The Relationship Between Annual GDP Growth and Income Inequality: Developed and Undeveloped Countries

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Abstract

The hypothesis is that there exists a linear relationship between income inequality and annual GDP growth rate. When the GDP growth rate decreases, the income inequality also decreases. The researchers measured this across two major categories of countries: the developed and the undeveloped countries to see if there exists an optimal range of GDP growth that results in the lowest level of income inequality.

I. Introduction

Income inequality has been a hot topic recently, especially raising to concerns after the great recession. It seems to many that the rich are getting more affluent, while the vast majority are left behind. According to New York Times, there are many reasons why income inequality can negatively impact societies. When the economic gaps become too great, it can give wealthier people an unacceptable degree of control over other people's lives. In the most extreme of cases, this can create an aristocratic society, where money equates to power, undermining the roles of the government. Another problem with inequality is a less stable political structure. According to a research paper from Harvard University, "income inequality increases social-political stability which in turn decreases investment" (Alesina and Perotti, 1996). Due to globalization, political stability in one country can in turn affect the economic growths and national securities of many other countries as well.

There are many currently existing indexes that can be used as a rough approximation of a country's political stability based on income gaps. Since GDP growth is easier to control than income inequality, this research paper could serve as an understanding of what countries should expect to happen based on projected GDP growth rates, and perhaps aim for a GDP growth zone that is most optimal at increasing stability. The researchers will not only be studying the impact of economic growth but also what happens to income inequality during recessions.

The researchers believe there will be some trade offs between economic growth and income inequality. If the economic growth is slow or not existing, people may become less optimistic towards their future and their government; however, extreme growths may lead to unacceptable gaps in income inequality. The researchers believe that there exists ranges, for the developed, developing, and underdeveloped countries, where the income inequality is clearly the lowest at a certain GDP growth rate.

II. Literature Review

Admittedly, there exists extensive literature on the relationship between income inequality and economic growth. The famous one is probably the Kuznets Curve. Simon (1955), the creator of the Kuznets Curve, based his assumptions on the data for the United States, England, and Germany. From his data, he was able to see this trend that the relationship between economy and income inequality is similar to a U-shape graph. When the nation's economy is in its early stage, the income inequality will be higher as the economy grows, and when the economy reaches its final stage, the income inequality will be lower as the economy grows. He admitted that the date he used measured the household incomes before income taxes and contributions from the government, although he recognized 'the distribution of income after direct taxes and including free contributions by government would show an even greater narrowing of inequality in developed countries with size distributions of pre tax, ex-government-benefits income similar to those for the United States and the United Kingdom.' He noticed that 'stability or reduction in the inequality of the percentage shared was accompanied by significant rises in real income per capita.' Therefore, after careful scrutiny on his data, Kuznets thought that the major offset to income inequality was the transformation of a country from agriculture and countryside to industry and cities, because the lower-income group in the cities would get more opportunities to earn their lives when the cities were growing. However, Kuznets suggested that widening inequality would happen in early phases of economic growth, 'especially in the older countries where the emergence of the new industrial system had shattering effects on long-established pre-industrial economic and social institutions,' which is the transformation of the country from pre-industrial to industrial. That is why the income structure is more unequal in underdeveloped countries than the more advanced.

If Kuznets was focusing on whether the economic growth will lead to the income inequality, then Inyong Shin (2012) in his paper establishes on the effect of inequality on economic growth. Existing literatures find either a positive or negative relationship, but Shin (2012) finds both to be true. His findings suggests that is a higher income inequality will cause different economic growth rate during different phases of the country. If the country is near the early stage of development, then a higher inequality can retard the economic growth of this particular country. On the opposite, if the country has a robust economy and is considered to be more advanced, the higher income inequality can encourage more growth in the economy. This coincides with Barro's conclusions which we will discuss later. Shin also calculated the 'optimal time paths of economic variables using a heterogeneous model including a progressive tax system.' He showed that 'the income redistribution by high income tax does not always reduce income inequality. Income inequality can be reduced by higher income tax near a steady state, but it cannot be reduced in an early stage of economic development.'

Let's briefly talk about Barro (1991). Dr. Barro is from the Department of Economics in Harvard University. In his research, he finds that evidence shows little overall relation between income inequality and rates of growth and investment. He thinks that economic growth will fall with greater inequality when GDP per capita is below around $2000 (1985 US dollars) and to rise with inequality when GDP per capita is above $2000. The data he uses dated through 1995 is from the World Bank.

Another journal paper that is more related to what we are going to do is Jauch and Watzka (2016). They extend the existing literature by using a larger database covering a longer time horizon and more countries. Their sample consists of 138 countries with observations covering the years from 1960 to 2008. They measure financial development as private credit divided by GDP. They believe it is a good proxy for financial development, because the correlation between private credit over GDP and access to finance is high. Since gross income excludes all income from non private sources and net income includes all types of public transfers and deductions, they use both gross income and net income to measure income inequality so that the number reflects both the actual amount of an individual to spend on and also the individuals' earning entitlements on pensions and other social benefits. Their results suggest that economic theories predicting an income inequality reducing effect of financial development should be rejected.

This paper is unique in the way that it is exploring previously done research, but with all the major categories of countries in the world. We believe there will be differences between a developed country's statistics compared with that of an underdeveloped country. Therefore, after analyzing the global trend of how the economic growth of each country impacts on the individual income inequality, we are going to conduct the analysis on each category of countries separately and compare them with each other. This research is much more current and applicable to future trends in the upcoming years than previous researches, such as that from Barro. We also contribute to the literature by compiling a large amount of data for 134 countries, including their GDP growth in 2013, GDP per capita, political stability index and so on. We hope that through this large sample size, we are able to gain a more precise model that represents the characteristics of the world's economy in recent years, especially the model to predict the income inequality of a country by calculating its GINI index. Our model at the end should contain several independent variables that are essential to determine the country's GINI index. To achieve our model, we will use the Ordinary Least Squares (OLS) method. Then we will run several tests to confirm our model is accurate.

III. Data

The purpose of this study is to explore the effect of economic growth on income inequality. The most accepted measurement of economic growth worldwide is the GDP growth (*ggrowth*), so the idea is to have a measurement of GDP growth as the independent variable. Since different countries have different sizes of economy, measuring GDP growth in dollars will produce confusing results, as a 1% increase of a large economy might equal a 10% change of a small economy. Therefore, GDP growth in percentage is chosen to be the independent variable. Specifically, the GDP growth rate in percentage in 2013 of 134 countries is obtained. On the other hand, Gini index (*gini*) is used to measure the degree of income inequality in different countries. Gini index measures the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution. Its formula is as following: the numerator is the area between the Lorenz curve of the distribution and the uniform distribution line; the denominator is the area under the uniform distribution line. A value of 0 represents absolute equality, and a value of 100 represents absolute inequality. Out of the many ways possible to measure income inequality, Gini index stands out for several reasons. First, it is the most accessible and there are more sources available compared to other ways combined; second, most of the research papers that elaborate on income inequality which we include in the literature review use Gini index as its measurement of income inequality. Therefore in this paper we used Gini index to measure income inequality across the globe.

In the multiple linear regression model, we took into account the impacts of agriculture percentage (*agri*), GDP per capita (*ppp*), urban population percentage (*urb*), political stability (*pol*) and adult literacy rate (*lit*) on the income inequality of each country. All of the data were taken from the year of 2013, except the adult literacy rate which was taken from 2015.

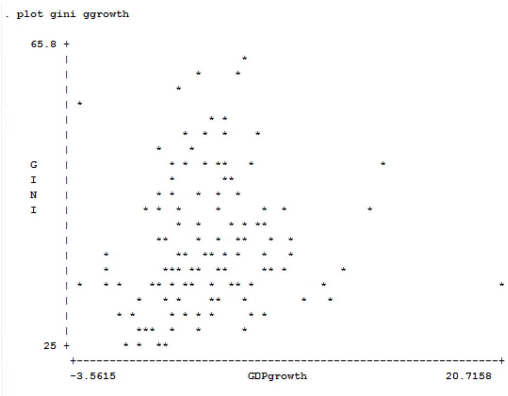
In particular, the agriculture percentage is the percentage of the agriculture sector in GDP. The data of agriculture percentage from the World Bank does not contain information of some countries, including Angola, Canada, Israel, Liberia and some others. We were able to find the data for some of these countries through their government websites. We did not include the data if we cannot find the specific number in percentage for 2013. The concept of GDP per capita itself is self-explanatory. However, it is noteworthy that we used both GDP per capita and GDP growth in our models to estimate the country's income inequality. This is because we believed that GDP growth and GDP per capita can tell the country's economy from different perspectives. In addition, we included urban population percentage, which is the ratio between the total population in an urban area and the total population of the entire country. We put political stability as a factor, because we were curious to see if political stability plays a role on determining the income inequality. This political stability index is given by the Worldwide Governance Indicators Project, which is a project under the World Bank. Its full name is given as 'Political Stability and Absence of Violence/Terrorism' and it captures 'perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.' (Kaufmann, Kraay and Mastruzzi, 2010) The index ranges approximately from -2.5 and 2.5, where -2.5 means the country has the highest risk of a overthrown government and 2.5 means the opposite. The index is essentially a measurement that is weighted over 30 data sources. The Appendix will include a list of these data sources.

After our presentation to the class, we realized the importance of the country's adult literacy rate may affect the income inequality. Therefore, we added this factor into our model. The data is measured in 2015 by the World Bank. Even though all of our other data are from 2013, we believe that the two-year period would not make the literacy rate increase or decrease a lot.

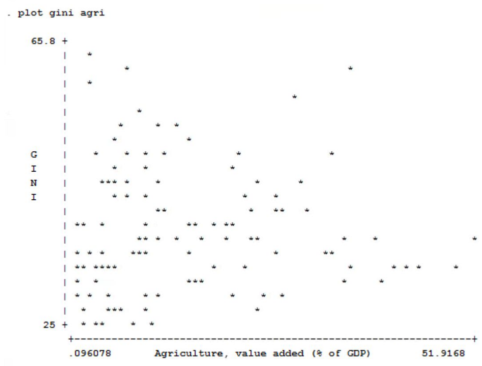
The GDP growth rate data is obtained from the World Bank database, and the Gini index is obtained from Human Development Reports, a United Nations Development Program. The other variables are all contained from the World Bank, except that the stability index is found under the Worldwide Governance Indicators Project, which is still monitored by the World Bank. For all the variables we have, the dataset contains 134 countries in 2013. Only data from year 2013 is used in this study mainly because the data on Gini index is not complete, and for many years there are only 20-40 countries released their Gini index information in the World Bank database. Year 2013 is the most recent year that we can find the most countries releasing their Gini index data; therefore the relationship between economic growth and income inequality is tested only using 2013 data. Out of the 134 counties available, Central African Republic and Sierra Leone were taken out because their GDP growth in 2013 is -36.7% and 20.7%, respectively. These two data points are considered outliers and will significantly interfere with the rest of the dataset and affect the results; therefore they were taken out. See Table 1 in the Appendix for a complete list of countries we used.

Through the literature review, it is found that the Gini index is related to GDP growth in some way; therefore, it is valid to assume first that Gini index and GDP growth rate have a linear relationship. We can also assume that the Gini index is in a multiple linear relationship with all the independent variables, because they are all related to the economy of the country. For the Random Sampling assumption, we took all countries that have Gini data in 2013, satisfying this assumption, because we did not hand-select a group of countries, but only took out two countries as outliers. The Sample Variation in the Explanatory Variable assumption is met simply by having different GDP growth in different countries. In addition we assume Zero Conditional Mean by assuming no other factor affecting Gini index. For Homoscedasticity, we assume for every country the variance for Gini index stay constant.

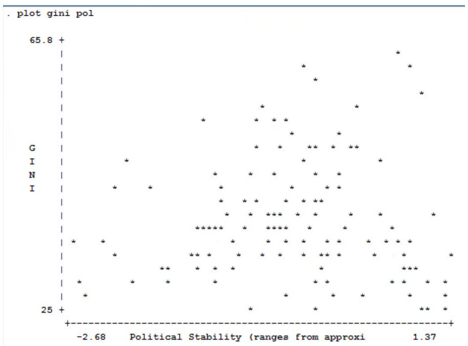
Here are some scatterplots between our dependent variable (Gini index) and the independent variables. Looking at each scatterplot, we found some linear relationship between each independent variable with our dependent variable. On the first scatter plot, it shows more of a quadratic relationship between Gini index and GDP growth rather than a linear relationship. On the second scatter plot, we saw a lower agriculture percentage will result in a lower Gini index, which means less income inequality. The later scatterplots are all unclear to show whether a linear relationship exists.

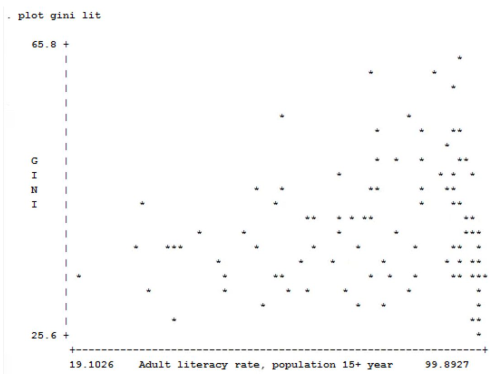


gini vs. ggrowth



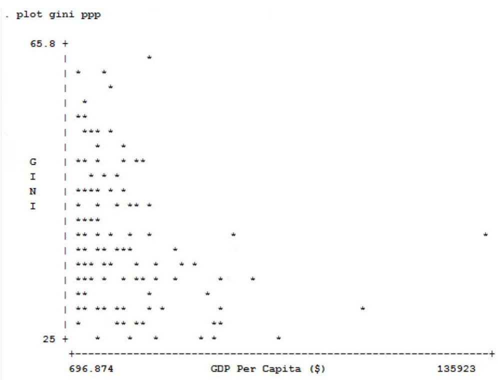
gini vs. agri

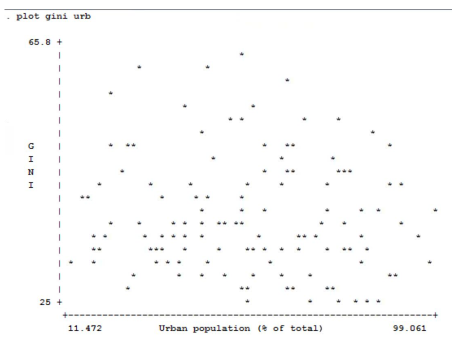




gini vs. pol

gini vs. lit





gini vs. ppp

gini vs. urb

IV. Results

a. Simple Regression Model

Our hypothesis is that as the country's GDP growth decreases, the country will have less income inequality. To test our hypothesis, we supposed that the Gini index is determined by the model

$$gini = \beta_0 + \beta_1 ggrowth + u.$$

Using our data, we were able to find the OLS regression line relating Gini index to GDP growth, which is

$$\hat{gini} = 38.65 + 0.39ggrowth,\ n = 132,\ R^2 = 0.02$$

where the intercept and slope estimates have been rounded to two decimal places. It is also shown in the Appendix (STATA Table 1).

To interpret the equation, first, if the GDP growth rate is zero, *ggrowth = 0*, then the predicted GINI index is the intercept, 38.65, which shows some income inequality but not extreme. Next, we wrote the predicted change in Gini index as a function of the change in *ggrowth*: $\Delta\hat{gini} = 0.39(\Delta ggrowth)$. This means that if the GDP growth rate increases by one percentage point, $(\Delta ggrowth) = 1$, then *gini* is predicted to change by about 0.39. Using the R-squared (rounded to two decimal places) reported for this equation, we saw how much of the variation in Gini index is actually explained by the GDP growth rate. The answer is: not much. The country's GDP growth only explains about 2% of the variation in Gini index for this sample of 132 countries. That means that 98% of the Gini index variations for these countries is left unexplained! This lack of explanatory power may not be too surprising because many other characteristics should influence Gini index, but this does reject our original hypothesis that there exists some linear relationship between income inequality and GDP growth.

After failing to estimate Gini index using GDP growth, we wondered if we could use GDP per capita to predict Gini index better, so our assumption is

gini = beta0 + beta1*ppp + u.

The STATA output is marked as STATA Table 2 in the Appendix. According to STATA, the estimators are

$$\hat{gini} = 42.27 - 0.0001ppp,\ n = 132,\ R^2 = 0.07$$

Here, if the GDP per capita is zero, then the Gini index is the intercept, which is 42.27, different than what we get from the regression between *gini* and *ggrowth*. Next, we wrote the predicted change in Gini index as a function of the change in *ppp*: $\Delta\hat{gini} = -0.0001(\Delta ppp)$. This means that if the GDP per capita increases by 1 US dollar, $(\Delta ggrowth) = 1$, then *gini* is predicted to decrease by about 0.0001. Using the R-squared (rounded to two decimal places) reported for this equation, we saw the country's GDP per capita explains about 7.3% of the variation in Gini index for this sample of 132 countries. This is better than what we got before, but the R-squared is still pretty low, so we wanted to use the multiple regression models to estimate a more precise Gini index.

b. Multiple Regression Model

Since from the simple regression model, we saw that GDP per capita was a better explanatory variable than GDP growth to predict Gini in a linearity, we only included GDP per capita in the following multiple regression model. We obtained the following OLS regression line to predict Gini index from GDP per capita and political stability (STATA Table 3):

$$\hat{gini} = 43.49 - 0.0002ppp + 1.88pol,\ n = 131,\ R^2 = 0.08$$

First, the intercept 43.49 is the predicted Gini index if *ppp* and *pol* are both set to be zero. Since no country has a zero GDP per capita, the intercept in this equation is not meaningful by itself. More interesting estimates are the slope coefficients on *ppp* and *pol*. As expected, there is a negative partial relationship between *ppp* and *gini*: Holding *pol* fixed, another US dollar on *ppp* is associated with .0002 decrease in Gini index. In other words, if we choose two countries, A and B, and these countries have the same political stability index, but country A has one dollar higher in its GDP per capita than Country B, then we would predict Country A to have a Gini index 0.0002 lower than Country B.

The sign on *pol* implies that, while holding *ppp* fixed, a change in the political stability index by 1 points – a very large change, since the maximum political stability index is 2.5 and the minimum is -2.5 – affects Gini index by 1.88 points. Later, we showed that the coefficient on *pol* is statistically insignificant.

The equation has its R-squared as 0.10. This means that *pol* and *ppp* together explain about 10% of the variation in Gini index for this sample of countries. This many not seem like a high percentage but we must remember that *ppp* explains about 7% of the variation in Gini index. That means political stability explains 3% of the variation in Gini index, which is not a lot, but still valid.

We had another multiple linear regression model that takes more independent variables into the equation, hoping that the coefficient will be more precise and the R-squared will be higher. That is:

$$gini = 48.91 - 0.0001ppp - 0.15agri - 0.06lit + 2.33pol + 0.04\ urb,\ n = 108,\ R^2 = 0.08$$

This model (STATA Table 4) has R-squared as 0.08, which is not very high, compared to our previous models which have less independent variables. Note that the sample size dropped from about 130 to 108. This is because the adult literacy rate lacks some data from various countries, bringing down the whole sample size. Together, *ppp*, *agri* and lit cause negative increase in *gini*, and two of them are reasonable, because if a country has a larger GDP per capita, this country must be more developed and therefore has a small income inequality; if a country has a higher literacy rate, then the country is more developed and hence has a small income inequality. However, the negative relation between *agri* and *gini* is interesting. It means that a country that has a large percentage of agriculture in its GDP will have less income inequality. This phenomenon could be explained by the Kuznets Curve, that a country that just starts to grow may have a small income inequality than a country that has developed for a period of time.

Then we looked at *pol* and *urb*, which are political stability and urban population percentage. They both have a positive relation with gini, and these are both reasonable. For a country that has a higher political stability index, it means that the country has a more stable government and policies, then it probably indicates that the country is more developed and therefore has a lower income inequality. For a country that has a higher urban population, the country should be developed as well, then it will probably have a lower income inequality.

Overall, the best model we had is the one with only *ppp* and *pol* as the independent variables, because it has the best R-squared. On top of that we chose to analyze one further question: do developed countries have a statistically significant different pattern in Gini index compared to that of developing and underdeveloped countries. A new binary (dummy) variable "*dev*" is added to the model. For all developed countries *dev* equals one, and for all other countries *dev* equals zero. In this case, undeveloped countries are the benchmark group.

The equation (STATA Table 5) is:

$$\hat{gini} = 43.12 - 0.0001ppp + 2.14pol - 6.94dev,\ n = 128,\ R^2 = 0.14$$

This equation implies that a developed country has a predicted Gini index 6.94 lower than an undeveloped country. Since developed countries have better social welfare, there will be less extremely poor people, which contributes to income equality and a lower Gini index.

c. Statistical Inference

Using either t-stat, p-values or confidence interval, we can find the statistical significance of each estimator. We chose to perform statistical inference on our best model, which is:

$$\hat{gini} = 43.49 - 0.0002ppp + 1.88pol,\ n = 131,\ R^2 = 0.08$$
$$(1.21) \quad (0.00005) \quad (1.04)$$

Firstly, using t-stat, write H_0: $ß_{ppp} = 0$ versus H_1: $ß_{ppp} \neq 0$. Since we have 129 degrees of freedom, we can use the standard normal critical values. The 5% critical value is 1.96, and the 1% critical value is 2.576. The t statistic for $ß_{ppp}$ is t = 0.0002/0.00005 = 4, and so *ppp* is statistically significant even at the 1% level. We also say that $ß_{ppp}$ is statistically greater than zero at the 1% significance level.

Secondly, using p-value, let's see if pol is statistically significant at 5%. The

$$\text{p-value} = P(|T| > 1.8) = 2P(T > 1.8) = 0.074,$$

where P(T > 1.8) is the area to the right of 1.96 in a t distribution with 129 degrees of freedom. This means we would observe an absolute value of the t statistic as large as 1.8 about 7.4 percent of the time. We would not reject the null at the 5% significance level.

We wondered if the coefficient of pol is at 10% significance level, so we run the same model using STATA at 10% significance level. The confidence interval for *pol* is from 0.148 to 3.606. Since zero is not in this interval, we rejected the null hypothesis at 10% significance level for *pol*.

For our model with binary variable dev, our equation is:

$$\hat{gini} = 43.12 - 0.0001ppp + 2.14pol - 6.94dev,\ n = 128,\ R^2 = 0.14$$

(1.20) (0.00006) (1.03) (2.86)

Similar to the previous model we analyzed, the 95% confidence interval of *pol* and *dev* does not contain 0, with means we can reject the null hypothesis of ß = 0 and accept the alternative hypothesis that ß ≠ 0. GDP per capita has a 95% confidence interval that contains 0, which means it is not significant at 95%; however, its t-value is -1.77, given that the critical value for 90% at this degree of freedom is 1.645, this parameter is significant at 90%.

d. Robustness Tests

First we wanted to use the F-test to justify deleting three variables: *agri*, *lit* and *urb* by showing that the chance that all three coefficient equal 0 is quite large. For the F test, the unrestricted model is:

$$gini = 48.91 - 0.0001ppp - 0.15agri - 0.06lit + 2.33pol + 0.04\ urb$$

and our restricted model is:

$$\hat{gini} = 43.49 - 0.0002ppp + 1.88pol$$

Our null hypothesis is that H_0: $ß_{agri} = 0$, $ß_{lit} = 0$ and $ß_{urb} = 0$, and our alternative hypothesis H_1 is that at least one of $ß_{agri}$, $ß_{lit}$ and $ß_{urb}$ is not zero.

We saw from STATA Table 6 that the F statistics for urban and agri is 1.14, and the p-value for this test is 0.34. It shows that the chance of observing a value of F as large as we did when $ß_{agri} = 0$, $ß_{lit} = 0$ and $ß_{urb} = 0$ is 34%. This is a rather weak evidence against H_0, thus this justifies the decision to remove *urb*, *lit* and *agri* from our unrestricted model.

Then we wanted to use the F-test to test the overall significance of our restricted model. In this case, we use $\hat{gini} = 43.49 - 0.0002ppp + 1.88pol$ as our unrestricted model and $\hat{gini} = ß + u$ as our restricted model. Our null hypothesis is that H_0: $ß_{ppp} = 0$ and $ß_{pol} = 0$, and our alternative hypothesis H_1 is that at least one of $ß_{ppp}$ and $ß_{pol}$ is not zero. STATA Table 7 is our result.

The F statistics for this test is 6.86, and the probability of getting a F value as large as this one when $ß_{ppp} = 0$ and $ß_{pol} = 0$ is 0.0015, which is very small. This is a strong indication that we should reject the null hypothesis and accept the alternative hypothesis. It also shows that our model is statistically significant.

V. Conclusions

The original question we had was the effect of economic growth on income inequality, and from this question we used the GDP growth rate vs Gini index model. The first conclusion we got from earlier analysis is that Gini index is not a result of GDP growth, but more of a result of GDP per capita (PPP). By analysing several models we conclude that PPP is the most significant independent variable that affects Gini index, the higher the PPP, the lower the Gini index. This answers our original question: the more economically developed a country is, the less income inequality it should have. Better social welfare, higher minimum wage and many other factors can lead to this relationship.

The second part we computed more models with more independent variables, literacy rate, urban population percentage, agriculture percentage of GDP, political stability, and one binary variable which is development. Using different criteria such as t-test, p-value and F-test, we reached same conclusion: GDP per capita, political stability is the most significant variables, along with development. If a country is more politically stable, its predicted Gini index will also be higher. This could happen because political stability creates an environment where wealthy people can easily run their business and accumulate their wealth. Compared to GDP per capita which reduces income inequality on the poor end, political stability increases income inequality on the wealthy end. At the same time, agriculture percentage, literacy rate and urban population percentage are irrelevant factor that do not show significant impact on income inequality. Also based on our analysis, even though political stability is a significant factor, it is usually significant at 90% but not 95%, which indicates that we are less certain about its impact on income inequality compared to GDP per capita. Our final model is:

$$\hat{gini} = 43.12 - 0.0001ppp + 2.14pol - 6.94dev,\ n = 128,\ R^2 = 0.14$$

Another important conclusion is that, income inequality is very hard to predict using just few variables. Even though we found two significant independent variables, the R-square for all our models are quite small, sometimes less than 0.1. This indicates that these two variables alone do not explain the pattern of income inequality well enough, and there should be more underlying significant factors that either our research did not include or are hard to quantify, such as cultural impact.

References

Alesina, Alberto, and Roberto Perotti. 1996. Income distribution, political stability, and investment. European Economic Review 40(6): 1203-1228.

Barro, Robert J. "Economic growth in a cross section of countries." *The quarterly journal of economics* 106.2 (1991): 407-443.

Jauch, Sebastian, and Sebastian Watzka. "Financial development and income inequality: a panel data approach." *Empirical Economics* 51.1 (2016): 291-314.

Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682130

Kuznets, Simon. "Economic Growth and Income Inequality." *The American Economic Review*, vol. 45, no. 1, 1955, pp. 1–28., www.jstor.org/stable/1811581.

Shin, Inyong. "Income inequality and economic growth." *Economic Modelling*29.5 (2012): 2049-2057.

Appendix

Table 1: List of All Countries in This Study

Afghanistan	Bulgaria	Djibouti	Guinea	Kyrgyz Republic	Mongolia	Poland	Suriname	Venezuela, RB
Albania	Burkina Faso	Dominican Republic	Guinea-Bissau	Lao PDR	Montenegro	Qatar	Swaziland	Vietnam
Angola	Burundi	Ecuador	Haiti	Latvia	Morocco	Romania	Sweden	Yemen, Rep.
Argentina	Cambodia	Egypt, Arab Rep.	Honduras	Lesotho	Mozambique	Russian Federation	Switzerland	Zambia
Armenia	Cameroon	El Salvador	Hungary	Liberia	Namibia	Rwanda	Syrian Arab Republic	
Austria	Canada	Estonia	India	Lithuania	Nepal	Sao Tome and Principe	Tajikistan	
Azerbaijan	Chad	Ethiopia	Indonesia	Luxembourg	Netherlands	Senegal	Tanzania	
Bangladesh	Chile	Fiji	Iran, Islamic Rep.	Madagascar	Nicaragua	Serbia	Thailand	
Belarus	China	Finland	Iraq	Malawi	Niger	Seychelles	Togo	
Belgium	Colombia	Gabon	Ireland	Malaysia	Nigeria	Slovak Republic	Tunisia	
Belize	Comoros	Gambia, The	Israel	Maldives	Norway	Slovenia	Turkey	
Benin	Congo, Dem. Rep.	Georgia	Italy	Mali	Pakistan	South Africa	Uganda	
Bhutan	Congo, Rep.	Germany	Jamaica	Mauritania	Panama	South Sudan	Ukraine	
Bolivia	Costa Rica	Ghana	Jordan	Mexico	Paraguay	Spain	United Kingdom	
Bosnia and Herzegovina	Cote d'Ivoire	Greece	Kazakhstan	Micronesia, Fed. Sts.	Peru	Sri Lanka	United States	
Brazil	Croatia	Guatemala	Kenya	Moldova	Philippines	Sudan	Uruguay	

Table 2: Sources of the Political Stability Index

Data Sources Used in 2015 Update of Worldwide Governance Indicators

Code	Source	Type*	Public	Country Coverage	Represe -ntative	1996	1998	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ADB	African Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	54			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
AFR	Afrobarometer	Survey	Yes	22				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ASD	Asian Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	28				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
BPS	Business Enterprise Environment Survey	Survey	Yes	30				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
BTI	Bertelsmann Transformation Index	Expert (NGO)	Yes	129					x	x	x	x	x	x	x	x	x	x	x	x	x	x
CCR	Freedom House Countries at the Crossroads	Expert (NGO)	Yes	69							x	x	x	x	x	x	x	x	x	x		
EBR	European Bank for Reconstruction and Development Transition Report	Expert (GOV)	Yes	33		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
EIU	Economist Intelligence Unit Riskwire & Democracy Index	Expert (CBIP)	Yes	183	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
FRH	Freedom House	Expert (NGO)	Yes	198	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GCB	Transparency International Global Corruption Barometer Survey	Survey	Yes	115					x	x	x	x	x	x	x	x	x	x	x	x	x	x
GCS	World Economic Forum Global Competitiveness Report	Survey	Yes	144	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GII	Global Integrity Index	Expert (NGO)	Yes	62						x	x	x	x	x	x	x	x	x	x	x	x	x
GWP	Gallup World Poll	Survey	Yes	161	Y								x	x	x	x	x	x	x	x	x	x
HER	Heritage Foundation Index of Economic Freedom	Expert (NGO)	Yes	183	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
HUM	Cingranelli Richards Human Rights Database and Political Terror Scale	Expert (GOV)	Yes	194	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IFD	IFAD Rural Sector Performance Assessments	Expert (GOV)	Yes	98							x	x	x	x	x	x	x	x	x	x	x	x
IJT	iJET Country Security Risk Ratings	Expert (CBIP)	Yes	197	Y						x	x	x	x	x	x	x	x	x	x	x	x
IPD	Institutional Profiles Database	Expert (GOV)	Yes	143	Y								x	x	x	x	x	x	x	x	x	x
IRP	IREEP African Electoral Index	Expert (NGO)	Yes	54				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
LBO	Latinobarometro	Survey	Yes	18		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MSI	International Research and Exchanges Board Media Sustainability Index	Expert (NGO)	Yes	71					x	x	x	x	x	x	x	x	x	x	x	x	x	x
OBI	International Budget Project Open Budget Index	Expert (NGO)	Yes	100								x	x	x	x	x	x	x	x	x	x	x
PIA	World Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	136		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PRC	Political Economic Risk Consultancy Corruption in Asia Survey	Survey	Yes	17			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PRS	Political Risk Services International Country Risk Guide	Expert (CBIP)	Yes	140	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RSF	Reporters Without Borders Press Freedom Index	Expert (NGO)	Yes	177	Y				x	x	x	x	x	x	x	x	x	x	x	x	x	x
TPR	US State Department Trafficking in People report	Expert (GOV)	Yes	185	Y			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VAB	Vanderbilt University Americas Barometer	Survey	Yes	26							x	x	x	x	x	x	x	x	x	x	x	x
WCY	Institute for Management and Development World Competitiveness Yearbook	Survey	Yes	59		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
WJP	World Justice Project Rule of Law Index	Expert (NGO)/Survey	Yes	97														x	x	x	x	x
WMO	Global Insight Business Conditions and Risk Indicators	Expert (CBIP)	Yes	203	Y	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*Types of Expert Assessments: CBIP -- Commercial Business Information Provider, GOV -- Public Sector Data Provider, NGO -- Nongovernmental Organization Data Provider

STATA Table 1

Source	SS	df	MS			
				Number of obs	=	133
				F(1, 131)	=	2.71
Model	225.982019	1	225.982019	Prob > F	=	0.1024
Residual	10943.6026	131	83.5389512	R-squared	=	0.0202
				Adj R-squared	=	0.0128
Total	11169.5846	132	84.6180654	Root MSE	=	9.14

gini	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ggrowth	.3911046	.2377938	1.64	0.102	-.0793082	.8615175
_cons	38.64753	1.252223	30.86	0.000	36.17033	41.12473

STATA Table 2

Source	SS	df	MS			
				Number of obs	=	133
				F(1, 131)	=	10.38
Model	819.979491	1	819.979491	Prob > F	=	0.0016
Residual	10349.6051	131	79.0046194	R-squared	=	0.0734
				Adj R-squared	=	0.0663
Total	11169.5846	132	84.6180654	Root MSE	=	8.8885

gini	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ppp	-.0001321	.000041	-3.22	0.002	-.0002132	-.000051
_cons	42.27357	.9958101	42.45	0.000	40.30362	44.24352

STATA Table 3

Source	SS	df	MS			
				Number of obs	=	132
				F(2, 129)	=	6.86
Model	1071.41628	2	535.708142	Prob > F	=	0.0015
Residual	10072.3922	129	78.0805601	R-squared	=	0.0961
				Adj R-squared	=	0.0821
Total	11143.8085	131	85.0672407	Root MSE	=	8.8363

gini	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ppp	-.0001829	.0000496	-3.69	0.000	-.0002811	-.0000847
pol	1.877128	1.043644	1.80	0.074	-.1877471	3.942002
_cons	43.48661	1.212144	35.88	0.000	41.08835	45.88486

STATA Table 4

Source	SS	df	MS			
				Number of obs	=	109
				F(5, 103)	=	1.72
Model	666.912509	5	133.382502	Prob > F	=	0.1377
Residual	8009.41851	103	77.7613448	R-squared	=	0.0769
				Adj R-squared	=	0.0321
Total	8676.33102	108	80.3363984	Root MSE	=	8.8182

gini	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ppp	-.0001466	.0000734	-2.00	0.048	-.0002921	-1.01e-06
agri	-.1513262	.1140466	-1.33	0.187	-.3775108	.0748585
lit	-.0590964	.064968	-0.91	0.365	-.1879451	.0697523
pol	2.3272	1.257417	1.85	0.067	-.1665905	4.820991
urb	.0373388	.0606716	0.62	0.540	-.082989	.1576666
_cons	48.91028	7.431231	6.58	0.000	34.17218	63.64837

STATA Table 5

```
. regress gini ppp politicalstability dev
```

Source	SS	df	MS			
				Number of obs	=	129
				F(3, 125)	=	6.57
Model	1464.3836	3	488.127868	Prob > F	=	0.0004
Residual	9282.65276	125	74.2612221	R-squared	=	0.1363
				Adj R-squared	=	0.1155
Total	10747.0364	128	83.9612216	Root MSE	=	8.6175

gini	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ppp	-.0001031	.0000582	-1.77	0.079	-.0002182	.000012
politicalstability	2.14383	1.030113	2.08	0.039	.1051098	4.182551
dev	-6.936448	2.862924	-2.42	0.017	-12.60253	-1.270365
_cons	43.1174	1.196231	36.04	0.000	40.74991	45.48489

STATA Table 6

```
test agri lit urb

( 1)  agri = 0
( 2)  lit = 0
( 3)  urb = 0

      F(  3,   103) =    1.14
           Prob > F =    0.3378
```

STATA Table 7

```
. test ppp pol

 ( 1)  ppp = 0
 ( 2)  pol = 0

       F(  2,   129) =    6.86
            Prob > F =    0.0015
```