

Watekhi, Watekhi; Nachrowi, Nachrowi D.

**Article**

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\*Corresponding author: Watekhi Watekhi, Education and Training Centre, BPS-Statistics Indonesia, Jakarta, Indonesia  
E-mail: [watekhi@bps.go.id](mailto:watekhi@bps.go.id)

Reviewing editor:  
Muhammad Shafiullah, Economics, University of Nottingham - Malaysia Campus, Malaysia

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## GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

# The effect of trade liberalization on inter-industry wage difference in Indonesia's manufacturing sector

Watekhi Watekhi<sup>1\*</sup> and Nachrowi Djalal Nachrowi<sup>2</sup>

**Abstract:** This study analyzes the effect of trade liberalization on wage inequality through industry wage premiums in Indonesia's manufacturing sector between 2000 and 2015, a period marked by low import tariffs. The study was undertaken by adopting a two-stage estimation approach. Using the national labor force survey dataset from *Sakernas* (*Survei Angkatan Kerja Nasional—Indonesia Labor Force Survey*), first, the study estimates industry wage premiums conditional on individual worker characteristics. In the second stage, the data are pooled across industries over time, then regressed on import tariff of final goods as a measure of trade liberalization, controlling for market concentration. The study finds a negative effect of import tariffs on industry wage premiums, implying that industry wage premiums decreased by more in sectors facing a larger tariff hike, and, vice versa, industry wage premiums increased by more in sectors experiencing larger tariff cuts. This suggests that trade liberalization contributes to wider wage inequality through inter-industry wage difference. Therefore, a more selective measure should be taken in implementing trade liberalization by opening wider access for superior commodities and protecting less-competitive commodities with high domestic demand.

**Subjects:** Economics; Labour Economics; International Economics; Industry & Industrial Studies

**Keywords:** trade liberalization; wage inequality; inter-industry wage difference

### ABOUT THE AUTHORS

Watekhi completed his First Degree in Statistics from the Institute of Technology Sepuluh Nopember Surabaya, Master's Degree, and Ph.D in economics both from Universitas Indonesia. He has been teaching in the Polytechnic of Statistics Jakarta for the last 20 years. He has also been working as a trainer of statistics and economics in Education and Training Center, BPS Statistics Indonesia. He is interested in regional development, labor economics, and international trade research.

Nachrowi Djalal Nachrowi is a professor of economics Faculty of Economics and Business Universitas Indonesia. He is an expert in the research of the manufacturing industry, finance, labor economics, and international trade.

### PUBLIC INTEREST STATEMENT

Since implemented trade liberalization in Indonesia, income inequality has increased rapidly. So, it is interesting to analyze the impact of trade liberalization on wage inequality in Indonesia and we focus on manufacturing sectors. We use industry wage premium – the portion of individual wage that can only be explained by the industry where he works – to measure wage inequality. Understanding the industry wage premium for Indonesia is essential because of the rigidity of the labor market. We find a negative effect of import tariff on the industry wage premium, implying that industry wage inequality increases more in sectors facing trade liberalization.

Jel: F14; F16; J31

## 1. Introduction

After the 1990s, the degree of trade liberalization in Indonesia has been increasing through the major influence of AFTA in 1991, APEC in 1994, and the formation of WTO in 1995. The tariff has been significantly reduced from 22.18% in 1989 to 6.75% in 2000 and since then trade liberalization has become much more prominent. The indications were that Indonesia has the lowest tariff rates in Asia, tariff reductions continued to be in place, and the average tariffs were pushed below 10% (Basri & Patunru, 2012).

During the period of high trade liberalization, economic growth remains positive except when the 1997–98 economic crisis hit (BPS, 2015). On the other hand, income inequality has widened in comparison to ASEAN countries. Income gini ratio rose from 0.30 in 2000 (lowest in the region) to 0.41 in 2013 (WorldBank, 2016). Furthermore, consumption per capita of the richest 10% grew at 6% per year between 2003 and 2010, compared to the poorest 40% which only grew at less than 2%. Moreover, the gini ratio of wage increased from 0.41 to 0.45 in the period of 2001–2012 and from 0.39 to 0.43 for formal workers (WorldBank, 2014). On average, the Gini ratio of wage is 22% higher than the Gini ratio of income in the period of 2001 to 2012 (Tadjoeddin, 2016).

Has Indonesia's trade liberalization redounded to inequality as evidence suggest? The Heckscher-Ohlin-Samuelson (HOS) trade model predicts that trade liberalization reduces wage inequality. In fact, not all studies consider the effect of trade liberalization on wage inequality in line with that of the HOS model, especially in developing countries as Goldberg and Pavcnik (2007), Lee and Wie (2015) and USAID, 2006 may have suggested. Others, such as Amiti and Cameron (2012) stated that trade liberalization almost reduces wage inequality. Therefore, a study on how trade liberalization influence wage inequality through various channels is an interesting topic to discuss.

In Indonesia, studies of trade liberalization-wage inequality relationship are observed using the skill premium channel—the ratio of skilled to unskilled wages—in the manufacturing industry (Amity & Cameron, 2012; Lee & Wie, 2015). They focus on the return of specific workers' characteristics (i.e. skill) under the assumption that workers can move between sectors in the long term. However, Goldberg and Pavcnik (2005) suggest that the inter-sectoral movement of workers is unattainable in the short or medium term. Examining wage inequality through skill premium in the economic spectrum would not explain the role of the industry where they work. In fact, the inter-industry wage difference also exists in Indonesia (Setiaji, 2002). This study use the industry wage premiums framework—the proportion of individual wages that can only be explained by the industry where the worker works—to measure the effect of trade liberalization on wage inequality in Indonesia. Understanding the relationship between trade liberalization and industry wage premium in Indonesia is essential due to the less flexible labor market.<sup>1</sup> In the rigid labor market, workers are difficult to move quickly across the industry at a low cost. In addition, it is difficult for wage to fluctuate as a result of changes in workers productivity without causing social disturbances. So analyzing wages based on the industry is appropriate to observe the effect of trade policy on wage distributions in the short and medium-term. According to Azar et al. (2017) and Handwerker and Spletzer (2016), market structure affects wages; therefore, we use the market structure as a control variable. This differs from previous studies where the market structure is excluded. This study contributes to a way of measuring the effect of liberalization on wage inequality in Indonesia, namely the industry wage premium.

The paper is structured as follows. The next section presents a brief overview of the literature on trade liberalization and industry wage premiums. Section 3 discusses the estimation strategy.

Section 4 provides the dataset. Section 5 presents the results of the analysis, and Section 6 closes with a conclusion.

## 2. Trade liberalization and inter-industry wage difference

The three following frameworks explain the effect of trade liberalization on industry wage premiums. First, according to specific-factors (short-term) and Ricardo-Viner (medium-term) models, sectors with a relatively large reduction in import tariffs will experience a greater decline in wages relative to the average wage in the economy. In the short and medium-term, the inter-sectoral labor movement is rigid. Wage depends on the marginal product of labor and the price of products in the industry. Based on the model prediction, a decrease in tariffs will lead to a proportional decrease in industrial wages.

Secondly, the international trade policy provides an additional perspective in explaining wage under an imperfect competition market. Trade liberalization reduces barriers to trade and induces greater opportunity to import a variety of goods: intermediate goods, final goods, and capital goods. This condition triggers domestic companies to substitute labor with imported or input goods. In this case, trade liberalization may threaten the worker's bargaining power facing capital owner in terms of rent sharing. Rodrik (1998) stated that globalization leads to wider wage inequality as a result of weak labor power.

Third, (Melitz, 2003) found that trade liberalization will raise industry productivity. This view is also supported by Jacob and Meister (2005), Eslava et al. (2013), Nataraj (2011), and Harrison et al. (2012). Meanwhile, Amiti and Konings (2007) estimate that a reduction in intermediate and final goods tariffs between 1991 and 2001 in Indonesia will result in increased productivity, which will consequently increase wages (De Locker, 2007).

A number of empirical studies has been conducted to analyze the effect of trade liberalization on inter-industry wage difference (industry wage premiums) in developing countries. Pavcnik et al. (2004) conclude that trade liberalization has no effect on industry wage premiums in India; however, Kumar and Mishra (2008) conclude that trade liberalization raises industry wage premiums among urban manufacturing workers in India. Goldberg and Pavcnik (2005) conclude that trade liberalization has a negative effect on industry wage premiums in Colombia; however, Attanasio, Goldberg, and Pavcnik (2004) conclude that trade liberalization has a positive effect on industry wage premiums.

Thus, while industry affiliations provide an important channel through which trade policies can influence workers' wage distribution, it does not provide the same predictions about the extent to which trade liberalization affects the industry wage premiums. Previous studies possess a varying degree of perspectives. In order to increase our scientific knowledge, empirical evidence is needed.

## 3. Model estimation

We use a two-stage estimation framework to analyze the effect of trade liberalization on inter-industry wage difference through industry wage premiums. We capture variations in industry wage premiums and import tariffs over a certain period of time to identify the effect of trade liberalization on wage distributions.

### Stage 1

We construct industry wage premiums (iwp), in the first stage, by estimating the wage model separately for each year as follows:

$$\ln(w_{ji}) = \alpha + X'_{ji}\beta + \sum_{i=2}^I iwp_i S_i + \varepsilon_{ji} \quad (1)$$

where  $w_{ji}$  is worker  $j$ 's real wages in industry affiliation  $i$ 's,  $S_i$  indicates the industry  $i$ 's where the worker work. There are  $I = 22$  subsectors of the manufacture industry,  $iwp_i$  indicates the industry wage premiums. Vector  $X$  consists of variable sex (1: man, 0: woman), age (years), age square, marital status (1: married, 0: others), education level is recorded as a series of dummies capturing the highest level of education attained (primary school, junior school, senior school, and diploma/university) with no schooling as the omitted category, and region (1: urban, 0: rural). We refer to Haisken-DeNew and Schmidt (1997) and Krueger and Summers (1988) to compute a normalized industry wage premiums variable.

#### Stage 2

In this stage, we regress a set of estimated industry coefficients ( $iwp_i$ ) from the previous stage and industry tariffs, where the industry wage premium estimator is a dependent variable. Let *Tariff* be import tariff variable, the following is the estimate model

$$\widehat{iwp}_{it}^* = \text{Tariff } f_{it-1}\theta + Z'_{it}\beta + u_{it} \quad (2)$$

This study uses lag tariff as empirical evidence suggests that the impact of trade policy on industrial wages is indirect (Lundin & Yun, 2009). Vector  $Z$  includes the control variable. The control variable in this case refers to the Herfindahl-Hirschman Index (H). We use "H" as a measure of the industry's production concentration. Since the returns of the worker characteristics vary from year to year, the regression coefficient captures the value of the worker characteristics in accordance with the labor supply each year. Therefore, a dummy of years is included.

The dependent variable in equation (2) is the estimated dependent variable (EDV), so the variation of the estimator will occur. This condition will cause the problem of heteroscedasticity (Lewis & Linzer, 2005). Therefore, the weighted least square (WLS) method was adopted for estimating the model and the inverse of the weighted industry wage premiums. The process makes greater weight to industries that have a smaller variance estimate. Taking into account the existence of heteroscedasticity and autocorrelation in the error term, then we use a robust method (Huber-White).

#### 4. The dataset

This study uses three data sources. First, the national labor force dataset from Sakernas (Survei Angkatan Kerja Nasional—Indonesia Labor Force Survey), which contains information about the characteristics of all working-age individuals within the sampled household, seven days prior to the survey. This is an annual survey that covers about 200,000 individuals. We collected data based on Sakernas in August 2000, 2005, 2010, and 2015. It should be noted that this research requires a minimum of two digit ISIC code to classify the business sector. This industrial classification has only been available since Sakernas 2000; hence, the data were undertaken based on Sakernas 2000 and its following period.

For wage analysis, we primarily use the data of workers aged 15 and over whom receive wages. Since we focus on quantifying the existence of trade liberalization in elucidating wage distribution in the manufacturing sector, our observation is only limited to workers in that sector. This is in line with those of Gonzaga et al. (2006), and Pavcnik et al. (2004), which focus on manufacturing workers. In this study, the wage is spatial hourly real wages, calculated as the average monthly wage that workers received divided by monthly working hours. All monetary values are deflated by

the annual provincial capital consumer price index and provincial poverty line differentiated by the region (urban and rural).<sup>2</sup>

Second, we use the nominal tariff in 22 industries to measure trade-related variable, for the period of 2000–2015, from the World Trade Organization.<sup>3</sup> We convert HS1996 commodity tariff into ISIC Revision 3 (ISIC3), then we use the mean of nominal tariff based on ISIC3 level 2 (two digits) as industry tariff. Industry tariffs are presented in Table 1. Third, we use the Annual Manufacturing Industry Survey to calculate Herfindahl-Hirschman Index (H). H is defined as the sum of the squares of the market share of each firm within an industry.

**Table 1. Indonesia Manufacturing Industry Tariffs**

No	ISIC Code	Industry Description	Tariff (%)			
			2000	2005	2010	2015
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	15	Food products and beverages	11.27	15.17	14.31	9.72
2	16	Tobacco products	13	14.41	14.44	4.82
3	17	Textiles	9.23	9.59	9.67	11.04
4	18	Wearing apparel	13.45	13.75	14	22.42
5	19	Leather and related products	7.8	7.59	10.94	13.40
6	20	Wood and related products, except furniture	2.86	4.69	3.94	5.33
7	21	Paper and paper products	3.9	4.42	4.48	4.36
8	22	Publishing, printing, and reproduction of recorded media	4.53	5	4.3	7.36
9	23	Coke, refined petroleum products, and nuclear fuel	3.85	4.6	2.03	4.33
10	24	Chemicals and related products	4.82	5.28	4.68	5.19
11	25	Rubber and plastics products	11.35	13.22	11.95	11.48
12	26	Other nonmetallic mineral products	5.91	7.33	6.86	7.66
13	27	Basic metals	7.49	8.46	6.54	8.36
14	28	Fabricated metal products, except machinery, and equipment	9.85	10.93	9.53	8.35
15	29	Machinery and equipment n.e.c.	2.98	2.91	2.9	5.91
16	30	Office, accounting, and computing machinery	1.67	1.63	1.43	3.36
17	31	Electrical machinery and apparatus n.e.c.	7.01	7.02	6.09	6.07
18	32	Radio, television and communication equipment and apparatus	5.25	6.25	5.43	5.45
19	33	Medical, precision and optical instruments, watches, and clocks	4.77	4.62	4.64	5.65
20	34	Motor vehicles, trailers, and semitrailers	25.2	30.1	19.08	18.56
21	35	Other transport equipment	6.17	12.75	7.02	9.37
22	36	Furniture; manufacturing n.e.c.	10.82	11.2	10.53	8.42

Source: Authors' calculations based on commodity tariff from World Trade Organization

## 5. Result

The first-stage result shows that the characteristics of workers are related to higher real wages: being male, being married, age, education, and urban areas (Table 2). A comparison of the coefficients across years suggests that the returns to several worker characteristics have changed over time. The returns to education seem to vary substantially over time. Our results on the return to a college degree are consistent with the patterns documented in other studies the developing countries; in particular, we find the gap between male and female's wage has narrowed from year

**Table 2. First-Stage Regressions Result for Worker Characteristics**

Variables	Year			
	2000	2005	2010	2015
(1)	(2)	(3)	(4)	(5)
Sex (1: male, 0: female)	0.313*** (0.019)	0.241*** (0.013)	0.236*** (0.009)	0.089*** (0.013)
Age (years)	0.036*** (0.005)	0.023*** (0.004)	0.028*** (0.003)	0.029*** (0.003)
Age Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Marital (1: married, 0: others)	0.074*** (0.021)	0.105*** (0.016)	0.081*** (0.010)	0.139*** (0.015)
Education				
Primary School	0.206*** (0.042)	0.313*** (0.043)	0.173*** (0.016)	0.163*** (0.026)
Junior School	0.363*** (0.044)	0.517*** (0.044)	0.370*** (0.017)	0.452*** (0.026)
Senior School	0.642*** (0.063)	0.777*** (0.050)	0.627*** (0.022)	0.851*** (0.033)
Diploma/University	1.169*** (0.078)	1.300*** (0.057)	1.154*** (0.031)	1.497*** (0.039)
Region (1: urban; 0: rural)	0.170*** (0.019)	0.194*** (0.015)	0.116*** (0.008)	0.117*** (0.013)
Industry Dummy	√	√	√	√
Industry x skilled	√	√	√	√
Constant	7.248*** (0.095)	7.412*** (0.083)	7.480*** (0.045)	7.557*** (0.060)
Observations	3,922	6,733	20,006	15,868
F	.	73.93	163.0	.
P-Value (F)	.	0.000	0.000	.
R <sup>2</sup>	0.381	0.416	0.340	0.297
R <sup>2</sup> <sub>adj</sub>	0.373	0.411	0.339	0.295
Mean of VIF	2.91	3.04	3.10	2.80

Standard error in parentheses; \*\*\* p < 0.01; \*\* p < 0.05; \* p < 0.1  
 Source: Authors' calculations



to year as indicated by a change in gender stereotype over the years. The negative sign of age squared indicates the decreasing marginal effect of age. The education return indicates that the higher the education, the higher the wages. The role of worker characteristics in this study is in accordance to previous studies, i.e. Ferreira et al. (2007), Kumar and Mishra (2008), Mehta and Hasan (2012), and Pavcnik et al. (2004).

### 5.1. Inter-industry wage difference

The estimate of industry wage premiums (iwp) that has been normalized across industries is displayed in Table 3. It represents the inter-industry wage difference. Take an example of iwp for the tobacco manufacturing industry in 2000 which equals to  $-0.23$ . This value implies that the wage in this industry is 20.61% lower than the average wage in the manufacturing industry ( $(\exp(-0.23) - 1) \times 100 = -20.61\%$ ). In 2000, iwp ranged between 0.56 and 0.79 for electrical machinery and apparatus n.e.c. manufacturing industry (ISIC = 31) and coke, refined petroleum products, and nuclear fuel

**Table 3. Industry Wage Premiums (IWP)**

ISIC	Industry <sup>+</sup>	Year			
		2000	2005	2010	2015
	(1)	(2)	(3)	(4)	(5)
16	Food products and beverages	-0,23***	-0,12***	-0,20***	-0,31***
17	Tobacco products	-0,22***	-0,04	-0,24***	-0,28***
18	Textiles	-0,21***	-0,12***	-0,13***	-0,02
19	Wearing apparel	0,02	0,09**	0,02	0,03
20	Leather and related products	0,05	-0,02	-0,17***	-0,13***
21	Wood and related products, ...	0,10	0,00	0,05	0,06
22	Paper and paper products	-0,08	-0,18***	-0,18***	-0,22***
23	Publishing, printing, and ...	0,79***	0,00	0,23*	0,28**
24	Coke, refined petroleum products ...	-0,14*	0,01	0,01	0,15***
25	Chemicals and related products	-0,04	-0,03	-0,06*	-0,03
26	Rubber and plastics products	-0,30***	-0,28***	-0,28***	-0,32***
27	Other nonmetallic mineral products	0,18**	0,15*	0,13**	0,10
28	Basic metals	-0,06	0,00	-0,09**	-0,17***
29	Fabricated metal products, except ...	-0,19***	0,07	0,04	0,07
30	Machinery and equipment n.e.c.	0,24	0,00	0,50	-0,02
31	Office, accounting, and ...	-0,56***	0,07	0,11	0,20
32	Electrical machinery and ...	-0,10	0,16	0,25***	0,52***
33	Radio, television and ...	0,77***	-0,12	0,00	-0,02
34	Medical, precision and optical ...	-0,14	0,18*	0,10	0,05
35	Motor vehicles, trailers and ...	0,09	0,27***	0,09*	0,28***
36	Other transport equipment	0,01	-0,09***	-0,16***	-0,20***
	Standard deviation	0.31	0.13	0.19	0.22
	Correlation with a share of skilled	0.31	0.46**	0.80***	0.61***

\*\*\*p < 0.01; \*\* p < 0.05; \* p < 0.1

+) more industry description see Table 1

Source: Authors' calculations

manufacturing industry (ISIC = 23) respectively. The iwp standard deviations indicates the volatility of wage premiums. The variation of industry wage signifies that transforming industry affects wages.

IWP correlations are substantially lower when we focus on year-to-year correlations. While a few industries have persistently high- or low-wage premiums in all time periods, the ranking of most sectors shifts significantly over time. Sectors with persistently high wage premiums are publishing, printing, and reproduction of recorded media. Rubber and plastic products exhibit persistently low-wage premiums. However, their rankings in the economy as a whole change over time. While Katz et al. (1989) and Helwege (1992) find that the ranking of U.S. wage differentials is stable over time.

With regards to the correlation of skilled workers share (at the bottom of the table), an industry with a higher share of skilled labors, tends to have a higher industry wage premiums. For example, the manufacture of tobacco products with a low share of skilled workers (share of skilled workers = 21.5% (lowest)) has lower industry wage premiums (iwp = -0.23). An industry with a large share of skilled workers, such as the manufacture of medical, precision and optical instruments, watches, and clocks (share of unskilled workers = 66,7%) tends to have the highest industry wage premiums. The correlations between industry wage premiums and the share of skilled labors within the industry are 0,31 (2000), 0,46 (2005), 0.80 (2010), and 0,61 (2015) indicating the highest skilled workers within the highest wage premium industry.

Inter-industry wage premium correlations are presented in Table 4. The correlations have shifted over time since 2005. The correlation between the industry wage premiums in 2005 and 2010 is 0.602; and 0.732 for the correlation between 2005 and 2015. The significant value of industry wage premium correlation implies that the inter-industry composition has shifted over time.

### 5.2. Trade liberalization and inter-industry wage difference

The regression result between tariff and iwp is shown in Table 5. The labor quality as a control variable in the first-stage results in the relationship between wage premiums and tariffs to be unable to portray different worker compositions that influence trade liberalization as a protection policy. Due to the variation of labor quality returns over years in the first stage, the coefficients capture the shifts in economy reversion to labor qualities connected to shifts in worker supply. The estimation of the second stage is done in level including the year indicator. All specifications in Table 3(a) and subsequent tables include year indicators. Year indicators allow for the average wage premium to change over time in order to capture business cycle effects that may otherwise lead to a spurious correlation between tariffs and wage premiums. Suppose, for example, that as a result of a recession, wage premiums decrease, while the government responds to lower domestic demand by increasing tariffs. In the absence of any controls for the business cycle, our framework would attribute the decrease of wage premiums to the higher tariffs. In addition, year indicators control for the potential effects of the labor reform on wage premiums. The estimation is also done in discrepancy to count

**Table 4. Inter-industry Wage Premium Correlation Matrix**

	2000	2005	2010	2015
2000	1			
2005	0.026	1		
2010	0.375*	0.602***	1	
2015	0.223	0.732***	0.733***	1

\*\*\*p < 0.01; \*\* p < 0.05; \* p < 0.1

Source: Authors' calculations

**Table 5. Tariff and Inter-industry Wage Difference**

Variable	Model 1	Model 2	Model 3	Model 4
(1)	(2)	(3)	(4)	(5)
Tariff(t)	-0.006 (0.005)			
Tariff(t-1)		-0.011*** (0.003)	-0.010*** (0.003)	-0.011*** (0.004)
Herfindahl Index			0.418 (0.315)	0.406 (0.301)
Time effect				yes
Industry effect				yes
Constant	0.011 (0.067)	0.046 (0.052)	0.019 (0.049)	0.071 (0.096)
Observations	84	84	84	84
R <sup>2</sup>	0.021	0.083	0.115	0.130
R <sup>2</sup> -adj	0.009	0.072	0.093	0.074
F	1.363	10.31	6.071	3.460

Standard error in parentheses; \*\*\* p < 0.01; \*\* p < 0.05; \* p < 0.1

Source: Authors' calculations

the unmonitored time-invariant, particular variables such as dealing power and macroeconomic jolt that may affect wages and tariffs simultaneously.

Models are constructed for 2000, 2005, 2010, and 2015 by regressing industry wage premium with some independent variables (column (2) only tariff, (3) only lag of tariff, (4) lag tariff and Herfindahl index, and (5) lag tariff, Herfindahl index, and a dummy of the year) to examine tariff robustness. The lag tariff variables in models 2, 3, and 4 are negative and statistically significant at the 1% level. This indicates that the industry wage premium and tariffs are correlated. It can be explained by industry wage premiums which are formulated from labor wages and their relation with trade policies. The negative sign indicates the decreasing value of industry wage premiums as the result of the increasing value of tariffs. This is in accordance with the result of Kumar and Mishra (2008), and Mehta and Hasan (2012).

The inter-industry wage difference ignores the role of labor market condition which could actually affect the results, such as minimum wages. The minimum wage regulation is set without differentiating sectors that could affect the value of the education coefficient on the first stage which is related to the low-wage workers. Moreover, the effect that may have triggered by changes in the minimum wage on industrial wage through labor composition channel (for instance, industries that employ more unskilled workers) are already controlled since the first-stage regression has already control for the industry composition each year. This allows for the impact of wages (return) on education level to vary year to year.

## 6. Conclusion and implications

This study stems from the most recent policy that stresses out the advantages and costs of trade reforms. Many studies have discussed whether the potential advantages of trade liberalization (increased efficiency and welfare) exceed its disadvantages (increased wages inequality, “race to the bottom” wages). Recent studies have suggest considering labor market policies, such as minimum wages and government social protection programs to overcome the

increasing possibilities of inequality related to trade liberalization (Goldberg & Pavcnik, 2007; Kumar & Mishra, 2008; Mehta & Hasan, 2012).

This study contributes to the policy discussion in several ways. First, it focuses on trade policy variables, such as tariffs; instead, of outcome variables, such as openness, to examine the effect of trade reforms on labor markets, where trade policy variables are still hardly applicable in many studies. Rodriguez and Rodrik (2000) noticed that the trade liberalization effect is difficult to measure if trade reforms are valued by outcome variables, such as openness because it will explain both trade policies of a country and factors such as transportation charges, technology, demand, and factor price changes. Thus, observing trade policy variables is a benefit in this study.

Second, the anti-globalization wing views trade reforms would drive poverty in protected sectors while trade liberalization would bring wages to a downward toll. Several studies have corresponded to this; such as, studies by Goldberg and Pavcnik (2005) and Revenga (1997) which show that lowering tariffs leads to a decrease in industry wage premiums in Colombia and Mexico. Martín Rama (2001) and Goldberg and Pavcnik (2007) cross-country analysis proved that there is an inverse relationship between openness and wages in the short term. Meanwhile, this study proves that trade liberalization in Indonesia causes an increase in wages through the industry wage premium channel. Obviously, trade liberalization could still lower wages through other channels, such as lower returns to education or experience, which are not the main focus of this study. Further study should be conducted to analyze how trade reforms may affect wages through various channels based on different country characteristics.

In the end, the empirical study found that trade liberalization drives wage inequality through changes in the industry wage structure, whereas inter-industry wage premiums vary significantly in Indonesia. Sectors with a large share of unskilled workers have the lowest industry wage premium, which implies that unskilled workers receive less wages than the skilled one. This is not only caused by wider growth in skill premium, but also due to lower probability to be employed in industries with low-wage premiums which also causes inequality to remain uncovered in previous studies. This is the main cause of inequality, in line with the rising of skill premium, could be dealt with policies of the labor market, such as mentioned by (Rama (2001)), those are minimum wage changes and social security programs, besides easing education access.

This study shows that trade liberalization contributes to wider inter-industry wage inequality. Population growth and the expansion of the middle class will help accelerate domestic consumption. Without a substantial increase in national production capacity, imports will rise significantly. When the demand for imports continues to rise, especially for labor-intensive commodity, the government will reduce import tariffs. This leads to a reduction in wage thus greater inter-industry wage difference. Therefore, it is essential to enhance product competitiveness that will bring about an increase in productivity for exports of the labor-intensive sector to boost wages in that sector.

Trade liberalization in the globalization era is inevitable, though its adoption requires a selective approach. Indonesia needs to be selective in carrying out its trade liberalization agenda, by allowing broad liberalization for superior commodities and protecting nonsuperior commodities as well as less competitive commodities with high domestic demand.

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### Author details

Watekhi Watekhi<sup>1</sup>

E-mail: [watekhi@bps.go.id](mailto:watekhi@bps.go.id)

ORCID ID: <http://orcid.org/0000-0001-7477-4154>

Nachrowi Djalal Nachrowi<sup>2</sup>

ORCID ID: <http://orcid.org/0000-0002-6535-9335>

<sup>1</sup> Education and Training Centre, BPS-Statistics Indonesia, Jakarta, Indonesia.

<sup>2</sup> Faculty of Economics and Business, Universitas Indonesia, Depok, Jawa Barat, Indonesia.

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### Notes

1. Global Competitiveness Report on labor market flexibility reported that Indonesia ranks 131<sup>th</sup> of 140 countries in the world (WEF, 2015)
2. All values are indexed with Lampung Province as reference
3. <http://tariffdata.wto.org/ReportersAndProducts.aspx>

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