmission channel and carefully examine it before making any meaningful conclusions on the existence and significance of wage spillovers from FDI. The findings also suggest the need for the government to invest in enhancing technology at firm and industry levels if the expected benefits from foreign direct investments were to be realized. Domestic firms also ought to upgrade their human capital as well as their absorption and technical capacities in order to reap benefits accruing from the entry and presence of MNEs in their industry. Moreover, to optimize spillover benefits from FDI on wages in domestic labour markets from foreign linkages, the government ought to promote investment in value-addition to enhance the potential for industry-specific and economy-wide backward linkages.

This study is limited by the unavailability of data to explore vertical spillovers that occur via the forward linkage channel. Such an analysis would require an Input-Output table. Moreover, owing to data limitations, the study did not explore the short-term and long-term effects of FDI, as well as examine the impact of other forms of heterogeneity on wage spillovers. Further research should, in addition to undertaking research on spillovers via forward linkages and investigating both short-term and long-term effects of inward FDI, explore the impact of other forms of heterogeneity such as geographical proximity of foreign firms as well as foreign ownership structure on the workings of various wage spillover transmission channels.

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