



EMPIRICAL RESEARCH ON IMPACT OF TRADE LIBERALIZATION ON WAGE INEQUALITY IN INDONESIA

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Abstract

Indonesia initiated the tariff liberalization since the late 1980s up to the early 2000s. However, even though poverty within the country has been reduced, ever since the early 2000s, Indonesia experienced an increase in income inequality. In this paper, the impact of tariff reduction on wage inequality from 2003 to 2013 using bi-annual National Labor Survey data on individuals held by Indonesian Central Statistics Bureau that is representative on a province level is studied. Under the framework of Stolper-Samuelson theorem, considering labor market adjustment that take time as well another mechanism such as improvement in productivity by reduction in trade cost that is supported by importation, two mechanisms might appear: The effect of tariff imposition that leads unskilled labor to benefit in short and medium term as well as the productivity enhancing quality of lower input tariff that is supposed to increase wages among workers within these sectors.

The effect of trade liberalization on wage inequality is examined and it is found that reduction in tariff has a significant impact that increases skill premium in the urban part and manufacturing-heavy regions of Indonesia.

Keywords: Trade Liberalization; Wage Inequality; Indonesia.

1. Introduction

Indonesia has been increasingly more engaged in world trade and committed itself to reduce import tax rates accordingly past Uruguay Round in 1994. Since then, the country's export has amplified from US\$45 billion in 1995 to US\$145 billion in 2016, and import from US\$40 billion to US\$135 billion (WITS, 2017). Several studies have proven that Indonesia's exposure to world trade (e.g. import tariff reduction) has indeed positively affected welfare and the alleviation attempts of poverty in Indonesia (Kis-Katos & Sparrow, 2015).

The nation itself has been experiencing a quite rapid growth rate of economic development in the past few decades. During 1990-1997, Indonesia was named as one of the 'Asian tigers' for its high gross domestic product growth rate that reached 7 to 9% annually (Asian Development Bank, 2017). Although the growth has been relatively moderate compared to the years before Asian economic crisis in 1997, Indonesia's economic growth still proves its resilience during the crisis in 2009 and the economy has been continuing to achieve a welcome economic progress. Similar to other emerging economies, the absolute poverty (people living under \$1.25 every day) has been significantly reduced, both in percentage and head count. According to World Bank in 2009, urban Indonesia has massively reduced poverty rate from 63.8% in 1981 to 18.7% in 2005 and rural Indonesia from 73.8% in 1981 to 24% in 2005. In 2011, a huge improvement can be noticed from the percentage of population who still live under \$1.90 (2011 PPP) per day, as it was estimated to be only about 6.8% (World Bank, 2017).

However, the trend of rapid economic growth in the developing nations has sparked some heated debate. One concern to note is whether the growth benefits some part of the society way more than another, thus, perpetrating economic disparity between the members of the society that can possibly lead to other socio-economic problems.

While influential figures like Pope Francis explicitly stated that 'inequality is the roots of all evil', some economists argue that economic inequality is an initial result of development, and that it will become less of a problem as a country develops (Kuznets, 1955).

Indonesia has been claimed to have one of the fastest rising rates of inequality in the East Asia region with Gini coefficient of 0.41 in 2012, compared to 0.32 in 1999. Furthermore, regional inequality (usually between western part and eastern part of Indonesia) also contributes to the overall inequality. This somehow shows that the strong growth might not be enjoyed as much by a lot of Indonesians (World Bank, 2014). The current government of Indonesia, realizing this negative trend, is currently devoted to create "pembangunan yang berkeadilan" which more or less means "equitable development" as to not let anyone left behind.

These concerns raise a question whether Indonesia's exposure to international trade actually helps in minimizing the economic growth's impact on wage inequality or if it actually aggravates the problem of widening wage inequality in Indonesia.

2. Concept and Definition

2.1 Trade Liberalization

Trade liberalization is usually defined as a significant reduction of trade barriers that limit a country's trade with other countries in other parts of the world. There are many kinds of trade barriers whether in the forms of tariff or non-tariff barriers such as quota, subsidies, and so on. With the first measure getting more and more popular compare to the non-tariff trade barriers.

Trade liberalization aims to integrate the whole world into a global market. While trade liberalization in many countries had started earlier, a lot of developing countries just started to implement this during the 1980s through the program by World Bank and International Monetary Fund. Trade liberalization is believed to be able to improve a nation's welfare by benefits from specialization, competitiveness, and lower prices.

On many occasions have a lot of researches made a study on trade liberalization. Many literature have shown the impact of trade liberalization on countries and GDP growth. Jeffrey Sachs and Andrew Warner studied the impact of trade liberalization post-war and how economies more exposed to trade recover faster than those who weren't meanwhile Rodriguez and Rodrik claims that trade is not a guarantee for faster growth, mentioning the importance of fiscal and monetary policies (Marchand, 2008).

2.2 Income Inequality

OECD defines income inequality as an indicator of how resources are distributed in a society (OECD, 2011). Income inequality is usually measured for the whole population instead of only the richer or the poorer part of society. When the small rich part of the society earns significantly more in aggregate compared to their poorer counterpart, income inequality occurs. How big the problem of income inequality depends on the magnitude and the share of the income that goes to each equal part of the society. The bigger or the smaller a part of population gains in the term of income, reflects the seriousness of the problem.

Income inequality can be measured by several methods. According to World Bank (2006), below are some of the most common inequality measurements:

i) **Gini Coefficient**

This is the most widely used measure to get a picture of the income distribution problem. It is generated by drawing a Lorenz curve, where cumulative percentage of number of households or individuals are graphed from poor to rich on horizontal axis and the cumulative percentage of income on the vertical axis.

ii) **Decile Dispersion Ratio**

This measure is rather simple and so commonly used. It measures the average income of the richest 10 percent of the population divided by the poorest 10 percent. Not only in deciles, the ratio can also be counted for different quantiles such as percentiles, for example, the top and bottom five percent, or the top and bottom 25 percent.

iii) **Theil Index**

This measure belongs to general entropy index and is very commonly used especially when decomposition of within and between inequality is needed.

iv) **Skill Premium**

Skill premium is different in a sense that rather than comparing distribution of income based on their rank

in income share, wage skill premium seeks to compare the wage for skilled and unskilled labor by the ratio of the former against the latter.

3. Related Theories and Hypothesis Development

3.1 Stolper-Samuelson Theorem and Factor Price Equalization Theorem

Heckscher-Ohlin Theory is commonly called the standard trade theory whose influence is still palpable until today. This theory at its creation assume two nations with two factors of production (labor and capital) trading two kinds of commodities with each other. The specialization in these nations are incomplete in a sense that both nations produce both products. The other assumptions are as follow: 1) both commodities are produced under constant returns to scale; 2) tastes are similar; 3) perfect competition in both commodities and factor-market; 4) perfect factor mobility within each nation but no international trade mobility; 5) no transportation cost, no tariffs nor obstacles to the free flow of commodities; 6) full employment; 7) balanced international trade (export = import).

A commodity is called more capital-intensive if its labor-capital ratio is relatively smaller than another commodity, vice versa applies to labor-intensive commodity where labor-capital ratio is bigger than the other commodity. Meanwhile, a nation is called labor abundant when wage-interest rate ratio is relatively smaller than the other nation. So is vice versa.

Following this theory is Heckscher-Ohlin theorem and factor price equalization theorem. The former states that a nation will export a commodity whose production requires the intensive use of the nation's relatively abundant and thus, cheaper factor. In other words, if a country is labor-abundant, then it will export commodities that are labor-intensive. So does importing: a country will import the commodity whose production requires the intensive use of the nation's relatively scarce and expensive factor. Therefore, if a country is relatively labor-abundant, it will import products that are capital-intensive. Meanwhile, the factor equalization theorem notions that international trade will then bring equalization in relative and absolute returns to homogeneous factors across nations. In the end, ideally, wage will be equalized in both nations (Salvatore, 2012).

In the framework of this theory, international trade enables companies to do outsourcing of labor-intensive production to low-wage countries. This will create a lower demand for low-skilled workers and a higher demand for high-skilled labor, increasing the skill premium, in advanced economies. Production of commodities needing only low-skill labor then will shift to the low-wage countries. Roser (2016) notes that as international trade creates a bigger market, the prices of products that are exported (which the country produces using its abundant factor) becomes higher than they would be if that product were only to be sold inside the country. Product prices of imported goods become lower than the national price of the same products would be. This will be the base for trade.

Meanwhile Stolper-Samuelson theorem is an immediate derived theorem from Heckscher-Ohlin theory. It basically attempts to explain the relationship between the international trade and income distribution by linking changes in product price to changes in factor returns. In a scenario where there are two different factors of production which are high-skilled labor and low-skilled labor, international trade will affect the distribution of income between these two groups. The logic behind this notion is simple: as the demand of domestically produced imported goods falls, the price will fall and therefore making the wage decline. In contrast, as the demand of exported goods increases, price increases and so does the wage in exporting sectors. This causes further prediction that usually the wage in low-skilled labor-abundant developing countries will converge to the higher-income countries as trade liberalization would favor the low-skilled workers.

3.2 Other Mechanisms

After Stolper-Samuelson theorem failed to hold in a lot of studies in developing countries due to various circumstances, economists have tried to look for other mechanisms that can explain how trade liberalization affect wage inequality.

Feenstra and Hanson (1999) pay attention to the role of trade in intermediate goods or outsourcing and argue that the so called outsourcing can be one of the factors that allow another mechanism. Firms in recent decades do not find it hard anymore to get a supply of their input from another country where the production cost, and therefore price, of the good is lower. As a developed country shifts their intermediate input production to a developing country, although the input might be unskilled-labor intensive in the developed country, it can be considered as relatively skilled-labor intensive in developing country. As the production moves to the latter, the wage skill premium in both the developed and developing country rises.

Past few decades have also seen debates whether skill-biased technological change induced by trade has affected skill premium in both developed and developing countries. It is argued that technological change affect relative wages by lowering demand of the low-skilled group, demand for educated and skilled labor also may increase with the technology that need to be complemented by skill.

Meanwhile, Amiti and Konings (2007) studies the effect of both output and input tariffs on productivity among manufacturing firms in Indonesia through lower product (especially input) prices and showed that reduction in tariffs have a positive effect on productivity at firm level. Increase in productivity will lead to an increase in wage or job creation in industries that are affected by changes in tariffs.

3.3 Impact of International Trade on Wage Inequality

Similar to Survey paper by Goldman and Pavcnik (2007), Recent literature compiled in this proposal has two different approaches: one tries to see the overall effect of trade liberalization in an economy and another one focuses more on variation in change in trade protection according to their groups whether it is country, region, industry, or even firms.

3.3.1 General Equilibrium Approach

The first approach, usually known as general equilibrium approach, has a more complex modelling, usually uses stricter identification assumptions and then tries to validate their theoretical finding using available data afterwards as can be seen in Zhu and Trefler (2005) and Anwar and Sun (2012).

Zhu and Trefler (2005) exploits the concept of Northern and Southern countries, the latter being developing countries. They model the catch-up effect of the Southern (developing) countries to the Northern (developed) countries using assumption of no international barriers to trade in goods, perfectly competitive factor market and identical Cobb-Douglas preferences for consumers. They then try to determine the Southern catch-up rate as the driver of the rate its export shares shift toward more skill-intensive goods and affect the rate of growth in wage inequality.

Anwar and Sun (2012) study on the role of trade liberalization and increased market competition on skilled and unskilled labor wage gap in manufacturing sector in China. They use the previously existing theoretical literature to build an econometric model that is able to link both trade liberalization and skilled-unskilled wage gap and market competition and skilled-unskilled wage gap. Utilizing firm level data in 2000, 2003, and 2006, they find that trade liberalization has indeed contributed to the increase in gap while market competition contributes to a fall in the wage gap.

It is pretty straightforward that meanwhile the study is meaningful in determining the bigger picture, the level of aggregation causing possible aggregation bias means it disables the prospect of exploiting the country variation. For instance, their study ends up having a problem of differentiating the level of countries' exports on most products so that they can determine the trade cutoff, they instead use the measure of export share shift as a replacement.

3.3.2. Differential Exposure Approach

Meanwhile studies using the second approach tries to examine whether a country, industry, or region that is more exposed to trade liberalization faces bigger change in wage/income than those less exposed. Most of these studies exploit either household, industry, or labor data. These studies have been done on advanced economies (Lee, 2017), middle-income economies (Galiani and Sanguinetti, 2003), or low-income countries (Amiti and Cameron, 2012; Topalova, 2007). However each of these studies uses different approaches and estimates different channels through which trade affects income inequality

Helpman et al. (2015) uses the Brazilian employer-employee data from 1986-1995. They focus on the inequality within group instead of between groups, exhausting the extended heterogeneous-firm model of trade and inequality they previously developed that incorporates productivity, human resource management and fixed exporting costs. They argued that there are two channels through which international trade could affect the wage distribution: 1) market access effect: exporting increases demand and therefore employment and wages of a firm; and 2) selection effect in which they argue that exporting firms on average pay better wage than other firms. Using three different approaches, they conclude similar result and show a changing relationship between wage inequality and trade openness where the latter at first raises and then later reduces wage inequality.

A recent paper by Lee (2017) attempts to determine what factors affect the wage inequality in Korea, particularly Korean manufacturing industry. Collecting data from 1980 to 2012 and exploiting the decomposition method to see the contribution of within and between groups wage inequality to the overall wage inequality, it is found that wage inequality has experienced a non-monotonic change as it used to decrease during the 1980s only to later climb up during late 1990s and 2000s with contribution of within-group inequality increasing over time. The estimated results demonstrate that wage inequality rises as import competition turns more intense and skill biased technological change is a significant factor on the wage distribution within-group.

In Argentina, where trade liberalization has significantly affected the trade flows and even quadrupled it within the 1990s, manufacturing industry faced the harshest competition from abroad. Galiani and Sanguinetti (2003) are interested in finding out whether it has impact on Argentina's wage structure in the 1990s. They specifically aim to

investigate if the sectors that are the most affected by trade liberalization—as measured by import penetration at sectoral level—are also the sectors where greater increase in wage inequality occurred. They find that import penetration does have an impact on wage premium of the skilled workers. Nonetheless, trade deepening can only explain a small portion of change in wage inequality overall.

Instead of determining the impact of trade on wage gap, Amiti and Cameron (2012) separate the role of intermediate input tariffs from the output tariffs on the wage skill premium in Indonesia in the 1990s, a country that owns a high proportion of unskilled workers. Contrary to many other developing countries, trade liberalization proved to decrease wage premium in Indonesia. The study finds that 10% point cut in tariffs on intermediate inputs reduces the wage skill premium by 10% in an importing firm. As lower input tariffs decrease the relative price of imported inputs compared to domestic inputs, firms substitute their supply of intermediate inputs to imported inputs. As already pointed out before, Indonesia has a big share of unskilled workers—only 4% are college or higher graduate—and in Indonesia, producing intermediate inputs demand higher skills than the final goods. This implies that if firms shift their supply from domestically-produced inputs to the imported inputs, it will reduce the relative demand for high skilled workers, thus, decreasing the wage premium of the skilled workers.

Finally, Topalova (2004) studied the impact of tariff changes on poverty and inequality in Indian regions. She separates Indian regions into urban and rural area to see if the sudden policy change affects both areas differently. Her strategy is to find which regions are more exposed to tariff reduction by utilizing the share of workers in certain industries to total workers in the region. She shows that rural area, whose industries are more exposed to tariff reductions, has lower pace in poverty decrease. However, she finds that there is no significant effect of tariff on inequality.

3.4 Hypothesis Development

Stolper-Samuelson theorem argued that international trade liberalization should be able to increase wage of unskilled workers in developing countries as it decreases the trading costs and improve specialization of the abundant factor of a country, which in a developing country is unskilled workers. However, taking notes from Dix-Carneiro (2014) that following trade liberalization, transition in labor market can take several years and may delay the potential aggregate welfare, this setting should be different in short and medium run when the labor market is not mobile among the regions or industries to adjust with the changes and gain the supposedly welfare. This might result in a short or medium run reduction in real average wage in sectors that are affected, which means a delay in gain for the largely unskilled-labor abundant Indonesia. Besides, Indonesia is also a country where labor mobility is limited as shown by the small rate of migration between regions during the period. In line with this, in terms of wage effect of imposition of a tariff, imposition of a tariff will increase the price of a good domestically, giving benefits to the producer of the imported good. As most regions, if not all regions, in Indonesia are mostly less-skilled abundant, general increase in tariff will most likely benefit most unskilled workers by increasing their wage through relative increase in price of goods, at least in short and medium term, and vice versa.

Lower wage inequality or wage premium might be caused by either higher increase in wage of unskilled compared to the skilled, higher reduction in the wage of the skilled than that of the unskilled, or decrease in the wage of skilled labor and increase in the unskilled labor's.

Following study by Amiti and Konings (2007), I take into account possibility of productivity enhancement effect of tariff that has been proven in manufacturing firms in Indonesia. I am assuming the wage effect of the reduction in tariffs will be more prominent in regions where manufacturing sector is substantial enough to make impact in general wage level. The reduction in tariffs will also advantage labor skill group whose big share working in these industries (manufacturing).

Due to the data limitation (no access to firm data to determine disaggregated enough production of output and their inputs in each region) of this study, I am not able to distinguish tariff into both output tariffs and input tariffs and rather use the effectively applied tariff that doesn't differentiate between both.

In conclusion, unlike the primary sector, manufacturing sector might benefit more from this mechanism where reduction in tariff benefits workers by increasing their productivity. From the aforementioned mechanisms, I try to build a hypothesis for this study, that is:

Tariff reduction is to increase wage inequality in regions where unskilled labor are concentrated in primary sectors and skilled labor in manufacturing sectors.

As for the tariff reduction impact in regions where both skill groups are concentrated in the same aggregated sectors (manufacturing or primary), the impact is ambiguous since it involves other mechanism that is beyond the scope studied in this research. For instance, skill-biased technological change that can shift demand to skilled labor within an industry.

This study will focus on confirming whether Stolper-Samuelson Theorem under limited labor mobility and time-taking labor market adjustment and its implication on the wage level and wage inequality in is correct in Indonesia's case while the study of Amiti and Konings (2007) will serve as a possible explanation of the possible, if there is any, opposite effect of tariff imposition on wage inequality in Indonesia.

4. Data and Measurement

4.1 Data

i) Trade Liberalization Data

I calculate the extent of trade liberalization by effectively applied tariffs for each year from 2003 to 2013. I chose the data on 3-digit level tariffs based on ISIC Rev. 3 which contains more than 70 tradable sectors in agriculture, mining, and manufacturing due to the better comparability with most of the industry information of household data. Tariff information is collected from the database of UNCTAD-TRAINS.

ii) Wage and Labor Force Data

I use bi-annual household data on adults aged 15 to 65 (working age) from National Labor Survey (SAKERNAS) from year 2003, 2005, 2007, 2009, 2011 and 2013 to construct the regional statistics. The data from 2013 onwards is not used due to the limited access to the data and based on considerations such as the highly aggregated industry code. Before the industry code is aggregated to 3-digit up to 5-digit level based on KBLI and ISIC Rev. 3 but in recent years, the industry code is only aggregated up to 9 classifications, which is basically one-digit level. SAKERNAS compiled data containing varying number of sample up to more than 195,000 individuals that are representative to province level. Data for individuals on year, region, status of region (rural or urban), status of employment (formal or informal), industry at three-digit or five-digit level based on KBLI 2000 (heavily based on ISIC 3), weekly or monthly wage and weekly hours of work is collected.

iii) Other Data

Consumer Price Index data with base year 2010 to convert nominal to real wage is collected from World Development Indicator database of World Bank. As for minimum wage data, website of Central Statistics Bureau made available annual regional minimum wage in nominal term.

4.2 Measurement

i) Measurement of Wage Inequality

Theil index as a measure for wage inequality is specified as follows:

$$T_{wi} = \left\{ \sum_{p=1}^k \left(\left(\frac{Y_{ip}}{Y_i} \right) \cdot \ln \left[\frac{Y_{ip}/Y_i}{n_{ij}/n_i} \right] \right) \right\} \quad (4.1)$$

Where T_{wi} is the Theil index within region i , Y_{ip} is the wage for population weight group p in region i (each wage and individual sample in the survey has population weight), Y_i is the total wage in region i , n_{ij} is the number of people in group p in region i , and n_i is the total number of people in region i . Wage inequality is considered higher as Theil index increases.

ii) Measurement of Skill Premium

Skill premium as a measure for wage inequality is specified as follows:

$$\text{Skill Premium} = \frac{W_s}{W_u} \quad (4.2)$$

Where W_s is the average real hourly wage of skilled labor (as proxied by labor that has minimum high school diploma) and W_u is the average real hourly wage of unskilled labor (proxied by labor that has middle school diploma or lower).

iii) Measurement of Regional Tariff Exposure

As tariffs are measured in national scale, we need another method to measure trade liberalization within a specific region inside of a specific country. In line with Topalova (2004) on their research on trade liberalization impact on poverty in India, I follow their approach to measure tariff exposure at province level:

$$\text{Tariff}_{mt} = \sum_{n=1}^n ((L_{nm,2003} / L_{m,2003})) \times \text{Tariff}_{nt} \quad (4.3)$$

Where $Tariff_{mt}$ shows the tariff exposure at region m in year t , m is region, n is industry, t represents year, $L_{nm,2003}$ is the total number of labor in industry n in region m at initial year 2003, $L_{m,2003}$ is total number of labor in tradable sector in region m in year 2003 and $Tariff_{nt}$ is the tariff for industry n in year t .

The labor data weighting scheme is to measure the relative importance a tariff has on labor in the region. Labor data are designed to be of initial year (2003) to control for changes in labor structure caused by the tariff variations. The regional tariff measurement above is called the ‘scaled’ tariff measurement which includes all labor in a specific region without differentiating between industries that get affected by tariffs (tradable sectors such as agriculture, mining, and manufacturing) and labor in the entire region (including those working in services and other non-tradable industries).

5. Empirical Model

5.1 Wage Inequality and Skill Premium

The main interest of this study is to understand whether regions in Indonesia get similar benefits or loss (in terms of wage and wage gap) from trade liberalization in terms of reduction in tariff during the specific period of study or whether some regions gain or lose disproportionately compared to others. For this reason the empirical model would be:

$$\text{Log Theil} = \text{Tariff}_{mt} + \sum \beta_i X_{imt} + \gamma_m + \varepsilon_{mt} \quad (4.5)$$

$$\text{Log } \frac{W_s}{W_u} = \text{Tariff}_{mt} + \sum \beta_i X_{imt} + \gamma_m + \varepsilon_{mt} \quad (4.6)$$

to measure the effect of tariff liberalization on skill premium where Log Theil is the logarithm form of Theil index, $\text{Log } \frac{W_s}{W_u}$ is the logarithm form of skill premium, m is region, t represents year, $Tariff_{mt}$ is the previously mentioned regional tariff measurement that shows the tariff exposure in region m in year t , X are the control variables, γ_m is region-specific fixed effects and ε_{mt} is the error term.

I expect that in the short and medium run, reduction in tariffs will reduce the average wage, particularly in agricultural industries which is largely unskilled labor abundant. Regions that have relatively bigger agricultural sector (and therefore largely unskilled labor abundant) are expected to benefit more from increase in tariff in terms of increased average wage for unskilled labor that translates to higher average regional wage. This is also expected to decrease wage gap between skilled and unskilled labor. The control variables I use are the share of agricultural employment, the share of high school and university graduates in employment, as well as log of minimum wage.

6. Results

To see the impact of trade liberalization on wage inequality, analysis will be done on two measures of inequality as mentioned previously. The first measure is the Theil index and second measure is the skill premium of each region. Descriptive statistics for these measurements and the dependent variables are as shown in Table 1 below.

To test for the best approach for the empirical model I am using, I take Chow test and Hausman test to determine whether to use OLS, fixed-effect model or random effect model for both skill premium and Theil index. The results show that fixed effect model is preferred for both dependent variables and in different regions.

Table 1: Descriptive Statistics						
Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Obs
SKILLPR	2.066724	1.992656	4.155030	1.040646	0.530108	354
SKILLED	59.90175	63.03447	90.80726	18.93731	15.56426	354
NTDTARIFF	1.047093	0.854336	3.676035	0.017964	0.827114	354
MWAGE	850960.7	809503.8	1881950.	467337.5	207221.2	354
AGRIC	16.49895	9.962305	72.51514	0.000000	16.72525	354
THEIL	0.156407	0.148029	0.474764	0.052098	0.060965	354

Table 2: Correlations between Variables						
	LOG (SKILLPR)	LOG (THEIL)	SKILLED	NTDTARIFF	LOG (MWAGE)	AGRIC
LOG(SKILLPR)	1.000000					
LOG(THEIL)	0.499578	1.000000				
SKILLED	0.286535	0.207450	1.000000			
NTDTARIFF	-0.109934	-0.069816	-0.501924	1.000000		
LOG(MWAGE)	-0.113440	0.228097	0.178470	-0.277705	1.000000	
AGRIC	-0.407487	-0.215981	-0.690298	0.091505	0.152126	1.000000

To test for the best approach for the empirical model I am using, I take Chow test and Hausman test to determine whether to use OLS, fixed-effect model or random effect model for both skill premium and Theil index. The results show that fixed effect model is preferred for both dependent variables and in different regions.

The regression result below (see Table 3) shows that labor weighted tariff seems to have significant effect on the Theil index in general and in urban zone. To confirm further if regional level tariff has any effect in Indonesia, I do another regression on data for regions where the manufacturing sector that might benefit or lose from reduction in tariff is substantial enough to make the effect region wide. I choose several regions whose labor share of manufacturing industry is above national median level. The results show that indeed, in this area, tariff has a significant effect on the wage inequality. All tariffs, whenever significant has a negative effect on wage inequality in Indonesia which means reduction in tariff implies a greater wage inequality.

To make things clearer, I regress tariff not only on Theil index but also on skill premium (see Table 4). This enables me to see the more direct relationship between tariff and wage for different skill groups. The result shows similarity to the previous result on Theil index which indicates that tariffs are significant and negatively affecting the skill premium in urban zone, manufacturing zone as well as globally.

Table 3 Regression Result on Theil Index						
Dependent: Log(Theil)	URBAN	RURAL	Manufacturing > Median	West	East	Global
Labor Weighted Tariff	-0.2635**	0.0005	-0.1748**	-0.1014	-0.1656	-0.1246*
Std. error	(0.0900)	(0.1177)	(0.0800)	(0.0776)	(0.1958)	(0.0721)
R ²	0.511	0.493	0.619	0.568	0.391	0.504
F-stat (Prob)	0.000	0.000	0.000	0.000	0.000	0.000
N	180	174	168	222	132	354

Note: All calculations are subject to control variables and region fixed effects, indicates *** 1% statistical significance, ** 5% significance, * 10% significance.

Table 4: Regression Result on Skill Premium						
Dependent: Log(Skill Premium)	URBAN	RURAL	Manufacturing > Median	WEST	EAST	Global
Labor Weighted Tariff	-0.1569**	0.0489	-0.0932*	-0.0115	0.1935	-0.0959**
Std. error	(0.0643)	(0.0696)	(0.0521)	(0.0196)	(0.1514)	(0.0483)
R²	0.543	0.431	0.521	0.317	0.384	0.486
F-stat (Prob)	0.000	0.000	0.000	0.000	0.000	0.000
N	180	174	168	222	132	354

Note: All calculations are subject to control variables and region fixed effects, indicates *** 1% statistical significance, ** 5% significance, * 10% significance.

We can see that the tariff reduction in urban region, manufacturing-heavy region as well as globally has a negative effect on skill premium which means that the skilled labor is earning relatively less compared to the unskilled labor after imposition of a tariff and conversely, earning more than the unskilled on tariff reduction. As mentioned before, this might be caused by the unskilled labor gaining more than the skilled labor by imposition of a tariff or the unskilled labor gaining while the skilled losing benefits.

Again, the tariff effect to the skill premium is not significant across all regions. This time, similarly, tariff is significant in the urban and manufacturing part of Indonesia which are understandably more exposed to manufacturing and tradable sector compared to its west, rural or east counterpart. A reduction in tariff is expected to increase the skill premium in urban Indonesia where manufacturing sector is more pronounced. As was expected, the result again indicates that an increase in regional exposure to tariff is supposed to decrease skill premium in the manufacturing-region area of Indonesia. While in global sample, another negative and significant effect of tariff on wage premium is observed.

7. Conclusion

Indonesia initiated the tariff liberalization since the late 80s up to the early 2000s that is believed to increase welfare across countries. In this paper, the effects of tariff reduction on wage inequality represented by skill premium from 2003 to 2013 using bi-annual National Labor Survey data on individuals that is representative on a province level is studied.

With this paper, I attempt to seek the proof whether trade liberalization (represented by reduction in tariff) can have a positive or negative impact on the reduction in wage inequality. Based on all the results above, it is confirmed that tariff reduction, where it matters, has an increasing quality toward wage inequality and skill premium in Indonesia as it potentially decreases the wage of unskilled workers that mostly work in a primary sector (agriculture) and increase the wage of skilled workers, where whenever significant, working in manufacturing sector. In general, it is found that in regions where tariff can have an impact, imposition of a tariff can have a positive impact in the reduction of wage inequality in Indonesia.

References

- [1] Amiti, M & Konings, J. (2007). Trade Liberalization, Intermediate Inputs and Productivity: Evidence from Indonesia. *American Economic Review*, 97, 1611-1638
- [2] Amiti, M. & Cameron, L. (2012). Trade Liberalization and the Wage Skill Premium: Evidence from Indonesia. *Journal of International Economics*, 87, 277-287
- [3] Asian Development Bank. (2017). Together We Deliver: 50 Stories of ADB's Partnerships in Asia and the Pacific. Manila: Asian Development Bank.
- [4] Dix-Carneiro, R. (2014). Trade liberalization and labor market dynamics. *Econometrica*, 82(3), 825-885
- [5] Feenstra, R. C. & Hanson, G. H. (1997). Foreign Direct Investment And Relative Wages: Evidence From Mexico's Maquiladoras. *Journal of International Economics*, 42, 371-393.

- [6] Galiani, S. & Sanguinetti, P. (2003). The impact of trade liberalization on wage inequality: Evidence from Argentina. *Journal of Development Economics*, 72, 497–513.
- [7] Goldberg, P.K. & Pavcnik, N. (2007). Distributional Effects of Globalization in Developing Countries. *Journal of Economic Literature*, 45(1), 39–82.
- [8] Helpman, E., O. Itzhoki, M. Muendler, S. (2017). Redding. Trade and Inequality: From Theory to Estimation. *Review of Economic Studies*, 84(1), 357-405
- [9] Kis-Katos, K. & Sparrow, R. (2015). Poverty, labor markets, and trade liberalization in Indonesia. *Journal of Development Economics*, 117, 94-106.
- [10] Kuznets, S. (1955). Economic growth and income inequality. *American Economic Review*, 45(1), 1–28.
- [11] Lee, S. (2017). International trade and within-sector wage inequality: The case of South Korea. *Journal of Asian Economics*, 48, 38–47
- [12] Marchand, B.U. (2008). Trade Liberalization Encyclopedia of Global Business in Today's World. Edmonton: University of Alberta.
- [13] Organisation for Economic Co-operation and Development (OECD). (2011). *Divided We Stand: Why Inequality Keeps Rising*. Paris: OECD Publishing.
- [14] Roser, M. & Cuaresma, J. C. (2016). Why is inequality increasing in the developed world?. *Review of Income and Wealth*, 62(1), 1-27.
- [15] Salvatore, D. (2012). *International Economics*, 11th Ed. New Jersey: John Wiley & Sons.
- [16] Sun, S. & Anwar, S. (2012) Trade liberalisation, market competition and wage inequality in China's manufacturing sector. *Economic Modelling*, 29, 1268–1277.
- [17] Topalova, P. (2007). *Trade Liberalization, Poverty and Inequality: Evidence from Indian Districts. Globalization and Poverty*. Chicago: University of Chicago Press, 2007.
- [18] World Bank. (2005). *Introduction to Poverty Analysis*. Washington: World Bank Institute.
- [19] Zhu, S.C. & Trefler, D. (2005). Trade and inequality in developing countries: a general equilibrium analysis. *Journal of International Economics*, 65, 21– 48