Foreign Direct Investment and Wage Spillovers in Indonesian Manufacturing Industry

Akinori Tomohara
The City University of New York (CUNY)
and
Sadayuki Takii
The International Centre for the Study of East Asian Development, Kitakyushu

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Abstract

This paper examines whether foreign direct investment benefits workers employed by domestic companies in a host developing country. Using the key-industry hypothesis approach, the analysis shows that wages set by multinational companies have positive externalities on the wage level of domestic companies. Increased wages of domestic companies are due not only to increased productivity, but also to equity concerns. Specifically, fairness comparison plays an important role when there are larger wage gaps between multinational and domestic companies.

JEL classification: F21; F 23; J31

Keywords: FDI; Wage spillovers; Equity

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† Corresponding Author. Assistant Professor, Department of Economics, The City University of New York Queens College, 65-30 Kissena Blvd., Flushing NY 11367. Phone: (718) 997-5456; Fax: (718) 997-5466; e-mail: jujodai@yahoo.com.

‡ Research Assistant Professor, Research Department, The International Centre for the Study of East Asian Development, Kitakyushu, 11-4 Otemachi KokuraKita, Kitakyushu Fukuoka, 803-0814, Japan. Phone: 81-93-583-6202; Fax; 81-93-583-4603; e-mail: takii@icsead.or.jp.

1. Introduction

Does globalization really improve standards of living in developing countries? This question is of significant policy concern in the area of economic development. International organizations advocate the merit of accessing the global economy via foreign direct investment. Anti-globalization movements do not necessarily agree with this view. Those opposing globalization argue that self-interested, multinational companies exploit the resources of developing countries and impair development. Thus, for the purposes of long-run economic growth, it is better to protect domestic infant industries rather than rely on foreign capital.

This paper examines whether foreign direct investment benefits workers employed by domestic companies via increased wages. Previous works have reported wage gaps between foreign multinational companies and domestic companies (Aitken, et al. [1996] for Mexico and Venezuela; Matsuoka [2001] for Thailand; Lipsey and Sjöholm [2004] for Indonesia). Multinational companies tend to pay higher wages than domestic companies, even after controlling for factors such as industry and workers characteristics. In spite of this observation, few attempts have been made to examine wage spillovers from multinational companies to domestic companies.[1]

We examine whether wages set by multinational companies, operating in a developing country, affect the wage decisions of domestic companies. The analysis utilizes empirical models used in the literature on the key-industry hypothesis (Mehra, 1976; Christofides et al., 1980; Shinkai, 1980; Drewes, 1987; Lee and Pesaran, 1993; Smith, 1996). The hypothesis treats

[1] Girma, Greenway and Wakelin (2001) report similar wage gaps in UK. Using the UK electronics industry, Driffield and Girma (2003) study wage spillovers from multinational companies to domestic companies.

the wage set by a key-industry as a reference wage. The literature examines whether wage determination by a key industry affects wage determinations of other industries.

Our analysis employs a similar methodology. Multinational companies often dominate the market in developing countries. Their behaviors influences host countries' economies. Assuming multinational companies are wage-decision leaders, we explore whether wages set by multinational companies have externalities on the wage determination of domestic companies.

Our analysis is distinct from previous works. Previous works use indirect approaches to analyze wage spillovers from multinational companies to domestic companies. Aitken et al. (1996) define foreign direct investment (FDI) as the share of labor employed by foreign-owned affiliates in the industry. They infer no wage spillovers, since domestic companies' wages are not positively correlated with higher levels of FDI. Our empirical model introduces interactive decision-making of wages between multinational companies and domestic companies. Additionally, our analysis includes two different channels through which multinational companies affect domestic companies' wage decisions. A higher level of FDI could increase domestic companies' wages via increased productivity. Previous works consider this possibility only. We introduce non-market factors, specifically equity and/or efficiency wage considerations, into the argument. Employees working at domestic companies may become disgruntled if their wages are far below wages paid by multinational companies. Domestic companies may need to alleviate wage gaps between domestic and multinational companies in order to keep workers and/or motivate workers' efforts. These non-market factors also increase domestic companies' wages.

We use data based on an annual manufacturing survey by the Central Bureau of Statistics (CBS), Republic of Indonesia (*Biro Pusat Statistik, Republik Indonesia*) from 1989 to 1996. The

survey data is commonly used in the literature on Indonesian industry analysis [e.g., the relationships between FDI and technology spillovers (Blalock and Gertler, 2004; Takii, 2005); wage gaps between domestic and multinational companies (Lipsey and Sjöholm, 2004)]. The time period chosen corresponds to a period of foreign investment liberalization in Indonesia and, thus, a period when Indonesia experienced a large FDI inflow.

We construct a dynamic model of domestic companies' wage determination by referring to empirical models used in the key-industry hypothesis literature. We also relate our analysis to the literature on regional interaction of wage determination, i.e., companies in the same region affect the determination of wage levels each other (Christofides, Swidinsky, and Wilton, 1980; Drews, 1987; Driffield and Girma, 2003). Our analysis uses the generalized method of moments (GMM) proposed by Arellano and Bond (1991). The method is used in estimating a panel data model that contains a lagged dependent variable along with an unobserved effect.

The analysis shows that there are wage spillovers from multinational companies to domestic companies. Employees in Indonesian domestic companies enjoy increased wages in the presence of FDI. The effects operate through two channels, both increased productivity and equity concerns. The results are robust when we consider a sub-sample using Java and Sumatra islands, where many foreign affiliates are concentrated. Furthermore, we examine whether wage spillovers differ between large wage-gap industries and small wage-gap industries. The results indicate that fairness comparison plays an important role in determining the wage levels of domestic companies in large wage-gap industries but not in small wage-gap industries.

The paper proceeds as follows. In Section 2, we summarize the data used for the analysis. Section 3 describes an empirical model for studying wage spillovers. Results of the analysis are presented in Section 4. Section 5 concludes the paper and suggests future lines of research.

2. Data

We use data based on an annual manufacturing survey conducted by the Central Bureau of Statistics (CBS), Republic of Indonesia (*Biro Pusat Statistik, Republik Indonesia*) from 1989 to 1996. The Industrial Statistics Division of CBS (*Biro Statistik Industri*) conducts industrial surveys on manufacturing establishments with 20 or more employees. The survey provides information on industrial classification, the type of ownership (public, private, and foreign), location, labor (number and salary/wages), fixed assets, material and electricity costs, income, and output, etc. The survey data is commonly used in the literature on Indonesian industry analysis [e.g., the relationships between FDI and technology spillovers (Blalock and Gertler, 2004; Takii, 2005); wage gaps between domestic and multinational companies (Lipsey and Sjöholm, 2004)]. Data on WPI is obtained from *Monthly Statistical Bulletin*. Additionally, we calculate provincial unemployment rates from the labor force and unemployment data in *Labor Force Situation in Indonesia.*

We use a panel dataset for Indonesian manufacturing from 1989-1996. The presence of foreign multinational companies increased rapidly during the period, making it relevant for analyzing wage spillovers. In fact, Indonesia experienced foreign investment liberalization during the time period and, subsequently, a large FDI inflow. After oil prices collapsed in the mid-1980s, Indonesia tried to reduce dependency on oil and gas revenue. This effort resulted in policies encouraging FDI during the late 1980s and early 1990s. Annual FDI inflows increased tenfold from US$ 0.6 billion in 1988 to US$ 6.2 billion in 1996 until the Asian financial crisis struck the economy in 1997-98 (ICSEAD 2005, Table 7.2, pp. 107-110). The number of foreign-owned plants in manufacturing sectors nearly doubled during the sample period from 708 in

1991 to 1318 in 1996 (Table 1). Another reason for the chosen time period is technical. Our empirical analysis employs the Arellano-Bond estimation method. The method uses differenced and lagged variables with two or more periods as instruments. In the survey dataset, capital stock (at the beginning of period) is available from 1989. Thus, we set up the effective sample period as 1991-1996 and use data from 1989-1996 to estimate our empirical model (see the Model section for details).

Table 1 presents the sample's summary statistics. We have 27,066 observations (about 4,500 plants for each year) after eliminating outliers and establishments with missing variables.[2] The sample includes 29 industries at the 3-digit ISIC level. We observe a significant difference between wages paid by domestic companies and the ones paid by foreign-owned multinational companies. A domestic company's wage level is about one-third of a multinational company's wage level. The ratio of non-production workers is around 16% throughout the sample period. Standard deviations indicate characteristic variations among establishments and across industries. We will control for these observed characteristics, and other macroeconomic factors, such as unemployment rates in the following empirical analysis.

3. Model

We construct a model of domestic companies' wage determination by referring to empirical models used in the key-industry hypothesis literature. The wage paid by a domestic company's

[2] Our analysis focuses on domestic companies that stay in the market for five years or more. Thus, the positive wage spillovers shown in this paper are not the results of efficiency improvements, made possible as multinational companies let some inefficient domestic companies exit from the market.

establishment i in year t is denoted as w_{it}^{d}. Wage spillovers from multinational companies to domestic companies are examined by the following dynamic panel data model:

$$w_{it}^{d} = \beta_1 w_{it-1}^{d} + \beta_2 k_{it} + \beta_3 va_{it} + \beta_4 w_{jt-1}^{f} + \beta_5 wpi_{jt} + \beta' x_{it} + \lambda_t + \eta_i + \upsilon_{it},$$

where k_{it} is capital per employee at the beginning of year t, va_{it} is value added per employee, w_{jt-1}^{f} is a weighted-average wage of multinational company's affiliates in industry j that i belongs to in year $t-1$, wpi_{jt} is WPI for industry j, and x_{it} contains a set of control variables. A time effect, λ_t, controls for time varying elements that affect all establishments in a given year. An individual effect, η_t, captures time invariant elements that differ across establishments. An error term, υ_{it}, is assumed to be independently distributed across individual establishments. All variables are measured in logarithm units.

We define multinational company's affiliates if 10 percent or more of a firm's equity is foreign equity. Foreign equity is the share of equity held by foreigners at the establishment level. The weighted-average wage of multinational company's affiliates, w_{jt}^{f}, is calculated as $\sum_{r=1}^{m} \mu_{rt} w_{rt}$, where μ_{rt} is a weight and m is the total number of multinational company's affiliates in industry j that a domestic establishment i belongs to. The weight, μ_{rt}, is the fraction such that the number of employees in an establishment, r, is divided by the total number of employees in all multinational company's affiliates in industry j. The weight is similar to the one used to calculate weighted FDI in Aitken and Harrison (1999). We make use

of the redesigned Indonesian industrial classification[3] and stratify industry at the ISIC 3-digit level.[4]

The vector, x_{it}, is the set of observable characteristics that influence wage levels. The vector controls for the differences among establishments. Observable characteristics include material costs per employee, the ratio of non-production workers, provincial unemployment rates, and plant sizes (which are measured by the previous years output). Other possible unobservable characteristics that may influence wage levels are controlled by a time effect, λ_t, and an individual effect, η_t.

Standard economic theory explains how wages are determined in the market. Profit maximization requires wages to be equal to marginal revenue product (or marginal revenue multiplied by marginal product). In the competitive market, this is expressed as $w = P * MP_L$, where w is a nominal wage, P is the price of final goods, and MP_L is the marginal product of labor. The terms of capital intensity, k_{it}, and WPI, wpi_{jt}, incorporate the idea. The level of the marginal product of labor is a function of capital (Smith 1996, p.501; Aitken et al., 1996, p. 348; Blomström and Sjöholm, 1999, p. 917; Driffield and Girma, 2003 p. 457). WPI is used to proxy for the price of goods in each industry. The simple textbook explanation for determining wages is a static approach. In our model, we include a dynamic wage decision process. One may regard the previous year's wage as a reference in deciding this year's wage. Thus, wage levels are further adjusted based on previous year's wages, w_{it-1}^{d}.

[3] The Indonesian industrial classification system was redesigned in 1990.

[4] Oil-related industries (ISIC 353 and 354) are not included in the sample. The data on foreign-owned companies in the industries seem to suffer extensively from missing information and are inappropriate for the analysis.

In reality, wages are also determined by non-market factors. One example is an externality such that wages set by multinational companies affects the wage paid by domestic employers. Our analysis distinguishes two wage spillover effects. The first is wage spillovers via technology spillovers. Increased wages of domestic companies could be explained by increased productivity. As domestic companies absorb multinational companies' advanced technologies, the result of foreign direct investment is increased productivity.[5] The coefficient, β_3, represents wage spillovers via productivity increases. We use a value added term to capture such wage spillovers. This approach is consistent with the literature on technology spillovers, where the literature examines possible technology spillovers by using a model to evaluate whether FDI increases domestic companies' value added (Caves, 1974, Globerman, 1979; Haddad and Harrison, 1993; Kokko, 1994; Blomström and Sjöholm, 1999; Takii, 2005).

We also consider wage spillover channels introducing equity and/or efficiency wage considerations. Domestic companies may increase wages in order to match wages paid by multinational companies. This could be explained by equity concern. As in the literature on fair wage (in which the wage set by a leading company or industry affects wage determination by other companies or industries), multinational companies' wages could serve as a reference wage. Employees working at domestic companies may feel unfair if their wages are far below wages paid for comparable work by multinational companies. Another possible explanation is related to efficiency wage arguments. Multinational companies set higher wages for efficiency wage

[5] Aitken et al. (1996) consider this type of wage spillovers. Denote a production function, F. The marginal product of labor is expressed as $MP_L = A * \partial F(K,L)/\partial L$, when $Y = A * F(K,L)$, where Y is output, A is technology, K is capital, and L is labor. Assuming that A is a function of FDI, Aitken et al. examine whether FDI increases wages through increased productivity.

reasons. In this case, domestic companies are motivated to increase wages in order to prevent employees from seeking alternative employment. Otherwise, domestic companies end up with employing "left-over" labor. Additionally, wage increases may also encourage employees to work harder. These wage spillover effects are captured by the coefficient, β_4. If $\beta_4 > 0$, then employees in domestic companies benefit from the activities of multinational companies. Domestic companies' wages are set higher due to positive wage spillovers from multinational companies.

We use the generalized method of moments (GMM) proposed by Arellano and Bond (1991) to estimate the dynamic model using panel data. GMM is a convenient method for estimating a model using panel data "when the model contains a lagged dependent variable along with an unobserved effect (Wooldridge, 2001, p.97)." Anderson and Hsiao's instrumental variable (IV) methods (1981, 1982) used to be a standard method of estimating such models. However, using simulations, Arellano and Bond (1991) show that GMM provides possible efficiency gains over Anderson and Hsiao's method of estimator. The advantage of the Arellano and Bond estimator over Anderson and Hsiao's IV method relates to the availability of instrumental variables. The Anderson and Hsiao estimator use either Δw_{it-2} or w_{it-2} as an instrument for Δw_{it-1} in a first difference equation. Arellano and Bond (1991) propose the levels of endogenous variables dated $t-2$ and before as instruments in a first difference model.[6] With this construction, more instruments are available as a panel progresses (Konings and Walsh,

[6] We have a dataset ranging from 1989-1996. The Arellano and Bond method uses data from 1989-1994, since two cross-sections are lost in taking first-differences and constructing lags. Thus, we set up the sample period of 1991-1996 for our empirical model.

1994). Estimation is conducted by using the DPD98 program for Gauss (see Arellano and Bond (1988) for the program's details).

4. Results of the Analysis

Table 2 summarizes the results. Columns (1)-(4) show the results using observations dated t-2 and t-3 as instruments. Columns (5)-(8) are the results using observations dated t-2 and all past observations as instruments. The top half of the table summarizes estimates of the nationwide sample. The bottom half of the table presents estimates of a sub-sample (i.e., establishments in Java and Sumatra islands). We include the results of both one-step and two-step estimations.

The results show that the multinational companies have positive externalities on the wage level of domestic companies. The row "value added" in the table represents wage increases via the technology spillover channel. Domestic companies' wages increase by eight to 10 percent for one percent increase in the value added of domestic companies resulting from technology spillovers. The results indicate that hosting multinational companies increases the wage levels of domestic companies through increases in productivity.

We also observe wage spillovers resulting from equity and/or efficiency wage concerns. The wage level of domestic companies increases by four to five percent for one percent increase in the wages paid by the multinational company. The multinational companies impose an externality, a non-market-based wage determination, on the wages paid by domestic companies. The results imply that domestic companies try to reduce wage gaps between multinational and domestic companies. These equity-related wage spillovers are about the half size of wage spillover effects resulting from technology spillovers. Neither spillover effect is negligible.

We further examine the hypothesis using the Java and Sumatra islands as a sub-sample. Foreign affiliates are concentrated in the two islands. The bottom half of the table presents the results from the sub-sample. The results, both direction and magnitude, are similar to the ones obtained in the nationwide analysis. The results are robust, even when using different samples.

We conclude that hosting foreign multinational companies benefits employees of domestic companies. They received wages above the market-based wage that would prevail in the absence of multinational companies. Employees in Indonesian domestic companies enjoyed increased wages through two spillover channels, those resulting from increased productivity and those resulting from equity concern. The literature points out the creation of job opportunities as a benefit of FDI. The current analysis adds possible positive wage spillovers to the argument.

Other variables indicate expected coefficient signs that are in agreement with economic theory. Wages increase as capital or the ratio of non-production employees increases. Non-production workers (i.e., managers) receive a higher wage. A higher wage level is the result of a higher level of marginal product of labor, from $w = P * MP_L$. The marginal product of labor increases with capital, and is larger for non-production workers. The results also show that wages are positively correlated with unemployment rates. Intuitively, when the economy is suffering from a recession, employers with lower marginal products are the first ones who will lose their jobs. Those with a higher marginal product of labor retain their jobs. All estimates in the table are statistically significant at the 5% level.

Table 2 reports the m_2 statistic to examine the relevance of the Arellano-Bond estimation method. The consistency of the GMM estimators requires the assumption of no serial correlation in υ_{it}. "If the disturbances υ_{it} are not serially correlated, there should be evidence of significant negative first order serial correlation in differentiated residuals, and no evidence of second order

serial correlation in the differentiated residuals (Arellano and Bond, 1988, p.9)." Denote the first differences of errors as $\Delta\upsilon_{it} = \upsilon_{it} - \upsilon_{it-1}$. The consistency of the GMM estimators relies on the assumption, $E(\Delta\upsilon_{it}\Delta\upsilon_{it-2}) = 0$. The m_2 statistic tests for lack of second-order serial correlation in the first-difference residuals. The m_2 statistic in Table 2 shows that the assumption of serially uncorrelated errors seems to be appropriate. The test for first-order serial correlation also shows a negative relationship.

The level of wage gaps

We classify the sample into two sub-samples. The first is industries with large wage gaps between domestic and multinational companies. The second is industries with small wage gaps between domestic and multinational companies. The analysis examines whether there are any differences regarding wage spillovers between the two groups. This study is analogous to previous works on technology spillovers. The literature examines whether the spillover effects are different between industries with large technology gaps and small technology gaps. The results are controversial. Some works show that only industries with small technology gaps benefit. Small-gap industries already possess the basic technology necessary for adoption of the more advanced technology. Primitive industries are unable to utilize advanced technology. Production processes used by primitive domestic companies may differ inherently from the ones by multinational companies. Other works show that technology spillovers are effective only when there are large technology gaps. When there are large technology gaps, the possibilities for learning are much greater.

There are two alternative scenarios in our wage spillover analysis. First, one may expect larger equity-related wage spillovers when larger wage gaps between domestic and multinational companies exist. Observing large wage gaps, employees in domestic companies may feel that they are unduly underpaid. The second possible scenario is that employers may not have the sense of equity concern if the two companies differ intrinsically. Employers in domestic companies may tolerate receiving a lower wage.

We stratify the sample using the following procedure. We begin to calculate an industry-wide wage gap between multinational and domestic companies each year. Then, we calculate the average industry-wide wage gap during the sample period.[7] We order these industry-wide average wage gaps from the smallest to the largest at the ISIC's last two-digit level and split industries into two groups. The large wage-gap group includes 14 industries such as chemicals, iron and steel, and electronics. The small wage-gap group includes 15 industries such as food, textiles, and paper. The classification is stable during the sample period. The industry ordering based on average wage gaps during the sample period is consistent with the ordering based on average wage gaps from 1989 to 1991.

Tables 3.1 and 3.2 show the results for this part of our analysis. Columns labeled "large" represent large wage gap industries and columns labeled "small" represent small wage gap industries. Columns (1)-(4) show the results using observations dated t-2 and t-3 as instruments. Columns (5)-(8) present the results using observations dated t-2 and all past observations as instruments. The top half of the table summarizes estimates of the nationwide sample, and the

[7] An industry-wide wage gap is calculated as $(\overline{w}_{jt}^{f} - \overline{w}_{jt}^{d}) / \overline{w}_{jt}^{d}$, where $\overline{w}_{jt}^{f}$ is an average foreign wage in industry j for year t and $\overline{w}_{jt}^{d}$ is an average domestic wage in industry j for year t.

bottom half of the table presents estimates using the sub-sample of Java and Sumatra islands. Table 3.1 summarizes the results of the one-step estimates and Table 3.2 summarizes the results of the two-step estimates.

To summarize, wage spillovers via technology spillovers exist in both large-gap and small-gap industries. The row "value added" indicates results similar to the ones presented in the previous section. Domestic companies' wages increase by approximately eight to 10 percent for one percent increase in the domestic companies' value added resulting from multinational companies' technology spillovers.

The results differ from those in the previous section regarding equity-related wage spillovers. Fairness comparison plays an important role in determining wages of domestic companies in large-gap industries, but not in small-gap industries. The row "MNC wage" shows that the wage level paid by domestic companies in large-gap industries increases by approximately five percent if multinational companies in large-gap industries increase their wages by one percent. We do not see statistically significant relationships regarding wage interaction between domestic and multinational companies in small-gap industries. We can conclude that employees working for domestic companies in large-gap industries benefited from the countries' hosting foreign multinational companies. Large-gap industry employees received higher wages due to equity concern.

5. Concluding remarks

This paper examines whether foreign direct investment benefits workers employed by domestic companies via increased wages. The analysis utilizes empirical models used in the literature on the key-industry hypothesis. Assuming multinational companies are wage-decision leaders, we

study whether wages set by multinational companies have externalities on wage determination by domestic companies. The analysis shows that the activities of foreign-owned multinational companies benefit employees in domestic companies by increasing wages for domestic companies' employees. The effects operate through two channels, increased productivity and equity or efficiency wage concerns. The literature frequently highlights job creation as a benefit of FDI. The results of the current analysis add positive wage effect to the list of FDI's possible benefits. Our analysis also indicates that fairness comparison plays an important role in domestic companies' determination of wage levels in large wage-gap industries, but not in small wage-gap industries.

One last remark regarding model specification is in order. Theoretical foundations to analyze wage spillovers vary depending on the literature. The empirical literature on wage spillovers is classified as either a regional interaction or inter-industry interaction (including interactions such as union vs. non-union sectors). The latter includes Mehra (1976), Shinkai (1980), Vroman (1982), Lee and Pesaran (1993), Smith (1996), and Latreille and Manning (2000). Drews (1987) is an example of regional interaction for wage determination. Christofides, Swidinsky and Wilton (1980) and Driffield and Girma (2003) are spatial economy studies, and include both regional and industrial interactions. Among these works, some utilize the theory on union-firm bargaining behavior in wage determination. For example, Lee and Pesaran (1993) is based on the monopoly union model, where a union decides wage levels and employers decide the level of employment. Smith (1996) uses the right-to-manage model that derives wages as a Nash bargaining solution between an employer and a union (and employers decide an employment level). Alternatively, Mehra (1976) and Shinkai (1980) construct empirical models based on macroeconomic theory such as a Philips relation, where wages are

determined by unemployment and inflation rates, and the value added productivity theory, where output price and labor productivity determine the wage level. Others use empirical models that do not rely on specific economic theory. Despite these differences, empirical models used in the wage spillovers literature do employ a similar specification, including explanatory variables. In this sense, our model admits more than one theoretical interpretation.

Our analysis is motivated by a different policy concern from the wage spillover literature in a spatial economy, and employs different empirical specification. Driffield and Girma (2003) consider wage interactions in the UK electronics industry, introducing the effects of FDI. Using wages of domestic and multinational companies as independent variables, their empirical model examines the degree to which these wages affect domestic companies' wage decisions in an industry. Our analysis studies the case where multinational companies are a leader regarding wage decisions. The model specification in Driffield and Girma is not appropriate to examine whether multinational companies in developing countries affect wages of domestic companies. Domestic companies' wages are a function of multinational companies' wages. However, our model specification does not deny possible wage interactions among domestic companies. One may want to interpret our model as a reduced form, where domestic companies' wages are solved as a function of multinational companies' wages.

Our model can be applied to explore other interesting questions. Wage spillovers could be decomposed into vertical (backward and forward) and horizontal externalities, as in the technology spillover literature (Javorcik, 2004). Multinational companies may affect wage decisions of domestic companies that provide intermediate goods to the multinational companies (i.e., backward effects). Multinational companies may also affect wage decisions of domestic companies to which the multinational companies sell their goods (i.e., forward effects).

Similarly, multinational companies may affect wage decisions of domestic companies within the same industry (i.e., horizontal wage spillovers). Such analysis requires additional information, including an input-output table to relate different industries. Another extension includes examining whether the effects of wage spillovers differ between skilled workers and unskilled workers. The literature shows that wage gaps differ between skilled workers and unskilled workers. All of these topics are future lines of research.

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Table 1 Summary Statistics of the Sample

Variable	1991-1996 Mean	1991-1996 Std. Dev.	1991 Mean	1992 Mean	1993 Mean	1994 Mean	1995 Mean	1996 Mean
Domestic wage	1,855	(1,608)	1,376	1,538	1,740	1,910	2,152	2,318
MNC wage	5,257	(5,387)	4,097	4,442	4,786	5,125	5,647	6,537
Capital	8,862	(30,681)	7,188	7,255	8,591	9,066	9,980	10,727
Number of Labor	261	(904)	248	255	253	266	266	276
Material	14,494	(50,481)	10,915	12,120	12,473	14,722	17,265	18,862
The ratio of non-production workers	16.59	(15.49)	16.94	16.96	16.85	16.71	16.31	15.80
Plant size	9,224	(75,014)	5,919	6,998	8,073	9,439	10,934	13,517
Value added	7,060	(18,121)	5,273	6,042	6,306	7,453	8,070	8,908
Sample size	27,066		3,763	4,269	4,908	4,790	5,232	4,104
Number of Industries	29		29	29	29	29	29	29
Units: Rupiah 1,000 (except size that uses Rupiah million); all variables are measured by a per-employee unit at an establishment level except the number of labor, plant size, and the ratio of non-production worker (%).								
Number of MNC establishments			708	897	991	1,121	1,200	1,318

Source: Annual manufacturing survey by Indonesian Central Bureau of Statistics

Table 2 Analysis of Wage Spillovers

Variables	[1] one-step	[2] two-step	[3] one-step	[4] two-step	[5] one-step	[6] two-step	[7] one-step	[8] two-step
Nationwide								
Domestic wage (-1)	0.436	0.441	0.427	0.427	0.437	0.449	0.427	0.434
Capital	0.03	0.03	0.024	0.024	0.03	0.03	0.024	0.023
Value added	0.082	0.081	0.102	0.1	0.082	0.081	0.102	0.101
MNC wage	0.041	0.051	0.04	0.048	0.04	0.045	0.04	0.042
WPI (ISIC 3-digit)	0.14	0.163	0.18	0.204	0.138	0.16	0.178	0.202
The ratio of non-production workers	0.068	0.067	0.071	0.069	0.068	0.067	0.071	0.069
Unemployment rates (Province)	0.007	0.007	0.006	0.006	0.006	0.008	0.005	0.007
Material	0.054	0.059			0.054	0.062		
Plant size	-0.055	-0.055			-0.056	-0.054		
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.07	0.065	0.063	0.06	0.071	0.064	0.064	0.059
m2 test statistics	1.894	1.941	1.737	1.737	1.906	2.047	1.735	1.826
Sargan test	186.89	116.03	157.94	100.59	213.14	136.19	186.71	123.6
Sargan test-degree of freedom	31	31	21	21	46	46	36	36
Java-Sumatra								
Domestic wage (-1)	0.447	0.451	0.439	0.437	0.449	0.461	0.44	0.444
Capital	0.029	0.03	0.023	0.023	0.029	0.029	0.023	0.022
Value added	0.085	0.081	0.104	0.101	0.084	0.081	0.104	0.103
MNC wage	0.042	0.052	0.042	0.05	0.042	0.048	0.043	0.046
WPI (ISIC 3-digit)	0.131	0.149	0.17	0.19	0.124	0.134	0.165	0.181
The ratio of non-production workers	0.067	0.068	0.069	0.069	0.068	0.069	0.07	0.068
Unemployment rates (Province)	0.006	0.007	0.006	0.006	0.006	0.008	0.006	0.007
Material	0.051	0.056			0.054	0.064		
Plant size	-0.058	-0.057			-0.056	-0.051		
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.069	0.064	0.061	0.058	0.07	0.062	0.062	0.058
m2 test statistics	0.906	0.937	0.808	0.801	0.917	1.028	0.808	0.876
Sargan test	175.84	111.2	141.06	91.86	202.91	138.11	169.89	120.48
Sargan test-degree of freedom	31	31	21	21	46	46	36	36

We use DPD98 described in Arellano and Bond (1988). All point estimates are statistically significant at the 5% level (We use standard errors and test statistics corrected for heteroskedasticity). Equations (1)-(4) are estimated in first differences using observations dated t-2 and t-3 as instruments and Equations (5)-(8) are estimated using an observation dated t-2 and all past observations as instruments for a lagged dependent variable.

Table 3.1 Large wage gap vs. Small wage gap industries

(One step estimates)

Variables	one step [1] large		one step [2] small		one step [3] large		one step [4] small		one step [5] large		one step [6] small		one step [7] large		one step [8] small	
Domestic wage (-1)	0.418		0.443		0.421		0.423		0.418		0.440		0.423		0.418	
Capital	0.031		0.025		0.028		0.018		0.030		0.024		0.028		0.016	
Value added	0.081		0.083		0.102		0.101		0.082		0.083		0.103		0.101	
MNC wage	0.048		0.024	n	0.047		0.022	n	0.046		0.025	n	0.045		0.022	n
WPI (ISIC 3-digit)	0.245		0.018	n	0.288		0.063	n	0.250		0.005	n	0.294		0.050	n
The ratio of non-production workers	0.083		0.045		0.085		0.049		0.082		0.043		0.085		0.046	
Unemployment rates (Province)	0.006	c	0.006	c	0.005	c	0.005	n	0.005	n	0.006	c	0.005	n	0.005	n
Material	-0.068		-0.044	b					-0.067		-0.044	b				
Plant size	0.038	c	0.067	c					0.038	b	0.067	b				
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.065		0.078		0.062		0.068		0.067		0.079		0.063		0.069	
m2 test statistics	1.64	n	0.703	n	1.33	n	0.887	n	1.649	c	0.685	n	1.345	n	0.846	n
Sargan test	148.05		83.65		130.46		62.03		182.30		107.18		159.21		84.77	
Sargan test-degree of freedom	31		31		21		21		46		46		36		36	
Domestic wage (-1)	0.437		0.445		0.441		0.426		0.438		0.444		0.443		0.421	
Capital	0.032		0.022		0.029		0.015	b	0.031		0.021		0.029		0.014	b
Value added	0.083		0.087		0.104		0.104		0.083		0.087		0.104		0.104	
MNC wage	0.056		0.025	n	0.053		0.024	n	0.053		0.027	n	0.051		0.026	n
WPI (ISIC 3-digit)	0.232		0.046	n	0.275		0.085	n	0.236		0.025	n	0.281		0.069	n
The ratio of non-production workers	0.082		0.040		0.084		0.043		0.082		0.040		0.084		0.041	
Unemployment rates (Province)	0.007	b	0.004	n	0.006	c	0.004	n	0.006	c	0.005	n	0.005	n	0.004	n
Material	-0.067		-0.037	c					-0.069		-0.040	b				
Plant size	0.039	c	0.074	c					0.036	c	0.068	c				
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.063		0.077		0.059		0.064		0.064		0.077		0.060		0.066	
m2 test statistics	1.20	n	-0.26	n	0.93	n	0.00	n	1.20	n	-0.26	n	0.94	n	-0.04	n
Sargan test	137.73		85.80		117.63		61.36		172.20		117.05		147.58		89.30	
Sargan test-degree of freedom	31		31		21		21		46		46		36		36	

We use DPD98 described in Arellano and Bond (1988) for estimation. All point estimates (except b, c, and n) are statistically significant at the 1% level (We use standard errors and test statistics corrected for heteroskedasticity). b: statistically significant at the 5% level, c: statistically significant at the 10% level, and n: statistically not significant at the 10% level. A lagged dependent variable was instrumented by its level dated t-2 and t-3 in Equations (1)-(4) and by t-2 and all available past observations in Equations (5)-(8). Capital, the ratio of non-production workers, material, and plant size were instrumented by corresponding levels dated t-1.

Table 3.2 Large wage gap vs. Small wage gap industries

(Two step estimates)

Variables	[1] large		[2] small		[3] large		[4] small		[5] large		[6] small		[7] large		[8] small	
Nationwide																
Domestic wage (-1)	0.411		0.450		0.410		0.425		0.417		0.445		0.419		0.416	
Capital	0.031		0.025		0.026		0.018		0.029		0.024		0.025		0.016	
Value added	0.081		0.081		0.102		0.097		0.082		0.081		0.103		0.097	
MNC wage	0.044		0.043	c	0.044		0.036	n	0.033	b	0.037	n	0.032	b	0.031	n
WPI (ISIC 3-digit)	0.276		0.037	n	0.305		0.089	n	0.287		0.031	n	0.318		0.076	n
The ratio of non-production workers	0.076		0.046		0.077		0.051		0.077		0.044		0.079		0.047	
Unemployment rates (Province)	0.005	c	0.007	b	0.005	n	0.006	c	0.006	c	0.008		0.005	c	0.007	b
Material	0.060		0.052						0.064		0.048					
Plant size	-0.049		-0.063						-0.045	b	-0.066					
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.067		0.070		0.065		0.061		0.067		0.069		0.066		0.061	
m2 test statistics	1.63	n	0.75	n	1.28	n	0.92	n	1.67	c	0.72	n	1.35	n	0.84	n
Sargan test	98.25		53.94		85.26		41.91		120.09		71.91		102.88		60.68	
Sargan test-degree of freedom	31		31		21		21		46		46		36		36	
Java-Sumatra																
Domestic wage (-1)	0.422		0.457		0.426		0.430		0.431		0.448		0.435		0.414	
Capital	0.033		0.022		0.028		0.015	b	0.031		0.021		0.026		0.013	b
Value added	0.083		0.081		0.102		0.100		0.083		0.079		0.104		0.099	
MNC wage	0.050		0.044	c	0.048		0.039	n	0.036	b	0.042	c	0.034	b	0.038	c
WPI (ISIC 3-digit)	0.255		0.047	n	0.288		0.097	n	0.263		0.024	n	0.299		0.076	n
The ratio of non-production workers	0.077		0.040		0.075		0.045		0.077		0.039		0.076		0.039	
Unemployment rates (Province)	0.007	b	0.005	n	0.006	c	0.005	n	0.007	b	0.007	b	0.007	b	0.007	b
Material	0.055		0.048	b					0.064		0.049					
Plant size	-0.051	b	-0.067						-0.045	b	-0.062					
Time dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.065		0.070		0.064		0.058		0.066		0.068		0.065		0.057	
m2 test statistics	1.16	n	-0.19	n	0.87	n	0.04	n	1.22	n	-0.24	n	0.94	n	-0.08	n
Sargan test	98.25		55.16		81.67		40.66		120.73		80.67		101.04		65.41	
Sargan test-degree of freedom	31		31		21		21		46		46		36		36	

We use DPD98 described in Arellano and Bond (1988) for estimation. All point estimates (except b, c, and n) are statistically significant at the 1% level (We use standard errors and test statistics corrected for heteroskedasticity). b: statistically significant at the 5% level, c: statistically significant at the 10% level, and n: statistically not significant at the 10% level. A lagged dependent variable was instrumented by its level dated t-2 and t-3 in Equations (1)-(4) and by t-2 and all available past observations in Equations (5)-(8). Capital, the ratio of non-production workers, material, and plant size were instrumented by corresponding levels dated t-1.