

TRADE LIBERALIZATION, FOREIGN DIRECT INVESTMENT LIBERALIZATION, AND WAGE INEQUALITY IN INDONESIA

(Liberalisasi Perdagangan, Liberalisasi Penanaman Modal Asing, dan Ketimpangan Upah di Indonesia)

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Naskah diterima: 21 Oktober 2020

Naskah direvisi: 2 November 2020

Naskah diterbitkan: 30 Juni 2021

Abstrak

Penelitian ini bertujuan untuk mempelajari kembali hubungan antara liberalisasi perdagangan, liberalisasi penanaman modal asing (PMA), dan ketimpangan upah di Indonesia antara pekerja berkemampuan tinggi dan pekerja berkemampuan rendah dengan mempertimbangkan teori perdagangan internasional yaitu Heckscher-Ohlin-Samuelson model dan teori tenaga kerja yaitu teori Human Capital. Panel data berasal dari data terbaru survei angkatan kerja nasional (SAKERNAS) antara tahun 2015 dan 2017 yang digunakan untuk mengestimasi pekerja berdasarkan jenis kelamin, umur, status perkawinan, gaji per jam, tingkat pendidikan dan klasifikasi industri. Ketimpangan upah diukur menggunakan dua tahap metode estimasi. Di metode tahap pertama, dengan menggunakan data SAKERNAS di level individu, data upah diregresi menggunakan karakteristik pekerja untuk mendapatkan estimasi koefisien ketimpangan upah yang diinginkan yaitu untuk pekerja berkemampuan tinggi dan pekerja berkemampuan rendah. Di metode tahap kedua, hasil koefisien dari metode tahap pertama digunakan sebagai variabel terikat untuk kemudian diregresikan dengan nominal tarif sebagai proksi atau representasi dari liberalisasi perdagangan dan PMA inflow sebagai proksi dari liberalisasi PMA. Hasil penelitian ini mengindikasikan bahwa liberalisasi perdagangan dan liberalisasi PMA memiliki pengaruh yang signifikan terhadap ketimpangan upah untuk pekerja yang berkemampuan rendah, sedangkan untuk ketimpangan upah pekerja berkemampuan tinggi terdapat hubungan yang positif dan linier. Secara keseluruhan, hasil penelitian ini menunjukkan bahwa liberalisasi perdagangan menurunkan ketimpangan upah antara pekerja berkemampuan tinggi dan pekerja berkemampuan rendah yang linier dengan HOS model dan liberalisasi PMA menaikkan upah untuk pekerja berkemampuan tinggi yang linier dengan teori Human Capital.
Kata kunci: liberalisasi perdagangan, liberalisasi PMA, ketimpangan upah

Abstract

This study purposes to re-examine the relationship between trade liberalization, foreign direct investment (FDI) liberalization, and wage inequality between unskilled and skilled workers by considering international trade theories, the Heckscher-Ohlin-Samuelson model, and The Human Capital theory from labor economics. The panel data sourced from the latest SAKERNAS or National Labor Force Survey of Indonesia between 2015 and 2017 are estimated to determine employment by gender, age, marital-status, wages per hour, level of education, and classification of industry. Wage inequality is examined by using a two-stage estimation strategy. Specifically, in the first stage, using SAKERNAS data at the household level, wages are regressed with their worker characteristics to get coefficients of our interest, which are industry wage premium for unskilled workers and industry wage premium for a skilled worker. In the second stage, in the industrial level, two sets of estimated coefficients are used as dependent variables and regressed with nominal tariff and FDI inflow as proxy variables to trade liberalization and FDI liberalization, respectively. Our estimation showed that trade liberalization and FDI liberalization do have a statistically significant relationship with industry wage premium for unskilled workers. In contrast, there is a positive relationship for the case of an industry wage premium for skilled workers. Overall, the results show that trade liberalization decreases wage inequality between unskilled and skilled workers, which in line with the HOS model. Moreover, FDI liberalization increases wages for skilled workers, which in line with Human Capital theory.
Keywords: trade liberalization, FDI liberalization, wage inequality

INTRODUCTION

The wage differential between unskilled and skilled workers has become a serious issue, especially in developing countries. Indonesia, as one of the developing countries, has faced this issue in recent years. On the one hand, globalization brings some advantages to developing countries, such as increasing export and inducing new technology. On the other hand,

it gives disadvantages by swelling wage differential between unskilled and skilled workers. That condition happens because of new technology. Unskilled workers are considered a substitute for the new technology. Meanwhile, skilled workers are considered complements to the new technology. Therefore, the wage inequality among skilled and unskilled workers is getting bigger, especially in technology industries.

In the case of Indonesia, the studies about this issue mainly used trade liberalization as a determinant and skill premium that creates wage differential as their channels. It happens because a relative demand for workers who have high skill increases as a result of trade liberalization. However, those studies give mixed results in clarifying the relationship of trade liberalization on skill premium (Amiti & Cameron, 2012; Lee & Wie, 2015; Watekhi et al., 2018). Moreover, a relatively unexplored issue is the determinant of wage differential that has been growing in developing countries (Wang et al., 2017).

As a determinant of wage inequality, this study aims to use trade liberalization and foreign direct investment (FDI) liberalization as one of the new determinants, to examine the effect of globalization in Indonesia. In Indonesia, foreign presence and FDI inflow always show a positive trend over the years. Like other developing countries, FDI has become an essential source of external financing (UNCTAD, 2006). FDI is less volatile than other private flows and offers a steady funding foundation to encounter capital requirements. After establishing the ASEAN Free Trade Area (AFTA) and progress of ASEAN economic integration, Indonesia is effectively gain FDI inflow from investors (Verico, 2015). Based on several factors like market size, economic growth, infrastructure, labor market, financial system, and taxation, Indonesia is considered a potential FDI target (Fernandez et al., 2020). Thus, one of the main questions this study aims to answer is whether FDI liberalization is the primary determinant in the cause of wage differential between workers who have different skill. Moreover, this study wants to answer the relationship between those two determinants towards wage inequality in Indonesia. The strategy is to model the FDI inflow and nominal tariff of tradable sectors by controlling the number of firms in each sector or industry.

As a channel in creating wage differential in Indonesia, this study use industry wage premium for unskilled worker and industry wage premium for skilled workers. Industry wage premium is the wage of unskilled workers that can be explained by industry features of work. Meanwhile, the industry wage premium for skilled workers is the wage of skilled workers towards unskilled or less-educated workers in a particular industry of work. We focus on those two channels since they will reveal the wage inequality specifically in each industry. Therefore, we can examine wages based on the workers' education in observing trade and FDI liberalization. Besides, estimating wage premium on each industry is very appropriate to examine the relationship between trade liberalization and FDI liberalization on wage inequality in the short-

to-medium term since in an inflexible labor market, a worker will be less likely to move between sectors at low cost and in the short time.

To explain the relationship between trade liberalization on wage inequality, we use the international trade theory by Heckscher Ohlin Samuelson (HOS) that envisages trade liberalization will reduce wage differentials between unskilled and skilled workers in developing countries. In terms of FDI liberalization on wage differentials, we use the theory of human capital to assume that the presence of FDI liberalization will expose the developing countries to new technology, thereby giving advantages to workers who have high skill and growing wage differentials between unskilled and skilled workers.

In international trade theory by HOS model, it assumes that every single country has a different factor of production such as land, labor, and capital. Moreover, each country also has a similar preference for one good. Therefore, the country will have a comparative advantage in goods with abundance factor production. In this case, trade liberalization will affect developing countries by increasing the export of their commodities, which are labor-intensive commodities. Thus, it will increase the commodity's price and the demand for the unskilled worker since developing countries have an ample quantity of unskilled workers. Based on this notion, a developing country with comparatively plentiful unskilled workers will transfer labor-intensive commodities and ingress capital-intensive (skilled) commodities. Moreover, a change in the comparative price of the commodity will give an impact on factor prices of products. Consequently, the price of factor production will be changed by a change in the tariff rate of the commodity. This condition will increase the prices of the commodity and the demand for unskilled workers. Thus, it will eventually increase the comparative wage of unskilled workers. Eventually, the trade liberalization reduces wage inequality as it increases the wage for unskilled workers (Goldberg & Pavcnik, 2001). For instance, in the case of Malaysia, which has worked a very exposed trade system, import substitution, and export supporting policies, trade openness is not the case that associated with greater wage inequality (McNabb & Said, 2013).

In fact, not all developing countries are in agreement with the HOS model. There is some significant disagreement about this theory. Some empirical works found that the presence of trade liberalization augmented wage inequality. Goldberg & Pavcnik (2001), who look at trade liberalization as one of the impacts of creating wage inequality, show a significant relationship between tariffs and

wage inequality across industries. Similarly, Acharyya (2011) showed that the effect of trade restrictions into wage differentials in a HOS model was steer to a rise in wage differentials because of alteration in the quota import into an equal import tariff. Han & Liu (2012) showed that trade liberalization contributed to rising wage inequality in urban China, indicating contrary predictions of the HOS model. Mehta & Hasan (2012) also found that trade liberalization has managed to increase wage skill premium within the tradable sectors in India. In the manufacturing industry framework, Amity & Cameron (2012) showed that decreasing the import tariff of final goods tariff does not have an impact on skill premium. However, decreasing intermediate inputs is without a doubt decreasing skill premium in the case of Indonesia. Similarly, Lee & Wie (2015) identified that skill premium is increasing because of trade liberalization. Moreover, Watekhi et al. (2018) revealed that trade liberalization knowingly subsidizes to increasing wage differentials in Indonesia. Furthermore, Murakami (2021) initiate that a decrease in real tariffs on final goods steers to an upsurge in industry skill and wage premiums. Specifically, he found that the effect on the industry-skill-premiums is bigger for educated workers working in large firms.

To explain the relationship between FDI liberalization and wage inequality, we use Human Capital Theory or sorting model. In labor economics theories, Cahuc & Zylberberg (2004) show that the wage differential among workers can be explained by that theory. It clarifies that the differential of the wage among workers by making an allowance for the individual competencies. By that means, in this case, workers characteristics, for example, age, education, experience, and training, are connected with the existence of wage differential. Therefore, the difference in productivity will surge wage inequality for educated and uneducated workers. In the long run, this model explains that education generates more skilled worker who is more competent in the labor market.

To illustrate, the presence of FDI liberalization will bring new technology to the host countries. In such a situation, the firms are faced with the problem, which is the higher demand for high skilled workers. For that reason, employers need to collect a worker with high human capital characteristics. At that point, the sorting model and, or the human capital theory can be explained in this strategy. The human capital theory advocates that wage differences occur due to the change in the stock of human capital among workers. Well ahead, the level of production will get affected by the change of human capital stock. Besides, the relative wage will also get affected to the extent of the change in productivity. In this strategy, a high skilled

worker who has training experience will earn more wages. It happens because the skills will advance human capital stocks and productivity as well.

The Skill-Biased Technical Change (SBTC) can also be associated with this second strategy, because the presence of the latest technologies in a particular industry changes the demand for more workers with higher skill capability. These new technologies are considered accompaniments of skilled workers. Thus, the SBTC creates not only a relative change in labor composition but also in wages. The effect of SBTC on wage differentials has been enlightened by Aghion & Howitt theory (1998). In that theory, it describes that in an endogenous growth model of a general purpose technology (GPT), it can examine wage inequality. This model gives the more detailed explanation that companies absorb to accept new technology by perceiving the involvement and knowledge of other companies. Moreover, the model is suitable for developing countries, for example, Indonesia, which is facing a fast invasion of FDI, to improve their technology for production. In developing countries, FDI is expected to generate wage inequality as FDI inflow has an essential role in the economy and SBTC, which occurred along with rapid globalization and technological progress. It is also considered the cause of an upsurge in wage inequality (Figini & Gorg, 2011; Tomohara & Yokota, 2011; Wang et al., 2017; Zulfiu & Adnett, 2018).

Furthermore, in terms of FDI liberalization, there are several empirical works regarding the wage inequality associated with FDI liberalization. For example, Choi (2003) finds that higher local wages are caused by a higher number of foreign firms. It happens even after controlling for the observable characteristics of workers and the differences in wage of workers who have high-school, and some college degree. In the case of Mexico, Noria (2015) showed that wage differentials across industries have been affected by inward FDI significantly. The study found that the link between wage differentials across industries and FDI inflow is comparatively strong at a low FDI level. However, the link wage differentials across industries and FDI inflow deteriorates at the time of an increase in FDI inflow. Cho & Ramirez (2016) found strong evidence that claim FDI invasions have a tendency to increase income differentials in the short-run but decrease it in the long-run by using cointegration panel with the tests of Pedroni Augmented-Dickey-Fuller (ADF) and Phillips Perron (PP) in the Southeast Asian Countries. In the Republic of China, FDI has contributed to the wage gap between foreign firms and domestic firms due to the technology spillover effect (Chen et al., 2017). Another example, FDI enhances the relative demand for skilled workers in Malaysian manufacturing industries,

while trade has no spillover effects on the demand for skilled workers (Yunus et al., 2015). In contrast, Tomohara & Takii (2011) showed that FDI can bring advantages to local workers by increasing the wages above the market-based. It proves that the presence of multinational companies might have positive impacts on local workers.

As stated before, the association between trade liberalization, FDI liberalization, and wage differentials among workers has been assessed in a plethora of empirical works. In detail, many researchers have done research mainly to examine the association between trade liberalization and wage inequality. Meanwhile, the association between FDI liberalization and wage inequality was done separately. For that reason, this study will fill in the gap by taking together the relationship of trade liberalization and FDI liberalization to wage inequality in the case of Indonesia as one of the developing countries. In addition, the empirical results from those previous researchers of the relationship of trade liberalization and FDI liberalization to the workers' wage have been quite varied. Broadly speaking, there are two main groups regarding this study: those empirical works that said trade and FDI liberalization increase wage inequality and those empirical works that found the opposite results.

Considering some significant disagreements about the HOS model and the relationship between FDI liberalization on wage inequality based on the Human Capital model; as a result, this study will contribute to recent empirical works in two aspects. First, this study will re-examine the association between trade liberalization and FDI liberalization on wage inequality. Specifically, this study will examine whether or not trade liberalization reduces wage differentials between educated and uneducated workers, which consistent with the HOS model. Moreover, this study will analyze whether FDI liberalization increases the wage inequality between the skilled and unskilled workers, which in line with Human Capital theory. Consequently, this study will shed some light on the continuing debate regarding trade liberalization and FDI liberalization as a determinant of wage inequality.

Knowing the relationship of trade liberalization and FDI liberalization on industry-wage-premium will reveal the wage differentials because of workers' education in that particular industry. Huria & Pant (2018) explain that the effect of higher multinational activities on skilled and unskilled workers wage be subject to totally on the sectors wherein it happens. In that case, this industry wage premium for skilled workers can be used if liberalization in terms of trade and FDI can improve the skill of workers, so which affect wage inequality. For instance, if multinational

companies (MNCs) give training for their workers, it will improve industry skill premium since the workers will get better ability, knowledge and skill. In conclusion, this condition will give additional channel to estimate the FDI liberalization and trade liberalization on wage differentials. Another case in point, if the tariff decrease in the labor-intensive industry and relative wage decline as an effect of trade liberalization, it will decrease the relative wages of uneducated workers since the labor-intensive industry is dominated by unskilled workers.

In general, this study will re-examine the relationship between trade liberalization, FDI liberalization on wage differentials between unskilled and skilled workers for the case of Indonesia. Moreover, the objective of this study is to give some empirical evidence to the argument about the relationship of trade liberalization and FDI liberalization on wage inequality. There are two hypotheses in this study. First, trade liberalization and FDI liberalization reduce wage inequality for unskilled workers in the case of emerging countries, which in line with the HOS model. Second, trade liberalization and FDI liberalization increase wage for skilled workers.

METHODS

Type and Data Resource

This study will use two sources of data to estimate the model outlined above. In the first stage, this study will use data from the National Labor Force Survey of Indonesia (SAKERNAS) conducted from 2015 to 2017. This quarterly rotating panel survey is specifically conducted for labor data collection that is representative in the level household, which encompass about 200,000 respondents. This survey is filled with various data in an individual and household level in which some of them will be used in this study. The dependent variable in this study is wage per hour, which is the worker's wage defined as hourly wages. Meanwhile, independent variables are gender, marital status, education level, and industry classification. Industry classification applied in SAKERNAS 2015, 2016, and 2017 is the Indonesia Industrial Classification Standard (KBLI) 2009. Since this study is concerned with measuring the relative importance of trade liberalization and FDI liberalization in enlightening wage inequality, then it will only examine the wage of workers in tradable sectors in those industrial classifications, not completely on workers in the manufacturing sector. There are 35 tradable sectors, a sector whose output including goods and services are traded across many countries, that will be used in this study. The observations for this study are the educational level as a proxy for a worker's skill. The educational variable

is clustered into three groups, which are a secondary school, senior school, and diploma or university. Thus, the workers who have a diploma or university degree are categorized as skilled workers while workers who have educational attainment lower than a university degree are considered unskilled workers.

In the second stage estimation, this study will use a proxy for trade liberalization data, nominal tariffs for the independent variable. The data is done at the industrial level and obtained from the World Trade Organization (WTO), as revealed in Table 1. Considering that this study will not cover all the manufacturing sector but only covers the tradable sectors in the industry classification, then this study

will use tariffs data for final goods. The nominal tariff HS2012 code is transformed into (Indonesia Industrial Classification Standard 2009) or ISIC-Revision 3 (ISIC 3). Following that, the mean rate founded on ISIC 3 level-2 (2 digits) is calculated. Furthermore, in terms of FDI liberalization, this study will also use FDI inflows data (in a million Rupiah) for the independent variable as the proxy for FDI liberalization, which is achieved by Indonesia Investment Coordinating Board (BKPM). The FDI inflow data are categorized based on the industry classification of KBLI 2009 or ISIC3 and limited to 35 tradable sectors for this study. The nominal tariffs data and FDI inflows data, which will be used in this study are taken between 2015 and 2017.

Table 1. Industry Tariffs of Indonesia

No	ISIC code	Description of Industry	Tariff (%)		
			2015	2016	2017
1	01	Agriculture-hunting-related service activities	3.700	3.700	3.700
2	02	Forestry-logging-related service activities	5.000	5.000	5.000
3	05	Fishing-operation of fish hatcheries and fish farms-service activities incidental to fishing	4.500	4.500	4.500
4	10	Mining-coal and lignite-extraction of peat	3.300	3.100	3.100
5	11	Extraction of crude petroleum and natural gas-activities incidental to oil and gas extraction excluding surveying service	5.200	5.300	5.400
6	12	Mining-uranium and thorium ores	3.600	3.900	3.800
7	13	Mining-metal ores	2.600	4.800	4.800
8	14	Other mining and quarrying	4.000	1.800	2.000
9	15	Manufacture-food products and beverages	6.800	4.300	4.400
10	16	Manufacture-tobacco products	10.900	13.500	13.600
11	17	Manufacture-textiles	14.400	7.400	7.400
12	18	Manufacture- wearing apparel	5.900	12.000	12.000
13	19	Tanning and dressing of leather; manufacture of handbags; saddlery; harness; footwear luggage	13.100	14.800	14.800
14	20	Manufacture- wood and products of wood and cork, except furniture-manufacture in articles of straw and plaiting material	8.200	6.300	6.300
15	21	Manufacture-paper and paper products	23.000	13.200	13.200
16	22	Publishing-printing-reproduction of recorded media	6.300	8.400	8.200
17	23	Manufacture-coke; refined petroleum products and nuclear fuel	5.500	3.900	4.000
18	24	Manufacture-chemicals and chemical products	6.600	21.200	21.000
19	25	Manufacture-rubber and plastics products	3.100	3.400	3.500
20	26	Manufacture-other non-metallic mineral products	4.500	4.200	4.200
21	27	Manufacture-basic metals	2.800	3.900	3.900
22	28	Manufacture-fabricated metal products, except machinery and equipment	4.500	4.800	5.000
23	29	Manufacture-machinery and equipment n.e.c	3.900	3.800	3.900
24	30	Manufacture-office; accounting; computing machinery	3.700	3.500	3.300
25	31	Manufacture-electrical machinery and apparatus n.e.c.	3.600	2.000	2.100
26	32	Manufacture-radio; television and communication equipment and apparatus	12.300	5.100	5.100
27	33	Manufacture-medical; precision; and optical watches and clocks instruments,	10.900	13.700	13.700
28	34	Manufacture-motor vehicles; trailers; and semi-trailers	5.900	7.900	7.800
29	35	Manufacture-other transport equipment	5.200	5.000	5.000
30	36	Manufacture-furniture; manufacturing nec	5.000	7.500	7.500
31	40	Electricity-gas-steam-hot water supply	9.300	8.000	7.600
32	74	Other business activities	6.900	5.600	5.600
33	92	Recreational-cultural-sporting activities	6.200	10.300	10.300
34	93	Other service activities	13.700	6.100	5.100
35	99	Extra-territorial organizations and bodies	4.500	5.900	5.500

Note: nec – not-elsewhere-classified.

Source: WTO

Method Analysis

The aim of this study is to re-examine the relationship between trade liberalization, FDI liberalization on wage inequality between educated and uneducated workers for the case of Indonesia. To identify these relationships, it is necessary to control for variations in the industry wage premium for unskilled and industry wage premium for skilled workers because each industry has a diverse quantity of educated and uneducated workers. An alteration in industry-wage-premium will affect variations in relative wages of educated and uneducated workers. For instance, a decrease of tariff due to trade liberalization in labor-intesive industries that have an abundance number of unskilled workers will change the relative wage of unskilled workers towards skilled workers. Meanwhile, an increase in FDI inflow due to FDI liberalization in capital-intensive industries will affect the relative wage of skilled workers towards unskilled workers.

Concerning the empirical studies, it was decided to put the main focus of the empirical research on qualitative research methods, which are Ordinary Least Square (OLS) and Weighted Least Square (WLS). Specifically, the estimation strategy in this study will be conducted by using a two-stage estimation method by considering the concept and empirical strategy that was presented by Mehta & Hasan (2012) and Watekhi et al. (2018). In the first method, to examine industry-wage-premium for educated and uneducated workers coefficients, OLS is used to regress wages of workers on all industries classification, which are involved in a trade or tradable sectors. In the second method, WLS is used to regress the estimated coefficients of the industry wage premium for the unskilled and skilled worker from the first method that is attributable to wage differentials on trade and FDI variable. The reason for using WLS is to overcome the difference in the total number of the worker in each industry. The methods above are used in this study for two reasons. The first reason is that the characteristics of workers are need to be controlled. The second reason is to scrutinize the association between trade liberalization and FDI liberalization on the differences in wages across industries. If wages were estimated directly to variable tariffs or FDI, then it will give biased results (Goldberg & Pavcnik, 2001).

In the first stage, a regression analysis is constructed separately for each year to estimate the industry-wage-premium for educated and uneducated workers. The model is as follows:

$$\ln(w_{ij}) = \sum_{j=1}^J (a_j D_{ij} + b_j S_i D_{ij}) + X'_{ij} \beta + \varepsilon_{ij} \dots \dots \dots (1)$$

Where

- i : Superscript for worker
- j : Superscript for industry dummies ($j = 35$ industries in total)
- w_{ij} : Worker i 's real wage worked in industry dummy j
- α_j : Unskilled worker's wage premium in industry j which captures the industry-wage-premium
- b_j : Skilled worker's wage-premium in industry j which captures the industry-skill-premium (the wages of a skilled worker or having a diploma or university degree)
- S_i : Worker i is skilled (It indicates that worker i have a diploma or university degree)
- D_{ij} : Worker i 's worked in industry dummy j
- X : A vector includes secondary school and senior high school that is noted as a sequence of dummies taking the highest level of education completed (less from primary and primary school are omitted category)
- ε_{ij} : Error term
- β : The parameter

The important thing to note here is that we estimated the wage regression separately for three years (2015, 2016, and 2017) thus, we have the industry-wage-premium for educated and uneducated workers for each year. These results will allow us to control for industry fixed effect in the second stage.

In the second stage, a regression analysis is constructed by using two sets of estimated coefficients resulted from the first stage as dependent variables. For independent variables, nominal tariff and FDI inflow are used as a proxy of trade liberalization and FDI liberalization, respectively. Let $Tarif_{jt}$ and FDI_{jt} denote vector containing nominal tariff and FDI inflow respectively in the industry j at time t . Therefore, the second stage regression was estimated the industry-wage-premium for unskilled and skilled workers across different industries and periods. The models are as follows:

$$\alpha_{jt} = \alpha_1 Tarif_{jt} + \beta_1 FDI_{jt} + \vartheta_{1j} + \vartheta_{1t} + u_{1jt} \dots \dots \dots (2)$$

$$b_{jt} = \alpha_2 Tarif_{jt} + \beta_2 FDI_{jt} + \vartheta_{2j} + \vartheta_{2t} + u_{2jt} \dots \dots \dots (3)$$

where

- $Tarif_{jt}$: Nominal tariff in industry j at time t
- FDI_{jt} : FDI inflow in industry j at time t
- α, β, ϑ : The parameters

In this stage, the number of firms from each industry are utilized as weights since each industry has a different number of the firm.

In the HOS model, trade liberalization is predicted to reduce wage differentials between skilled and unskilled workers. Thus, there are two possible cases in the interpretation of this model, including:

- if trade liberalization increases unskilled workers wage, then the estimated coefficient $\alpha_1 > 0$, indicating that this study is in line with the HOS model.
- if it increases skilled workers' wages, then coefficient $\alpha_2 > 0$, meaning that this study is not in line with the HOS model.

Meanwhile, FDI liberalization in the Human Capital Theory is predicted to increase wages for skilled workers. Therefore, interpretation in this model also has two possible cases, including:

- If FDI liberalization increases skilled workers wages, then the estimated coefficient of $\beta_2 > 0$. In this case, the presence of FDI inflow has a positive relationship in increasing wages for skilled workers, which in line with human capital theory.
- If FDI liberalization increases wages for unskilled workers, then the estimated coefficient of $\beta_2 > 0$. In this case, FDI liberalization reduces wage inequality between skilled and unskilled workers.

RESULT AND ANALYSIS

We use a two-stage estimation to examine the industry wage premium between educated and uneducated workers. Before investigating the association between trade liberalization and FDI liberalization, results in the first stage, are shown in Table 2. The outcomes specify that several workers characteristics such as gender, age, marital status, and education are statistically significant in 1 (one) percent significance level to the higher real wages over the years from 2015 to 2017.

In the first stage, the results show that worker's characteristics such as gender, age, marital status, and education are statistically significant to the higher real wages over the years (2015, 2016, and 2017). Gender roles, which in this study is represented by man workers, decrease over the years. It indicates that gender inequality becomes smaller and female workers also participate more in the labor market. As regards the role of age to wages, it also shows a decreasing trend meaning that younger workers comparatively earn more than older workers. In terms of the marital status of workers, married workers earn relatively more in 2017 compared to 2015 and 2016. The role of education is in line with its level, which means that the more level of education, the more the wages. Workers with higher education attainment such as a worker who graduate from university earn more than the worker who only graduates from secondary and senior high school.

Table 2. OLS Results Dependent Variables is Log (wage)

Variables	2015		2016		2017	
	Coef.	Std.err.	Coef.	Std.err.	Coef.	Std.err.
Age	0.057 ***	0.001	0.057 ***	0.002	0.049 ***	0.001
Agesq	-0.006 ***	0.000	-0.001 ***	0.000	-0.001 ***	0.000
Male	0.347 ***	0.004	0.331 ***	0.007	0.302 ***	0.004
Married	0.132 ***	0.005	0.131 ***	0.009	0.135 ***	0.005
Secondary	0.189 ***	0.007	0.136 ***	0.011	0.149 ***	0.007
Senior	0.444 ***	0.017	0.381 ***	0.009	0.394 ***	0.006
Skilled	0.159 ***	0.009	0.472 ***	0.053	0.542 ***	0.031
Obs.		199905		50938		122609
F		472.790		95.130		253.850
p-value		0.000		0.000		0.000
R ²		0.255		0.274		0.294
Adj. R ²		0.225		0.271		0.293
Root MSE		0.815		0.759		0.713

Note: *** signifies 1 percent significance level.

** signifies 5 percent significance level.

* signifies 10 percent significance level.

Source: Base on authors' calculations by Stata App.

Table 3. Estimated Industry Wage Premium for Unskilled Workers

No.	ISIC code	Industry Description	Industry Wage Premium Low Skilled Workers		
			2015	2016	2017
1.	01	Agriculture-hunting-related service activities	0.200	-0.582	-0.920
2.	02	Forestry-logging-related service activities	0.300	-0.728	-0.999
3.	05	Fishing-operation of fish hatcheries and fish farms-service activities incidental to fishing	0.010	-0.843	-0.763
4.	10	Mining-coal and lignite-extraction of peat	1.120	-0.595	-0.536
5.	11	Extraction of crude petroleum and natural gas-activities incidental to oil and gas extraction excluding surveying service	1.070	-0.299	-0.252
6.	12	Mining-uranium and thorium ores	0.430	-0.604	-0.523
7.	13	Mining-metal ores	0.590	-0.479	-0.336
8.	14	Other mining and quarrying	0.010	-0.534	-0.415
9.	15	Manufacture-food products and beverages	0.200	-0.488	-0.416
10.	16	Manufacture-tobacco products	0.182	-0.574	-0.211
11.	17	Manufacture-textiles	0.083	-0.449	-0.302
12.	18	Manufacture- wearing apparel	0.430	-0.367	-0.352
13.	19	Tanning and dressing of leather; manufacture of handbags; saddlery; harness; footwear luggage	0.650	-0.374	-0.164
14.	20	Manufacture- wood and products of wood and cork, except furniture-manufacture in articles of straw and plaiting material	0.165	-0.236	-0.143
15.	21	Manufacture-paper and paper products	0.599	-0.389	-0.171
16.	22	Publishing-printing-reproduction of recorded media	0.240	-0.468	-0.154
17.	23	Manufacture-coke; refined petroleum products and nuclear fuel	1.050	-0.281	-0.170
18.	24	Manufacture-chemicals and chemical products	0.566	-0.201	-0.026
19.	25	Manufacture-rubber and plastics products	0.414	-0.182	-0.009
20.	26	Manufacture-other non-metallic mineral products	0.083	-0.118	-0.007
21.	27	Manufacture-basic metals	0.568	-0.157	-0.010
22.	28	Manufacture-fabricated metal products, except machinery and equipment	0.247	-0.149	0.032
23.	29	Manufacture-machinery and equipment n.e.c	0.532	-0.200	0.126
24.	30	Manufacture-office; accounting; computing machinery	0.732	-0.050	0.138
25.	31	Manufacture-electrical machinery and apparatus n.e.c.	0.756	-0.026	0.263
26.	32	Manufacture-radio; television and communication equipment and apparatus	0.983	-0.041	0.295
27.	33	Manufacture-medical; precision; and optical watches and clocks instruments,	0.771	-0.029	0.297
28.	34	Manufacture-motor vehicles; trailers; and semi-trailers	0.659	-0.052	0.237
29.	35	Manufacture-other transport equipment	0.744	0.104	0.350
30.	36	Manufacture-furniture; manufacturing nec	0.128	0.109	0.303
31.	40	Electricity-gas-steam-hot water supply	0.430	0.457	0.683
32.	74	Other business activities	0.093	0.357	0.547
33.	92	Recreational-cultural-sporting activities	0.259	0.408	0.562
34.	93	Other service activities	0.089	0.216	0.587
35.	99	Extra-territorial organizations and bodies	0.093	0.438	0.582

Source: Base on authors calculations by Stata App.

a. Industry Wage Premium for Unskilled workers

From the first stage, the results of the estimated coefficient of an industry-wage-premium for unskilled workers in 35 tradable sectors are shown in

Table (3). The industry wage premium's estimation coefficient varies across industries. Workers in the mining and industrial chain earn relatively more than other industries such as agriculture, forestry, and

other service activities. It means that industries that require more skill or capital-intensive industries tend to give more wages to their workers compared to labor-intensive industries.

b. Industry Wage Premium for Skilled Workers

Results from the first stage in terms of the industry wage premium for skilled workers in 35 tradable sectors are shown in Table 4. All estimated

Table 4. The Estimated Industry Wage Premium for Skilled Workers

No.	ISIC code	Industry Description	Industry-Specific Skill Premium University-Educated Workers		
			2015	2016	2017
1.	01	Agriculture, hunting, and related service activities	0.145	1.917	0.792
2.	02	Forestry, logging, and related service activities	0.154	0.481	0.435
3.	05	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	0.149	0.599	0.219
4.	10	Mining of coal and lignite; extraction of peat	0.288	0.348	0.242
5.	11	Extraction of crude petroleum and natural gas; activities incidental to oil and gas extraction excluding surveying service	0.601	0.217	0.517
6.	12	Mining of uranium and thorium ores	0.583	0.273	0.115
7.	13	Mining of metal ores	0.062	0.500	0.096
8.	14	Other mining and quarrying	0.084	0.487	0.259
9.	15	Manufacture of food products and beverages	0.063	0.247	0.054
10.	16	Manufacture of tobacco products	0.094	0.217	0.322
11.	17	Manufacture of textiles	0.123	0.416	0.124
12.	18	Manufacture of wearing apparel	0.008	0.351	0.131
13.	19	Tanning and dressing of leather; manufacture of handbags, saddler, harness, and footwear luggage	0.074	0.273	0.004
14.	20	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting material	0.232	0.391	0.148
15.	21	Manufacture of paper and paper products	0.317	0.299	0.315
16.	22	Publishing, printing, and reproduction of recorded media	0.623	0.213	0.102
17.	23	Manufacture of coke, refined petroleum products, and nuclear fuel	0.676	0.366	0.100
18.	24	Manufacture of chemicals and chemical products	0.552	0.051	0.030
19.	25	Manufacture of rubber and plastics products	0.257	0.183	0.004
20.	26	Manufacture of other non-metallic mineral products	0.005	0.100	0.051
21.	27	Manufacture of basic metals	0.471	0.001	0.200
22.	28	Manufacture of fabricated metal products, except machinery and equipment	0.256	0.275	0.036
23.	29	Manufacture of machinery and equipment n.e.c	0.450	0.367	0.174
24.	30	Manufacture of office, accounting, and computing machinery	0.683	0.051	0.074
25.	31	Manufacture of electrical machinery and apparatus n.e.c.	0.200	0.037	0.104
26.	32	Manufacture of radio, television, and communication equipment and apparatus	0.454	0.002	0.102
27.	33	Manufacture of medical, precision and optical watches and clocks instruments,	0.591	0.064	0.102
28.	34	Manufacture of motor vehicles, trailers, and semi-trailers	0.601	0.338	0.208
29.	35	Manufacture of other transport equipment	0.298	0.059	0.174
30.	36	Manufacture of furniture, manufacturing n.e.c	0.077	0.112	0.087
31.	40	Electricity, gas, steam, and hot water supply	0.693	0.336	0.199
32.	74	Other business activities	0.743	0.429	0.007
33.	92	Recreational, cultural, and sporting activities	0.322	0.857	0.209
34.	93	Other service activities	0.129	0.195	0.426
35.	99	Extra-territorial organizations and bodies	1.589	0.162	0.189

Source: Base on authors calculations by Stata App

coefficients of an industry wage premium for skilled workers are positive. This suggests that in all industries, university-educated workers have higher wages than those with lower education levels.

c. Trade Liberalization, FDI Liberalization, and Industry Wage Premium for Unskilled Workers

After we get the estimated coefficient of unskilled workers and skilled workers, we focus on our main objective. Those coefficients are used as our dependent variables in the second stage to scrutinize the association between trade liberalization, FDI liberalization, and wage-premium for unskilled workers. The outcomes for the second stage regression, which shows the results of the wage-premium for unskilled workers, are shown in Table 5.

In the second stage, in terms of the industry wage premium for unskilled workers, the tariffs and FDI coefficients are negative and significant in 1 (one) percent significance level. The result shows a relationship between industry wage premium with trade liberalization and FDI liberalization. The coefficient is negative, indicating that an increase in tariff of nominal goods in tradable sectors decreases the industry wage premium for unskilled workers. Moreover, workers in industries with a higher tariff will earn less than workers with equal observable characteristics in industries with a lower tariff. Meanwhile, an increase in FDI inflow in those particular tradable sectors will also decrease the wage-premium for unskilled workers. These values are in line with studies of Mehta & Hasan (2012), Noria (2015), and Watekhi et al. (2018) stated that the presence of trade liberalization and FDI liberalization reduced the wage differentials between skilled-unskilled workers.

Table 5. Industry Wage Premium - Unskilled Workers

Dependent variable	Unskilled worker's wage premium (α_{it})	
Independent Variables	Coef.	Std. error.
Tariff (α_1)	-0.085 ***	0.003
FDI Inflow (β_1)	-0.001 ***	0.001
Industry fixed effect	Yes	
Year fixed effect	Yes	
R ²	0.437	
Root MSE	0.219	
Mean of the dependent variable	-0.107	
Number of observation	101	

Note: *** signifies 1 percent significance level.

** signifies 5 percent significance level.

* signifies 10 percent significance level.

Source: Base on authors calculations by Stata App.

In addition, these results are in line with our hypothesis that stated FDI and trade liberalization would reduce wage inequality for unskilled workers in the case of emerging countries. These results are also in line with the HOS model, which predicts that trade liberalization in developing countries is expected to reduce wage inequality between skilled and unskilled workers. Moreover, in this channel, industry wage premium for unskilled workers, the presence of trade liberalization, and an increase in nominal tariff will bring less wage inequality compared to an increase in FDI inflow in the particular industry. It means that FDI liberalization is the primary determinant compared to trade liberalization in creating wage inequality between skilled-unskilled workers through this channel.

d. Trade Liberalization, FDI Liberalization, and Industry Wage Premium for Skilled Workers

Table 6 shows empirical estimates of the WLS model from the second stage for explaining the relationship between trade liberalization, FDI liberalization, and industry wage premium for skilled workers.

In this channel, industry wage premium skilled workers, the coefficient of nominal tariffs, and FDI inflow are positive. It means that trade liberalization and FDI liberalization has a positive relationship with wage inequality between skilled-unskilled workers by increasing wage for skilled workers. Those positive signs indicate that any increase in terms of the tariff of nominal goods and FDI inflow in tradable sectors will increase wages for university-educated workers. The results are in line with our hypothesis that stated trade liberalization and FDI liberalization increase the wage for skilled workers. Moreover, the presence of FDI liberalization through an increase in the number of FDI inflow in Indonesia will create more industry

Table 6. Industry-Specific Skill Premium – Skilled Workers

Dependent variable	Skilled worker's wage premium (b_{it})	
Independent Variables	Coef.	Std.err.
Tariff (α_2)	2x10 ⁻⁴	0.000
FDI Inflow (β_2)	0.003	0.003
Industry-fixed-effect	Yes	
Year-fixed-effect	Yes	
R ²	0.073	
Root MSE	0.198	
Mean of the dependent variable	0.038	
Number of observation	98	

Source: Base on authors calculations by Stata App.

wage premium for skilled workers compared to trade liberalization. However, it shows that there is no statistical indication to advise that tariff and FDI affect wage differentials between educated and uneducated workers through this industry channel. It means that trade liberalization and FDI liberalization through FDI inflow are not creating wage inequality through this channel.

CONCLUSION

This study focused on different channels to portray wage inequality across industries and to investigate the association between trade liberalization, FDI liberalization, and wage inequality in Indonesia. The channels are industry-wage-premium for unskilled workers and industry-wage-premium for skilled workers. The industry-wage-premium for unskilled workers is the wage of unskilled workers that can be described by industry features of work. Meanwhile, the industry wage premium for skilled workers is the wage of skilled workers towards unskilled or less-educated workers in a particular industry of work. The portion of skilled workers are different across the industry, and those skilled workers have the power to bargain their wage compared to unskilled workers so that wage will differ between workers with varying skill. Examining wages based on the workers' education in observing trade and FDI liberalization is important since it will reveal the wage inequality specifically in each industry. In addition, estimating wage premium on each industry is very appropriate to examine the relationship between trade liberalization and FDI liberalization on wage inequality in the short-to-medium term since in an inflexible labor market, a worker will be less likely to move between sector at low cost and in the short time. However, there are no previous studies scrutinizing the association between trade liberalization and FDI liberalization and wage inequality in Indonesia. In addition, our study also wants to re-examine the theory of trade liberalization and FDI liberalization and its relationship with wage inequality by using the HOS model and Human Capital Theory.

In order to capture the variations in the industry-wage-premium for unskilled workers and industry wage premium for skilled workers, we used a two-stage estimation strategy to examine wage inequality. Specifically, in the first stage, using SAKERNAS data, household wages are regressed with their worker characteristics and a set of industry dummies to get a yearly industry-wage-premium for unskilled and skilled workers. To identify the relationship of trade liberalization and FDI liberalization on wages, in the second stage, two sets of estimated coefficients

resulted from the first stage are used as dependent variables and regressed with FDI inflow and tariff as proxy variables to FDI liberalization and trade liberalization.

Our estimation shows that trade liberalization and FDI liberalization do have a statistically significant relationship on industry-wage-premium for unskilled workers, whereas for the case of an industry wage premium for skilled workers, a positive but not significant relationship is found to exist. In the case of an industry-wage-premium for unskilled workers, the coefficients of tariffs and FDI are negative, meaning that an increase of tariff and FDI will reduce wage inequality for unskilled workers. This result is consistent with the HOS model, which predicts that trade liberalization in emerging countries is expected to reduce wage inequality between skilled and unskilled workers. In terms of an industry-wage-premium for skilled workers, our results align with our hypothesis that stated FDI and trade liberalization increase wages for skilled workers.

Our approach estimations and results are open for further research, generally in two directions. In the first direction, in the theoretical part, a more deep theoretical framework and investigation need to be put in the study to found other channels in terms of FDI liberalization that generate wage inequality. In this study, FDI liberalization uses technology transfer as a channel for generating wage inequality in Indonesia. In the second direction, in the level of empirical part, more attention and effort need to take into account to measure wage inequality. In this study, wage inequality is measured in the level of industrial. In further research, other channels in terms of calculating wage distribution across industries can be used in measuring wage inequality.

ACKNOWLEDGMENT

I want to thank Allah SWT for all His blessings to me so I can finish this study. I also would like to express my grateful appreciation to my academic supervisor at Hiroshima University, Associated Professor Shingo Takahashi, for all his advice, support, patience, and motivation in writing this study. I would also like to extend my gratitude to my sub-advisors, Professor Ichihashi Masaru and Professor Kakinaka Makoto. I thankfully appreciate all professors, lecturers and staff both in Graduate School for International Development and Cooperation (IDEC) Hiroshima University and Graduate Program of Economics (PPIE) of Universitas Indonesia for all the knowledge, direction, recommendation, support, and assistance.

I also want to express my deepest gratitude to the Indonesia Ministry of National Development Planning (BAPPENAS) for all opportunities and

financial supports during my study in the Linkage or Double Degree program. I also want to express thank my friends, my supervisor, and all staff at Indonesia Investment Coordinating Board (BKPM) for allowing me and giving support to continue my study to get a master degree. I also thankfully appreciate to all my colleagues in Universitas Indonesia and IDEC Hiroshima University for a great friendship.

I dedicate this achievement and give special appreciation to my family, my sister, my husband, and my daughter. Many thanks for endless prayers and unlimited support along my journey to finish my study and obtain the master's degrees.

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