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# The Impacts of Multinational Companies on the Manufacturing Wage Inequality:Evidence from Indonesia

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***Abstract*— Inward Foreign Direct Investment (FDI) is generally believed to have a positive effect on the host country's economy. However, several studies have documented that FDI by multinational companies (MNCs) may also relate to rising wage inequality issue. Assuming that MNCs are playing an important role in introducing new technology in Indonesia's manufacturing sector, this study will investigate whether multinational companies have an impact on skilled-unskilled wage gap in the Indonesia's manufacturing sector. The study will also attempt to interpret whether the effect is non-linear – inward FDI increases wage inequality but at a decreasing rate over time. The findings show that MNCs give non-linear effect to wage inequality in Indonesia's manufacturing sector.**

***Keywords— wage inequality; skilled-unskilled wage gap; FDI; multinational companies***

## I. INTRODUCTION

In the World Bank's Report – Indonesia's Rising Divide, it is stated that income inequality is considered to be an urgent problem that needs to be solved by stakeholders. The urgency in solving this issue is because it may lead to slower growth and poverty reduction as well as an increased risk of conflict in Indonesia. Income inequality can be viewed from a number of perspectives, such as urban–rural wage gap, gender wage gap and skilled-unskilled wage gap or wage inequality [1].

Referring to previous studies on wage inequality, particularly in America, as in [2], there are two main lines of argumentation concerning on the underlying causes of increasing wage inequality. The first argument is based on Heckscher-Ohlin theory (HO theory) and Stolper-Samuelson theorem in which stated that the increase in trade volumes between developed and developing countries become the main contributor of the increasing wage inequality phenomenon. Meanwhile, the second argument suggests that skill-based technological change which is associated to the increased in the demand for skilled workers relative to unskilled workers become the main explanatory factor.

The hot debate on the theoretical studies implies the necessity of empirical studies. However, the findings of empirical studies indicate mixed or weak evidence as stated by Leamer (1996) in [2]. Thus, as an effort to seek for a definitive answer, some studies are conducted by focusing on the condition of developing countries.

Several studies on wage inequality in developing countries, such as [3] and [4], have documented that most developing countries have experienced rising inequality at around the same period of rapid globalization. This fact is contradictory to the conventional wisdom as predicted by HO-theory as in [5]. Hence, the impact of globalization on wage inequality in developing countries also becomes a debatable issue among scholars.

Another strand of literatures explains that wage inequality is strongly associated with increasing demand relatively for skilled workers (demand shift) in manufacturing industry as in [2], [4] and [6]. In addition, as mentioned in [3], [4], [7], [8], and [9], technology transfer through Foreign Direct Investment (FDI) by multinational companies also closely related to wage inequality.

References [3] and [4] stated that current theories give ambiguous predictions on the impact of FDI on wage inequality in host countries. The ambiguity in theoretical works highlights the need for empirical work. However, as cited in [4] and [10], the empirical studies that examine the impact of MNCs on wage inequality in the host country, is still limited with mixed findings, thus offers no consensus. Empirical studies in Indonesia which focus on the impact of FDI on wage inequality show inconsistent findings. For example, [11] found that FDI has no significant effect on skilled-unskilled wage gap in East Asia countries, including Indonesia. Their findings are somewhat similar to the result of [12], stating that technology transfer did not trigger a shifting in demand for skilled workers; as a result, FDI has no impact on wage inequality. In contrast, a study of [13] confirmed that the increase in demand for skilled workers in Indonesia's manufacturing industry is strongly associated with transfer of foreign technology through

FDI. However, their study did not highlight the MNCs impact on wage inequality and still questioning the exact channels through which globalization and technological progress influence the wage structure and income distribution in developing countries.

Considering the previous studies in Indonesia, particularly the issue from the study of [13], this paper focuses on skilled-unskilled wage gap in Indonesia's manufacturing industry by exploring the impact of MNCs on the wage inequality. The study examines the role of MNCs on inequality because Indonesia is considered as one of the most unskilled worker-abundant countries with relatively low wages that attracts multinational companies.

In reference to endogenous growth model developed by [14], it is presumed that MNCs introduce a higher technology in Indonesia's manufacturing industry, which in turn has increased demand for skilled workers, thus leading to a change in skilled-unskilled wage gap. By making use of two-digit industry level for Indonesia's manufacturing sectors over the period of 1998-2014, the study examines the impacts of MNCs on the manufacturing wage inequality. Furthermore, the study attempts to interpret whether the effect is non-linear – inward FDI by MNCs increases wage inequality but at a decreasing rate over time, as predicted by the theoretical framework. The regression result show that MNCs have contributed to skilled-unskilled wage gap in Indonesia's manufacturing sector and the effect is indeed non-linear, with increasing share of skilled workers in MNCs, wage inequality will initially increase, but eventually decrease after reach a maximum point.

The remainder of this paper is organized as follows: in Analytical Framework, theoretical background is reviewed; in Research Methodology and Data, the data and econometric model are described; in Regression Result, the regression results are presented and the findings are discussed; and in the last section, some conclusions are presented.

## II. ANALYTICAL FRAMEWORK

Theoretically, the link between MNCs and wage inequality is based on the firm-specific advantage, particularly the technological advantage, that should be possessed by MNCs to be succeed in competing with local companies in the host country as in [14], [15], and [4]. The technological advantage will lead to a discrepancy between the productivity of MNCs and local companies that subsequently lead to differences in profits which in turn should cause significant differences in factor demand (labor demand), where multinational firms will have greater preference for employing skilled labor to maximize their profit, in addition to the facts that their technology requires to do so. Because of the difference of labor demand, skilled workers will have higher wages than unskilled workers, thus affecting the wage gap between skilled-unskilled workers.

The transmission of how MNCs can cause demand shifts and affect the skilled-unskilled wage gap can be illustrated by using the model developed by [14] as described by [8]. In this model, MNCs are considered to have a very important role in introducing new and more sophisticated technologies because MNCs are viewed as vehicles to introduce new technologies in host country. Besides, MNCs also become "role models" for local companies in applying more advanced production technologies. It is also assumed that local companies in the host country only use the old technology. The new technologies are then only introduced by MNCs in the host country.

As in [14] and [8], also it is assumed that the production function uses labor as the only factor of production. Hence, the level of output is significantly influenced by the production technology. If the industrial sector uses the old technology in production, then the sector will have constant-returns to technology production function. On the other hand, when the sector uses new technology, its production function will have increasing-return to technology.

Furthermore, it is explained in [14] that technology innovation in each sector requires three breakthroughs which lead to three states. First, the new technology must be discovered (state 0, in which sectors have not acquired new template). Second, the period in which the existing companies in the industrial sector must obtain the template of the new technology (state 1: sectors already have the template but have not discovered to implement it). In the third stage, the company will use the template to perform production process with new technology (state 2: sectors have succeeded in implementing the new technology). Therefore, there will be fraction of sectors in the three states, represented respectively by $n_0, n_1, n_2$. In an effort to move from state 1 to state 2, the company must employ a certain amount of labor ($N$) per period. It can be said that sectors using the same technology (whether old technology or new technology), will have the same demand for the labor. The dynamics of changes in the number of firms / sectors and labor required during a transition from state 1 to state 2 can be seen in Fig.1 where MNCs will be automatically in state 2, while local companies that in a way of obtaining new technology templates will be at state 1.

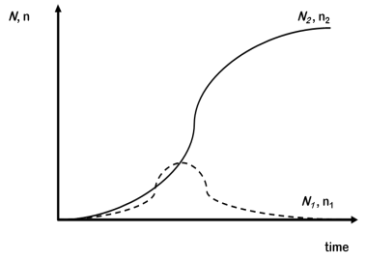


**Figure 1 –Number of Firms and Labor in Different Technology Stages**
Source: [14] as in [7]

References [14] and [8] described that the development of the number of firms would also lead to two stages of development of wages in the labor market as depicted in Fig. 2.

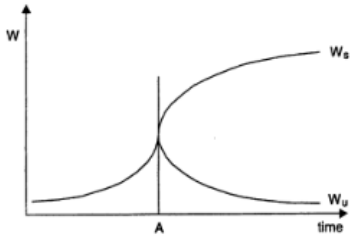


**Figure 2 – Development of Wages**

Source: [14] in [8]

Prior to the presence of MNCs and introduction of their technologies in the host country, skilled workers and unskilled workers are paid at the same wage rate, $w$. As the new technology is introduced by MNCs at Point (A), the labor market should be segmented; the skilled workers' wage will increase while unskilled workers' wage will decrease towards zero. The prevailing wage rates in the segmented labor market are:

$$w_s = \alpha\gamma^{\alpha}\left(\frac{n_2\gamma}{L_s - n_1 s}\right)^{1-\alpha} \quad \text{for skilled workers} \qquad (1)$$

$$w_u = \alpha\left(\frac{(1-n_2)\gamma}{L - L_s}\right)^{1-\alpha} \quad \text{for unskilled workers} \qquad (2)$$

The equation (1) and (2) imply that the wage rate is strongly influenced by the number of skilled workers ($L_s$) in the economy and the number of companies that acquired the new technology ($n_2$). Skilled workers' wage rates ($w_s$) will be higher if the firms that use old technology ($n_1$) employ more skilled workers. In contrast, unskilled workers' wage rates ($w_u$) will decrease as the number of firms using new technologies grows.

The implications of the two stages of development on wage inequality are: (i) in the beginning of the presence of MNCs in the host country, wage inequality will increase as local companies move from State 1 to State 2 and demanding more skilled labor in an effort to imitate the technology introduced by MNCs and; (ii) As more companies move from State 1 to State 2, in which in State 2 demand for unskilled workers will fall towards zero and there will be only skilled workers employed in the economy, wage inequality will decrease due to narrow wage gaps between skilled and unskilled workers. It is also assumed that the number of multinational companies will affect the speed of adjustment of local companies. /The higher number of MNCs in the economy and their labor share, the faster the adjustment process are. In another word, the wage inequality trends will decrease if the number of MNCs and the number of companies in State 2 is higher. This means that MNCs give a non-linear effect on wage inequality.

As in [8], to capture wage inequality trends in each sector, the distribution of wages in each sector was measured by using the gap between the average wages of skilled workers ($w_s$) and unskilled workers ($w_u$) in each sector as follows:

$$INEQ_{i,t} = [(w_s - w_u)/w_s]_{i,t} \qquad (3)$$

Following previous studies such as [8], [17], [4], and [18], wages of production workers would be a proxy for unskilled workers' wages and wages of non-production workers would be a proxy for skilled workers' wages. The measurement of wages itself, following [5], is calculated from the ratio of total wage bill shares for skilled-unskilled workers and total skilled-unskilled workers in each sector.

## III. Research Methodology and Data

The study examined the impacts of MNCs on wage inequality in Indonesia's manufacturing industry by following the empirical strategy used by [8] based on the model developed by [14]. Reference [8] used a wage gap between the average wages of white-collar workers as proxy for skilled workers' average wage ($w_s$) and blue-collar workers as proxy for unskilled workers' average wage ($w_u$) in each sector to represent wage inequality between skilled-unskilled workers. The wage inequality in each sector $i$ at time $t$ was calculated as in (3).

To analyze the impacts of MNCs on skilled-unskiled wages and development of wages, the following specification is used:

$$ineq_{i,t} = b_0 + b_1 foreign_{i,t} + b_2 foreign^2{}_{i,t} + b_3 capex_{i,t} + b_4 edu_{t-3} + b_5 imp_{i,t} + b_6 eks_{i,t} + e_{i,t} \qquad (4)$$

where:

| | | |
|---|---|---|
| $ineq_{i,t}$ | : | wage gap between skilled workers (non-production) and unskilled workers (production) in sector $i$ at time $t$ |
| $foreign_{i,t}$ | : | MNCs' share of employment in sector $i$ over total employment in the sector at time $t$ |
| $foreign^2{}_{i,t}$ | : | the square of $foreign_{i,t}$ to capture development of wages |
| $capex_{i,t}$ | : | share of capital expenditure by MNCs in sector $i$ at time $t$ |
| $imp_{i,t}$ | : | import intensity in sector $i$ at time $t$ |
| $eks_{i,t}$ | : | export intensity in sector $i$ at time $t$ |
| $edu_{t-3}$ | : | Enrolment ratio in third-level education in time $t$-3 |
| $e_{i,t}$ | : | error term in sector $i$ at time $t$ |

The empirical model specification as in (4) identifies that the skilled-unskilled wage gap in the industrial sector $i$ at time $t$ is related to the share of employment in MNCs over total employment in the industrial sector. However, as stated in the previous studies, trade is also closely related to wage inequality, therefore import and export will serve as a proxy of trade in the empirical model.

The main data source used to estimate (5) is the Annual Survey of Manufacturing Firms (SI) data for the years 1997-2014 provided by the Indonesian Statistical Agency (BPS). The detailed information on the data and sources are shown in Table I.

TABLE I. DATA SOURCE

| Data | Source | Period |
|---|---|---|
| Wages of production workers | SI – BPS | 1997–2014 |
| Wages of non-production workers | SI – BPS | 1997–2014 |
| The value of industry import | WITS | 1997–2014 |
| The value of industry export | WITS | 1997–2014 |
| Enrolment ratio for third-level education | APM - BPS | 1994–2011 |
| Capital net expenditure (machinery replenishment/ purchasing) | SI – BPS | 1997–2014 |

The wages of production workers as a proxy for unskilled workers' wages and wages of non-production workers as a proxy for skilled workers' wages may not be entirely appropriate, since in most cases the skills are identified with the level of education. However, as stated in [18], the division of labor by category of production / non-production in SI-BPS is good enough to measure the skills of the workers.

All variables that are related to the industrial sector are weighted by the two-digit industry share of the total manufacturing wage bill. Referring to [4], the weighted value is required since the data are aggregated from the firm level into sector.

## IV. REGRESSION RESULT

This study compared estimation results with pooled regression, fixed effects estimation, random effects estimation and time-specific fixed effects estimation to test hypotheses about non-linear effects of multinational corporations on wage inequality. This analysis is conducted at the 2-digit level of the manufacturing sector. Based on Breusch-Pagan Test results, it is known that there is unobserved heterogeneity, so it is assumed that the behavior of company data in industry sector in different period of time will influence the estimation result. Therefore, it is necessary to estimate the fixed effect and random effect to obtain the best estimation (best linear unbiased estimation). The estimation result obtained from fixed-random effects estimation is then tested by Hausman test. The results obtained from the Hausman test show that the fixed effect model is the most appropriate. Furthermore, to determine whether a certain period of time can affect the estimation results, testparm is performed after regression with fixed effect model. The testparm result shows Prob value> F is 0.0020, which indicates that it is necessary to add time dummy to the model to consider the time-specific effects. Table 2 shows and compares the regression results obtained with those methods.

TABLE II. REGRESSION RESULTS

| List of Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $foreign_{i,t}$ | 2,6161*** (0,1822) | 2,3613*** (0.2857) | 2,5610*** (0,2417) | 2,2398*** (0,2822) |
| $foreign^{2}{}_{i,t}$ | -3,4519*** (0,2740) | -2,4293*** (0.4508) | -2,8725*** (0,3793) | -2.2159*** (0,4473) |
| $capex_{i,t}$ | 0,1221* (0,0472) | -0,0113 (0,0453) | 0,0143 (0,0447) | 0,0026 (0,0446) |
| $imp_{i,t}$ | -0,0141 (0,0219) | 0,0357 (0,0281) | 0,0199 (0,0262) | 0,0624* (0,0283) |
| $eks_{i,t}$ | 0,0024 (0,0083) | -0,0014 (0.0077) | -0,0010 (0,0076) | -0,0053 (0,0077) |
| $edu_{t-3}$ | -0,0029*** (0,0005) | -0,0031*** (0,0004) | -0.0031*** (0,0004) | -0,0039*** (0,0007) |
| Constant | 0,0306*** (0,0306) | 0,0322*** (0,0039) | 0,0314*** (0,0041) | 0,0438*** (0,0074) |
| Time effect | Yes | Yes | Yes | Yes |
| Number of Observation | 396 | 396 | 396 | 396 |

Notes:
1. Dependent variable: *wage inequality* (*skilled-unskilled wage gap*)
2. Column (1): *pooled regression;* Column (2): *fixed effects estimation;* Column (3): *random effects estimation;* Column (4): *time-specific fixed efects estimation*
3. *** significant at 1%, ** significant at 5%, * significant 10%

Referring to Table II, it can be stated that MNCs have a positive and significant impact on wage inequality. This means when the share of employment of MNCs in the industrial sector increases, there will be an increase in the wage gap between skilled workers and unskilled workers. However, as its share of employment is become higher, MNCs will give negative and significant impact on wage inequality, indicating that MNCs will reduce the skilled-unskilled wage gap. Based on the estimated coefficient value, it can be concluded that MNCs are proven to give a non-linear effect on wage inequality in Indonesia's manufacturing sector. This result is in line with the results obtained by [4], [7], [8], and [10].

This study used four control variables. The first and second control variables, respectively import and export, are used to represent the impact of trade liberalization on wage inequality. The data in Table II shows that import and export have different effects on wage inequality. Import variables have a positive and significant impact while export variables are not proven to have an impact on wage inequality in Indonesia's manufacturing sector. Thus, imported variables, as found in [8] research, will actually increase wage inequality. While the results obtained for export variables in accordance with [19], found no impact of exports on wage inequality in manufacturing industry sector. If it is compared to the results obtained for the main variables, where the foreign has a significant impact on wage inequality, it can be concluded that the presence of MNCs in the industrial sector affects the wage gap among skilled-unskilled workers more rather than trade liberalization (especially export). Based on export data from Indonesia's manufacturing sector, it can be said that the most exporting sector is a relatively labor-intensive sector and does not require the mastery of sophisticated technology such as food and beverage industry, textile industry and apparel industry. This is suspected to cause insignificant impact on skilled-unskilled wage gap.

The next control variable, the share of capital expenditure of MNCs, is used to illustrate that multinational firms generally have capital intensive characteristics as well as to capture the existence of industrial wage differential caused by technological differences required by an industrial sector. The regression results in Table II show that capital expenditure variable is not proven to have an impact on wage inequality. Thus, the purchase or replenishment of machinery by MNCs

does not significantly affect the skilled-unskilled wage gap in the industrial sector. This is suspected because the proportion of the purchase of machines by MNCs is still relatively small.

The final control variable, the enrollment ratio of higher education, is used to indicate that labor supply is another factor that can affect wage inequality in a sector; the ratio of the number of people who have higher education in the economy will affect the wage inequality of the industrial sector. From Table II it can be seen that the ratio of higher education has a negative and statistically significant impact on wage inequality. This confirms that if the ratio of the highly educated workers increases, the wage gap among skilled-unskilled workers will decrease.

## V. CONCLUSION

The objective of this study is to estimate the impacts of FDI by multinational companies on skilled-unskilled wage gap (wage inequality) in Indonesia's manufacturing industry sector. In particular, this study was conducted to verify whether MNCs would give a non-linear effect on wage inequality in Indonesia's manufacturing sector.

Considering the results and analysis, it can be concluded that MNCs give a non-linear effect on wage inequality in the manufacturing sector of Indonesia. This implies that MNCs will initially increase wage inequality, but then as the share of employment from MNCs increasing, wage inequality in the industrial sector will be reduced. This result is in line with the proposed hypothesis in endogenous growth theory as in [14]. In addition, the results of this study are also in line with the results found in [4], [7], [10], stating that MNCs made non-linear effect on wage inequality.

The limited data for education level of the workers that usually become the basis for skilled-unskilled workers in the SI-BPS data may cause the results of this study does not represent the wage gap between skilled-unskilled workers in the Indonesian manufacturing sector precisely. However, although the categorization of production / non-production workers is not entirely appropriate to describe skill levels, based on previous research conducted in Indonesia as conducted by [17] and [18], it can be stated that the categorization is closely related with a level of education that typically describes the skill level of the workforce.

The non-linear impact of MNCs resulted from this study implies that the issue of the distribution effect of FDI by MNCs will not prevail in the long run, because MNCs will actually reduce wage inequality between skilled-unskilled workers. Therefore, the existing investment in industrial sectors should be more encouraged to spread out more evenly. Thus, wage inequality in all sectors will decrease and labors in Indonesia become more skilled and qualified.

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