The Inequality and Growth Nexus: The Role of Institutions in Mitigating the Negative Effects of Income Inequality

By

Audun Gjerde

NEKP01: Master’s thesis in Economics

Lund University
School of Management and Economics

Supervisor: Milda Norkute
June 2019

Abstract

The link between income inequality and economic growth has been a popular topic in the empirical research literature in the past decades. Despite that, a consensus is yet to emerge. This paper analyzes the effect of income inequality on economic growth and the role of institutions in mitigating potentially negative effects using a panel of 48 countries in the time-period 1977-2009, including a mixture of developed and developing countries. Using a fixed effects panel data threshold model, I find evidence of an overall negative effect of income inequality on economic growth. In addition, I identify a threshold level of institutional quality, where the negative effects of income inequality are partially mitigated when institutional quality is above this threshold. Adjusting the trimming percentage of the threshold model provides further evidence of the overall negative effect of inequality while splitting the sample into developed and developing countries do not yield any significant results.

Keywords: Economic growth, income inequality, threshold model, panel data, institutional quality.

Contents

1. Introduction

> *"The form of law which I propose would be as follows: In a state which is desirous of being saved from the greatest of all plagues—not faction, but rather distraction—there should exist among the citizens neither extreme poverty nor, again, excessive wealth, for both are productive of great evil"*
>
> *– Plato, Greek Philosopher (427-347 B.C.)*

As the quote by Plato suggests, the debate surrounding inequality is nothing new. Today, it still remains a popular topic of discussion, both among policymakers and economists. Especially in the aftermath of Thomas Pikkety's best-selling book Capital in the Twenty-First Century in 2014, it became a hot topic of discussion not only amongst economists but also in the general public. The biggest concern is the effect that inequality, both in income and in wealth, has on the growth of the economy. Is the concentration of income at the top of the distribution good for economic growth, and will the rising tide indeed lift all the boats? Or is it, in fact, harmful for economic growth?

Economists have been trying to answer this question for decades and despite a large body of both theoretical and empirical literature, the effect of income inequality on economic growth is still very much unclear. Inequality in itself is not necessarily bad, as it is important to provide incentives for economic agents to innovate, become entrepreneurs and work hard. However, it is well documented that societies with high levels of income inequality suffer from a lower degree of social mobility (Kearney & Levine, 2014). This is problematic not only from a social point of view but also from an economic point of view. If income inequality limits individuals access to quality healthcare and education, the aggregate level of human capital in the economy will also suffer, leading to lower economic growth. The concentration of income and wealth also allows the economic elite to engage in rent-seeking activities like lobbying or even corruption in order to influence political decisions and the distribution of privileges. Empirical research from the US shows that the preferences of regular voters have little or no impact on public policy, but that the preferences of the economic elite to a large degree shape public policy (Gilens & Page, 2014).

Such rent-seeking activities are harmful to economic growth, as the resources could instead have been utilized in a productive manner. My theory is that the better developed the institutions, and the more transparent the political process is, the less rent-seeking activities will occur. A rational economic agent will only engage in a certain activity if the benefits outweigh the costs. If the cost of that activity, either social or economic, increases, then that activity will occur less frequently. In that way, well-developed institutions might decrease some of the negative aspects of high levels of income inequality.

In this paper, I aim to provide answers to two related questions. First, whether income inequality is harmful to economic growth, and second, whether well-developed institutions can mitigate the potentially negative effects of income inequality. In order to answer these questions, I estimate a fixed effects panel threshold model, where the effect of income inequality is allowed to differ based on the underlying institutional quality. This is done by estimating a threshold level that sorts the observations into one of two regimes with different slope coefficients. To the best of my knowledge, I am the first one in the literature to estimate a relationship between income inequality and economic growth that depends on the threshold level of institutions. This is my contribution to the existing literature. I will also conduct two robustness tests to investigate the sensitivity of the results.

The rest of the thesis is structured as follows: First I give an extensive review of the theoretical literature as well as the previous empirical research on the link between inequality and economic growth. Further, some fact about the evolution of income inequality is given. Then the econometric framework and possible estimation issues are presented and discussed before the data is presented. After that, the empirical results are presented and later discussed. In the last section I provide a conclusion.

2. Literature Review

In this section, I first give an overview of the possible channels in which income inequality affects economic growth, based on the existing theoretical literature. I also discuss how institutional quality affects this relationship. Finally, previous empirical research is presented.

2.1 Theoretical foundation

The theoretical literature identifies several different channels in which income inequality affects economic growth. Lazear and Rosen (1981) propose a positive effect of income inequality on growth by providing incentives to engage in innovation and entrepreneurship. Entrepreneurship implies some sort of risk-taking by economic agents, and if there are no rewards in the form of higher wages or returns, rational agents will not invest any resources into such activities. This will, in turn, have a negative effect on technological progress and economic growth. So clearly some level of inequality is natural and perhaps also necessary to sustain economic growth. Benhabib (2003) suggests that the relationship between inequality and economic growth is non-linear. When the initial level of inequality is very low, an increase in inequality can enhance growth, while a further increase in inequality past a certain level encourages rent-seeking and hurts economic growth. Savings rates are by many believed to be related to the level of income, and that rich individuals, in general, have higher saving rates (Barro, 2000). A higher concentration of incomes should according to this theory lead to an increase in investment and subsequent higher growth. In the presence of high fixed costs or start-up costs related to investments, this effect becomes even more prominent, especially in poor countries. The concentration of assets and incomes allows at least some individuals to pass the minimum threshold to be able to invest in human capital and start businesses.

A central channel in most of the theoretical literature, and closely related to the abovementioned investment perspective, is the presence of imperfect capital markets. The effect proposed is, however, the opposite. Researchers claim that higher levels of inequality are negatively related to economic growth (Deininger and Squire, 1998; Galor and Zeira, 1993; Perotti, 1996). In the presence of borrowing constraints, investment opportunities will not be equally available to all, as poor individuals will not be able to afford the fixed investment cost or provide collateral to obtain credit. This might for example limit investments in human capital that provide a relatively high rate of return. On aggregate this will lead to underinvestment in the human capital stock of the economy, adversely affecting growth.

The political economy setting proposed by Barro (2000) is also a popular approach in which to explain the link between inequality and growth. Considering a democracy with a majority voting system, a high concentration of income in the right tail of the distribution implies that that the mean income will exceed the income of the median voter. This leads to the majority of voters having a preference towards redistribution, either through pure transfer systems or through public goods provided by the government (education, health care, etc.). This government expenditure has a discouraging effect on savings and investment, thus negatively affecting growth (Perotti, 1996). Using the same political economy approach, Saint Paul and Verdier (1993) claim that high levels of inequality might actually be positively related to growth through increased human capital accumulation. In unequal societies, the median voter will ensure a higher degree of taxation in order to finance public education. This will increase human capital and economic growth. These approaches are based on the assumption that political power is more equally distributed than economic power (Ostry et al., 2014), but this might not be the case. In reality, an individual's economic power might affect the degree of political influence (Deininger and Squire, 1998).

However, inequality can still affect growth even if no actual redistribution takes place. In order to protect privileges and prevent redistributive policies from being implemented, better-off individuals can employ resources in lobbying, or even resort to bribes and corruption. This is a form of rent-seeking, implying that resources are utilized in a non-productive manner. The higher the level of inequality, the more redistributive policies will be demanded from the median voter, thus more resources must be invested into rent-seeking activities by the rich individuals in order to maintain their level of privilege.

Finally, high levels of inequality increase the polarization of society and create incentives for individuals to pursue activities outside ordinary market activities (Perotti, 1996). This means that inequality increases the risk for individuals to engage in rent-seeking activities, violent protests, or even going as far as conducting assassinations or coups. This sociopolitical instability threatens property rights and also increases uncertainty regarding existing laws and political regimes (Barro, 2000). This increases risk and given the same level of returns to investors, the inflow of investments should decrease.

As we can see, the literature offers several potential channels and explanations of the relationship between inequality and economic growth. However, it does not provide a clear-cut answer to the magnitude or even the sign of this effect. To hopefully paint a clearer picture, we will have to turn to the empirical literature. But before that, it is useful to go more in depth on the concept of rent-seeking and the role that institutions can play in mitigating potentially negative effects of income inequality.

2.1.1 The role of institutions

When evaluating the role of institutions, the most relevant channel identified above is the political economy channel and the occurrence of rent-seeking activities. Rent-seeking refers to the concept of trying to increase one's income or wealth without conducting any productive activities. This is often done by obtaining some sort of privilege from the government (Aidt, 2016). The existence of an obtainable rent is what induces rent-seeking behavior. Otherwise, rational agents would not invest any resources into such activities.

Contestable rents must not be mistaken for contestable profits. In the market economy, these contestable profits give companies incentives to invest in new markets and innovate in order to secure these profits. However, these activities help improve resource allocation by increasing competition, increase the output of the economy through the introduction of new technologies and increase overall social welfare in the economy. Contestable rents are in many cases created and controlled by government policies which in turn is controlled by politicians and officials. Tullock (1996) points out that officials in corrupt countries have the opportunity to write laws with the sole purpose of being bribed in exchange for not carrying out the law.

These rents cannot be captured by shifting resources directly into the production of the underlying services or goods. It requires economic agents to invest resources, time and effort in order to either obtain the initial right to produce or deliver the service or to prevent others from gaining the same privilege. Examples of such contestable rents include, but are not limited to national resource rights, protectionist trade policies, monopoly rights, and budget allocations.

Since rent-seeking activities aim to affect the distribution of resources rather than contributing to productive activities to increase output, society suffers a social loss equal to the foregone output (Hilman, 2013). This loss is incurred in addition to the standard deadweight loss in economics due to imperfect competition, taxes, etc. The social loss that society incurs from rent-seeking activities depends on the underlying level of institutions (Congleton, 1980). Well-defined private property rights and civil liberties both tend to decrease rent-seeking activities by reducing the domain in which the government operates in (Congleton, 2004).

The basic idea emerging from these theories is thus quite simple. The higher the level of income inequality, the higher is the potential gains from rent-seeking and therefore also the negative effects on economic growth. But if the institutional quality is above a certain threshold, some of the negative effects will be mitigated and inequality will be less harmful to economic growth compared to a society where institutions are less developed.

2.2 Empirical research

Despite a large amount of empirical literature on the link between inequality and economic growth in the last few decades, a consensus is yet to emerge. A part of the explanation comes down to the application of different methods, different measures of inequality and different data sets. Due to a large number of studies conducted, only cross-country studies are covered. Alesina and Rodrik (1994) analyze the effect of income inequality on economic growth and find an overall negative effect. Like much of the literature at the time, they also divide countries between democracies and non-democracies and find that income inequality is negatively related to growth in both samples. In addition, Perotti (1996) differentiates between poor and rich countries and finds that income inequality negatively affects growth for rich countries but does not have a significant effect on poor countries. Similar results are also found by other authors in the same time period, even though they employ different data sets and inequality measures (Persson & Tabellini, 1994; Clarke, 1995; Birdsall & Londoño, 1997). Although some authors find insignificant results within sub-samples, the emergence of a consensus seems to take place: Income inequality is harmful to economic growth.

However, the important contribution by Deininger and Square (1998) serves as a turning point. Not so much their own empirical work, which followed most of the previous empirical literature, but their data set which most of the consecutive empirical research make use of. Most of the early research using this data set finds a positive and significant impact of income inequality on economic growth. Using this new data set, Li and Zou (1998) find a positive impact of income inequality on economic growth in a panel of countries. Forbes (2000) also supports these findings when analyzing the effect of income inequality on middle- and high-income countries. Barro (2000) finds a positive effect for rich countries, but negative for poor countries.

Past this point, however, the literature yields conflicting evidence. Knowles (2005) finds a negative impact on his sample as a whole, but when differentiating by income level the negative effect of inequality only persists for the poor countries. Castelló-Climent (2010) reports similar findings, but in addition, he also finds a positive effect for rich countries. Ostry et al. (2014) also find a negative effect on growth, while Halter et al. (2014) report a positive relationship between income inequality and growth. Similar to the previous findings, they also report a positive effect in rich countries and a negative effect in poor countries.

The use of threshold models when investigating the impact of income inequality on economic growth is not widespread. Lin et al. (2009) investigate the effect of changes in inequality on growth using initial income as the threshold variable. They find that an increase in inequality is bad for growth in poor countries, while it accelerates growth for high-income countries. Bhatti et al. (2015) employ a threshold model to investigate the effect of income inequality on economic growth using a measure of human capital to physical capital ratio as the threshold variable. They report a negative effect of income inequality on growth above a certain threshold and a positive impact below the estimated threshold level.

3. The evolution of income inequality

In 1955, Simon Kuznets attempted to theorize the relationship between economic development and income inequality (Kuznets, 1955). He claimed that as an economy develops market forces would first increase income inequality, but when development surpassed a certain point, market forces would then decrease the overall inequality. He uses the example of the transition from an agricultural based economy to an industrialized society. In the beginning, the new investment opportunities would fall only to the already wealthy and, combined with an inflow of rural migrants looking for better-paid jobs keeping the wages down, the income gap will increase. However, as the economy reaches a certain level of average income the inequality will decrease due to democratization and the emergence of a welfare state often associated with industrialization. From this theory, the famous inverted U-shaped Kuznets curve emerged.

Kuznets's observations and theory were based on the decrease in inequality following a period including World War 1 and World War 2. Historically, one of the true driving forces behind decreased inequality has been war on a large scale as well as the secondary effects, like inflation, democratization, etc. that follows (Scheidel, 2017). However, in recent decades the trend seems to have turned, with inequality within countries increasing for many countries. Most OECD countries are now experiencing the highest level of inequality in 30 years (Cingano, 2014), but this trend is not as clear when applying a more global perspective.

Although this trend seems to hold for most of the advanced industrial economies as well as for the main part of the remaining European countries, inequality tends to be declining in Africa, Latin America and the Middle East (Hasell, 2018). This should make it apparent that the choice of countries could have a potentially large impact on the big picture when assessing the global trends in inequality. It is therefore interesting to see how the sample countries included in this paper have evolved with regards to income inequality.

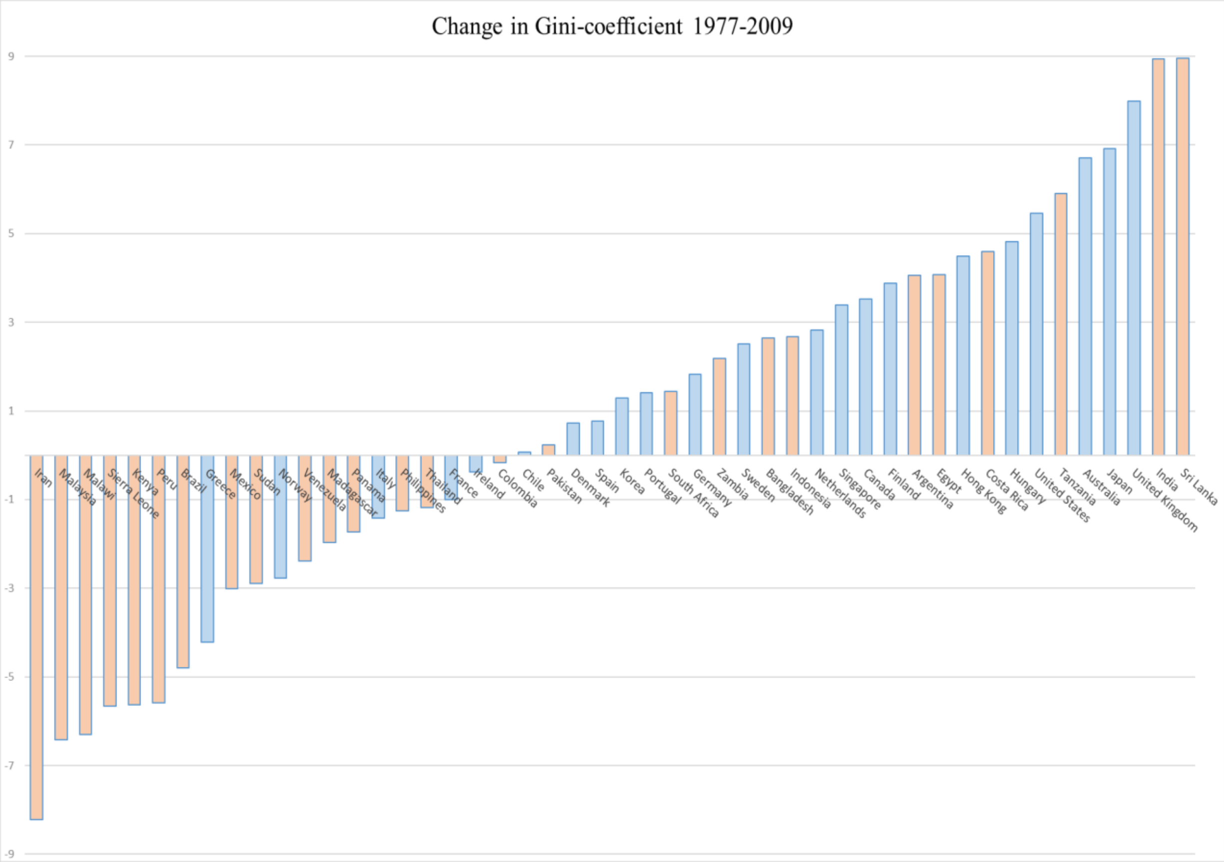

Figure 1: Evolution in income inequality for sample countries. Developed countries in blue and developing countries in orange. Data from Solt (2019)

Figure 1 above gives a graphical representation of the evolution of inequality for the countries in the data set from 1977 to 2009 measured by the Gini-coefficient of disposable income. Following the country classification of the World Bank, developing countries are given by orange while the developed countries are in blue. On average there is very little development in income inequality, but this illustration makes it evident that there is a large degree of heterogeneity. On average the Gini coefficient increased by 0.81 to an average value of 38.2. Although the effects vary across both groups of countries, there is a general trend that must be addressed. As a whole, income inequality among developing countries dropped by 0.4 to 43.6, despite a substantial increase in both Sri Lanka and India. On the other hand, the developed countries experienced an increase in inequality by 2.3 to 31.7 measured by the Gini coefficient with inequality decreasing in only 5 out of the 22 developed countries during the period. There seems to be a degree of convergence in income inequality between the two groups of countries.

Although large differences exist within these group of countries, the general development goes against the famous Kuznets curve that proposes that income inequality should first increase and then decrease following economic development. On the contrary, the development rather implies an upside-down Kuznets curve.

4. Econometric framework

The classic panel ordinary least squares (OLS) estimator assumes that the slope parameters are homogenous across all cross-sectional units and across time. Using a threshold model, the observations can be divided into different groups based on the value of an observed variable. The panel threshold regression model allows both for heterogeneity and time-varying parameters in the sense that two cross-sectional units can have different slope parameters, and one single cross-sectional unit can have different slope parameters at different times during the sample period.

4.1 Baseline model

The panel data model with fixed-effect and one threshold is estimated as suggested by Hansen (1999), which is given by:

$$y_{it} = \mu_i + Ineq_{it}\beta_1 I(Inst_{it} \leq \gamma) + Ineq_{it}\beta_2 I(Inst_{it} > \gamma) + \theta' Z_{it} + e_{it}, \qquad (1)$$

Where γ denotes the threshold level, $Inst_{it}$ is the threshold variable measuring the level of institutions, and $Ineq_{it}$ is the regime dependent regressor measuring income inequality. The indicator function $I(\cdot)$ takes the value 1 if the expression inside the parentheses is true, and 0 otherwise. Θ' is a 1x4 vector of coefficients and Z_{it} is a 4x1 vector of control variables including life expectancy, population growth, human capital, and investment share of GDP. The parameter μ_i is country-specific fixed effects and e_{it} is the error term, where the error term is assumed to be $iid(0, \sigma^2)$.

The threshold variable divides the observations into two separate regimes, depending on whether $Inst_{it}$ is higher or lower than the threshold level γ. These two regimes differ by the slope of the regressors β_1 and β_2. The threshold level γ's estimator is obtained by minimizing the sum of squared residuals:

$$\hat{\gamma} = \arg\min_{\gamma} SSR(\gamma)$$

Given $\hat{\gamma}$, the slope coefficients $\beta_1(\hat{\gamma})$ and $\beta_2(\hat{\gamma})$ can then be estimated. For a given threshold level the slope coefficients can be estimated using OLS.

4.2 Threshold test

In order to determine whether the threshold effect is statistically significant a hypothesis test is conducted. The null hypothesis which corresponds to no threshold effect and the alternative hypothesis is given by:

$$H_0: \beta_1 = \beta_2 \qquad H_a: \beta_1 \neq \beta_2$$

Under the null hypothesis of no threshold effect, the earlier model is reduced to a linear model

$$y_{it} = \mu_i + Ineq_{it}\beta + \theta' Z_{it} + e_{it},$$

With $\beta = \beta_1 = \beta_2$

The main issue is that under the null hypothesis, the threshold parameter γ is not identified, meaning that classical tests have non-standard distributions. As suggested by Hansen (1999), a bootstrapping procedure is applied to simulate the asymptotic distribution of the above test statistic[1]. The p-values constructed with this procedure is shown to be asymptotically valid (Hansen, 1996). The above threshold model and the testing procedure can easily be extended to more than one threshold.

4.3 Cross-sectional dependence

A common problem in macroeconomic panel data models is the issue of cross-sectional dependence in the error term. This stems from the presence of common shocks that, if not controlled for, eventually ends up in the error term. Cross-sectional dependence in the errors can lead to biased standard errors, making inference problematic (De Hoyos & Sarafidis, 2006). This can be modeled by assuming that the errors u_{it} follow a multifactor structure given by:

$$u_{it} = \lambda'_i f_t + e_{it},$$

Where λ'_i is a 1 x m vector of factor loadings and f_t is a m x 1 vector of unobserved common effects. The individual-specific residuals e_{it} are assumed to be $iid(0, \sigma^2)$. This modifies (1) to the following:

$$y_{it} = \mu_i + Ineq_{it}\beta_1 I(Inst_{it} \leq \gamma) + Ineq_{it}\beta_2 I(Inst_{it} > \gamma) + \lambda'_i f_t + \theta' Z_{it} + e_{it}. \quad (2)$$

As shown by Pesaran (2006) and extended to non-linear models by Hacioуglu Hoke and Kapetanios (2017), equation (2) can be consistently estimated by approximating the unobserved common factors f_t by the cross-sectional means of the dependent variable, $\bar{y}_{it}$, as well as the

[1] For more details regarding the bootstrapping procedure see Hansen (1999) p. 350

control variables, $\bar{Z}_{it}$. The estimation and threshold testing procedures are otherwise identical to the one described for model (1).

5. Data

The data set used includes annual observations for 48 countries, of which 22 are developed countries and 26 are developing countries and covers the time period 1977 – 2009. This gives a balanced panel consisting of a total of 1584 observations (N=48, T=33). As the econometrical procedure demands a balanced panel, the selection of countries and time-period is done as a compromise between the inclusion of as many countries as possible and covering the largest time span possible. An overview of the countries divided by development status following the World Bank's classification can be found in the appendix in Table A4. Descriptive statistics for both the sample as well as the split samples are provided in Table 1 below. We can note that developed countries on average have a higher growth rate of per capita GDP, more developed institutions and that income is more equally distributed.

Variable	Sample	Obs	Mean	Std. Dev.	Min	Max
Gdp per cap. growth	All	1584	0.018	0.04	-0.284	0.188
	Developed	726	0.023	0.03	-0.161	0.112
	Developing	858	0.015	0.047	-0.284	0.188
Gini-coeff.	All	1584	37.953	9.235	20.464	60.336
	Developed	726	30.464	6.033	20.464	48.472
	Developing	858	44.29	6.248	29.631	60.336
Pop. Growth	All	1584	0.015	0.01	-0.009	0.063
	Developed	726	0.007	0.007	-0.005	0.033
	Developing	858	0.022	0.008	-0.009	0.063
Log (Inv/GDP-ratio)	All	1584	-1.641	0.611	-5.189	-0.394
	Developed	726	-1.319	0.231	-2.424	-0.394
	Developing	858	-1.913	0.695	-5.189	-0.567
Log (Life Exp.)	All	1584	4.221	0.163	3.575	4.418
	Developed	726	4.334	0.041	4.173	4.418
	Developing	858	4.124	0.165	3.575	4.365
Log (Human Cap.)	All	1584	0.817	0.308	0.105	1.305
	Developed	726	1.061	0.164	0.439	1.305
	Developing	858	0.61	0.244	0.105	1.065
Ind_1	All	1584	0.683	0.232	0.136	0.966
	Developed	726	0.878	0.112	0.34	0.966
	Developing	858	0.518	0.171	0.136	0.91
Ind_2	All	1584	0.624	0.241	0.112	0.945
	Developed	726	0.827	0.126	0.314	0.945
	Developing	858	0.452	0.17	0.112	0.884
Ind_3	All	1584	0.566	0.254	0.119	0.961
	Developed	726	0.799	0.127	0.343	0.961
	Developing	858	0.368	0.142	0.119	0.838

Table 1: Descriptive statistics

5.1 Economic growth

As is the standard in the empirical growth literature (Barro, 1991; Levine and Renelt, 1992; Sala-i-Martin, 1997) the dependent variable is the growth rate of real gross domestic product (GDP) per capita. The growth rate is calculated using data on real GDP at constant 2011 USD using data obtained from the Penn World Table (PWT) (Feenstra et al, 2015). The data is then divided by population to obtain a per-capita measure before the growth rate is calculated as the first difference of the natural logarithm. Using real GDP isolates and removes the effect of price changes, letting us measure any changes in output more accurately. Per capita GDP is also a more relevant, although not perfect, measure of welfare.

5.2 Income Inequality

As a measure of income inequality, the Gini coefficient of disposable income is included, obtained from the Standardized World Income Inequality Database (SWIID) (Solt, 2019). This functions as the regime dependent variable in the previously stated models. It is the measure of inequality with best data coverage across both time and countries and is also the most frequently used measure in the previous empirical literature

The index ranges from 0 to 100 (or 0 to 1) and is normally calculated directly from the income distribution illustrated by the Lorenz curve (Fao.org, 2005)[2]. The Lorenz curve gives a graphical representation of the income distribution showing the cumulative share of the population, sorted from poor to rich, and their cumulative share of the total income. A value of 0 represents a perfectly equal society where income is distributed equally among everyone, while a value of 100 represents the case where one person earns the entire income of the society.

Despite being the most popular measure of income inequality, it also has its drawbacks as most measures of inequality. The strength of the Gini-coefficient is at the same time its weakness. While having one single number measuring inequality across the entire distribution is very convenient, it is incapable of distinguishing between different kinds of inequality (De Maio, 2007). The Lorenz curves of different countries can cross each other, implying different income distributions, but the calculated Gini coefficient can be identical. It is also much more sensitive to changes in the middle of the income distribution than in the tails, even though what happens at the bottom and the top of the distribution is in many cases more interesting from a policy point of view.

Another popular measure is income shares. Calculated as the share of total income received by a certain percentile of the population, it is perhaps the most intuitive of all measures. When discussing inequality in the very top of the distribution, measures on the top 1 and top 10 percentiles, or even the 0.1 percentile is often used. Similarly, one can also look at the income share of the bottom of the distribution, as the share of the total income of the bottom 50 percent in the economy. However, these measures do not say anything about how the income is distributed within the percentiles, or how the remaining part of the income distribution looks like. Several measures have to be employed in order to obtain a detailed picture, which is exactly what the Gini-coefficient does in one single measure.

[2] For a detailed step by step procedure and a graphical representation, see (Fao.org, 2005, p 9-11)

Another commonly used measure is decile ratios, which combines different deciles total income shares into one ratio, for example, the 20:80 ratio which gives the ratio between the income share of the top 20 percent and the bottom 80 percent. Depending on the field of research, one can combine different income deciles to suit the research question.

5.3 Institutions

It can be argued that there does not exist one single measure that completely captures the institutional quality of a country. Different indicators measure different aspects, for example, the degree of civil liberties, the severity of corruption, property rights, or the rule of law. As institutions take time to develop, the different measures of institutions are fairly static and can often take the same values several years in a row. In order to increase the amount of variability in the data, as well as improving the accuracy, it is useful to combine several different measures into one aggregate measure of institutions, although some specificity is lost in the process. This is especially relevant in the case of a threshold model where only one variable can be included as the threshold variable.

When aggregating and constructing a new indicator it is desirable to capture as much as the variation in the original data as possible. One way to ensure this is to apply principal components analysis (PCA). Using PCA new variables can be created as linear combinations of the original variables. The linear combination of the variables that explain the maximum amount of variation is referred to as the first principal component, then the second principal component is calculated as the linear combination that best explains the remaining variation, and so on (Abeyasekera, 2005).

Since only one variable can be defined as the threshold variable, only the first principal component is utilized. Three different measures are constructed using different variables from the original data. A new variable Ind is calculated as a linear combination between the original data as $Ind = a_1^2 x_1 + a_2^2 x_2 + \cdots a_p^2 x_p$, where $i \in \{1,2, \dots, p\}$ and a_i^2 is the squared principal component coefficient.

Using the methodology above three alternative measures of institutions are constructed.[3] All data on institutional measures are obtained from the Varieties of Democracy data set (Coppedge et al., 2019). The first index, Ind_1 combines three often used measures of institutions, namely corruption, civil liberties, and property rights (Mauro, 1995; Grier & Tullock, 1989; Leblang,

[3] Measures of corruption are inverted so that all measures range from poor institutions (0) to good institutions (1)

1996). The second index, Ind_2, adds an egalitarian democracy index, which concerns itself with how material and immaterial inequality prevents citizens from different social groups to enjoy equal rights and access to power. Although not commonly used to measure institutional quality, it should be especially relevant in the case of assessing the effect of inequality on economic growth. The third and last index, Ind_3, only relates to corruption and transparency and includes measures of corruption, clientelism and the disclosure of campaign donations. As corruption is closely related to rent-seeking, it is of interest to include a separate index only related to this. A graphical representation of the three indices for the whole sample and for the split samples is given in the appendix in figure A1.

5.4 Control variables

The choice of control variables is also inspired by the previous empirical work and includes population growth, investment as a share of GDP, a human capital index and life expectancy. Life expectancy, obtained from the World Bank (Data.worldbank.org, 2017), serves as a non-educational measure of human capital (Sala-i-Martin, 1997) and is expected to have a positive impact on economic growth. The rest of the control variables are obtained from the PWT. The human capital index is based on average years of schooling and an assumed rate of return to education and is expected to have a positive effect on economic growth. Population growth is expected to be negatively related to per capita growth since population growth leads to less capital per worker and investment share of GDP is expected to have a positive effect as more investment means a higher capital stock and eventually higher output per capita. Life expectancy, investment share and the human capital index are all transformed using the natural logarithm.

6. Results

As a reminder, the two separate single threshold models discussed will be estimated using the three different indices of institutions constructed using PCA. When interpreting the results, the most weight will naturally be put on the slope coefficients of inequality in the two different regimes, β_1 and β_2, and the threshold level. All the main results are reported in Table 2 below.

	Ind_1		Ind_2		Ind_3	
	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	CS-means	Baseline	CS-means	Baseline	CS-means
Log (Inv/GDP)	0.0250***	0.0254***	0.0252***	0.0256***	0.0258***	0.0259***
	(0.00289)	(0.00288)	(0.00289)	(0.00288)	(0.00292)	(0.00290)
Log (Life Exp.)	0.116***	0.138***	0.116***	0.138***	0.104***	0.122***
	(0.0298)	(0.0293)	(0.0298)	(0.0293)	(0.0299)	(0.0293)
Log (Human Cap.)	-0.0507***	-0.0431*	-0.0542***	-0.0469**	-0.0290*	-0.0401*
	(0.0150)	(0.0228)	(0.0151)	(0.0227)	(0.0149)	(0.0228)
Pop. Growth	-0.294	-0.339*	-0.283	-0.321	-0.390*	-0.438**
	(0.206)	(0.199)	(0.206)	(0.199)	(0.205)	(0.198)
$\beta_1(Inst_t \leq \hat{\gamma})$	-0.00130**	-0.00133**	-0.00121**	-0.00128**	-0.00113**	-0.00141**
	(0.000569)	(0.000574)	(0.000568)	(0.000574)	(0.000572)	(0.000575)
$\beta_2(Inst_t > \hat{\gamma})$	-0.000766	-0.000800	-0.000637	-0.000727	-0.00152***	-0.00182***
	(0.000579)	(0.000591)	(0.000582)	(0.000592)	(0.000574)	(0.000579)
Constant	-0.352***	0.0140	-0.355***	-0.0788	-0.292**	0.534
	(0.119)	(1.151)	(0.119)	(1.151)	(0.119)	(1.153)
Threshold	0.3424*	0.3406*	0.2885**	0.2885**	0.2179	0.2179
P-value	0.0767	0.0867	0.0433	0.0433	0.2533	0.1800
Observations	1,584	1,584	1,584	1,584	1,584	1,584
R-squared	0.082	0.172	0.083	0.173	0.076	0.168
Countries	48	48	48	48	48	48
Country FE	YES	YES	YES	YES	YES	YES
CS-means	NO	YES	NO	YES	NO	YES

*Table 2: Main regression results. Significance levels: p < 0.10: * p < 0.05: ** p < 0.01: ***. Standard errors are presented below*

6.1 Main results

Columns 1-2 report the results using Ind_1 as a measure of institutions and will be the starting point of the analysis. The estimated threshold level is fairly consistent across the two models and is estimated to be around 0.34. It is also significant on the 10 percent level, which entails that the two regime coefficients β_1 and β_2 are statistically different from each other, as the H_0 states that $\beta_1 = \beta_2$. Turning to the coefficients themselves, the slope coefficient for the first regime, β_1, is negative and significant at the 5 percent level. This implies that income inequality has a negative and significant effect on economic growth when institutions are below the estimated threshold level. The slope coefficient for the second regime, β_2 is also negative, but however not significant at any of the conventional significance levels. The magnitudes of the coefficients are also very similar across the two models, although marginally bigger when controlling for common shocks. The control variables all display the expected sign except the human capital index which is both negative and significant, while it was expected to have a positive impact on economic growth. This holds across all the models and institutional measures.

Adding in democracy to the institutional measure gives us the second measure Ind_2, with the corresponding results reported in columns 2-3. As we can see it does not drastically change the results, but there are some minor differences. The estimated threshold level, while now being significant also on the 5 percent level, is identical across the two models and slightly lower at 0.29. The slope coefficients retain the same degree of significance, although numerically slightly lower when including the measure of democracy.

Moving on to the last part of the results, namely columns 5-6, the results differ quite a bit from the previous two sections now that only measures of corruption are included in the institutional index Ind_3. The most noticeable change is that there is no longer any significant threshold effect between the two different regimes. Interestingly, the slope coefficient is now also significant at the 1 percent level for the second regime, in addition to being significant on the 5 percent level for the first regime. When controlling for cross-sectional dependence, the magnitude of the negative effect on economic growth is also slightly higher compared to the previous results.

6.2 Robustness tests

In order to test the sensitivity of the main results, two separate robustness tests are applied: Splitting the sample into developed and developed countries when estimating the model and increasing the trimming percentage when searching for possible threshold levels.

6.2.1 Split sample

The average level of institutional quality tends to be higher among developed countries, and it is therefore expected that both the estimated threshold level as well as the slope coefficients might differ between the two groups of countries. The previous research covered earlier also suggests that income inequality has different effects on poor and rich countries. The results from the split sample regression can be viewed in full in table A1 for the developing countries, and table A2 for the developed countries in the appendix.

There is only one significant threshold level estimated for the developing countries at 0.22, which is obtained using Ind_3. This entails that only 19 observations are sorted into the first regime. The coefficient for the second regime, where the rest of the observations are sorted, is both negative and significant at least when controlling for cross-sectional dependence. All the other slope coefficients are negative using the two other institutional indices, but not significant.

As expected the threshold levels estimated for developed countries are higher than in the developing countries, as the general quality of institutions is also higher in these countries. However, there is no significant threshold effect identified using any of the three measures of institutions. The coefficients are also mainly insignificant, although two of the slope coefficients for the second regime is negative and significant. However, two of the slope coefficients are also estimated with a positive sign.

6.2.2 Increasing the trimming percentage

As it is desirable that a certain amount of observations are sorted into each regime, one can limit the interval of possible values of institutional quality that is considered as the threshold level. This is defined as the trimming percentage. The highest threshold level estimated in the main results is 0.34, which entails that approximately 11 percent of the observations are sorted into the first regime and the remaining into the second regime. The trimming percentage is therefore increased to 20% in order to see how the results react. This implies that when observations are sorted by institutional quality, the value of the institutional measure at the 20^{th} percentile is the first value considered as a potential threshold level, and the value at the 80^{th} percentile is the last value considered. The results are reported in full in table A3 in the appendix.

The threshold levels estimated all increase significantly from those estimated in the main results, as would be expected. When applying the first and third measure of institutions the coefficient for the second regime is again estimated to be higher compared to the first regime. However, as there is no significant threshold effect we cannot say for sure that there is any difference in the slope coefficients in the two regimes. Using the second measure, which includes democracy in addition to the usual measures, the threshold level is significant and estimated to be around 0.73. This implies that the observations are almost equally sorted between the two regimes, and much higher than the restriction imposed at 20 percent. Both coefficients are significant at least at the 10 percent level, with the magnitude of the second regime's coefficient higher than the first.

7. Discussion

The aim of this paper was to investigate the role of institutions in mitigating potentially negative effects of income inequality on economic growth, using several different constructed measures of institutions. Based on the theoretical literature I expected to find a negative and significant effect of income inequality on economic growth. Moreover, I expected to find a significant threshold level of institutions, where the negative effect of income inequality would be less prominent when the institutional quality exceeded this level. The results support this idea to a certain degree. There is evidence to support the hypothesis of a threshold level, however, the robustness of this result is questionable. The results using Ind_3, which only considers measures of corruption, also seems to differ somewhat compared to the results using the two other measures. They will thus be treated separately in the following discussion.

Using the first two measures of institutions, there seems to be support for the idea that the effect of income inequality depends on the underlying quality of institutions. Although the estimated threshold level is perhaps lower than what was expected, it is still significant. The fact that the coefficients for the first regime are all significant at the 5 percent level, combined with the non-significant coefficients, which are also lower in magnitude, for the second regime provides further support for this idea. Even though they are not statistically significant, the slope coefficients for the second regime are still consistently negative, so an overall negative effect of income inequality on economic growth cannot be completely discarded. The results from these two measures imply that when the quality of institutions is very low, income inequality negatively affects economic growth. However, when institutions are developed beyond this point they are able to mitigate most of the negative effects of income inequality.

As mentioned the results are not robust with regards to the split sample test and when adjusting the trimming percentage. The estimated threshold level when adjusting the trimming percentage is, in reality, a second-best solution, as restrictions are put in place when choosing potential threshold levels. Some caution should thus be applied when interpreting the results. However, it is still interesting that the threshold level jumps significantly instead of just slightly adjusting to include the restricted amount of observations. This could imply that the threshold level estimated in the main results is not very robust. Even though this robustness test does not give further support to the existence of a threshold level of institutions, it does support the theory of an overall negative effect of income inequality on economic growth.

Splitting the sample into developing and developed countries produce overwhelmingly non-significant results when using Ind_1 and Ind_2 as institutional measures. It neither supports the existence of a threshold level depending on the level of institutions nor the overall negative effect of income inequality on GDP growth.

Using the last measure of institutions, Ind_3, yields rather different results. Given that the underlying variables used to construct this index are quite different from the first two measures, this is not entirely surprising. Although the results indicate that there is no significant threshold effect, the fact that both regime coefficients are negative and significant gives strong evidence of a negative effect of income inequality on economic growth. The robustness tests also partially support this. The second model controlling for cross-sectional dependence always yields a negative and significant coefficient for the second regime. Since there is no significant threshold effect the coefficients are not significantly different from each other, and thus cannot reject the possibility that there is an overall negative effect across the two regimes. To be precise there is one significant threshold level but given the low threshold value and the limited number of observations sorted into the first regime, it does not add much to the analysis. As the number of observations is so large in the second regime, it rather supports the fact that when using corruption as the underlying institutional measure there is a negative effect of income inequality regardless of the institutional quality.

As the previous empirical literature has produced a large range of different results, the results are naturally not consistent with all of it. In line with Lin et al. (2009) and Bhatti et al. (2015), I also find evidence of a non-linear relationship between income inequality and economic growth. Many of the previous empirical papers have also found a differentiated effect between low-income and high-income countries. When splitting the sample, I am however not able to reproduce these findings, as the results are largely insignificant for both groups of countries. Given that the estimated threshold level from the main regression is rather low, and poor countries tend to have less developed institutions, all the observations sorted into the first regime using Ind_1 and Ind_2 belong to developing countries. One can, therefore, argue that there are indeed contrasting effects when it comes to income levels, and that income inequality is harmful to growth only for poor countries while being insignificant for richer countries, more in line with the previous research.

8. Conclusion

The goal of my thesis was to investigate if there exists some threshold level of institutional quality that helps mitigate the potentially negative effects of income inequality on economic growth. Using the one threshold fixed effects panel data model I find a significant threshold level using two different measures of institutions. Above this threshold level, the negative effects of income inequality are no longer significant. This result is however not robust. Using the index measuring corruption, I find no significant threshold effect dependent on the level of institutions, but rather an overall negative effect from income inequality on economic growth. The implications are straightforward. Income inequality has an overall negative effect on economic growth. However, once the quality of institutions exceeds a certain level, which is estimated to be fairly low, some of the negative effects are mitigated. Countries and policymakers should seek to avoid high levels of inequality. If countries are already experiencing high levels of income inequality they should focus on increasing the transparency of the political process, thus limiting an individual’s ability to engage in rent-seeking activities.

One limitation in this regard is the issue of redistribution. In order to decrease inequality, redistributive measures must be put in place. This is known to have a distortive effect on the economy. Although the results imply that inequality is bad for economic growth, it refers only to the level of income inequality and not the change. So even if the lower level of inequality implies higher economic growth, the effect of redistribution must be investigated further. The results also seem to depend on the measure of institutions used. As there is not one correct way to measure institutions, a more careful construction of the institutional indices might also yield different results. This is also a possible focus of future research. Further, the transition function assumed is of a binary nature, with the indicator function taking either the value 0 or 1. An interesting possibility is to instead allow for regression coefficients to adjust smoothly when moving from one regime to another. This is also left for future research.

References

Abeyasekera, S. (2005). Chapter XVIII Multivariate methods for index construction. *Reading (UK): University of Reading. hlm*, 377-378.

Aidt, T. S. (2016). Rent seeking and the economics of corruption. *Constitutional Political Economy*, *27*(2), 142-157.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *The quarterly journal of economics*, *109*(2), 465-490.

Barro, R. J. (1991). Economic growth in a cross section of countries. *The quarterly journal of economics*, *106*(2), 407-443.

Barro, R. J. (2000). Inequality and Growth in a Panel of Countries. *Journal of economic growth*, *5*(1), 5-32.

Benhabib, J. (2003). The tradeoff between inequality and growth. *Annals of economics and finance*, *4*, 491-507.

Bhatti, A. A., Haque, M. E., & Osborn, D. R. (2015). *Threshold Effects of Inequality on the Process of Economic Growth* (No. 205). Economics, The University of Manchester.

Birdsall, N., & Londoño, J. L. (1997). Asset inequality matters: an assessment of the World Bank's approach to poverty reduction. *The American Economic Review*, *87*(2), 32-37.

Castelló-Climent, A. (2010). Inequality and growth in advanced economies: an empirical investigation. *The Journal of Economic Inequality*, *8*(3), 293-321.

Cingano, F. (2014). Trends in income inequality and its impact on economic growth.

Clarke, G. R. (1995). More evidence on income distribution and growth. *Journal of development Economics*, *47*(2), 403-427.

Congleton R. (2004) Rent Seeking and Political Institutions. In: Rowley C.K., Schneider F. (eds) *The Encyclopedia of Public Choice*. Springer, Boston, MA

Congleton, R. (1980). Competitive process, competitive waste, and institutions. *Toward a theory of the rent-seeking society*, *153*, 179.

Coppedge, M., Gerring J., Knutsen, C. H., Lindberg, S. I., Teorell, J., Altman, D., Bernhard, M., Fish, M. S., Glynn, A., Hicken, A., Lührmann, A., Marquardt, K. L., McMann, K., Paxton, P., Pemstein, D., Seim, B., Sigman, R., Skaaning, S., Staton, J., Wilson, S., Cornell, A., Gastaldi, L., Gjerløw, H., Ilchenko, N., Krusell, J., Maxwell, L., Mechkova, V., Medzihorsky, J., Pernes, J., von Römer, J., Stepanova, N., Sundström, A., Tzelgov, E., Wang, Y., Wig, T., & Ziblatt, D. (2019). *"V-Dem Country-Year Dataset v9"*, Varieties of Democracy (V-Dem) Project. https://doi.org/10.23696/vdemcy19

Data.worldbank.org. (2017). Life expectancy at birth, total (years). Data. [online] Available at: https://data.worldbank.org/indicator/SP.DYN.LE00.IN

De Hoyos, R. E., & Sarafidis, V. (2006). Testing for cross-sectional dependence in panel-data models. *The stata journal*, *6*(4), 482-496.

De Maio, F. G. (2007). Income inequality measures. *Journal of Epidemiology & Community Health*, *61*(10), 849-852.

Deininger, K., & Squire, L. (1998). New ways of looking at old issues: inequality and growth. *Journal of development economics*, *57*(2), 259-287.

Fao.org. (2005). *Income Analysis: The Gini Index*. [online] Available at: http://www.fao.org/docs/up/easypol/329/gini_index_040en.pdf

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn World Table. *American economic review*, *105*(10), 3150-82.

Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American economic review*, *90*(4), 869-887.

Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *The review of economic studies*, *60*(1), 35-52.

Gilens, M., & Page, B. I. (2014). Testing theories of American politics: Elites, interest groups, and average citizens. *Perspectives on politics*, *12*(3), 564-581.

Grier, K. B., & Tullock, G. (1989). An empirical analysis of cross-national economic growth, 1951–1980. *Journal of monetary economics*, *24*(2), 259-276.

Hacioglu Hoke, S., & Kapetanios, G. (2017). Common correlated effect cross-sectional dependence corrections for non-linear conditional mean panel models.

Halter, D., Oechslin, M., & Zweimüller, J. (2014). Inequality and growth: the neglected time dimension. *Journal of economic Growth*, *19*(1), 81-104.

Hansen, B. E. (1996). Inference when a nuisance parameter is not identified under the null hypothesis. *Econometrica: Journal of the econometric society*, 413-430.

Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of econometrics*, *93*(2), 345-368.

Hasell, J. (2018). *Is income inequality rising around the world?* [online] Our World in Data. Available at: https://ourworldindata.org/income-inequality-since-1990 [Accessed 22 May 2019].

Hillman, A. L. (2013). Rent seeking. *The Elgar companion to public choice*, 307-330.

Kearney, M. S., & Levine, P. B. (2014). Income inequality, social mobility, and the decision to drop out of high school (No. w20195). National Bureau of Economic Research.

Knowles, S. (2005). Inequality and economic growth: the empirical relationship reconsidered in the light of comparable data. *The Journal of Development Studies*, *41*(1), 135-159.

Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of political Economy*, *89*(5), 841-864.

Leblang, D. A. (1996). Property rights, democracy and economic growth. *Political Research Quarterly*, *49*(1), 5-26.

Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *The American economic review*, 942-963.

Li, H., & Zou, H. F. (1998). Income inequality is not harmful for growth: theory and evidence. *Review of development economics*, *2*(3), 318-334.

Lin, S. C., Huang, H. C., Kim, D. H., & Yeh, C. C. (2009). Nonlinearity between inequality and growth. *Studies in Nonlinear Dynamics & Econometrics*, *13*(2).

Mauro, P. (1995). Corruption and growth. *The quarterly journal of economics*, *110*(3), 681-712.

Ostry, M. J. D., Berg, M. A., & Tsangarides, M. C. G. (2014). *Redistribution, inequality, and growth*. International Monetary Fund.

Perotti, R. (1996). Growth, income distribution, and democracy: What the data say. *Journal of Economic growth*, *1*(2), 149-187.

Persson, T., & Tabellini, G. (1994). Is inequality harmful for growth? *The American economic review*, 600-621.

Pesaran, M. H. (2006). Estimation and inference in large heterogeneous panels with a multifactor error structure. *Econometrica*, *74*(4), 967-1012.

Saint-Paul, G., & Verdier, T. (1993). Education, democracy and growth. *Journal of development Economics*, *42*(2), 399-407.

Sala-i-Martin, X. X. (1997). *I just ran four million regressions* (No. w6252). National Bureau of Economic Research.

Scheidel, W. (2017). *The great leveler: Violence and the History of Inequality from the Stone Age to the Twenty-First Century*. Princeton University Press.

Solt, F. (2019). The standardized world income inequality database, Version 8. https://doi.org/10.7910/DVN/LM4OWF, Harvard Dataverse, V1.

Tullock, G. (1996). Corruption theory and practice. *Contemporary economic policy*, *14*(3), 6-13.

Appendix

	Ind_1		Ind_2		Ind_3	
	(1) Baseline	(2) CS-means	(3) Baseline	(4) CS-means	(5) Baseline	(6) CS-means
Log (Inv/GDP)	0.0214***	0.0208***	0.0218***	0.0214***	0.0219***	0.0197***
	(0.00367)	(0.00397)	(0.00366)	(0.00397)	(0.00367)	(0.00392)
Log (Life Exp.)	0.134***	0.129***	0.131***	0.127***	0.117***	0.110***
	(0.0366)	(0.0362)	(0.0364)	(0.0360)	(0.0364)	(0.0359)
Log (Human Cap.)	-0.0191	-0.0651	-0.0212	-0.0514	0.0121	-0.0760*
	(0.0212)	(0.0405)	(0.0211)	(0.0407)	(0.0209)	(0.0403)
Pop. Growth	0.0692	0.0862	0.225	0.221	0.181	0.259
	(0.301)	(0.305)	(0.302)	(0.305)	(0.301)	(0.305)
$\beta_1(Inst_t \leq \hat{\gamma})$	-0.000855	-0.00102	-0.000547	-0.000650	-0.000726	-0.00109
	(0.000846)	(0.000842)	(0.000847)	(0.000848)	(0.000846)	(0.000838)
$\beta_2(Inst_t > \hat{\gamma})$	-0.000368	-0.000587	-1.11e-05	-0.000148	-0.00118	-0.00159*
	(0.000857)	(0.000857)	(0.000868)	(0.000876)	(0.000850)	(0.000847)
Constant	-0.468***	-5.498***	-0.471***	-5.840***	-0.388***	-4.684**
	(0.148)	(1.875)	(0.147)	(1.876)	(0.147)	(1.867)
Threshold	0.3406	0.3406	0.2896	0.2896	0.2193	0.2193*
P-value	0.1533	0.3033	0.1233	0.2367	0.1300	0.0567
Observations	858	858	858	858	858	858
R-squared	0.100	0.155	0.105	0.159	0.102	0.163
Countries	26	26	26	26	26	26
Country FE	YES	YES	YES	YES	YES	YES
CS-means	NO	YES	NO	YES	NO	YES

*Table A1: Split sample - Developing countries. Significance levels: $p < 0.10$: * $p < 0.05$: ** $p < 0.01$: ***. Standard errors are presented below*

	Ind_1		Ind_2		Ind_3	
	(1) Baseline	(2) CS-means	(3) Baseline	(4) CS-means	(5) Baseline	(6) CS-means
Log (Inv/GDP)	0.0372***	0.0271***	0.0280***	0.0321***	0.0403***	0.0372***
	(0.00635)	(0.00594)	(0.00671)	(0.00613)	(0.00738)	(0.00635)
Log (Life Exp.)	-0.0995	-0.256***	-0.144*	-0.158	-0.0229	-0.0995
	(0.0986)	(0.0950)	(0.0783)	(0.0970)	(0.0824)	(0.0986)
Log (Human Cap.)	-0.0782***	-0.0474*	-0.0290	-0.0468*	-0.0376	-0.0782***
	(0.0263)	(0.0268)	(0.0302)	(0.0267)	(0.0301)	(0.0263)
Pop. Growth	-1.172***	-0.932***	-0.879***	-1.019***	-1.164***	-1.172***
	(0.255)	(0.248)	(0.284)	(0.251)	(0.296)	(0.255)
$\beta_1(Inst_t \leq \hat{\gamma})$	-0.000498	-0.000949	-0.000148	-0.000431	0.000471	-0.000498
	(0.000673)	(0.000667)	(0.000742)	(0.000692)	(0.000748)	(0.000673)
$\beta_2(Inst_t > \hat{\gamma})$	-0.00112*	-0.000395	0.000258	-0.000849	-0.000208	-0.00112*
	(0.000661)	(0.000704)	(0.000749)	(0.000668)	(0.000738)	(0.000661)
Constant	7.284***	7.538***	0.720**	7.745***	0.225	7.284***
	(1.136)	(1.144)	(0.309)	(1.144)	(0.325)	(1.136)
Threshold	0.9045	0.9045	0.8483	0.6949	0.7335	0.7365
P-value	0.2333	0.6033	0.7800	0.4467	0.1200	0.1133
Observations	726	726	726	726	726	726
R-squared	0.367	0.357	0.087	0.360	0.098	0.367
Countries	22	22	22	22	22	22
Country FE	YES	YES	YES	YES	YES	YES
CS-means	NO	YES	NO	YES	NO	YES

*Table A2: Split sample - Developed countries. Significance levels: $p < 0.10$: * $p < 0.05$: ** $p < 0.01$: ***. Standard errors are presented below*

	Ind_1		Ind_2		Ind_3	
	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	CS-means	Baseline	CS-means	Baseline	CS-means
Log (Inv/GDP)	0.0245***	0.0249***	0.0249***	0.0254***	0.0250***	0.0252***
	(0.00290)	(0.00288)	(0.00289)	(0.00288)	(0.00290)	(0.00289)
Log (Life Exp.)	0.117***	0.134***	0.119***	0.136***	0.112***	0.130***
	(0.0300)	(0.0293)	(0.0299)	(0.0293)	(0.0299)	(0.0293)
Log (Human Cap.)	-0.0352**	-0.0508**	-0.0354**	-0.0544**	-0.0343**	-0.0431*
	(0.0148)	(0.0229)	(0.0147)	(0.0229)	(0.0148)	(0.0228)
Pop. Growth	-0.412**	-0.466**	-0.439**	-0.495**	-0.370*	-0.414**
	(0.205)	(0.198)	(0.205)	(0.197)	(0.206)	(0.198)
$\beta_1(Inst_t \leq \hat{\gamma})$	-0.000879	-0.00117**	-0.000726	-0.00106*	-0.000684	-0.000923
	(0.000581)	(0.000580)	(0.000582)	(0.000580)	(0.000598)	(0.000597)
$\beta_2(Inst_t > \hat{\gamma})$	-0.00152***	-0.00185***	-0.00144**	-0.00180***	-0.00117**	-0.00141**
	(0.000574)	(0.000581)	(0.000570)	(0.000576)	(0.000572)	(0.000576)
Constant	-0.356***	0.436	-0.370***	0.593	-0.346***	0.215
	(0.119)	(1.152)	(0.119)	(1.150)	(0.119)	(1.154)
Threshold	0.7711	0.7711	0.7314*	0.7314**	0.6234	0.6234
P-value	0.1433	0.1367	0.0567	0.0333	0.2267	0.2133
Observations	1,584	1,584	1,584	1,584	1,584	1,584
R-squared	0.076	0.168	0.081	0.172	0.075	0.166
Countries	48	48	48	48	48	48
Country FE	YES	YES	YES	YES	YES	YES
CS-means	NO	YES	NO	YES	NO	YES

*Table A3: Increased trimming percentage. Significance levels: p < 0.10: * p < 0.05: ** p < 0.01: ***. Standard errors are presented below*

Developing countries	Developed countries
Argentina	Australia
Bangladesh	Canada
Brazil	Chile
Colombia	Denmark
Costa Rica	Finland
Egypt	France
India	Germany
Indonesia	Greece
Iran	Hong Kong
Kenya	Hungary
Madagascar	Ireland
Malawi	Italy
Malaysia	Japan
Mexico	Netherlands
Pakistan	Norway
Panama	Portugal
Peru	Singapore
Philippines	South Korea
Sierra Leone	Spain
South Africa	Sweden
Sri Lanka	United Kingdom
Sudan	United States
Tanzania	
Thailand	
Venezuela	
Zambia	

Table A4: List of countries divided by development status

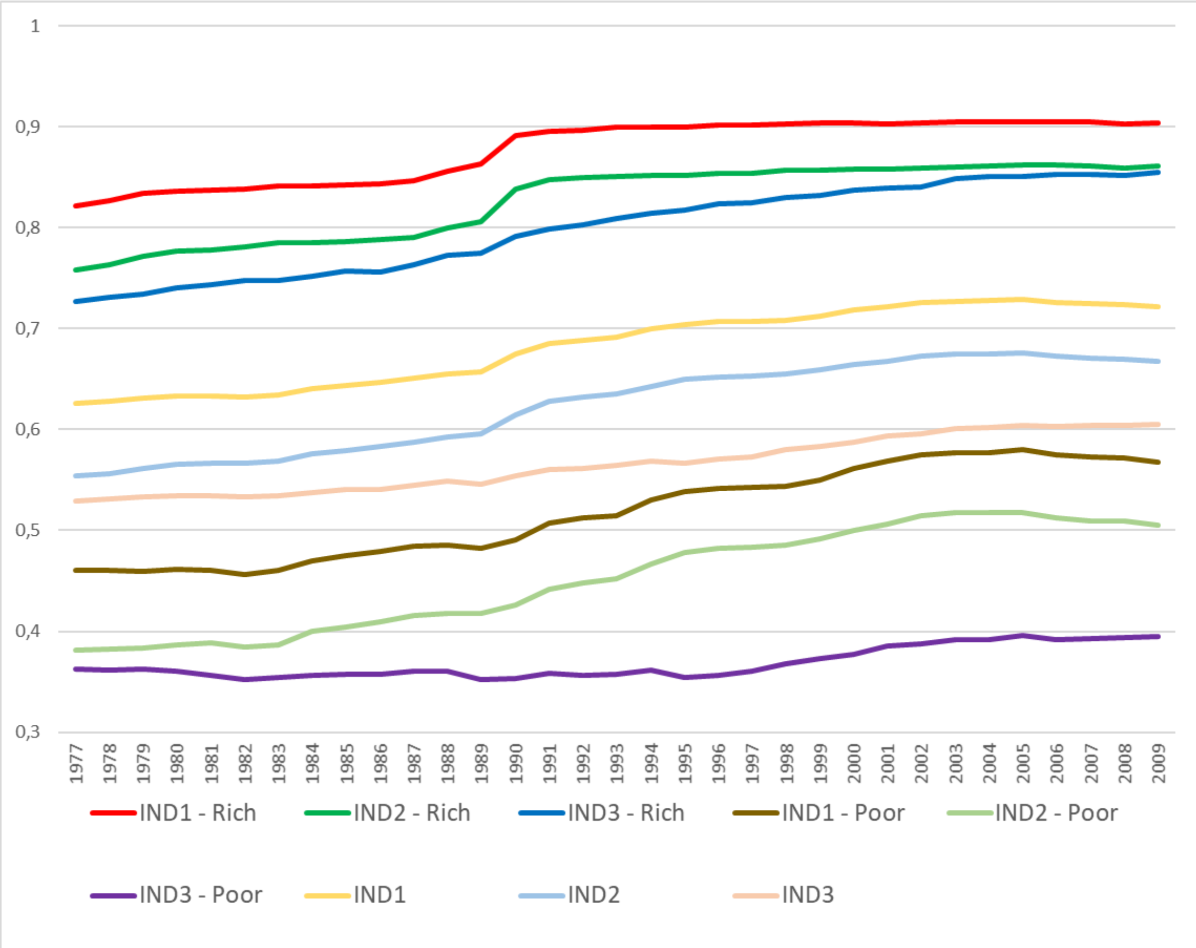

Figure A1: Averages of the three indices measuring institutions