Globalization and Income Inequality: Comparative Analysis of 83 Countries

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Abstract: The effect of globalization on income inequality is an issue of significant academic interest. On the one hand, globalization is considered to promote global economic growth and social progress, while on the other, it is blamed for growing income inequality and environmental degradation, causing social degeneration and difficulty of competition. This paper aims to examine the impact of globalization on the inequality in rich/ middle/ poor economies. This study uses the least square method to establish a multiple linear regression model, adding dummy variables. The results show that globalization indeed has varied impacts on the current level of inequality around the world. The growth in the current globalization level will reduce the inequality degree in rich/middle countries but rise the inequality degree in poor countries. We also find that there exists an uneven impact of globalization on the inequality of rich countries and middle poor countries. For middle/poor countries, this impact is even stronger.

1 INTRODUCTION

Globalization and its adverse effects are issuing that human are commonly concern with. The regions of the world are increasingly becoming a whole, with unprecedented connection and dependence. No country that wants to develop can ignore this trend of globalization. However, Globalization is a global trend and a state of gradual approach among all countries, which is accompanied by a debate over whether globalization is at the cost of inequality. An obvious paradox of globalization is that the growing global economic integration caused by globalization leads more to social disintegration than social integration. This article studies the relationship between globalization and inequality through the review of current research, using mathematical modeling and data analysis.

2 LITERATURE REVIEW

This part will provide a brief overview of the debate between inequality and globalization, which are two main elements of this topic, namely the definitions of inequality and globalization, the relationship and the reasons why globalization causes inequality. Although current studies on this issue cover a wide variety of opinions, this paper will focus on three major questions. To begin with, what are definitions of globalization and inequality? Additionally, what is the relationship between globalization and inequality? Eventually, why globalization creates inequality?

2.1 Definition of Globalization and Inequality

Globalization refers to the global organic economic whole of global economic activities beyond borders through foreign trade, capital flow, technology transfer, provision of services, interdependence and interconnection, which is a political project that operates under the increase of spatial connectivity, driven by technological changes in transportation, and produces new forms of national sovereignty that promote more flexible and rapid rescheduling in space (Ludden, 2012). It is explained that the reason for globalization is dynamic and progressive vision of capitalism's worldwide expansion (Munck, 2011). Economic globalization is an important trend of the

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world economic development in the contemporary world.

In addition, because the concept of common human beings is based on the acceptance of inherent equality in mankind, inequality is a violation of human rights and prevents billions of people from realizing the comprehensive development of human beings (Khondker, 2017).

It is depicted three kinds of inequalities that may stand in our way of fully functioning human Being, which interact with each other, namely vital inequality, existential inequality and resource inequality, including health, autonomy, income and many items (Firebaugh, 2003). Khondker illustrates that innequalities are socially generated and maintained by systematic arrangements and processes (Khondker, 2017). There appears to be a consensus about the trends in inequality. According to IMF in 2007, Income disparities increased mainly in middle-to middle-income countries, while decreased in low-income countries. This reflects the growing differentiation between the countries out of globalization, instead of growing integration (Mills, 2009).

2.2 The Relationship between Globalization and Inequality

Globalization is increasingly linked to inequality, but with often divergent and polarized result.

Some researchers show that globalization accentuates inequality both within and between countries (Firebaugh, 2013), namely globalization could lead to the decentralization of increased personal income around the world, while others arguing that globalization blurs the restrictions of national boundaries, promotes economic integration, improves the income level of the poor population, and converges the wealth gap and narrowing the inequality gap (Alderson, Nielsen, 2002). By studying in a United Nations University study that surveyed seventy-three countries in 2001, Munck concludes that inequality among and within countries has increased with globalization overall (Munck, 2011). More importantly, Global polarization among countries continues.

Globalization does not mean that every country can benefit from it, it depends on international institutions and rules (Alderson, Nielsen, 2002). Under the current international system, the developed and developing countries, as two different types of countries, have the different impact of globalization. Western developed countries are the dominant part of economic globalization and can have more advantages and gain more benefits in the process of economic globalization (Munck, 2011). Developed countries have mastered the world's most advanced productivity and new science and technology and are in a dominant position in the global division of labor system. Multinational corporations in developed countries are an important promoter of economic globalization and the main carrier to realize the flow of global production factors and the optimal allocation of resources (Firebaugh, 2003).

The internationally accepted system is dominated by the developed countries. The international rules largely reflect the characteristics of its domestic rules, and there is no serious conflict with the foreign rules. In short, globalization contributes to economic growth in developed countries and reduces inequality.

In comparison, in terms of developing countries, they are in a disadvantageous position in the current process of economic globalization. As developed countries are the leaders and promoters of economic globalization and hold the initiative, most of the existing international economic rules are formulated and dominated by the developed countries (Wei, 2000). Meanwhile, Khondker emphasizes that due to the unstable economic foundation of developing countries, incomplete market development, relatively weak economic structure, lack of funds and backward technology, it is easy to suffer from the impact of economic globalization and produce domestic economic fluctuations (Khondker, 2017). In addition, it is proposed that financial globalization brings financial risks and economic impact that cannot be ignored, while promoting the economic growth of developing countries (Ludden, 2012).

2.3 The Reason Why Globalization Causes Inequality

Mills and Blossfeld define Globalization as four interrelated structural shifts that roughly occurred since the 1980s of internationalization of markets and declining importance of borders for economic transactions, tougher tax competition between countries, rising worldwide interconnectedness through new Information and Communication Technologies (ICTs), and the growing relevance and volatility of markets, which may lead to inequality (Mills, 2009, Wei, 2000).Furthermore, Mills et al. use a flow chart to illustrate the process where globalization affects inequality. That is, the impact of globalization varies on the developed and developing countries, which is consistent with Munck findings (Munck, 2011, Mills, 2009).

3 EXPLORATORY DATA ANALYSIS

3.1 Globalization

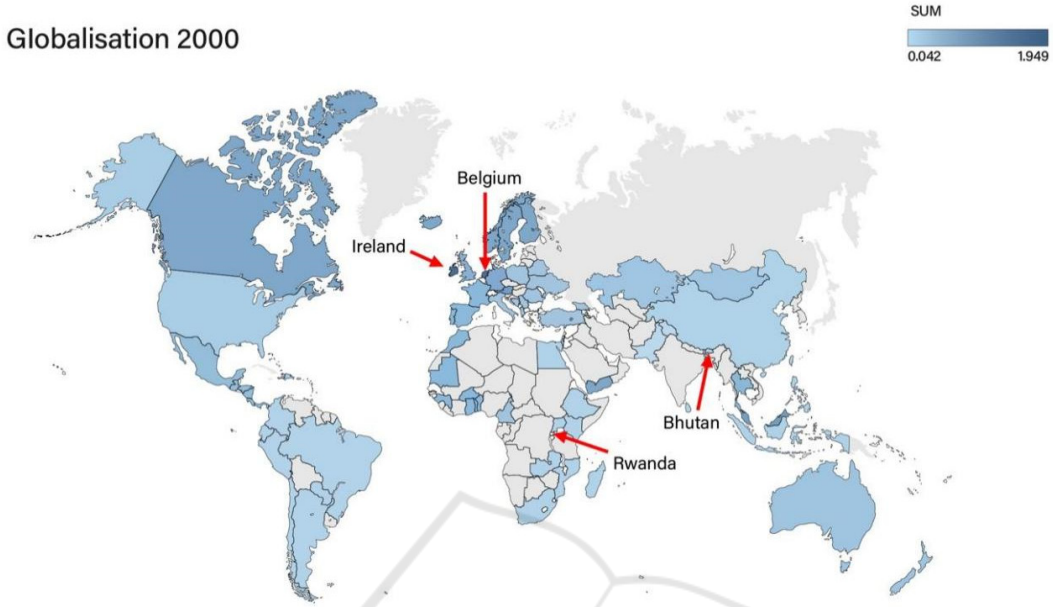

Figure 1: Globalization in 2000.

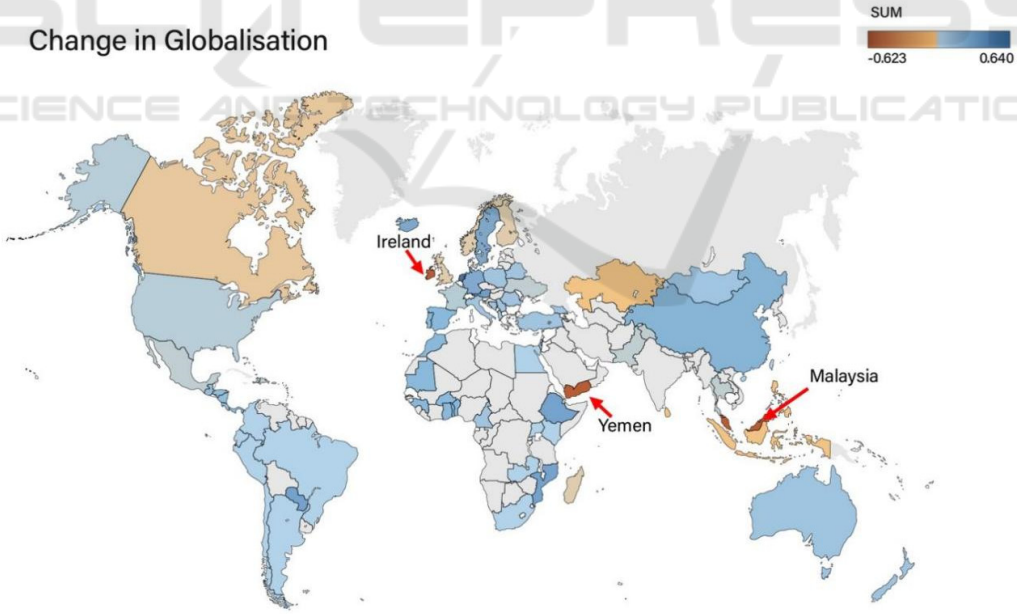

Figure 2: Change in Globalization from 2000 to 2015.

Figure 1 shows the globalization in 2000, the darker blue in the graph illustrates that country was more globalized that year. The average globalization index of these countries was 0.450. There are some outliers, such as Belgium and Ireland, with globalization of 1.949 and 1.581 respectively. There are also some countries that were basically not globalized, such as Bhutan and Rwanda, both are quite small countries.

As shown in figure 2, orange indicates the level of decreasing in globalization and blue indicates

increasing. Over this period, 68 out of 83 countries had rising globalization. There are several outliers, such as Malaysia, Yemen and Ireland. Some significant decreasing trends could be seen in their globalization level.

3.2 Income Inequality

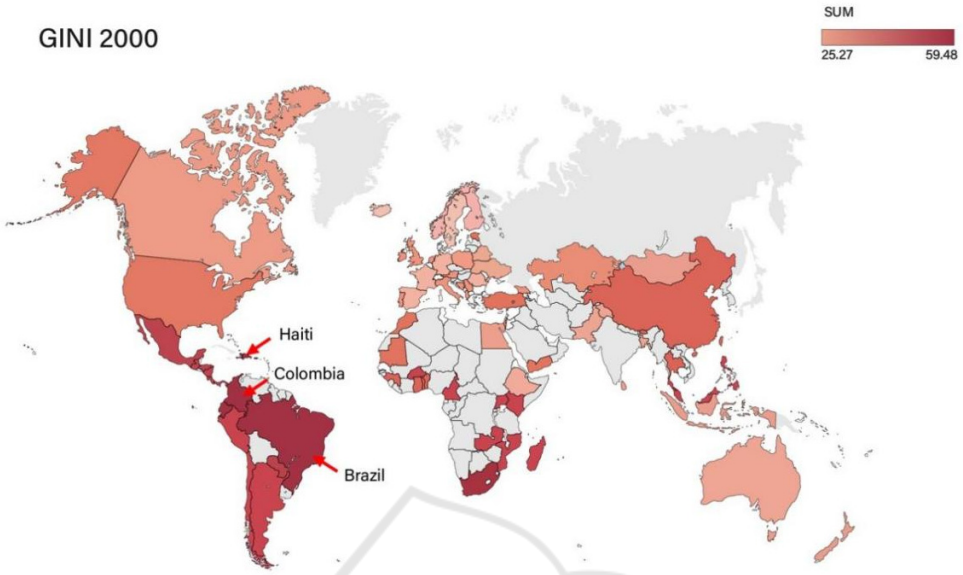

Figure 3: Gini Index in 2000.

To explore income inequality, Gini coefficient was adopted to indicates the inequality level. In figure 3, the darker red illustrates the higher Gini index. In 2000, Gini index in the southern hemisphere is generally higher than that in the northern hemisphere, especially in South America, every country researched had a Gini of over 50. Brazil with Gini of 58.41 at that time, Colombia was 58.68 and so forth. The country with highest Gini was Haiti, with Gini of 59.48.

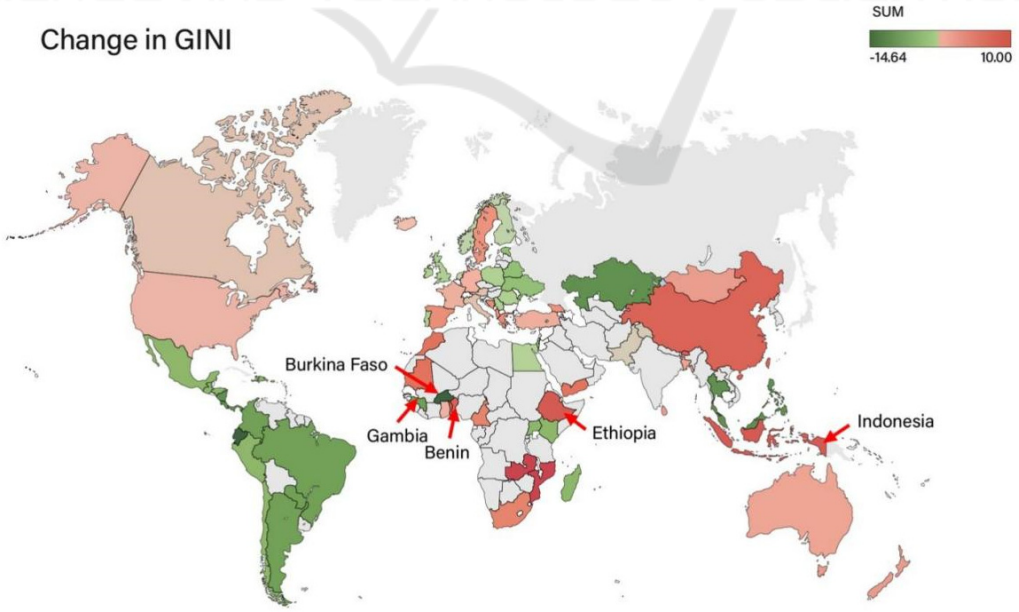

Figure 4: Change in Gini from 2000 to 2015.

During the period of 15 years, as shown in figure 4, the shade of the color represents the level of change

in globalization over the period from 2000 to 2015, green represents decreasing in Gini and red represents increasing. Overall, the average Gini decreased by 1.49 and 50 out of 83 countries had falling inequality. It is worth mentioning that Gini of countries in South America all decreased and there are some outliers: Burkina Faso -14.64, Gambia -12.60, Indonesia +10.00, Benin +9.18, Ethiopia +9.09.

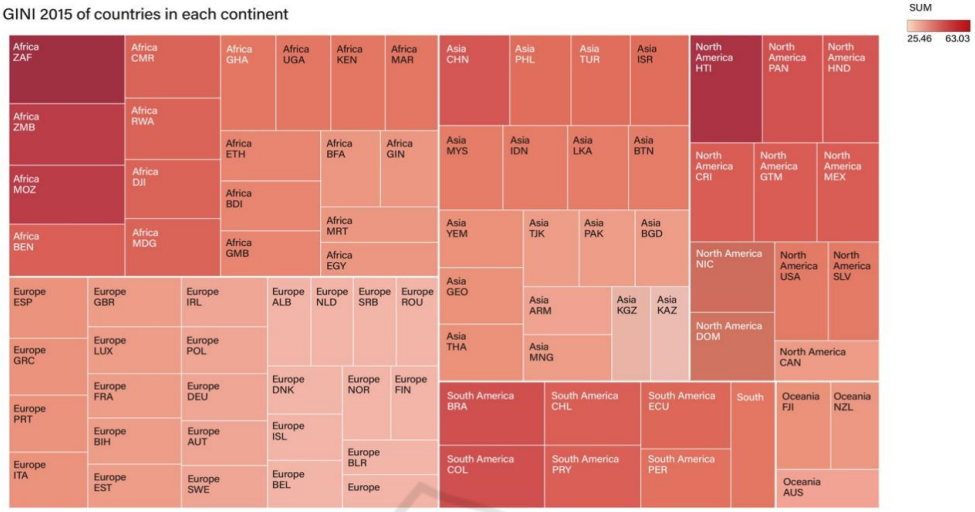

Figure 5: Gini index in 2015 of countries in each continent.

Figure 5 shows countries (country code) in different continents, with their Gini coefficient in 2015. Overall, European countries have the lowest Gini coefficient. Some countries in southern Africa had very high Gini coefficients, such as South Africa, Zambia. Despite the decreasing trends, countries in South America still had relatively high Gini coefficients.

3.3 Effects of Globalization

To explore the effects of globalization on countries with different levels of development. Countries selected are divided into three groups, rich, middling and poor, based on their Human Development Index.

3.3.1 Effects of Globalization on Average GDP

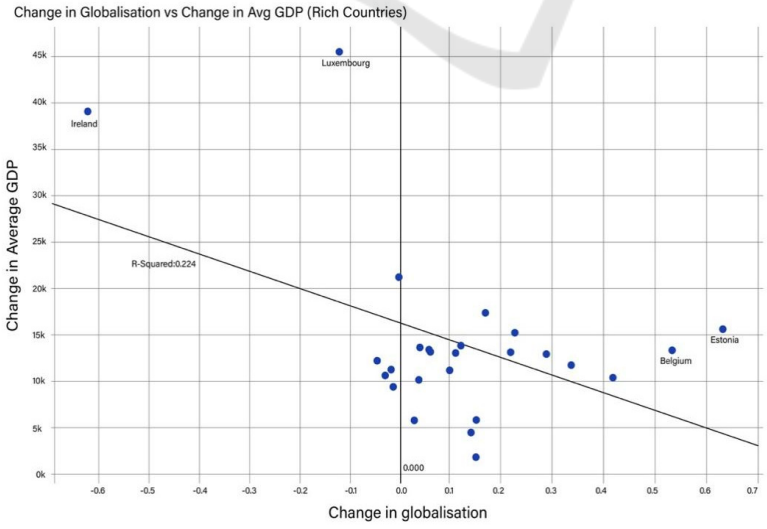

Figure 6: Rich Countries.

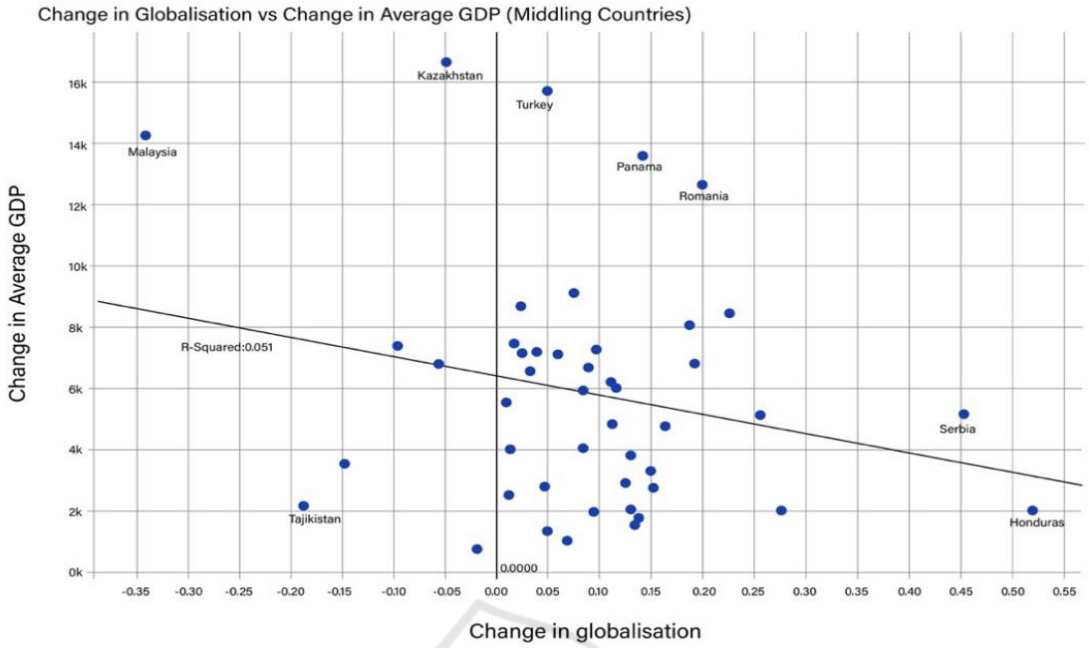

Figure 7: Middling Countries.

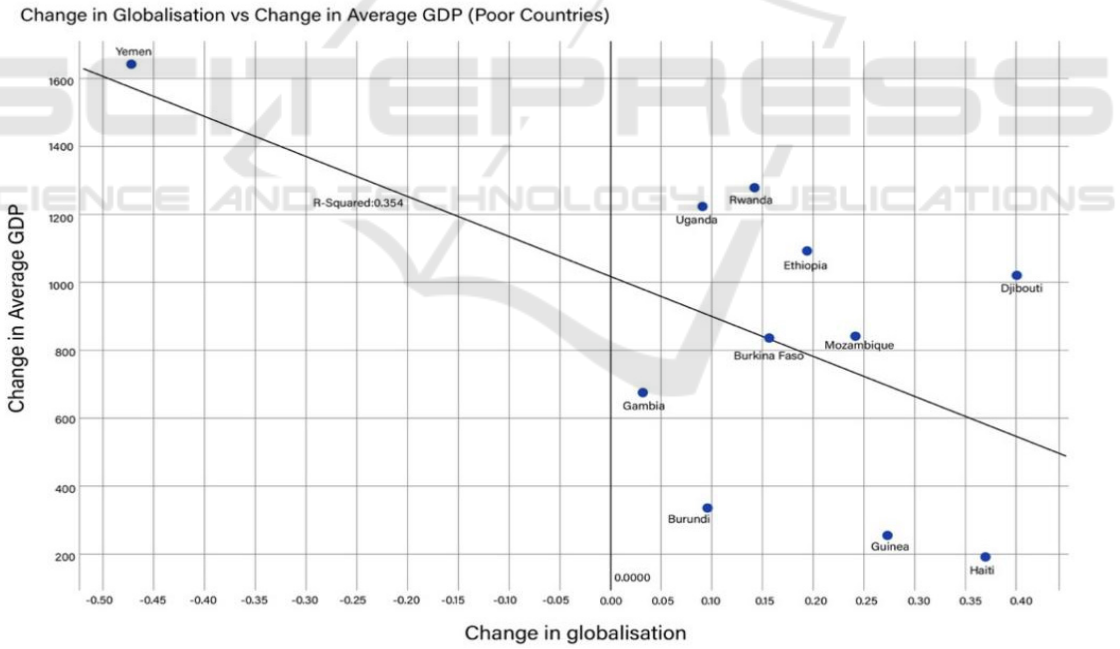

Figure 8: Poor Countries.

For rich countries (figure 6), the trend line shows a negative slope, that indicates a rise in globalization may lead to a smaller rise in average GDP for these rich countries. There are some outliers, for example, globalization in Luxembourg slightly decreased, but its average GDP increased quite a lot. This illustrates there are many other factors affecting average GDP that need to be considered. For middling countries (figure 7), the trend line also shows a negative slope with an even lower R-Squared value. For poor countries (figure 8), the trend line shows a negative slope as well.

3.3.2 Effects of Globalization on Inequality

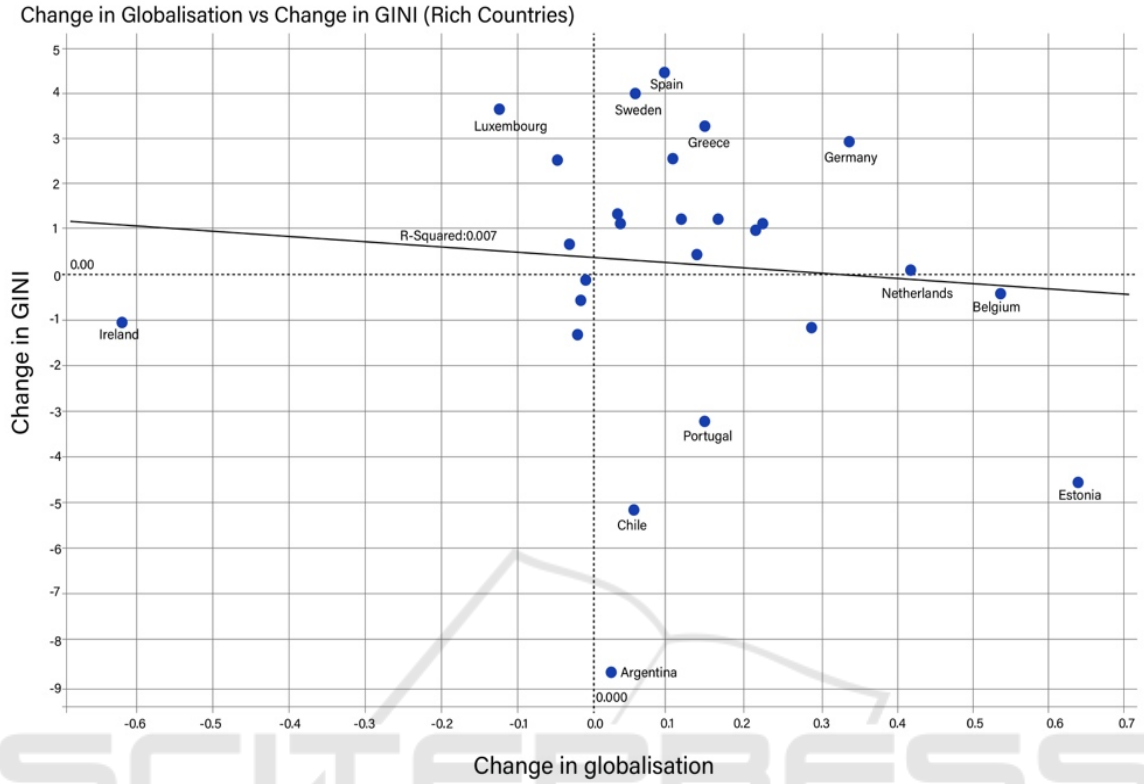

Figure 9: Rich Countries.

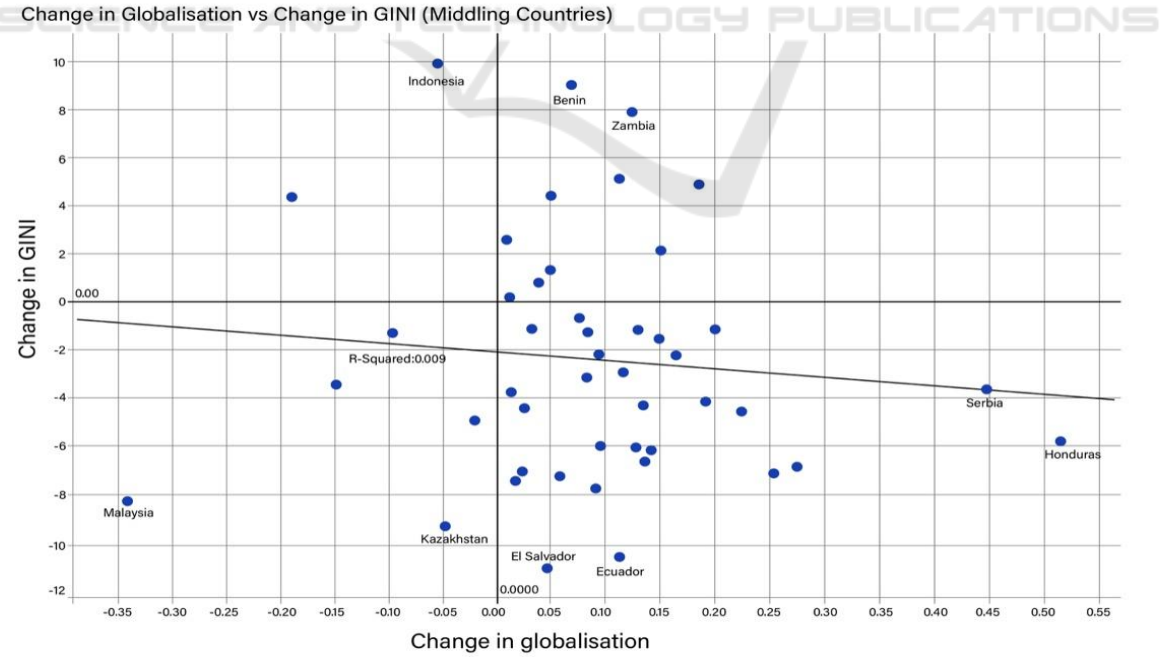

Figure 10: Middling Countries.

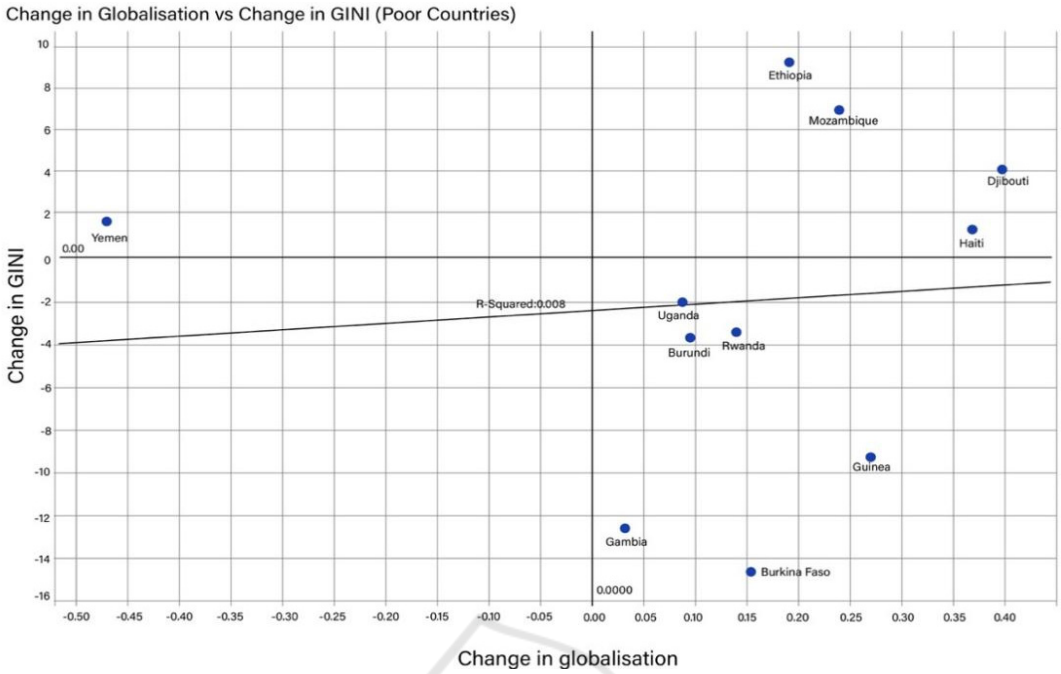

Figure 11: Poor Countries.

For rich countries (figure 9), the Gini coefficient of 16 out of 26 countries increased. The trend line shows a slightly negative slope, that indicates a rise in globalization may lead to a fall in inequality for these rich countries. There are some outliers, for example, as discussed previously, globalization in Ireland decreased a lot, but the Gini coefficient also decreased. For middling countries (figure 10), the Gini coefficient of 34 out of 46 countries decreased. The trend line also shows a negative slope. For poor countries (figure 11), the Gini coefficient of 5 countries increased and the other 6 countries decreased. The trend line shows a positive slope, that indicates a rise in globalization may lead to a rise in inequality for these poor countries. It is worth mentioning that the R-squared values in all three cases are small, that means change in globalization is not explaining that much in the variation of change in Gini and this will be discussed in later part.

4 MODEL BUILDING

4.1 Data Analysis

4.1.1 Modeling and Research Methods

In order to study the impact of the degree of globalization on the degree of inequality in different countries, we selected 83 countries which spread across all continents. The variable globalization is measured by adding import and export as a percentage of GDP. We use the Gini coefficient to measure the variable of inequality. And we add income and inflation as control variables in our model. We select the data of different indicators in 2000 and 2015 and get the change value of different indicators between 2000-2015 as variables. Table 1 gives an insight into the definitions and sources of all variables.

In order to better study the situation of countries with different levels of development, we divided the 83 sample countries into three categories: rich countries, middle countries and poor countries according to their HDI index.

So, the regression model in algebraic form is as follows:

$$INQ = \beta_0 + \beta_1 \Delta GL + \beta_0 \Delta Y + \beta_0 \Delta INF + \beta_0 (DUM = RICH)$$
$$+\beta_0 (DUM = MIDDLE) + \beta_0 (DUM = RICH) * \Delta GL$$
$$+\beta_0 (DUM = MIDDLE) * \Delta GL + \beta_0 (DUM = RICH) * \Delta Y$$
$$+\beta_0 (DUM = MIDDLE) * \Delta Y + \beta_0 (DUM = RICH) * \Delta INF$$
$$+\beta_0 (DUM = MIDDLE) * \Delta INF + \varepsilon$$

The dataset studied in this project consists of 83 observations and 9 variables as follows:

Table 1. Data dictionary.

Variable	Notation	Measurement	Data source
Income inequality	INQ	Gini coefficient	WDI,World Bank
Globalization	GL	|Share of import|+Share of export	www.ggdc.net/pwt
Income	Y	Ln(GDP per capita)	www.ggdc.net/pwt
Inflation	INF	GDP deflator: linked series (annual %)	WDI,World Bank
Three categories	Divides all countries into three categories (rich; middle; poor) depend on HDI index. Rich countries: HDI＞0.826 Median countries: HDI ≥ 0.5 Poor countries: HDI < 0.5		

4.1.2 Result Analysis

Table 2. Estimation Results.

	Model without DUM	Model with DUM		
	All countries	Rich countries	Middle countries	Poor countries
constant	-4.34 (4.53)	2.55 (24.07).	13.17 (19.82)**	-39.41 (17.80)*
△GL	-0.36 (3.11)	-1.56 (13.39)*	-5.9162 (13.77)*	25.72 (12.66)*
△Y	0.34 (0.52)	-0.25 (3.06).	-1.80 (2.74)*	4.98 (2.54).
△INF	0.001 (0.03)	-0.22 (0.36)*	-0.02 (0.32).	0.52 (0.32)
R-Squared	0.006	0.18		
Countries	83	26	46	11

Note: The standard error of each coefficient is in brackets; the number above the brackets is the coefficienof the independent variable.

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

By comparing the second and last three columns of the table2, after adding dummy variable and intersection, the significance of the variables have been greatly improved, and our model fit better.

It is interesting to observe that the coefficient of GL index, indicator for change in globalization, is negative in all countries model, and in rich countries and middle countries, but positive in poor countries. The GL index is significant in each country. This result shows that the impact of the degree of globalization on the degree of inequality varies among countries with different development levels. The increase of globalization will cause the inequality of poor countries to increase, but it will also cause the inequality of rich countries and middle countries to decrease.

Another interesting result to observe is the same trends of the impact of change in capita GDP and change in inflation on the change in inequality. For poor countries, per capita GDP and inflation are in the same direction as inequality. For rich countries and middle countries, per capita GDP and inflation and inequality change in the opposite direction.

4.2 Model Check

4.2.1 Regression Diagnostics

In model building we have chosen linear regression model to estimate the relationship between change in gini index which interprets the change in inequality (△INQ) and other variables, in the model of linear regression, checking whether it conforms to the GaussMarkov assumptions is the preference.

In the early stage of building the model, we use the summary function to repeatedly filter out three explanatory variables which are change in

globalization (GL), change in income (Y) and change in inflation (INF). And we decided to add dummy variables in order to divide rich, middle and poor countries and interaction transformations. From checking the standardized residual plot, Obviously, the Residuals vs Fitted plot (Figure.12) are basically independent of the predicted values, this shows that the linear hypothesis is rational. For checking the normal distribution of errors, by looking through the Q-Q plot (Figure.13) and histogram (Figure.14), we can easily find that, most of observations are landed close to the straight line except #53 and #80. Even more clear in the histogram of Distribution of Errors, the Normal Curve is almost coincided with the standard normality curve - Kernel Density Curve. Therefore, the assumption of normality is proved.

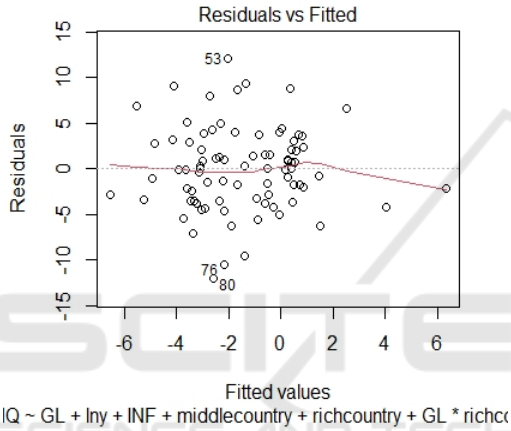

Figure 12: Residuals vs Fitted plot.

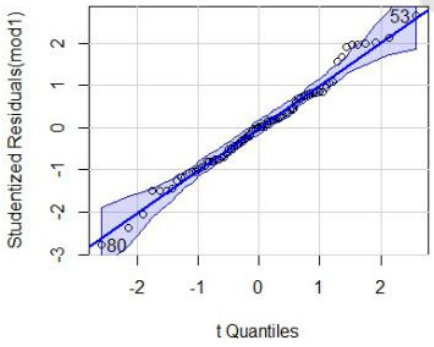

Figure 13: Q-Q plot

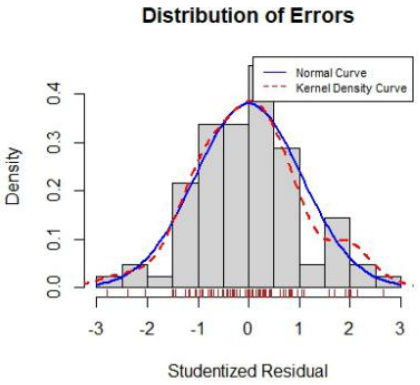

Figure 14: Histogram of Distribution of Errors.

Because of each data point is one unique country in the world, the assumption of independence of errors is reasonable. From observation of Scale - Location plot (Figure.15) in order to check the homoscedasticity assumption, the points are not distributed around the horizontal line smoothly concentrated in the middle to the left, this indicates mild heteroskedasticity.

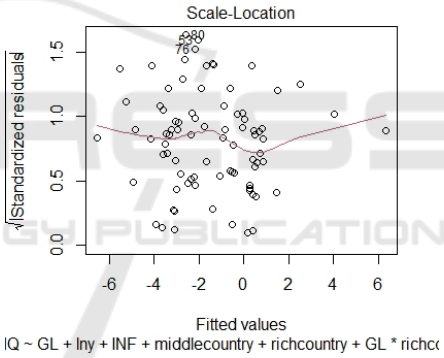

Figure 15 Scale-Location plot.

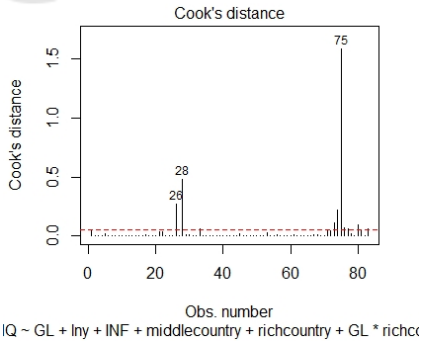

Figure 16: Cook's distance.

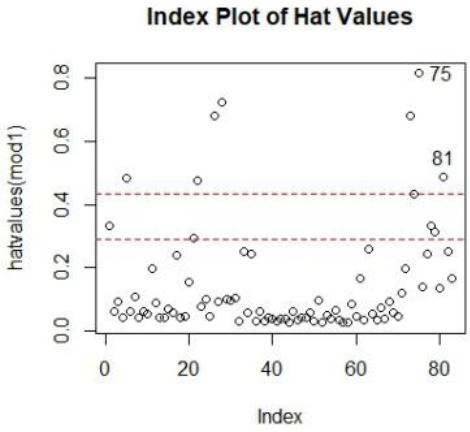

Figure 17: Index Plot of Hat Values.

4.2.2 Outlier Analysis

And Cook's distance plot (Figure.16) and Index Plot of Hat Values plot (Figure.17) show #75 data observation which is Yemen (poor countries) has the largest cook's distance and hat values, there is a big rise in Yemen's inflation rate from 2000 to 2015 (22.924), it has the highest inflation rate among Arab countries. According to common sense, inflation is mostly caused by economic development, but Yemen's economic development is so backward that even food can not meet national needs. According to the statistics, the Yemen's government faced deficit valued about 10 billion dollars. Since inflation will lead to changes in income inequality to a great extent, we may overestimate the impact of globalization on income inequality.

From Q-Q plot (Figure.13) and the Scale-Location plot (Figure.15), #80 which is Burkina Faso, one of the least developed countries in the world and a major exporter of migrant workers from neighboring African countries. Economically, the country is based on agriculture and animal husbandry, accounting for nearly 80% of the country's labor force. The country is short of resources and is located on the edge of the desert with less arable land, we can easily see the change of income inequality is the highest among all the countries. Additionally, the education in Burkina Faso is very weak, the literacy rate is only 36%, as a result, the gap between the skilled and unskilled labor is wide, this might be a reason why income inequality is such serious. Furthermore, the neonatal mortality rate is 60.9%, and the poor with a daily income of less than US $1.9 account for 47.3% of the national population. This may possibly cause overestimation the impact of globalization on inequality.

However, we chose to keep the outliers. Firstly, we are exploring the influence of globalization on income inequality globally, each country is one unique part in the globe. Moreover, the model after deleting outliers, some explanatory variables are not significant. The model with all the countries can better reflect the objective situation.

5 DISCUSSION

5.1 Key Findings

We find out that globalization indeed has varied impacts on the current level of inequality around the world. But these impacts vary from different countries: the growth in the current globalization level will reduce the inequality degree in rich and middle countries and rise the inequality degree in poor countries. For poor countries, rise in per capita GDP and inflation will causes increasing in inequality. For rich countries and middle countries, rise in per capita GDP and inflation will lead to decreasing in inequality.

5.2 Theoretical and Empirical Implications

Our research provides some useful findings for those curious about the relationship between globalization and inequality and allows people to make in-depth research on this basis. It also reveals the limitations of some indicators, such as GINI index.

And by studying the relationship between globalization and inequality, a more powerful, accurate and scientific basis for the government's macro decision-making could be provided. The government may be able to formulate policies based on national conditions. This would be one of the empirical implications.

5.3 Limitation

The obvious one would be the insufficient data size, in other words, only 87 countries were selected due to the incomplete data and limited time, but there are totally 197 countries in the world. Another would be, there are some missing values in data set, for example, it's hard to find all the type of data in all countries such as HDI in small poor countries.

Also, Gini index shortcoming is one of the limitations, they do not consider, for example, whether income inequality changes because of the rich becoming richer, the poor becoming poorer (or

both).

Some other limitations could be that it might be necessary to explore non-linear relationships between globalization and income inequality; and there could be other measures for income inequality. As well as we might try other ways of grouping, such as 'divided countries by continent'.

6 CONCLUSIONS

In conclusion, this study has evaluated how globalization has contributed to inequality changes in 83 countries from 2000 to 2015. The results show that globalization indeed has varied impacts on the current level of inequality around the world. The growth in the current globalization level will reduce the inequality degree in rich/middle countries but rise the inequality degree in poor countries. We also find that there exists uneven impact of globalization on the inequality of rich countries and middle/poor countries. For middle/poor countries, this impact is even stronger.

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