The Impact of International Trade on Income Inequality in the United States since 1970's

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Abstract:

This research analyzes the impact of openness to trade on the level of income inequality in the United States. Using time series data of periods between 1970 and 2014, this study found that trade increases income inequality. It is also found that an increase in trade volume leads to a wider income gap as more income goes to the top 10% wealthiest people in the United States.

When elaborating trade into export side and import side, it is found that both of them significantly contribute to a higher income inequality when it is measured by GINI.

However, it is only the import side that contributes to the increase in the income share of the top 10%. This study also found that there is a negligible effect of FDI inflow on income inequality in the United States.

Keywords: international trade, income inequality, GINI, FDI

JEL Codes: D31, F14, and O15

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1. Introduction

The United States has experienced growing income inequality, especially since the late 1970's. The share of income for the top 1 percent has more than doubled, from 7.8% in 1970 to 17.85% in 2014 (World Top Income Database, 2014). In addition, the earnings of the top 1 percent households increased by about 275% (after federal taxes and income transfer) over the period between 1979 and 2007, while the income of the bottom 60 percent households only increased by less than 40% in the same period (Congressional Budget Office, 2011). It has been a large discussion among economists, politicians, and researchers regarding the causes of this problem that has brought United States to be the worst among industrialized countries in terms of income inequality. Among the factors contributing to income inequality, one of them is the participation of the country in international trade (Cline, 1997). This will be the main focus of this research.

Even though United States can be considered as a relatively closed economy (in terms of trade/GDP ratio), the trend towards more integrated world market in the beginning of 1980's has led countries in the world (including United States) to be continuously more open to trade. Based on the basic Ricardian model, United States can be considered to have comparative disadvantage in the production of goods that intensively use low-skilled labor. The new participants from emerging market since the last decade have become a threat for the low-skilled labor (which can be categorized as a low to middle class) in the United States. A cheaper labor and raw materials from countries like China and India hurt the low and middle class in the United States through a decline in domestic demand for unskilled labor and preference for import of products. At the same time, employers of large manufacturing companies in the United States get benefit from the supply of cheap labors and raw materials from developing countries by starting production overseas. The establishment of trade agreements such as NAFTA in 1994 and WTO in 1995 also made this problem more obvious. Regardless of the contribution on economic growth, these agreements have forced U.S. workers to compete directly against workers from countries with no or less labor protection. At the same time, these agreements protect U.S. big firms to offshore their production to those countries. This drawback of trade agreements can be shown to have worsened the wage gap between the upper class and the middle class in the United States. While the share of income for the top 10% households rose by 1.3 percent per year from 1981 up to the establishment of NAFTA and WTO, it doubled to 2.3 percent per year in the first 6 years of the establishment of these agreements (Pikkety & Saez, 2006).

According to those statistics, one thing that grabs attention to do this research is how this growing participation on trade happened at the same time when income inequality started to increase. This research will try to answer the research question: How is the impact of international trade, especially the openness to trade, on the income inequality in the United States since 1970?

2. Literature Review

As mentioned in the introduction, there should be a role of international trade on the income inequality in the United States. A question arises about why still countries trade with each other. In this section, some basic models of international trade will be used to explain the reason behind the U.S. engagement in trade. Then, some previous studies about the relationship between openness to trade and income inequality will be provided.

2.1. Illustration of the Basic Models of International Trade on the Case of United States

Ricardian trade theory suggests that relative difference in technology leads to trade and countries will gain from trade as long as this relative difference in requirements exists (Ricardo, 1821). Regardless of the oversimplified assumption from the theory, United States can be considered as a country that has a comparative advantage in the production of high-tech, such as aerospace, mobile phone, and automotive. In contrary, it has a comparative disadvantage in production of textile goods. It is obvious that it will cost cheaper to produce garment in India than in the United States.

In another extent, U.S. comparative advantage on high-tech can also be explained according to Heckscher-Ohlin model. The main idea of this model is how difference in factor endowments will lead to trade. It says that a country will export the good that intensively uses the factor of production that is abundant in that country and it will import the good that intensively uses the factor of production that is scarce in that country (Mark, 1992). In the case of United States, it can be considered as a capital abundant country. Heckscher-Ohlin theory also brought a controversy since the presentation of Leontief Paradox (Leontief, 1954), which proved that the United States after the World War II was considered to be the most capital abundant country but turned out exporting relatively more labor-intensive goods and importing relatively more capital-intensive goods.

However, it seems that the Heckscher-Ohlin theorem is partially supported by what the U.S. trade account looks like today, especially in the export side. In 2014, the top 3 export commodities in the United States are refined petroleum, cars, and planes & spacecraft (OEC, 2014) which all of them can be categorized as capital-intensive commodities. However, in terms of import, the statistics do not support the Heckscher-Ohlin theorem. In 2014, the U.S. major import commodity was crude petroleum, which was also considered as capital-intensive sector. Furthermore, if we define factor endowments based on skilled labor and unskilled labor, the U.S. trade statistics today is more relevant with the theorem.

The more crucial model that can relate U.S. income inequality problem with trade is the Stolper-Samuelson theorem. The main idea of this theorem says that free international trade will benefit the factor of production that is abundant in the

country, while the factor of production that is scarce in the country will lose (Stolper & Samuelson, 1941). By observing the gains and losses of trade, it raises a problem of inequality. In the United States, most of the capital-intensive sectors are owned by small number of the upper class. In terms of financial market, in 2010, the top 1% owned 50.4% of total investment assets in the United States, while only 12% is owned by the bottom 90% (Wolff, 2012; Miller and Choi, 2014; Thalassinos *et al.,* 2012; Thalassinos and Politis, 2012).

Figure 1. *The U.S. GINI index from 1960 to 2012*

GINI Index of the US 1960-2012
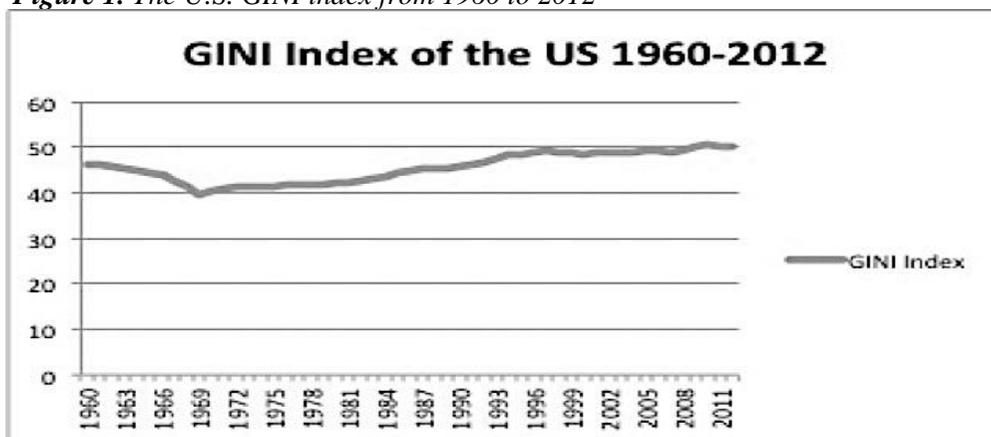
Source: SWIID, 2014.

Figure 1 above shows the trends of income inequality in the United States based on the gross GINI (pre-tax and pre-transfer) for the period between 1960 and 2012. It shows that there was a declining trend in GINI before 1970. Since then, the trends have been continuously rising. Many economists argue that trade is one of the determinants of income inequality in the United States.

Figure 2 below shows the trends of U.S. trade volume from 1960 to 2014. Trade volume is defined by the total export and import as a percentage of GDP. From figure 2, it shows that the trends toward the U.S. participation in international trade can be considered low and steady before 1970's. After that, there has been an increasing trend of the U.S. trade volume until today. From figure 1 and 2, it can be said that the increasing trends of income inequality and trade were started to happen at the same time. By looking at both trends, it supports the motivation of conducting this research to find the answer of how trade affects income inequality in the United States.

2.2. Previous Studies
There have been many studies conducted about the relationship between openness to trade and income inequality. Even though most of them analyze the case in a global scale, the approaches are quite similar between one another. Moreover, due to

income inequality caused by many factors, the choice of variables results in variety of findings.

Figure 2. *The U.S. trade volume from 1960 to 2014*
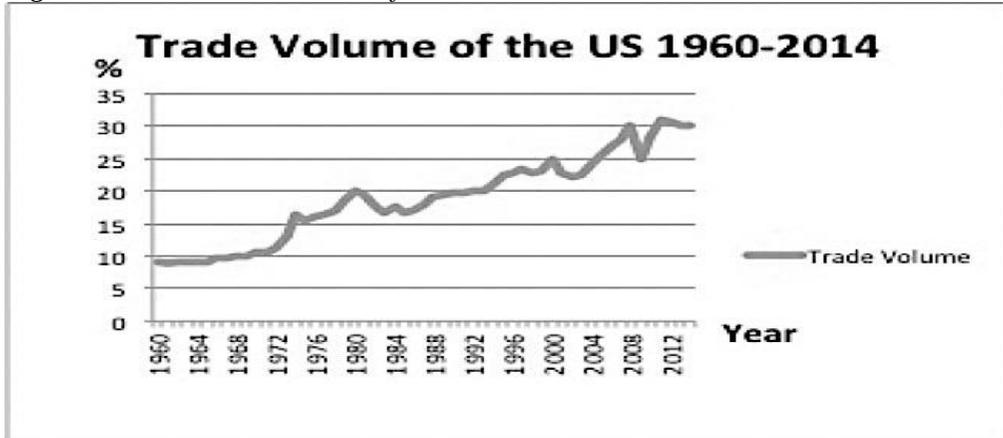
Source: *World Bank, 2016.*

Richardson (1995) in his paper analyzes about the connection between trade and technology on income inequality. Focusing on the study of developed countries, he found that trade gives a moderate contribution on income inequality and a decline in median wage, while the most significant contribution on income inequality comes from the development of technology.

Gourdon, Maystre, and Melo (2008) try to prove the importance of factor endowments in analyzing the relationship between trade and income inequality. They found that openness to trade is associated with increase in income inequality in high-income countries, and it reduces inequality in low-income countries. Furthermore, a more openness to trade is associated with higher inequality in capital abundant and high-skilled abundant country. This type of country is relevant to U.S. case.

Roser & Cuaresma (2016) argued that the bulk of international trade nowadays is not based on different factor endowments. Instead, trade could happen between countries with similar factor endowments - i.e., intra-industry trade. For instance, the trade between United States and Japan in the last few decades is mainly on technology and cars. Based on this argument, they try to analyze the impact of trade between developed and developing countries with some control in data mining. They utilize data on the volume of import from developing countries whose production is low-skilled labor intensive and volume of export from developed countries whose production is high-skilled labor intensive. They found that low-wage import from developing countries increase income inequality in developed countries.

Jaumotte, Lall, and Papageorgiou (2013) study the impact of globalization on income inequality. Globalization is divided into 2 categories: trade openness and financial openness. They found that globalization as a whole gives a minor effect on income inequality. This is due to its components having offsetting effects: trade openness reduces income inequality, while financial openness exacerbates it. It is technological changes that give the highest contribution to the increase in income inequality.

Ebenstein, Harrrison, and McMillan (2015) identify the effect of international trade and offshoring on the wage of workers in the United States. They found that offshoring to low wage countries and imports are associated with decline in the wage of U.S. workers. Also, globalization has led to reallocation of U.S. workers from high-wage manufacturing sector into other sectors, with a declining wage from this switch.

Spilimbergo, Londono and Szekely (1999) study about the empirical relations between factor endowments, trade and personal income distribution. By using panel data from 108 countries and covering period between 1947 to 1994, they found that countries highly endowed with land and capital have a less equal income distribution while skill intensive countries have a more equal income distribution. They also found that the effects of trade openness on income inequality depend on factor endowments.

Cline (1997) in his book *Trade and Income Distribution* summarized several studies about the impacts of trade on U.S. income inequality. All of the studies mentioned in his book were conducted in 1990's and compiled in the table 1 below. From the table, the studies that were conducted give varieties of result. There is a concentration in the distribution of estimations around range of 10% to 15%. However, due to those studies analyzing the data of period between 1980's until early 1990's, it should not fully represent how much is the estimation if the data since last decades are incorporated.

Table 1. *1990's studies on trade's impact on income inequality in the USA*

Author(s)	Year of Study	Portion of Inequality Increase Attributed to Trade
Borjas, Freeman, Katz	1997	5%
Lawrence	1996	9%
Borjas and Ramey	1993	10%
Cooper	1994	10%
Krugman	1995	10%
Baldwin and Cain	1994	9-14%
Leamer	1994	20%
Cline	1997	39%
Karoly and Klerman	1994	55-141%
Wood	1994	100%

Source: *Public Citizen (2014)*

Studies and findings that were mentioned previously suggest that there has been no consensus about the effect of international trade, or openness to trade in particular, on income inequality. Therefore, a country specific study should be conducted in this study in order to know the effect in the United States. Also, unlike many previous studies, which were mostly conducted in 1990's and only involved 2-decades time span, this study will try to incorporate a wider range of time spans and more recent data until 2014.

3. Data and Methodology

This section will discuss about the sample and variables that will be used in the analysis. Then, it will be followed by further reasoning about why adding each variable into the regression and the source of the data.

3.1. Sample

This research will focus on the United States. Thus, time series data will be used. This research will choose the starting point in 1970, when the trend of income inequality in the United States started to rise. Also, due to some problems in finding the latest data for a particular variable, the models that will be introduced later will use 2 different ranges of period: 1970 to 2012 and 1970 to 2014.

3.2. Dependent Variable

The dependent variable of the model is variable that measures income inequality. In this analysis, two types of variable will be used.

3.2.1. GINI Coefficient

The first is GINI coefficient, which is the most common measure of income inequality. Basically, the value ranges between 0 and 1. However, in some sources, GINI is multiplied by 100, so the range is between 0-100. A zero GINI means perfect equality, and the higher the value of GINI, the higher the inequality. Due to GINI coefficient has bounded values, a logarithm term for GINI, which is calculated as $ln(\frac{GINI}{100-GINI})$ will be applied to transform the GINI into unbounded measure (Reuveny, 2003). In the regression, this variable will be stated as *ln_gini*. The data will be collected from *Standardized World Income Inequality Database* (SWIID) version 4.1. In this study, the market (gross) GINI, which is based on the market (pre-tax, pre-transfer) income, will be used. The reason to choose gross GINI instead of net GINI (post-tax, post-transfer) is because gross GINI is considered to be more directly related to changes in factor prices, which is one important channel through which trade influences income inequality. SWIID provides the latest data for GINI index only until 2012. Thus, the models that use GINI coefficient as the dependent variable will do the observation with range of periods between 1970 until 2012.

3.2.2. Top 10% Income Share

GINI coefficient cannot fully capture in which part of the society that drives the

income inequality, and this driver is often different between countries. In dealing with this case, another measure of income inequality can be seen from the amount of share of income for the top class. In the United States, income inequality has grown as a result of the widen gap between the top 1% and 10% comparing to the rest of the population. This kind of method is similar to study by Gourdon et al. (2008) where he also used income share in deciles in order to capture which part of the population in terms of income level is mostly affected by trade. In this study, as an alternative to GINI coefficient, the top 10% income share will be used. The higher share of income for the top 10% can be interpreted as a higher income inequality. The data can be obtained from *The World Top Income Database,* described as the share of income for the highest top 10% (including capital gains) as a proportion of the total income in the country. Moreover, for the models using the top 10% income share as the dependent variable, they will analyze the data with periods between 1970 until 2014. This variable is also assumed to grow exponentially and will be defined in natural logarithm form as well as transformed into unbounded measure (with method that is similar to GINI). This variable will be called as *ln_top10* in the regression.

3.3. Independent Variables of Interest: Trade Volume, X/GDP, M/GDP
The main idea of this study is to know whether there is a significant impact of international trade on income inequality. The openness to trade is a good indicator to measure trade and also has been widely used to study the impact of trade on income inequality. There are 3 types of openness to trade measure that will be used.

The first is *trade volume* (Reuveny, 2003, Jaumotte *et al.,* 2008, Jakobsson, 2006), measured as the total amount of export and import as a percentage of GDP. By using *trade volume*, the size of the country is filtered out due to the amount of export and import that are denominated in GDP. The data are obtained from World Bank *World Development Indicators* (WDI) and defined as the total amount of export and import of goods and services of a country as a percentage of GDP. In addition, an elaboration of trade volume into *export/GDP* and *import/GDP* (Squalli and Wilson, 2009) will be used to know which side of trade contributes more on income inequality. These data are also collected from WDI.

3.4. Controlling Variable
There are 4 controlling variables that will be used in the model. Each of the following variables will be included based on previous studies and some reasoning will be provided about the contribution of these variables on the level of income inequality.

3.4.1. 1-decade Lagged Dependent Variable
Income inequality today can be the result of the level of income inequality from the past periods. Therefore, a 1-decade lagged GINI coefficient and a 1-decade lagged top 10% income share will be used. There are several reasons mentioned by Reuveny (2003) about the importance of including lagged income inequality into the

model. He argued that wealth concentration is often associated with political influence, which can generate a favor to wealth of owner in the future. Furthermore, people tend to marry with those in the same socio-economic group. Thus, wealth gap between the rich and the poor is expected to be maintained or even gets wider due to socio-economic background that persuades people not to blend. Also, using 1-decade lagged period gives more reliable outcomes compare to using shorter period. It is expected that the level of past income inequality needs several time intervals to influence the level of future income inequality. Also, using 1-decade lagged income inequality avoids multicollinearity problem.

3.4.2. Inflation
Inflation is used in many studies (e.g., Gourdon et al., 2008, Roser et al., 2016) to capture macroeconomics situation. The inflation used in this analysis is measured by the annual growth rate of GDP implicit deflator. The data for inflation can be obtained from World Bank *World Development Indicator* (WDI). Cassette, Fleury, and Petit (2012) argued that inflation should increase income inequality through erosion on real wage, which disproportionately affects the lower class income. On the other hand, the presence of inflation could also give negative effect to the bondholders through declining in real value of the bond. As bondholders are more associated with the upper class, a negative effect of inflation on income inequality is also expected. The latter case is more relevant to the United States, which is considered to have highly developed financial market.

3.4.3. Government expenditure
Government expenditure, which is the expenditure by government on final consumption as percentage of GDP will be used (Demir et al., 2012, Dollar and Kraay, 2002). It consists of all government current expenditures for purchases of goods and services, including compensation of employees as well as national defense and security. However, it does not include military spending. The data can be obtained from World Bank *World Development Indicators* (WDI) database. The inclusion of this variable is necessary in describing the government expenditure on income transfers, education and healthcare, which is expected to benefit the lower class and to narrow the income gap (Demir et al., 2012). Even though government expenditure on defense is considered to equally benefit all classes of income, it is only a minor portion of total U.S. government spending. In 2016, only 12% of total government spending is contributed to defense, while the top 3 spending which account to 56% of total government spending goes to healthcare, pensions, and education (U.S. Government Spending, 2016).

3.4.4. FDI Net Inflow
FDI is considered to have influence on income inequality of a country, but no general direction has been concluded. Several studies found that FDI raises income inequality in some ways. In one side, the presence of FDI is expected to have influence on government actions. As FDI can create jobs and enhance economic growth in the country, government would try to make the domestic market

interesting for foreign investors. Some of the ways are by taming the labor union and reducing the minimum wage. On the other side, foreign investors leaving the country can result in higher unemployment rate and lower bargaining power of labor union (Salvatore, 1998). In addition, a more pressure towards wages of workers who perform routine task in developed countries can be found as a result of offshoring (Grossman and Rossi-Hansberg, 2008). In contrast, a study by Chintrakarn, Herzer, and Nunnenkamp (2012) found that FDI inflow has negative impact on income inequality in the U.S. country level.

To clarify these findings, *FDI net inflow* will be used in this research. The data can be found from World Bank (WDI, 2016). It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as a percentage of GDP.

3.5. Estimation Method

OLS estimator will be used in this research, as it is suitable with the characteristic of the variables that will be analyzed in the model. There are 3 essential assumptions (Stock & Watson, 2015, pp. 170-174) that need to be satisfied in order for the estimation to be considered reliable. First, the conditional mean of the error term should be zero: $E(\varepsilon|X)=0$. It implies that any other variable that has influence on income inequality and is not included in the model should not be related to the independent variables. Second, the sample drawn should be independently and identically distributed. Third, large outliers should be unlikely.

4. Empirical Results

This section will divide the results into 2 main categories based on the dependent variable used. In section 4.1 the results of regressions using *ln_gini* as the dependent variable will be explained. Then, it is followed by the results from using *ln_top10* in section 4.2.

4.1. Dependent Variable: ln_gini

In the table 2 below, the results for the OLS regressions with GINI coefficient as the dependent variable are shown. The coefficient with the star signs indicates the significance level. Below each estimated coefficient is the standard error. The numbers with brackets in the top row indicate which model is run.

Table 2. *OLS estimation of the GINI coefficient in the United States for period between 1970 and 2012.*

Model	(1)	(2)	(5)	(6)	(9)	(10)
Trade volume	0.0237***		0.0145***		0.0158***	
	(0.00195)		(0.00157)		(0.00162)	

Export /GDP		0.00853 (0.0109)		0.0226*** (0.00543)		0.0228*** (0.00522)
Import /GDP		0.0325*** (0.00654)		0.00843 (0.00420)		0.0104* (0.00415)
Inflation			-0.0228*** (0.00256)	-0.0235*** (0.00255)	-0.0232*** (0.00246)	-0.0238*** (0.00246)
Government expenditure			-0.0208** (0.00661)	-0.0232** (0.00667)	-0.0271*** (0.00697)	-0.0288*** (0.00698)
Lagged_gini			0.00419 (0.00257)	0.00543* (0.00264)	0.00551* (0.00253)	0.00651* (0.00259)
FDI net inflow					-0.000218* (0.000102)	-0.000204 (0.00010)
Constant	-0.652*** (0.0412)	-0.612*** (0.0497)	-0.237* (0.112)	-0.259* (0.111)	-0.200 (0.108)	-0.221* (0.108)
N	43	43	43	43	43	43
R-Squared	0.782	0.792	0.952	0.955	0.957	0.960

*Note: Standard errors in parentheses; * $p<0.05$, ** $p<0.01$, *** $p<0.001$*
The model 1 shows that there is a highly significant ($p<0.1\%$) effect of trade volume on income inequality. The model 2 shows another results when the trade volume is split into export/GDP and import/GDP. It shows a bit different result from model 1 that it is only the import side that gives significant effect on the increase in GINI coefficient, while the export side can be considered to have negligible effect.

When 3 controlling variables are introduced; *government expenditure, inflation,* and *1-decade lagged GINI coefficient*, model 5 shows that the effect of trade volume on GINI is still highly significant. However, as shown in model 6, when trade volume is elaborated into export side and import side, it is only the export side that shows a significant contribution on income inequality. In addition, government expenditure

shows a negative effect on GINI both in model 5 and 6. This is in line with the findings from Demir *et al.* (2012) that higher government expenditure can benefit the lower class more than the rich. Therefore, there is decreasing income inequality. Similarly, the coefficient of inflation is also negative towards GINI in both models. This contradicts the finding of Cassette *et al.* (2012), but in line with the expectation that inflation in the United States should affect more to the upper class through their participation on bonds market. It is also shown in both model 5 and 6 that the effect of lagged GINI is positive, but only significant (p<5%) in model 6. This supports Reuveny (2003) who argues that past income inequality should give positive contribution on the present inequality.

When *FDI net inflow* is included in model 9, it is shown that trade volume still significantly increases the income inequality. Also, interesting results are found in model 10, where both export side and import side now significantly increase income inequality after the inclusion of FDI. Furthermore, similar results are also shown for the effect of government expenditure and inflation before and after the inclusion of FDI. Lagged GINI is also significant in both model 9 and 10. Moreover, an increase in FDI net inflow is associated with negligible decrease in income inequality.

4.2. Dependent Variable: ln_top10

Table 3. *OLS estimation of the top 10% income share in the United States for the period between 1970 and 2014.*

Model	(3)	(4)	(7)	(8)	(11)	(12)
Trade volume	0.0428*** (0.00273)		0.0230*** (0.00421)		0.0214*** (0.00400)	
Export/ GDP		-0.0109 (0.0136)		-0.00148 (0.00834)		0.000502 (0.00806)
Import/ GDP		0.0756*** (0.00850)		0.0426*** (0.00705)		0.0388*** (0.00700)
Inflation			-0.0306*** (0.00456)	-0.0279*** (0.00417)	-0.0296*** (0.00430)	-0.0275*** (0.00400)
Government expenditure			-0.0297* (0.0112)	-0.0248* (0.0101)	-0.0199 (0.0112)	-0.0178 (0.0103)
Lagged top10			0.0119* (0.00465)	0.00977* (0.00422)	0.0104* (0.00441)	0.00887* (0.00408)

FDI net inflow					0.000393*	0.000303*
					(0.000156)	(0.000146)
Constant	-1.262***	-1.133***	-0.719***	-0.719***	-0.826***	-0.802***
	(0.0589)	(0.0600)	(0.178)	(0.160)	(0.173)	(0.159)
N	45	45	45	45	45	45
R-squared	0.851	0.893	0.957	0.966	0.963	0.970

*Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
Table 3 shows the results of regressions using income share of the top 10% as an indicator of income inequality in the United States. Recalling that the higher the share can be interpreted as higher income inequality, as more portions of total income in the country are gone to the small portion of wealthiest people.

The model 3 and 4 show the effects of different types of openness to trade measure without adding any controlling variable to see the basic direction of the coefficient on income inequality. In model 3, it shows that trade volume as a whole is positively affecting the income share of top 10%. It can be said that the more the country engages in trade, the more the benefit goes to the top 10%. This is in line with Gourdon et al. (2008) finding that shows that more openness to trade is associated with more income goes to the upper class in countries endowed with highly skilled workers and capital. However, in model 4, a significant effect is only found in the import side. These basic models have similar results with the basic models that are used when *ln_gini* is the dependent variable - i.e., model 1 and 2.

Similar results are also found for the trade volume's coefficients when controlling variables are added into the regressions. All of the models in table 3 show that the effects of trade volume on the income share of top 10% are positive and statistically significant at 0.1 percent level. Moreover, *import/GDP* is always attributed to an increase in the income share of top 10%. However, the effect of *export/GDP* is always non-significant.

Government expenditure significantly reduces income share of top 10% when *FDI* is excluded from the regression. This support the argument that expenditure by government mostly through income transfer, health care, and education gives more benefit to the middle and lower class than to the rich. But, when FDI net inflow is taken into account to capture another side of country's openness, the government expenditure is no longer significant.

Inflation is shown to have stronger effect on the income share of the riches. In all of the models that include inflation, all of them show highly significant coefficient on

reducing income share of top 10%. Again, this supports the argument about the high-income earners who control most of the financial market will suffer loss in holding financial asset when higher inflation occurs.

For the *1-decade lagged top 10% income share* variable, all of the models show that past income share of top 10% gives positive effect on the level of income share of top 10% at the present time. Again, this supports the findings by Reuveny (2003). When FDI net inflow is taken into account in model 11 and 12, it is found that a higher FDI net inflow is associated with higher income share of the top 10%, which means higher income inequality. However, the coefficients are still considered too small.

5. Conclusion and Limitations

This research studies the effect of openness to trade on the income inequality in the United States. Using two types of dependent variable for the measure of income inequality, this study found that there is a significant effect of trade volume to the increase of income inequality when measured both by GINI coefficient and income share of the top 10%. These results are also robust to adding controlling variables.

When openness to trade measures are defined by *export/GDP* and *import/GDP*, slightly different results are observed between using GINI and using top 10% income share as the measure of income inequality. When using GINI to define income inequality, it is shown that both export and import give positive effect on income inequality, with export having a greater effect. Different results are found when using top 10% income share as the dependent variable. It is found that only the import side which gives significant effect to the increase of the top 10% income share.

The inclusion of FDI shows that it has a significant effect on income inequality using either GINI or top 10% income share. However, the effect is so small that it might be considered negligible. By using the latest data, this study concludes that increase in trade is associated with increase in income inequality in the United States.

There are two limitations of this research. First, this research does not include technological progress on the model. As mentioned by Richardson (1995) that the major cause of income inequality in developed countries is the development of technology. The reason for not including technology is because of the limited availability of the data. There is a difficulty in finding the data of the variables that measure the development of technology (e.g., the number of internet subscribers, ICT investment), as most of the sources only provide the data starting in 1990's, while this research focuses on the income inequality problem since 1970.

Second, this research only focuses on the impact of trade as a whole on income inequality. It does not include a more detail study about the U.S. trade based on the

factor endowments, which can explain more deeply of who gains and losses from trade. Therefore, an assumption that the United States is highly endowed with capital and skilled labor should hold in order to draw a conclusion that the Stolper-Samuelson theory is supported by this study.

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