

## **Foreign Direct Investment and Wage Spillovers in Vietnam: Evidence from Firm Level Data**

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# Foreign Direct Investment and Wage Spillovers in Vietnam: Evidence from Firm Level Data

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## Abstract

This paper examines the impact of FDI on wages paid by domestic firms in Vietnam. The existing literature has examined the impact of foreign firms on domestic firms' wage levels within an industry. We expand on the literature by examining inter-industry linkages as an additional conduit for wage spillovers. There is strong evidence of horizontal wage spillovers from foreign firms to domestic firms in Vietnam, despite different labour market conditions and firms' characteristics. Vertical wage spillovers exist, but depend on the specific characteristics of firms and industries. A further finding is that training activities facilitate wage spillovers.

JEL Classification: C23, F23, J31.

Keywords: Foreign Investment, Wages, Spillovers, Vietnam.

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## **1. Introduction**

Foreign direct investment (FDI) is often considered as an engine to economic growth and development. Host country effects of multinational enterprises (MNEs) are well documented in the literature (Lipsey, 2003; Gorg and Greenaway, 2004). A number of studies have examined productivity spillovers from both horizontal and vertical linkages, although the empirical evidence remains inconclusive. Comparatively little effort has been spent on identifying other host-country benefits from FDI, such as wage spillovers from foreign firms. FDI may have direct and indirect effects on average wages. The direct effects operate through MNEs paying higher wage levels than those paid by domestic firms operating in the same sector, hence raising average wages. The indirect effects arise through the positive impact that the entry or the presence of MNEs may have on wages in domestic firms.

The conclusions from empirical studies on wage spillovers from FDI are mixed. Some studies suggest that wages in domestic firms are improved by the presence of FDI (Lipsey and Sjöholm, 2001; Driffield and Girma, 2003). Other researchers find negative effects of foreign presence on wage levels of domestic firms (Barry, Gorg and Strobl, 2005). Finally, some studies find that FDI has no significant impact on domestic firms' wages (Aitken, Harrison and Lipsey, 1996).

The existing literature is subject to a number of shortcomings, which may explain the mixed results or failure to detect significant wage spillover effects on domestic firms. First, most studies only examine horizontal wage spillovers, relating the wage level of a domestic firm to the presence of foreign firms in the same industry. Foreign firms often pay higher wages than domestic firms, even after controlling for size and other firm and

sectoral characteristics (Girma et al, 2001; Lipsey and Sjöholm, 2001), so that, if foreign and domestic firms compete in the same labour market, domestic firms have to pay higher wages to attract workers. Thus, horizontal wage spillovers occur through the shift in labour demand or increased competition in labour markets. This neglects the possibility of vertical wage spillovers to domestic firms from linkages with foreign firms in different industries. If there are positive productivity spillovers from foreign firms to domestic firms through vertical linkages, then domestic firms will become more productive and be able to pay higher wages.

Secondly, in many studies the coefficient indicating wage spillovers is constrained to be the same for all firms. All domestic firms are assumed to benefit equally from FDI, so that findings on wage spillovers are a result of ignoring differences in the characteristics of firms and industries. When firm heterogeneity is taken into account, wage spillovers may be associated not only with identifiable differences across industries, but also with differences between firms within industries.

Thirdly, it is usually assumed that FDI is homogeneous and therefore that the wage spillover effect is the same for all types of FDI. However, as Moran (2001) shows in a number of case studies, foreign investment is heterogeneous with respect to its relationship with domestic firms, which can be assumed to have implications for any spillovers. Wage spillovers can arise when workers receive training or accumulate experience by working for foreign firms and then move to domestic firms. Using a matched firm and worker level dataset for Ghanaian manufacturing firms, Gorg, Strobl and Walsh (2002) find that those who work for and receive training in foreign firms experience more rapid wage growth than workers being trained only in domestic firms.

This is consistent with their theoretical model, which shows that training provided by foreign firms is more productive than that of domestic firms, and hence that workers trained in foreign firms have steeper wage profiles.

In this paper, we take all of these issues into account using firm level data for Vietnamese industries from 2000 to 2004. First, we investigate the importance of both horizontal and vertical wage spillovers. We distinguish spillover effects due to the presence of foreign firms in the same industry from effects due to vertical linkages between foreign and domestic firms, and in doing so we clarify the relative strength of channels through which wage spillovers occur. Secondly, we examine the existence and strength of wage spillovers under different characteristics of firms and industries. Thirdly, we allow for the heterogeneity of FDI by distinguishing wage spillovers from foreign firms with and without training activity in the host country.

The rest of the paper is organised as follows. The estimation strategy is described in Section 2 and the data are discussed in Section 3. The empirical results are in Sections 4-6, which report the baseline findings on horizontal and vertical spillovers, relationships between industry characteristics and wage spillovers, and the role of domestic training activity. Finally, Section 7 presents conclusions.

## 2. Estimation Strategy

In examining wage spillovers from foreign firms to domestic firms in Vietnamese industry, we estimate an equation of the following form:

$$\ln W_{ijt} = \beta_1 HS_{jt} + \beta_2 VS_{jt} + \beta_3 X_{ijt} + S_j + D_t + L_i + \varepsilon_{ijt} \quad (1)$$

where  $i$ ,  $j$ , and  $t$  represent firm, industry, and year respectively.  $W_{ijt}$  is average wage of firm  $i$  in sector  $j$  in year  $t$ .  $S_j$  is a dummy for industry fixed effects.  $D_t$  represents time dummies that account for aggregate shocks.  $L_i$  is a dummy for regional fixed effects.  $\varepsilon_{ijt}$  denotes a random noise term.  $X_{ijt}$  is a vector of firm  $i$ 's characteristics that may influence the level of wages.

Horizontal wage spillover ( $HS_{jt}$ ) is measured as the share of employment accounted by all foreign firms in industry  $j$  in which the firm operates.

$$HS_{jt} = \frac{\sum_{k=1}^m FL_{kjt}}{\sum_{k,i=1}^{m,n} (FL_{kjt} + DL_{ijt})} \quad (2)$$

where  $FL_{kjt}$  ( $k=1, \dots, m$ ) is employment of foreign firms  $k$  in industry  $j$  and year  $t$ , and  $DL_{ijt}$  ( $i=1, \dots, n$ ) is employment of domestic firms  $i$  in industry  $j$  and year  $t$ . This spillover indicates the degree of foreign penetration in each industry's labour market, and the competitive pressures from foreign firms that encourage domestic firms to increase wages in order to attract workers.

Vertical wage spillover ( $VS_{jt}$ ) is derived from the extent of contacts between domestic firms and foreign firms in different industries. These contacts may lead to productivity gains to domestic firms and they will pay higher wages.

$$VS_{jt} = \sum_{r=1}^p \alpha_{jrt} * HS_{rt} \quad (r=1, \dots, p) \quad (3)$$

where  $\alpha_{jrt}$  ( $0 \leq \alpha_{jrt} \leq 1$ ) is the proportion of industry  $r$ 's output that is supplied to industry  $j$  taken from the input-output table (IO table) at the two-digit level of the

Vietnamese Standard Industrial Classification (VSIC). The values of  $\alpha_{jrt}$  from 2000 to 2004 are based on the 2000 IO table.<sup>1</sup> Besides data limitation, this approach may be justified on the grounds that industrial structures do not change rapidly. Although the coefficients taken from the IO table remain fixed, horizontal values do change over time, so the measures of vertical linkages are time-varying sector-specific variables (Smarzynska, 2004).

In this paper we consider the role of training on wage spillovers. Hence, the measures of horizontal and vertical wage spillovers are calculated considering the training activities of foreign firms to obtain four variables, namely HS-Training, HS-No-training, VS-Training and VS-No-training. The measures with the Training suffix relate to foreign firms which undertake domestic training, whereas the measures with the No-training suffix relate to foreign firms that do not train local labour. The training activity of foreign firms is likely to be relevant to wage spillovers since it contributes to the degree of contact foreign firms have with domestic markets.

Regarding firm's characteristics, we control for capital intensity, scale and concentration, technology, and skill levels. Foreign firms may be more capital-intensive and larger than domestic firms, and these characteristics may account for some of the

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<sup>1</sup> The IO table was published in 2000 with three variants: domestic transactions at producer prices, domestic transactions at basic prices, and domestic transactions at purchaser prices. This study considers domestic transactions at purchaser prices.

The 2000 IO table classified industrial production into 119 categories. Sectors in the IO table were regrouped so as to match the industry classification of two-digit level industries (VSIC).

wage differentials between foreign and domestic firms. We measure capital intensity by the ratio of fixed assets to total employment.

To account for the impact of scale on wage differentials, we measure the scale effect using the ratio of sales in each firm to total industry sales. Another factor that may influence the average wages paid by firms is the level of competition in each industry, which is proxied by the Herfindahl index. The Herfindahl index in industry  $j$  in year  $t$  is calculated as follows:

$$HERF_{jt} = \sum_{i=1}^n \left( \frac{x_{ijt}}{X_{jt}} \right)^2 \quad (i=1, \dots, n) \quad (4)$$

where  $x_{ijt}$  is the sales of the firm  $i$  in industry  $j$ ;  $X_{jt}$  denotes the total sales of industry  $j$ . A higher value of the Herfindahl index indicates a high degree of industry concentration, and thus less competition.

To examine the effects of technology gap on wage spillovers, we define the technology gap for each firm as the percentage difference between its labour productivity and that of the average of foreign firms in the same industry:

$$Technology\ Gap_{ijt} = (Average\ LP_{jt} - LP_{ijt}) / LP_{ijt} \quad (5)$$

where  $Average\ LP_{jt}$  is the mean of the labour productivity of foreign firms in industry  $j$  in year  $t$ , and  $LP_{ijt}$  is the labour productivity of domestic firm  $i$  in industry  $j$  in year  $t$ . A negative value of the variable indicates that firm  $i$  is more productive than the average foreign firm in the industry and a positive value indicate that firm  $i$  is less productive than the average foreign firm in the industry. A larger positive value shows that a larger technology gap exists between the domestic firm and the average foreign firm in the same industry.



Skills that workers attain through education and training may affect the level of wages. We use workers' educational attainment to control for the impact of skills on wages. Firm-specific data on educational attainment are not available, so the firm's skill level is proxied by the educational attainment of workers in the province where the firm is located.

All regressions in this paper are estimated using OLS with White's correction for heteroskedasticity and are restricted to domestic firms. Considering only domestic firms allows us to avoid a potential bias stemming from the endogeneity problem that occurs if foreign investors tend to acquire stakes in the largest and most successful domestic firms.

Another econometric issue is the potential endogeneity of foreign presence and domestic firms' wages. Foreign firms may choose to locate in a region or an industry with lower wage level. Therefore the observed correlation between foreign presence and domestic firms' wages may overestimate the positive impact of the foreign sector. As a result, an OLS estimator may lead to inconsistent results. We control for this endogeneity by adding fixed effects for industry, region and time. Specifically, the industry, region and time dummies control for unobserved variables that may be driving changes in, for example, the attractiveness of a given industry or region.

### **3. Data**

The data come from the annual enterprise survey conducted by the General Statistics Office of Vietnam (GSO). The data provide information on formal economic entities in Vietnam from 2000 to 2004. The number of firms per year varies from a low of 10,945 firms in 2000 to a high of 23,121 firms in 2004. After deleting firms with missing

values, zero wages, zero sales, zero output, zero employment, and observations failing to satisfy other basic error checks, the usable data set is an unbalanced panel of 7,140 domestic firms and 1,461 foreign firms.<sup>2</sup> All variables are deflated to 1994 prices using the appropriate producer price index deflators.

The domestic sector is defined to include state owned enterprises (SOEs), non-state collective establishments, and domestic private firms and households. Foreign firms are defined as all establishments with foreign investors (joint ventures and 100% foreign-invested firms). No distinction is made between joint ventures and 100% foreign-invested firms because the aim is to examine the impact of foreign firms on domestic firms' performance.

The data set contains information on the property structure of the enterprise, wages, sales, output, capital stock, employment, investment, location, research and development (R&D) activity and international trade.<sup>3</sup> The sectoral classification of

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<sup>2</sup> A two-stage cleaning process was used for labour, wages, output, capital, and sales. First, the earliest and latest years in which a firm reported were identified, and interpolation was used to fill-in up gaps of up to two missing years within the reporting window. If more than two continuous years of data were missing, the firm was dropped from the sample. Second, firms with unreasonably large jumps or drops in key variables not accompanied by corresponding movement in other variables (for example, large increase in labour not accompanied by any increase in output) were dropped.

<sup>3</sup> Nominal output and sales are available every year. The numbers of workers are reported in all years, and in most years wage payments are detailed in four categories: normal wages, overtime, gifts and bonuses, and other payments. We used the total of all payment as our measure of wages. The replacement value of fixed assets is used as the measure of capital stock for all firms.

enterprises is at the two-digit level of Vietnamese Standard Industrial Classification (VSIC), which includes 29 sectors from three industrial groups. There are four sectors in mining and quarrying, twenty-three in manufacturing, and two in electricity, gas and water supply (see Appendix). The high-wage industries are chemicals, computer and office equipment, and television and telecommunication devices, and the low-wage industries are food and beverages, and textiles.

The Appendix table provides some descriptive statistics by sector. Among industries at the two-digit VSIC level, electrical machinery and appliances, radios, television and telecommunication devices, and medical equipment and optical instruments are relatively large in terms of foreign share of employment. The foreign shares of employment are small in mining, cigarettes and tobacco, and collection, purification and distribution of water. Wages in foreign firms are relatively high in all industries except cigarettes and tobacco; the average wage in foreign firms is about 70 per cent higher than in domestic firms within two-digit industries.

#### **4. Horizontal and Vertical Effects of FDI on Wages**

This section reports results on the effect of FDI through both horizontal and vertical linkages on wages of domestic firms obtained by estimating equation (1). In the first column of Table 1, showing wage spillovers from foreign firms to domestic firms, the coefficients on both horizontal and vertical linkages are positive and significant.

A greater presence of foreign firms is positively associated with higher average wages of domestic firms, after controlling for fixed effects of industry, region and time. This suggests that, *ceteris paribus*, the presence of foreign firms causes a shift in labour

demand leading to upward pressure on wages faced by both foreign firms and domestic firms. The vertical linkages between foreign firms and domestic ones may be a result of technological or productivity spillovers from foreign firms leading to higher productivity in the domestic firms which is accompanied by higher wages.

The potential impact of FDI on domestic wages may be conditional on geographical proximity (Lipsev and Sjöholm, 2001). In addition, the Vietnamese labour market shows some degree of regional segmentation. Thus, labour may be mobile among industries within a province, but not across provinces. In order to capture the effect of geographical proximity, we calculate an alternative measure of horizontal wage spillover – *HS province* - which is the share of foreign firms' employment in the same industry and the same province. The result from column 2 in Table 1 shows that foreign firms affect wages in domestic firms in the same industry within the same province, as the coefficient on *HS province* is positive and significant. This implies that wage spillovers occur at both industry level and provincial level.

Among other explanatory variables, average wage levels are positively associated with educational level of workers, capital intensity and scale. The effect of competition on wages is captured by the concentration variable, which is negative and significant; a reduction of industry concentration (increase in the level of competition) by 10% increases the average wages of domestic firms in that industry by 0.02%. This also suggests that competition from a domestic firm may be important for the wage level of another domestic firm. Competition from a domestic firm may induce other domestic firms to pay higher wages in order to attract good workers.

To test the hypothesis that the technology gap affects the extent to which domestic firms can benefit from wage spillovers, we interact the technology gap and wage spillover coefficients. The coefficients on the interaction terms are negative and significant (column 3), which suggests that, the larger the technology gap between domestic and foreign firms, the smaller the wage spillovers.

## **5. Industry Characteristics and Wage Spillovers**

Firm heterogeneity may explain part of the nexus between FDI and wage spillover. In this section we examine the relationship between various industry characteristics and wage spillovers. We focus on differences in ownership structure, technology level and scale economies.

Table 2 presents the results of the impact of ownership structure on wage spillovers. Horizontal wage spillovers affect all types of firms: state, private and collective. However, vertical wage spillovers only affect private firms, and wages in state firms and collective firms are not significantly influenced by vertical linkages with foreign firms. This may be due to the fact that state firms and collective firms are heavily protected by different means, and as a result private firms have a stronger linkage with foreign firms than state and collective firms.

The pooling of all firms in the sample to estimate wage spillover effects may hide important variations in spillover effects for different types of industry. The sample is divided into low technology; medium technology and high technology industries, based on the classification of the General Statistics Office of Vietnam (see Appendix). While firms in low and medium technology industries experience horizontal wage spillovers,

firms in high technology industries are not affected by horizontal spillovers (Table 3). Foreign firms only generate vertical wage spillovers to domestic firms in industries of low technology. FDI in low technology sectors like textiles and clothing, food and beverages etc, seems to create greater wage spillovers since the success of these kinds of FDI depends on market and labour costs.

Table 4 shows the results of wage spillovers in different sizes of firms. All domestic firms are divided into two types by firm size: large firms, and small and medium firms. A large firm is defined as one with more than 100 employees, and a small and medium firm is one with less than 100 employees. The presence of foreign firms in an industry increases the wage levels of firms in both size groups, but only small and medium firms gain wage spillovers from vertical linkages with foreign firms.

## **6. The Role of Training in Wage Spillovers**

Table 5 reports the effects of the training activity of domestic firms on wage spillovers. Foreign firms generate horizontal wage spillovers to both domestic firms with and without training activity. However, only domestic firms having training activity experience vertical wage spillovers. This may imply that training enables domestic firms to get labour movement from foreign firms, hence enhancing wage spillovers.

As pointed out in section 2, foreign firms with domestic training activities have more contacts with domestic firms than those without training activities. Therefore, domestic training by foreign firms may be relevant to the process of wage spillovers, because training may promote labour mobility and the extent of FDI spillovers on wages. Domestic firms experience horizontal wages spillovers only from foreign firms, which

provide domestic training activity (Table 6). These results are in line with the idea that foreign firms with integrated labour markets have a larger impact on wages of domestic firms than those that are not involved in such markets. The finding for horizontal spillovers applies to domestic firms both with and without their own training.

Foreign firms with domestic training activity generate positive and significant vertical wage spillovers to domestic firms with training, but not to domestic firms without training. This reflects the fact that domestic firms with training commitments have more contacts with foreign firms than domestic firms without such commitments. As a result, it is more likely that there is labour mobility between foreign firms and domestic firms with training, hence leading to wage spillovers between these firms.

## **7. Conclusion**

This paper examines wage spillovers from foreign firms to domestic firms using firm level data of Vietnam from 2000 to 2004. Unlike previous empirical studies, this paper investigates not only horizontal (intra-industry) wage spillovers, but also vertical wage externalities (inter-industry). The empirical results provide strong evidence of wage spillovers from foreign firms to domestic firms in Vietnam. Wage levels in domestic firms are higher in sectors where there is a higher presence of foreign firms (horizontal wage spillovers), and domestic firms with backward linkages to foreign firms can gain productivity spillovers and pay higher wages (vertical wage spillovers).

Wage spillovers vary across sectors and firms, and the characteristics of domestic firms and sectors are relevant in analysing the impact of FDI on domestic wages. This is especially true with respect to vertical spillovers. While horizontal wage spillovers affect

firms by all ownership types, vertical wage spillovers only affect private firms. Horizontal spillovers affect firms in low and medium technology industries, but vertical spillovers only affect firms in low technology industries. Horizontal spillovers affect firms in all size groups, but vertical spillovers only affect small and medium firms. Horizontal spillovers impact firms whether or not they provide training, but vertical wage spillovers only reach domestic firms with training.

The training activity of domestic and foreign firms alike is relevant to wage spillovers. Both horizontal and vertical wage spillovers occur when the foreign firm has training activity, but not in the absence of training by the foreign firm. The vertical wage spillovers are not significant when the domestic firm does not have training activity. In sum, although wage spillovers from FDI to domestic producers are widespread in Vietnam and can be both horizontal and vertical, their incidence is related to industry and firm characteristics.



**Table 1: Horizontal and vertical effects of FDI on wages**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	1	2	3
Horizontal	0.002 (0.0008)*		0.002 (0.0008)*
Horizontal - province		0.002 (0.0001)**	
Vertical	0.008 (0.004)**	0.009 (0.004)**	0.007 (0.004)**
Capital intensity	0.16 (0.002)*	0.16 (0.02)*	0.16 (0.002)*
Skills	0.05 (0.003)*	0.05 (0.003)*	0.05 (0.003)*
Scale	0.15 (0.004)*	0.15 (0.004)*	0.15 (0.004)*
Concentration	-0.002 (0.0001)*	-0.003 (0.0001)*	-0.002 (0.0001)*
Technology gap	-0.002 (0.0008)*	-0.002 (0.0008)*	-0.002 (0.0001)*
Horizontal* Technology gap			-0.0003 (0.000)*
Vertical*Technology gap			-0.0007 (0.000)*
Industry dummies	yes	yes	yes
Region dummies	yes	yes	yes
Year dummies	yes	yes	yes
Number of firms	7140	7140	7140
Number of observations	34508	34508	34508
R-squared	0.36	0.35	0.36

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

**Table 2: The effect of ownership structure of domestic firms on wage spillovers**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	State firms	Private firms	Collective firms
Horizontal	0.002 (0.001)**	0.001 (0.0009)***	0.003 (0.002)***
Vertical	0.008 (0.008)	0.01 (0.005)**	0.01 (0.01)
Capital intensity	0.12 (0.006)*	0.12 (0.003)*	0.13 (0.007)*
Skills	0.07 (0.005)*	0.05 (0.004)	0.03 (0.009)*
Scale	0.14 (0.006)*	0.13 (0.01)*	2.99 (0.23)*
Concentration	-0.004 (0.0002)*	-0.002 (0.0001)*	-2.22 (0.24)*
Technology gap	-0.005 (0.0002)*	-0.003 (0.0001)*	-0.001 (0.0001)*
Industry dummies	yes	yes	yes
Region dummies	yes	yes	yes
Year dummies	yes	yes	yes
Number of firms	1397	4971	772
Number of observations	6930	23811	3767
R-squared	0.53	0.27	0.32

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

**Table 3: The impact of type of industry on wage spillovers to domestic firms**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	Low technology	Medium technology	High technology
Horizontal	0.002 (0.001)*	0.006 (0.004)***	- 0.002 (0.002)
Vertical	0.03 (0.007)*	0.001 (0.007)	0.006 (0.009)
Capital intensity	0.13 (0.003)*	0.15 (0.005)*	0.11 (0.01)*
Skills	0.05 (0.004)*	0.06 (0.006)*	0.11 (0.01)*
Scale	0.15 (0.006)*	0.41 (0.02)*	0.47 (0.03)*
Concentration	-0.002 (0.0001)*	-0.02 (0.001)*	-0.05 (0.006)*
Technology gap	-0.004 (0.0001)*	-0.003 (0.0001)*	-0.002 (0.0002)*
Industry dummies	yes	yes	yes
Region dummies	yes	yes	yes
Year dummies	yes	yes	yes
Number of firms	4148	1915	557
Number of observations	20218	9277	2756
R-squared	0.33	0.36	0.37

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

**Table 4: Wage spillovers in different sizes of domestic firms**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	Small and medium firms	Large firms
Horizontal	0.001 (0.0009)***	0.003 (0.001)*
Vertical	0.01 (0.005)*	0.004 (0.007)
Capital intensity	0.14 (0.003)*	0.16 (0.004)*
Skills	0.05 (0.004)*	0.06 (0.005)*
Scale	0.13 (0.01)*	0.14 (0.006)*
Concentration	-0.002 (0.0002)*	-0.003 (0.0002)*
Technology gap	-0.003 (0.0001)*	-0.001 (0.0001)*
Industry dummies	Yes	Yes
Region dummies	Yes	Yes
Year dummies	Yes	Yes
Number of firms	4948	2192
Number of observations	23695	10813
R-squared	0.30	0.46

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

**Table 5: The effect of training activity of domestic firms on wage spillovers**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	Domestic firms with training	Domestic firms without training
Horizontal	0.002 (0.001)**	0.002 (0.001)**
Vertical	0.01 (0.005)**	0.004 (0.007)
Capital intensity	0.14 (0.003)*	0.16 (0.005)*
Skills	0.04 (0.004)*	0.08 (0.006)*
Scale	0.13 (0.008)*	0.17 (0.007)*
Concentration	-0.002 (0.0001)*	-0.004 (0.0002)*
Technology gap	-0.002 (0.0001)*	-0.004 (0.0002)*
Industry dummies	yes	yes
Region dummies	yes	yes
Year dummies	yes	yes
Number of firms	5351	1789
Number of observations	25744	8764
R-squared	0.33	0.44

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

**Table 6: The effect of domestic training activity of foreign firms on wage spillovers**

Dependent variable: Logarithm of wages per employee in a domestic firm

Explanatory variable	All domestic firms	Domestic firms with training	Domestic firms without training
	1	2	3
Horizontal - Training	0.002 (0.001)*	0.002 (0.001)**	0.003 (0.001)**
Horizontal - No training	0.001 (0.001)	0.001 (0.002)	0.001 (0.003)
Vertical – Training	0.01 (0.004)*	0.01 (0.005)*	0.008 (0.008)
Vertical - No training	-0.003 (0.006)	-0.001 (0.008)	0.001 (0.01)
Capital intensity	0.16 (0.002)*	0.14 (0.003)*	0.16 (0.005)*
Skills	0.05 (0.003)*	0.05 (0.004)*	0.05 (0.004)*
Scale	0.15 (0.04)*	0.13 (0.008)*	0.17 (0.007)*
Concentration	-0.002 (0.0001)*	-0.002 (0.0001)*	-0.004 (0.0002)*
Technology gap	-0.002 (0.0008)*	-0.002 (0.0001)*	-0.004 (0.0002)
Industry dummies	yes	yes	yes
Region dummies	yes	yes	yes
Year dummies	yes	yes	yes
Number of firms	7140	5351	1789
Number of observations	34508	25744	8764
R-squared	0.36	0.33	0.44

Notes: \*, \*\* and \*\*\* indicate statistically significant at the 1%, 5%, and 10% respectively. Standard errors are in parentheses.

## References

- Aitken, B., Harrison, A., and Lipsey, R., 1996. Wages and foreign ownership: A comparative study of Mexico, Venezuela and the US. *Journal of International Economics* 40, 345-371.
- Barry, F., Gorg, H., and Strobl, E., 2005. Foreign direct investment and wages in domestic firms in Ireland: Productivity spillovers versus labour market crowding out. *International Journal of the Economics of Business* 12, 67-85.
- Driffield, N., and Girma, S., 2003. Regional foreign direct investment and wage spillovers: Plant level evidence from the UK electronics industry. *Oxford Bulletin of Economics and Statistics* 65, 453-474.
- Feliciano, Z., and Lipsey, R., 1999. Foreign ownership and wages in the United States, 1987-1992. NBER Working Paper, no. 6923.
- Fosfuri, A., Motta, M., and Ronde, T., 2001. Foreign direct investment and spillovers through workers' mobility. *Journal of International Economics* 53, 205-222.
- Girma, S., Greenaway, D., and Wakelin, K., 2001. Wages, productivity and foreign ownership in UK manufacturing. Centre for Research on Globalisation and Labour Markets. Research Paper no. 99/14.
- Gorg, H., and Greenaway, D., 2004. Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *The World Bank Research Observer* 19, 171-197.
- Gorg, H., Strobl, E., and Walsh, F., 2002. Why do foreign firms pay more? The role of on-the-job training. IZA Discussion Paper no. 590.
- Lipsey, R., 2002. Home and host country effects of FDI. NBER Working Paper no. 9293.

Lipsev, R., and Sjolholm, F., 2001. Foreign direct investment and wages in Indonesian manufacturing. NBER Working Paper no. 8299.

Lipsev, R., and Sjolholm, F., 2003. Foreign firms and Indonesian manufacturing wages: An analysis with panel data. NBER Working Paper no. 9417.

Moran, T., 2001. Parental Supervision: the New Paradigm for Foreign Direct Investment and Development. Institute for International Economics, Washington DC.

Smarzynska, B., 2004. Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American Economic Review 94, 605-626.



## **Appendix**

The sectoral classification of enterprises is at the two-digit level of Vietnamese Standard Industrial Classification (VSIC), which includes 29 sectors from three industrial groups.

### **Group 1: Mining and quarrying**

C10: Mining of coal and lignite; extraction of peat

C11: Extraction of crude petroleum and natural gas

C12: Mining of metal ores

C13: Other mining and quarrying

### **Group 2: Manufacturing**

D15: Food and beverages

D16: Cigarettes and tobacco

D17: Textile products

D18: Wearing apparel, dressing and dyeing of fur

D19: Leather and products of leather; leather substitutes; footwear.

D20: Wood and wood products, excluding furniture

D21: Paper and paper products

D22: Printing, publishing, and reproduction of recorded media

D23: Coke and refined petroleum products and nuclear fuel

D24: Chemicals and chemical products

D25: Rubber and plastic products

D26: Other non-metallic mineral products

D27: Iron, steel and non-ferrous metal basic industries

D28: Fabricated metal products, except machinery and equipment

D29: Machinery and equipment

D30: Computer and office equipment

D31: Electrical machinery apparatus, appliances and supplies

D32: Radios, television and telecommunication devices

D33: Medical equipment, optical instruments

D34: Motor vehicles and trailers

D35: Other transport equipment

D36: Furniture and other products not classified elsewhere

D37: Recycles products

**Group 3: Electricity, gas and water supply**

E40: Electricity, gas, steam and hot water supply

E41: Collection, purification and distribution of water

Industries are defined in terms of technology. Low technology industries are D15-23 and D36-37. Medium technology industries are D24-28. High technology industries are D29-35.

**Table A1: Descriptive statistics for foreign and domestic firms by sector in 2004**

Code	Sector	Domestic firms	Firms with foreign capital	All firms	Share of firms with foreign capital in the sector	HS	BS	The ratio of wages in foreign firms to wages in domestic firms
C10	Mining of coal and lignite; extraction of peat	35	1	36	2.85	0.73	0.15	1.39
C11	Extraction of crude petroleum and natural gas	0	2	2	-	100	10.05	1.70
C12	Mining of metal ores	22	1	23	4.54	2.55	1.10	1.33
C13	Other mining and quarrying	320	7	327	2.18	0.69	0.08	1.84
D15	Food and beverages	1930	175	2105	9.06	14.58	2.02	1.94
D16	Cigarettes and tobacco	17	1	18	5.88	2.65	0.02	0.99
D17	Textile products	267	85	352	31.83	24.18	14.98	1.55
D18	Wearing apparel, dressing and dyeing of fur	378	178	556	47.08	54.96	5.56	1.01
D19	Leather and products of leather; leather substitutes; footwear	165	90	255	54.54	53.87	7.14	1.45
D20	Wood and wood products, excluding furniture	479	53	532	11.06	14.35	13.02	1.80
D21	Paper and paper products	334	33	367	9.88	15.11	5.65	1.53
D22	Printing, publishing, and reproduction of recorded media	254	13	267	5.11	4.16	0.28	1.37
D23	Coke and refined petroleum products and nuclear fuel	3	2	5	66.66	36.57	6.28	6.98
D24	Chemicals and chemical products	266	111	377	41.72	20.82	13.02	2.27
D25	Rubber and plastic products	341	109	450	31.96	27.79	14.23	1.17
D26	Other non-metallic mineral products	741	67	808	9.04	9.39	6.98	1.76
D27	Iron, steel and non-ferrous metal basic industries	97	20	117	20.61	12.05	13.98	1.73
D28	Fabricated metal products, except machinery and equipment	470	118	588	25.11	24.79	12.98	1.50
D29	Machinery and equipment	181	37	218	20.44	20.80	10.39	1.61
D30	Computer and office equipment	0	2	2	-	100	25.68	1.33
D31	Electrical machinery apparatus, appliances and supplies	95	56	151	58.94	61.14	17.98	0.92
D32	Radios, television and	37	38	75	102.7	63.49	20.99	1.49

	telecommunication devices								
D33	Medical equipment, optical instruments	19	19	38	100	59.45	13.89	1.46	
D34	Motor vehicles and trailers	80	40	120	50	49.23	7.13	1.30	
D35	Other transport equipment	165	53	218	32.12	37.60	3.98	1.55	
D36	Furniture and other products not classified elsewhere	350	144	494	41.14	45.34	1.99	1.12	
D37	Recycles products	7	0	7	0	0	0	-	
E40	Electricity, gas, steam and hot water supply	4	5	9	125	10.15	1.98	1.59	
E41	Collection, purification and distribution of water	83	1	84	1.2	0.37	0.54	2.74	
	Total	7140	1461	8601	20.46	-	-	1.70	