

THE ROLE OF FORMAL INSTITUTIONS ON ECONOMIC INEQUALITY.



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EC-1049 Bachelor's Thesis

Academic year 2018-2019, degree in Economics

July 2019

Abstract

This document will review the literature that provides information about growing inequality and formal institutions, taking as a starting point the evolution of inequality and then connecting it with formal institutions, analyzing their effects on inequality. The collected data belong to the period 2011-2016 of many countries of the world with variables that influence inequality and represent formal institutions, such as: Voice and accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and, finally, Control of corruption; We will look at the effects of these variables on inequality to see how having good government affects or not.

Key words: inequality, formal institutions, Gini index.

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THE ROLE OF FORMAL INSTITUTIONS ON ECONOMIC INEQUALITY

1. Introduction

Is inequality present in our societies nowadays? Is it easily recognizable? How does inequality affect? Do formal institutions influence the level of inequality? Are there remedies to reduce inequality between rich and poor?

These questions are very important for all people who live in society. However, they are difficult to answer. The objective of this paper is to obtain concise answers as they are topics that are increasingly present in national and international consultations and it is one of the most important topics in the socio-economic world, needing to be resolved.

Inequality has been measured in the vast majority of analyzes and empirical work through the Gini index, which presents a moderate level of inequality in developed countries if we compared with developing countries, which present very high levels. It is natural and it is known that a certain degree of inequality favors growth and gives rise to individual successes as a reward for the effort made. But high levels of inequality can turn against us and cause damage to political systems, damage social cohesion causing civil conflicts and can cause economic instability, among other consequences.

Apart from the generic consequences that inequality can bring, we will focus on the variations that can occur when formal institutions come into play. Formal institutions are the rules of the game of a society, the rules that control social interactions (Mantzavinos, North and Shariq, 2015). Various factors have been studied, such as economic freedom (McMullen et al., 2008), governance (Dau and Cuervo-Cazurra, 2014), among others. However, we have focused the efforts of our analysis on studying the effects of government quality on inequality.

At present, the headlines of the news are covered by corruption cases of governments or companies, existing police violence such as in the US for racial issues or in Spain by separatist or unionist ideologies; for these reasons, in our analysis we will study the quality of government through six indicators of The Worldwide Governance Indicators (WGI) which are: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and, finally, Control of corruption. This decomposition of the quality of government is considered the most reliable and accurate way to achieve a quality and faithful image about how to govern (Kaufmann, Kraay y Mastruzzi, 2010).

We carry out the analysis through three types of estimates: Pooled Ordinary Least Squares, Fixed Effects and Random Effects, among other contrasts such as individually, that is, of each variable to check the importance of these factors for inequality. The results that our contrasts show is that, individually, the government quality variables, such as "Control of Corruption" or "Rule of Law", do influence inequality in such a way

that the level of inequality decreases when there is a better quality of government. However, when we perform joint contrasts we find that the best estimate according to our calculations is the estimate by Fixed Effects, which may be due to the temporal limitation of our data.

In the next section, we will present the literature review. In this review, we analyze at first the importance of inequality and its study, as well as main concepts to understand our analysis well; we also offer an explanation about the Gini index as a measure of inequality and formal institutions trying to offer a theoretical and historical basis. In section 3 we explain the variables that we have used in the empirical analysis, the collected data and graphs in which we can observe the most important results. In section 4 we explain the methodology applied to make the required calculations and the different regressions with our variables of interest. After this, we analyze the results obtained. In section 5 we conclude our work with the ideas that we can extract from our results. Finally, after the conclusion, we will find the bibliographic references used throughout the work.

2.Literature review

2.1 The importance of studying inequality.

The initial questions in the previous section refer to inequality / income inequality, being a central issue in political and economic research, as it is considered "one of the greatest social, economic and political challenges of our time" (The Economist, 2012). There are many reasons for giving such importance to inequality: for example, it has been linked to the malfunctioning of political systems, the lack of economic freedom and lower economic growth (Persson and Tabellini, 1994; Stiglitz, 2013; Picketty, 2014). In addition, inequality has been considered a driver of environmental degradation, crime, poor health and a wide range of social problems. (Picketty and Wilkinson, 2009, 2015; Baland and Bardhan., 2007) Throughout the world, the gap between the rich and the poor is at its highest level in decades. Oxfam (2018) recently reported that 42 individuals have the same wealth as the lowest 50% of the world population, or what is the same, 3,700 million people; In addition, 82% of all economic growth created in 2017 went to the richest 1% of the population, while the poorest 50% did not see any increase at all. In the United States, things have been even more extreme, since 95% of the income growth between 2009 and 2012 was aimed at the richest 1% of the population. (Saez, 2014). As summarized by Markus (2017), we are faced with "increasingly pronounced social hierarchies and growing global inequality." Although it is logical to think, and widely recognized, that a certain degree of inequality is necessary to reward the most productive agents and with more capacity in order to move forward in life, inequality at higher levels has negative consequences within a society. In the recent study, (Dabla-Norris et al., 2015) affirms that inequality: erodes the functioning and quality of political systems since political power can be concentrated in the hands of a small part of society, the elite ; increases the risk of financial crisis, causing economic instability and reducing growth; hinders the reduction of poverty; and it can damage social cohesion and provoke civil and social conflicts as it reduces opportunities for the poor and also the mobility of income between generations.

In addition, there is an abundance of studies about inequality and the consequences that this entails, such as, for example, Rufrancos, Power, Pickett and Wilkinson (2013) demonstrated the positive relationship between inequality and homicide rates, that is, if we have more inequality, we will see how the homicides in a country increase; also the highest levels of childhood obesity have been associated in a similar way with higher levels of economic inequality. (Stamatakis, Zaninotto, Falaschetti, Mindell & Head, 2010) ; positive links have also been established between inequality and mental illness, including schizophrenia and depression (por ejemplo, Burns, Tomita y Kapadia, 2014; Johnson, Wibbels y Wilkinson, 2015). Inequality can also affect institutional quality. This has been investigated in works for several years, as in Hoff and Stiglitz (2004) and Sonin (2003), which suggest that an equitable distribution of income, that is, a level of minimum or moderate-low inequality, is a more fertile ground in which good institutions can grow. The first of these studies presents a static framework of institutional subversion; the second, suggests an institutional vehicle for the negative effect of inequality in growth, whereby low quality institutions are related to a greater inclination of the balance towards the rich in terms of the redistribution of wealth.

Likewise, we need an index, a variable to be able to measure economic inequality. There are several indices to measure inequality. Throughout history, the index that has been used the most, including at governmental levels to carry out statistics and policies, is the Gini index (Lyon, Cheung & Gastwirth, 2016). The Gini index is a well-known measure in the field of economic study that is used to measure inequality (Allison, 1978). The Gini coefficient varies between 0 (case of perfect equality) and 1 (perfect inequality); that is, it is equal to 0 if all individuals have the same income value and equal to 1 if all people except one have income 0 and that person has the total amount of income. (Giorgi & Gigliarano, 2016).

2.2 Institutions and their influence on inequality.

Before relating the concepts of institution and inequality, we must ask ourselves: what is an institution? There are many possible definitions that have been given over the decades, but in our analysis we are going to borrow the one presented in the work of Matzavinos, North, Douglass and Shariq (2015): "Institutions are the rules of the game in a society or, more formally, the restrictions devised by humans that structure human interaction. They consist of formal rules (constitutions, statutes, common law and regulations), informal rules (conventions, moral rules and social norms), and the characteristics of each of them in terms of how society enforces them. As these rules establish the incentive structure of a society, they define the way in which the game develops over time. " As they say, institutions are the "rules of the game", the rules of a society. But now, not all rules are imposed in the same way. Literature generally distinguishes two types of institutions: formal and informal. (North, 1990). To understand the meaning, we can say that the formal can be understood as rules, whether regulatory, political or economic, which facilitate exchanges. Informals are norms that have not been designed as such, they simply come from what is transmitted socially, through the so-called culture (North, 1990).

Once we know the concepts of 'inequality' and 'institutions', we can focus on the preceding studies that show the institutions and / or the inequality between them or with other concepts, which can serve as a guide when understanding better our analysis. Literature tries to relate institutions with entrepreneurship since the end of the 20th century, but we will pay more attention to the most recent works. For example, factors such as governance (Dau and Cuervo-Cazurra, 2014), economic freedom (McMullen et al., 2008), property rights and financial capital (Bowen and De Clercq, 2008), entry regulation (Klapper et al., 2006) and control of corruption (Anokhin and Schulze, 2009) are several key institutional factors considered. Also McMullen et al. (2008) shows how the institutional sphere influences the opportunity and the need to undertake in different ways. Bowen and De Clercq (2008) show how financing and education positively affect the allocation of business resources and, on the other hand, the corruption of a country has a negative influence. Similarly, Anokhin and Schulze (2009) demonstrate how controlling corruption increases the confidence of agents in government, fostering innovation and business activity. Recent studies show that if there are high levels of corruption, more government activity and weaker property rights, the potential growth of entrepreneurs diminishes (Estrin et al., 2013).

Particularly, the quality in the way of governing and, in general, the quality of the institutions, is vital to understand up to what level political decentralization can harm the individual welfare (Rodríguez-Pose, & Tselios, 2019). The World Bank (Kaufmann, Kraay and Mastruzzi, 2010) carries out a decomposition of the quality of governments through the construction of 6 pillars: voice and responsibility, political stability and absence of violence / terrorism, effectiveness of the government, regulatory quality, state of law and control of corruption; These indicators are considered the most accurate and reliable indexes to obtain an image of quality in the way of governing. According to Sánchez and Goda (2018) there are studies that analyze corruption as an alternative explanation to the differences between countries in the redistribution of income. We make a point here because we are talking about the concept of income redistribution, which we can relate directly to inequality, and in particular, to inequality between countries.

Since the last decade of the twentieth century, numerous studies have been published in which a new concept appears, the "Quality of Government" (QoG), this being an important determinant of a large number of variables related to welfare of people within a country (Charron, Dijkstra and Lapuente, 2014). This indicator is born of the evident attention that has increased in recent years and, in addition, we must add the interest shown by some international organizations such as the World Bank and the United Nations, which have emphasized the importance of the value of good governance and the possession of solid institutions (Holmberg, Rothstein and Nasiritousi 2009). This has caused the creation of new data, and in particular of the most measurable aspects of "Quality of Government": such as the control of corruption, the strength of the rule of law and bureaucratic quality (Charron, Dijkstra & Lapuente, 2014). The correlation between these indicators in several countries is so high that the term "quality of government" has been coined to synthesize the concept of a government that is non-corrupt, impartial and efficient (Rothstein and Teorell, 2008). Countries with a high "quality of government" have higher scores in almost all areas related to citizens' welfare (Holmberg, Rothstein and Nasiritousi 2009). According to the study by Charron, Dijkstra, and Lapuente (2014): "those regions where the quality of life is perceived as low by its own citizens, are those same regions that have the worst performance in the standard indi-

cators of human development . A tentative normative conclusion would therefore be that, in addition to existing transfer policies, a joint effort aimed at improving “Quality of Government” in those regions with lower levels could substantially improve the economic prospects of these regions and the lives of their regions residents. "

In Chong and Gradstein (2004) they relate our two key concepts, inequality and institutions, reaching the following conclusions: based on the fact that in their analysis there is a significant correlation between income inequality and (low) institutional quality, it is reasonable to think that "Weak institutions can lead to income inequality" (Chong and Gradstein, 2004). For example, according to Chong and Gradstein (2004), when poor citizens are not given the protection of an independent judicial system, their capacity to obtain income is lower than that of wealthy citizens. It has also been suggested in Chong and Gradstein (2004), that a high inequality (of income) leads the rich to exert a more powerful influence and political pressure, and in this way, they transform the institutions so that they benefit the collective of rich citizens.

3.Measuring economic inequality and formal institutions.

Our benchmark for measuring economic inequality is the Gini index, as we mentioned in the previous section. The inequality index data are measured from 0 to 100, 0 points being the non-existence of inequality and 100 points the maximum level of inequality that can be achieved. On the other hand, in order to carry out the contrast of empirical form about the effects that formal institutions have with inequality, we have turned to The Worldwide Governance Indicators (WGI). (<https://info.worldbank.org/governance/wgi/#home>). The WGI contains global governance indicators at both the individual and aggregate levels. The Worldwide Governance indicators differentiates six dimensions of governance: Voice and accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and, finally, Control of corruption. In our analysis we have used these variables as representatives of formal institutions and also control variables, to avoid the possible bias of our variables of interest.

3.1 Variables' types in our model.

As we have already mentioned, the WGI has six indicators in total to refer to the quality or way of governing. We have obtained within these indices data from 2011 to 2016, which will allow us to see the evolution of the institutions, to observe if there are changes in our dependent variable and in what sense they do it in a sample of countries around the world, which are: Germany, Austria, Belgium, Bulgaria, Cyprus, Croatia, Denmark, Slovakia, Spain, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, Holland, Portugal, United Kingdom, Czech Republic, Romania, Sweden, Argentina, Belarus, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Indonesia, Kazakhstan, Panama, El Salvador, Thailand, Turkey and Ukraine.

First, regarding the indicators that refer to the quality of government, Political Stability and Absence of Violence measures the perception of the existing probability of political instability and / or violence for political reasons, including terrorism. This index, like the six indicators of good governance, is estimated in a range of -2.5 to +2.5, meaning -2.5 a weak government with political instability and presence of violence and / or terrorism and reaching up to +2.5, this being a strong government, that is, stable politically and without violence. Second, the Government Effectiveness reflects perceptions of the quality of public services, the quality of public administration and the degree of independence of political pressures, the quality of policy formulation and implementation, and the credibility of the commitment to said policies. Third, Rule of Law reflects the perceptions of the extent to which agents entrust and respect the rules of society, and in particular, the quality of compliance of contractors, property rights, police and courts, as well as the probability of crime and violence. Fourth, Regulatory Quality refers to the perceptions of the government's capacity to formulate and implement sound policies and regulations that allow and promote the development of the private sector. Fifth, Voice and Accountability, which reflects the perceptions of the extent to which the citizens of a country can participate in the selection of their government, as well as freedom of expression, freedom of association and free media. Sixth and last, as regards the institutional independent variables, we have Control of Corruption that reflects the perceptions of the extent to which public power is exercised to obtain private profits, including small and large forms of corruption, as well as the "Capture" of the state by elites and private interests.

In addition, we have introduced a new variable called "Totqog". This variable is formed from the annual average of each of the six "Quality of Government" indicators of the model. By creating this variable we seek to have a total measure of government quality that we can directly compare with inequality.

Apart from our dependent variable represented by the Gini index and the variables that represent the formal institutions of our model, we have included control variables. We have introduced these types of variables to control the possible biases towards our dependent variable, that is, with the purpose of eliminating or neutralizing its effects in our variable to be explained. We have introduced a total of four control variables:

- GDP per capita (in \$ currency)
- Population growth (annual %)
- Unemployment (% of total labor force)
- School enrollment, secondary (% net)

First, GDP per capita is the gross domestic product divided by the population, with the data in current US dollars. Second, population growth is the annual growth rate of the population for the year 't', that is, the exponential growth rate of the half-year population from the year 't-1' through year t, expressed in percentage. This index counts all residents regardless of their legal status or citizenship. Third, the Unemployment control variable refers to the proportion of the workforce that is unemployed but available and looking for work. It is measured as a percentage of the total workforce. Finally, School

enrollment is the net enrollment rate of children of official school age who are enrolled in school with respect to the total population of the corresponding official school age. It is also measured in percentage.

Once we know all the variables that are present in our analysis, it is necessary to specify the name that these variables take in our model:

- *Gin* : Gini index
- *GDPpc* : Gross Domestic Product per capita
- *Popgro* : Population growth
- *Unem*: Unemployment
- *School*: School enrollment
- *Control* : Control of corruption
- *Polabs* : Political Stability and Absence of Violence
- *Goveff* : Government Effectiveness
- *Rulaw* : Rule of Law
- *Voiaccount* : Voice and Accountability
- *Regqua* : Regulatory Quality
- *Totqog* : Total average quality of government

Knowing the nomenclature of the variables, we present a table below as a summary of the statistical panel data of our model, in which we can observe the standard deviation, the mean and the minimum and maximum:

Table 1. Descriptive statistics

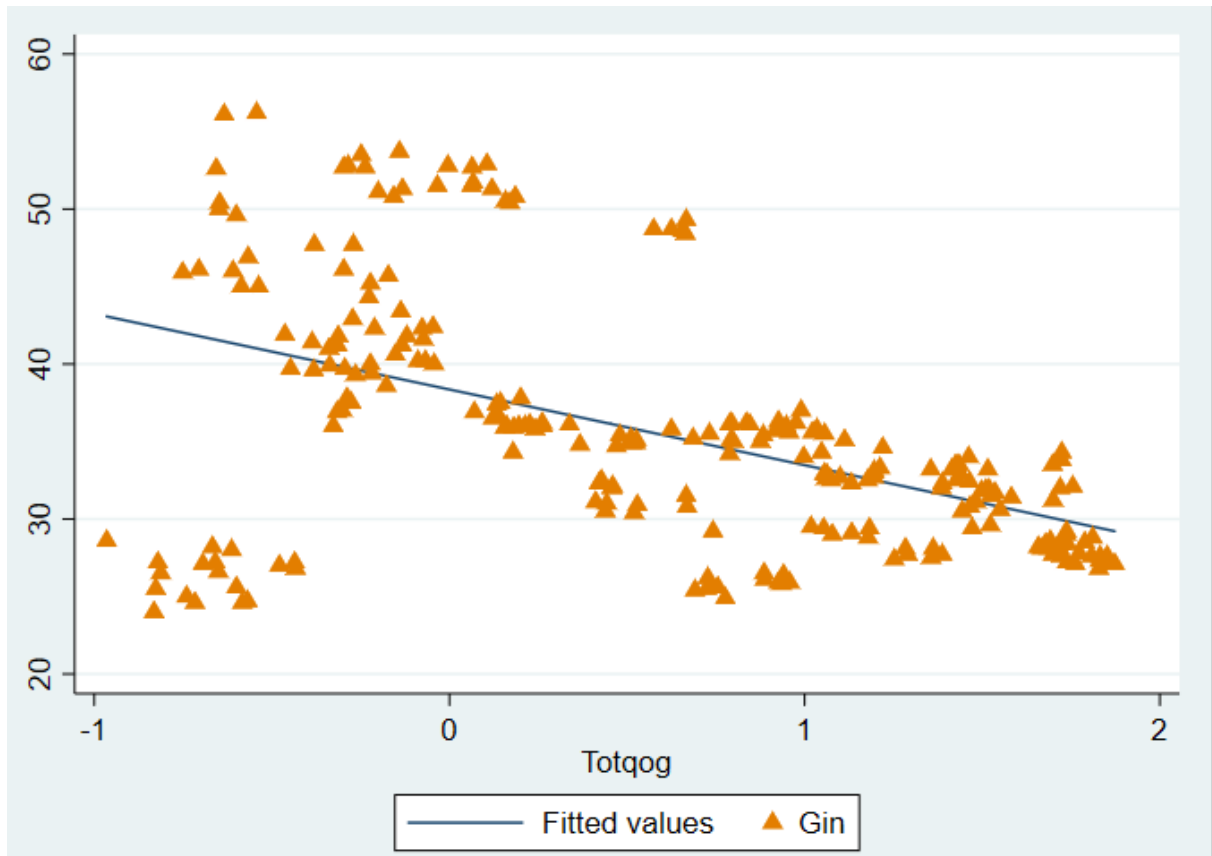
Variable	Obs	Mean	Std. Dev.	Min	Max
Países	0				
t	240	2013.5	1.711394	2011	2016
C	240	3.5	1.711394	1	6
Gin	240	35.61208	7.969617	24	56.2
Control	240	.4907908	1.011097	-1.131518	2.404901
Polabs	240	.3158389	.720957	-2.020833	1.439398
Goveff	240	.6577617	.8248285	-1.077807	2.241138
Rulaw	240	.5615321	.9713828	-1.205298	2.100273
GDPpc	240	24582.91	22047.1	2120.589	118823.6
Popgro	240	.5487945	.8044358	-1.853715	2.401542
Unem	240	8.333049	5.08809	.4892	27.4662
School	240	86.35549	10.71983	42.75494	99.64197
Voiaccount	240	.6497024	.7743268	-1.660208	1.690358
Regqua	240	.6994692	.8199219	-1.177444	1.976167
Totqog	240	.5625158	.8020728	-.9649974	1.872992

Source: own elaboration.

We can see in Table 1 how the independent variables that represent the formal institutions show data with a minimum of -2 from "Polabs" and a maximum from "Control" of 2.40, this being the variable that presents the highest standard deviation of the six that are measured in the same numerical parameters. In addition, this set of variables is between 0'3 and 0'7 in terms of the average of each of the variables, which would indicate that each of the measures for each country has an average of approved in terms of quality of government. We can also observe this with the variable "Totqog", which presents an average of 0.56. In this way we can anticipate that we are analyzing a sample of developed countries but with clear deficiencies in some index of governability of some of them.

In the Graph 1 we carry out the representation of the relationship between our dependent variable 'Gin' and our independent variable 'Totqog'. The data of both variables are in the time frame, that is, between 2011 and 2016 for each country of the analysis.

Graph 1: Scatter plot about Gini index and Political Stability.



Source: own elaboration

As we have said, we observe the relationship between the Gini index and the average of the total "Quality of Government" of each country. We can see that as the level of government quality rises, inequality is lower. That is, there is a negative relationship between institutions and inequality, since as the quality of institutions increases, inequality falls. In fact, when "Totqog" increases from 0 approximately, there is a sharp drop in inequality without reaching 40 points, due to better government.

Table 2. Correlation Panel Data 2011-2016

	Gin	GDPpc	Popgro	Unem	School	Control	Polabs	Goveff
Gin	1.0000							
GDPpc	-0.4282	1.0000						
Popgro	0.3814	0.1995	1.0000					
Unem	-0.1457	0.0659	-0.4545	1.0000				
School	-0.6828	0.4123	-0.3939	0.3523	1.0000			
Control	-0.4685	0.8479	-0.0122	0.1323	0.5079	1.0000		
Polabs	-0.4852	0.6386	-0.0939	0.1017	0.3884	0.7163	1.0000	
Goveff	-0.5199	0.8034	-0.0790	0.2270	0.5494	0.9511	0.7151	1.0000
Rulaw	-0.5224	0.8117	-0.1057	0.2222	0.5512	0.9597	0.7416	0.9744
Voiaccount	-0.3102	0.7105	-0.0976	0.3073	0.3755	0.8475	0.7448	0.8664
Regqua	-0.4449	0.7456	-0.1141	0.2173	0.4214	0.8962	0.6847	0.9313
Totqog	-0.4914	0.8167	-0.0866	0.2132	0.5025	0.9632	0.8091	0.9731

	Rulaw	Voiaccount	Regqua	Totqog
Rulaw	1.0000			
Voiaccount	0.8857	1.0000		
Regqua	0.9490	0.8590	1.0000	
Totqog	0.9858	0.9242	0.9506	1.0000

Source: own elaboration.

In the correlations table we can see how there are a great majority of positive signs, although negative ones are also present. The highest negative correlation is the one that relates the variable "School" and "Gin" of -0.6828. On the other hand, we have very high positive correlations, especially among the institutional variables and the average quality of government "Totqog". It is logical that the correlations between these variables are high since they represent data that are closely related, in this case, about the quality of government. In fact, the highest is almost a perfect positive correlation between "Rulaw" and "Totqog", being 0.9858.

Next, we will perform an econometric analysis that will allow us to verify these relationships and know if they are significant or not.

4. Empirical Analysis

4.1 Methodology

The main objective of this study is to analyze to what extent the variations produced in "Gin", that is, the Gini index in representation of inequality, are associated with changes in the variables that represent the formal institutions of our model. To carry out the empirical analysis we will use three types of econometric methodologies, namely: Pooled Ordinary Least Squares, Fixed Effects and Random Effects. During the analysis, we will try to analyze the different influences and the significance of the different variables and compare them.

First of all we carry out a particular analysis of each variable to check the influence and the significance they have on the "Gini index" and thus, be able to affirm exactly if they are important for inequality or not. Secondly, we will carry out several regressions with different sets of variables to compare the results of the estimates and analyze the differences between them. We have two groups of variables as we have already mentioned, the control variables and the variables that represent our formal institutions and also the variable "Totqog" representing the average of the sum of the 6 institutional variables. In the first phases we will use the method of Pooled Ordinary Least Squares and to finish the study we will make several estimations through Fixed Effects and Random Effects that allow us to have a stronger evidence to make the conclusions more solid.

4.2 Model and results

In this first part of the analysis, we estimate the following individual models to study the significance of each of the variables with our inequality index (the numbering of the following equations is directly related to the numbering of the screenshots of the program as follows: (1) -> [10], (2) -> [11], and so on.) :

$$(1) \quad Gin_{i,t} = B_0 + B_1 Control + u_{i,t}$$

$$(2) \quad Gin_{i,t} = B_0 + B_1 Polabs + u_{i,t}$$

$$(3) \quad Gin_{i,t} = B_0 + B_1 Goveff + u_{i,t}$$

$$(4) \quad Gin_{i,t} = B_0 + B_1 Rulaw + u_{i,t}$$

$$(5) \quad Gin_{i,t} = B_0 + B_1 Voiceaccount + u_{i,t}$$

$$(6) \quad \text{Gin}_{i,t} = B_0 + B_1 \text{Regqua} + u_{i,t}$$

$$(7) \quad \text{Gin}_{i,T} = B_0 + B_1 \text{Totqog} + u_{i,t}$$

$$(8) \quad \text{Gin}_{i,t} = B_0 + B_1 \text{GDPpc} + u_{i,t}$$

$$(9) \quad \text{Gin}_{i,t} = B_0 + B_1 \text{Popgro} + u_{i,t}$$

$$(10) \quad \text{Gin}_{i,t} = B_0 + B_1 \text{Unem} + u_{i,t}$$

$$(11) \quad \text{Gin}_{i,t} = B_0 + B_1 \text{School} + u_{i,t}$$

Through these estimations we try to identify the individual relationship of each variable with the Gini index ("Gin"). We want to analyze if an increase or decrease in the value of these variables translates into an increase or decrease in the Gini index. The signs we expect from each of the β_1 vary according to the independent variable: of the equations (1), (2), (3), (4), (5), (6), (7), (8) and (11) we expect a negative sign because as these variables increase, this will translate into a decrease in inequality since they are the variables of good government, including the total average of these and two of the control variables, "GDPpc" and "School" which it is reasonable to think that if any of these factors increases in any unit, it will cause a decrease in the level of inequality. As Chong and Gradstein (2004) state: "weak institutions can lead to income inequality". On the other hand, we expect a positive sign from the remaining equations, because when we increase any of these variables, it is logical to intuit that inequality will increase. We also expect that the coefficients of determination are related to the correlation between the variables analyzed previously and, thus, we expect them to be all elevated

In the regressions that we will see next we tested the null hypothesis that the coefficient in the different indicators is equal to zero ($H_0: \beta = 0$) and the alternative that the coefficient is different from zero ($H_1: \beta \neq 0$). The levels of significance chosen are: 10% (*), 5% (**) and 1% (***). We present Table 3, which shows the results of the first eight regressions.

Table 3. OLS Robust Data Panel

Variable	eq_10	eq_11	eq_12	eq_13
Control	-3.475516***			
Polabs		-3.8621436***		
Goveff			-4.18809***	
Rulaw				-4.030057***
Voiaccount				
Regqua				
Totqog				
GDPpc				
Popgro				
Unem				
School				
_cons	37.300392***	36.773873***	38.299679***	37.828342***
N	240	240	240	240
r2	.86472943	.85148779	.8784649	.88059284

legend: * p<.1; ** p<.05; *** p<.01

Variable	eq_14	eq_15	eq_16	eq_17
Control				
Polabs				
Goveff				
Rulaw				
Voiaccount	-3.1591133***			
Regqua		-4.0294796***		
Totqog			-4.7483187***	
GDPpc				-.00014074***
Popgro				
Unem				
School				
_cons	37.63349***	38.408477***	38.239042***	39.020377***
N	240	240	240	240
r2	.82975982	.85686627	.88031285	.87005087

legend: * p<.1; ** p<.05; *** p<.01

Variable	eq_18	eq_19	eq_20
Control			
Polabs			
Goveff			
Rulaw			
Voiaccount			
Regqua			
Totqog			
GDPpc			
Popgro	1.6569733***		
Unem		-.08724117	
School			-.39355513***
_cons	34.677837***	36.276581***	69.518109***
N	240	240	240
r2	.86501866	.85798959	.8990359

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

It is necessary to emphasize that there is a previous work, the Breusch-Pagan test of heteroscedasticity, which revealed that it is present in our models. To solve this, we carry out the calculation of robust standard errors and, in this way, the probability of rejecting the null hypothesis when it should not be rejected is lower. We have done this process for all the regressions of our model. (We attach an example of this process in the appendix for the variable "Control", "Appendix, Image 1).

The results obtained do not vary too much of the expected since all the institutional variables and also the average ("totqog") present negative coefficients with values between 3'15 and 4'7, being this reasonable because they represent measures of "quality

of government" ", It is to be assumed that inequality will decrease, since it is an important determinant of a multitude of societal welfare variables within a country (Charron, Dijkstra and Lapuente, 2014). On the other hand, there is a sign that contradicts our predictions: the sign of the variable "Unem" is negative, which does not make much economic sense because we would be affirming that as unemployment increases, inequality decreases, something contradictory in social terms. economic however, as it is not significant, we will not take it into account. Regarding the significance of our variables, we can affirm that they are all significant at 1% in the individual contrast except the variable "Unem".

Next, we will divide the variables into three groups to see how the significance has varied, the sign of our coefficients and the importance of the variables throughout the analysis. Equation (12) contains only the institutional independent variables without the control variables, equation (13) contains only the independent control variables and the average of the sum of the government quality indicators ("Totqog") and, finally, the equation (14) contains all the variables of our model except "Totqog" since it would not be logical to include a total average variable within a model with our variables of interest and it will throw us wrong data of our contrasts, too.

(12)

$$Gin_{i,t} = B_0 + B_1Control + B_2Polabs + B_3Goveff + B_4Rulaw + B_5Voiaccount + B_6Regqua + u_{i,t}$$

(13)

$$Gin_{i,t} = B_0 + B_1Control + B_2Polabs + B_3Goveff + B_4Rulaw + B_5Totqog + u_{i,t}$$

(14)

$$Gin_{i,t} = B_0 + B_1Control + B_2Polabs + B_3Goveff + B_4Rulaw + B_5Voiaccount + B_6Regqua + B_7GDPpc + B_8Popgro + B_9Unem + B_{10}School + u_{i,t}$$

In the same way as in the previous section, we have performed the Breusch-Pagan test to see if there is heteroscedasticity, and indeed, we have rejected the null hypothesis of non-existence of heteroscedasticity. Therefore, we have been forced to calculate robust standard errors. Furthermore, as before, we have proposed the null hypothesis that the coefficient is equal to zero ($H_0: \beta = 0$) and the alternative hypothesis that the coefficient is different from 0 ($H_1: \beta \neq 0$). The chosen levels of significance for our test are again 10% (*), 5% (**) and 1% (***).

In the first place, the variables that we are going to analyze in this section are only the independent variables that represent the institutions: "Control", "Polabs", "Goveff", "Rulaw", "Voiaccount" and "Regqua".

Table 4. OLS Robust Data Panel I

Variable	eq_1
Control	5.1903866***
Polabs	-4.2145733***
Goveff	-5.6992227***
Rulaw	-11.798984***
Voiaccount	8.68477***
Regqua	4.0353076**
_cons	36.304964***
N	240
r2	.48789317

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

In Table 4 we observe our independent variables representing the formal institutions, which are significant at 1% all except "Regqua", which is significant at 5%. Regarding the signs, we find half of them negative from "Polabs", "Goveff" and "Rulaw", which fits with our literature and logic since, being indicators of good governance, they should decrease the inequality. On the other hand, we found positive signs from "Control", "Voiaccount" and "Regqua", which is not very logical since if, for example, if control of corruption increases, it must necessarily translate into a decrease in inequality, keeping everything else constant, *ceteris paribus*. These results contradict, for example, what Anokhin and Schulze (2009) demonstrated, that by controlling corruption, citizens' confidence in government increases, promoting innovation and business activity. However, we will continue with the other regressions before drawing conclusions. What is undeniable is that our model has certain limitations.

Secondly, we have introduced the control variables and our total average variable of the quality of the institutions in order to see the significance of "Totqog" and how it

could affect the level of inequality. We have returned and the results obtained appear in Table 5.

Table 5. OLS Robust Data Panel II

Variable	eq_2
GDPpc	-.00010228***
Popgro	3.3109922***
Unem	.31997553***
School	-.36637446***
Totqog	-.27082154
_cons	65.433751***
N	240
r2	.56876016

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

The variable "Totqog" does not come out as significant, therefore, its effect on the dependent variable is not important. In this section we can also see how the four control variables are significant at 1% and the signs are the expected ones.

Thirdly, once the variables were analyzed, differentiating them into two groups, we carried out the analysis of all the variables that we have introduced in our model.

Table 6. OLS Robust Data Panel (All variables) III

Variable	eq_OLS
Control	3.8637979***
Polabs	-3.4040357**
Goveff	-4.5699397***
Rulaw	-3.445151*
Voiaccount	6.0795694***
Regqua	.41943501
GDPpc	-.00010939***
Popgro	3.1079911***
Unem	.18443294**
School	-.2631825***
_cons	57.661978***
N	240
r2	.65634812

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

In this table we can observe the control variables and the independent variables in representation of the formal institutions. There are several significativities: "Regqua" is not significant; "Rulaw" is significant at 10%; "Polabs" and "Unem" are at 5% and the remaining ones are significant at 1%. However, despite throwing significant data, some can be confusing when it comes to economically reasoning, for example, it is difficult to argue that any of the indicators of good governance show a positive coefficient that

causes increases in inequality as this increases, as is the case of the variable "Control". This may be due to the temporary limitations in our study.

Once we have the three equations returned, we are going to carry out a comparison between this three different groupings that we have carried out previously.

Table 7. OLS Robust Data Panel (all variables groups)

Variable	eq_1	eq_2	eq_OLS
Control	5.1903866***		3.8637979***
Polabs	-4.2145733***		-3.4040357**
Goveff	-5.6992227***		-4.5699397***
Rulaw	-11.798984***		-3.445151*
Voiaccount	8.68477***		6.0795694***
Regqua	4.0353076**		.41943501
GDPpc		-.00010228***	-.00010939***
Popgro		3.3109922***	3.1079911***
Unem		.31997553***	.18443294**
School		-.36637446***	-.2631825***
Totqog		-.27082154	
_cons	36.304964***	65.433751***	57.661978***
N	240	240	240
r2	.48789317	.56876016	.65634812

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

In Table 7 we can see how the signs, effects and significativities of the variables have varied in the three different regressions that we have carried out. Some variables suffer variations in terms of coefficient and significance but do not change sign. The variables "Control", "Goveff", "Voiaccount", "GDPpc", "Popgro" and "School" do not change in terms of significance or sign, they only vary in the value of the coefficient. There are variables that have lost significance, such as: "Regqua" that goes from being significant to 5% in the equation [1] to not being significant in the OLS equation, or also "Rulaw"

that of being significant at 1%, in the OLS equation it is significant at 10%. What we can highlight to a greater extent through the comparison of these three regressions, apart from the minimal variations that have occurred in the significance, is how the coefficient of determination has increased: it increases by almost 20% when passing from the equation [1] with only the institutional variables, to the equation (OLS) in which we find all the variables of our model, with a coefficient of determination of 65%.

Next, we will use all the variables of our model using different estimates. These will be: Pooled Ordinary Least Squares, Fixed Effects and Random Effects. Once each of them is calculated, we will individually analyze the results and compare them among them. To finish with the empirical analysis, we use the Breusch-Pagan test and the Hausman test to verify which is the most accurate and appropriate type of estimation for our analysis. As usual, we stated the null hypothesis which indicates that the coefficient is equal to zero ($H_0: \beta = 0$) and the alternative in which the coefficient is different from zero ($H_1: \beta \neq 0$). The levels of significance chosen are, again, 10% (*), 5% (**) and 1% (***).

As for the Pooled Ordinary Least Squares estimate for the regression that contains all the variables, we will not do it again since we have already done it in the previous section. With which, the results and conclusions are the same.

Regarding the estimation by Fixed Effects, we carry out the calculation of the equation.

Table 8. Fixed Effects Data Panel

Variable	eq_FE
Control	-.62031184
Polabs	-.43980401
Goveff	-.62317596
Rulaw	-1.6682015**
Voiaccount	-1.4545462*
Regqua	2.3822759***
GDPpc	-.00005495**
Popgro	.37417518
Unem	.0564814
School	.05014189
_cons	33.025547***
N	240
r2	.15584332

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

In Table 8 we can see the results obtained according to the estimation by fixed effects. We only have 4 variables that are significant: 1% "Regqua", 5% "Rulaw" and "GDPpc" and 10% "Voiaccount". Perhaps we could lose significance when estimating fixed effects because the temporal variation is low and therefore the institutions do not change too much in the short term. In this way, the fixed effects have been able to capture the effects of the institutions, losing significance. Regarding the signs, it is noteworthy that all except the variable "Regqua" have negative signs, which had not happened when returning with all the variables until doing so through fixed effects.

Then, we perform the analysis of our model through random effects estimation. (Table 9)

Table 9. Random Effects Data Panel

Variable	eq_RE
Control	-.77809001
Polabs	-.52678303
Goveff	-.58839063
Rulaw	-1.8421414**
Voiaccount	-.85496532
Regqua	2.2561268***
GDPpc	-.00006476***
Popgro	.57738623**
Unem	.05197974
School	-.0231044
_cons	39.39629***
N	240
r2	

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

In this regression estimated by random effects we can find two types of significativities: 1% are the variables "Regqua" and "GDPpc" and 5% "Rulaw" and "Popgro". The other variables are not significant. All the signs of this estimate are the expected ones except "Regqua", which is positive, which would mean an increase in inequality and we insist that it does not make economic sense.

Finally, we make a comparison of the three estimates in Table 10.

Table 10. OLS, Fixed Effects and Random Effects Data Panel

Variable	eq_OLS	eq_FE	eq_RE
Control	3.8637979***	-.62031184	-.77809001
Polabs	-3.4040357**	-.43980401	-.52678303
Goveff	-4.5699397***	-.62317596	-.58839063
Rulaw	-3.445151*	-1.6682015**	-1.8421414**
Voiaccount	6.0795694***	-1.4545462*	-.85496532
Regqua	.41943501	2.3822759***	2.2561268***
GDPpc	-.00010939***	-.00005495**	-.00006476***
Popgro	3.1079911***	.37417518	.57738623**
Unem	.18443294**	.0564814	.05197974
School	-.2631825***	.05014189	-.0231044
_cons	57.661978***	33.025547***	39.39629***
N	240	240	240
r2	.65634812	.15584332	

legend: * p<.1; ** p<.05; *** p<.01

Source: own elaboration

Table 10 shows the OLS estimates represented in the previous section, the estimates with fixed and random effects. The variables "Control" and "Voiaccount" are significant at 1% in the OLS equation; nevertheless, the sign is positive of both variables, which is not very economically reasonable. In contrast, in the estimates made for fixed effects and random effects it is negative, which is more logical but does not yield significant data of these two variables except "Voiaccount" that is significant at 10% in the equation estimated by fixed effects. Secondly, the variables "Polabs" and "Goveff" have not varied in sign, they remain negative, but they are only significant in the OLS equation, at 5% and 1% respectively. Third, the variables "Rulaw" and "Regqua" have also maintained the negative sign in the three regressions but, contrary to the previous variables,

have increased their significance in the FE and RE equations. Finally, the control variables yield data that approach our intuition with greater accuracy in the OLS equation due to the significant of these and the expected signs that are reasonable from a socio-economic perspective. For example, it is not reasonable to think that as the secondary school rate increases, it translates into an increase in inequality as indicated by the equation estimated by fixed effects. Although this result is not really important in our analysis because it is a control variable, it is interesting to see this type of results because it means that our study has limitations which can yield illogical data that contradict the literature.

It is necessary to make an incision to understand these results. The estimated regressions of panel data can also present a number of drawbacks. If the variation in our key variables is largely due to cross-sectional variations and not to regional internal variations, the estimation by fixed effects could yield misleading data (Barro, 2000). This means that if the causal factors that intervene in the growth are persistent, the long-term transverse effects are included in the fixed effects of the region, causing the explanatory coefficients of the endogenous variable to be less informative. Furthermore, as Banerjee and Duflo (2000) said, "the measurement-error bias worsens when using only the variation within the region, so the bias can be more severe than when using simple OLS". In conclusion, Partridge (2005) came to the conclusion that when estimating by fixed effects, the results can be inaccurate for analyzes in which the variations occur mainly in a transversal way. Unlike fixed effects, RE and Pooled OLS result in data closer to the standard OLS when the large part of the variation is transverse.

Another explanation may be the one offered in the work of Clark and Linzer (2015): affirm that the estimate of β by means of fixed effects it can be understood as the average of the effects within the unit of 'X' on 'Y'. That is, under certain assumptions, this estimator can yield data that is very dependent on the sample, that is, especially sensitive to random error in any data set. If we assume that there are few observations per unit, as is our case since we cover the year 2011 to 2016, in this case the estimates of the effects of 'X' on 'Y' may differ from the actual effect due solely to chance. This lack of robustness when estimating by FE is what is meant by high variance.

Next, to find out if the random effects model or the Pooled Ordinary Least Squares model is more appropriate, we used the Breusch-Pagan test carried out the Lagrange multiplier test for random effects. The table 11 shows the results obtained.

Table 11. Breusch-Pagan test

Breusch and Pagan Lagrangian multiplier test for random effects

$$G_{in}[numpai,t] = Xb + u[numpai] + e[numpai,t]$$

Estimated results:

	Var	sd = sqrt(Var)
Gin	63.51479	7.969617
e	.735416	.857564
u	25.86929	5.086186

Test: $\text{Var}(u) = 0$

chibar2(01) = 448.68
 Prob > chibar2 = 0.0000

Source: own elaboration

The null hypothesis of this test is that the variance of the random deviation "u" is equal to zero. If the test is rejected it is preferable to use the random effects method. In our model, we can reject the null hypothesis, so the random effects "u" are relevant and we prefer to use the random effects estimation than the Pooled Ordinary Least Squares.

Table 12. Hausman test.

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) eq_FE	(B) eq_RE		
Control	-.6203118	-.77809	.1577782	.2085086
Polabs	-.439804	-.526783	.086979	.0589279
Goveff	-.623176	-.5883906	-.0347853	.0909379
Rulaw	-1.668202	-1.842141	.1739399	.1761211
Voiaccount	-1.454546	-.8549653	-.5995809	.3419759
Regqua	2.382276	2.256127	.1261492	.2002569
GDPpc	-.0000549	-.0000648	9.81e-06	.0000123
Popgro	.3741752	.5773862	-.2032111	.0531379
Unem	.0564814	.0519797	.0045017	.0125667
School	.0501419	-.0231044	.0732463	.0166287

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 36.26
 Prob>chi2 = 0.0000

Source: own elaboration

Finally, to decide and choose the fixed effects model or the random effects model, we use the Hausman test. The response of this test depends on the possibility of a correlation between the individual error component "u" and the variables. Thus, the null hypothesis (H0) of the Hausman test is that the estimators of random effects and fixed effects do not differ substantially. While if the H0 is rejected, the estimators do differ and the conclusion is that the fixed effects are more convenient than the random effects. In our model we can affirm that we have sufficient evidence to reject the null hypothesis, because the estimators differ systematically, and therefore, we will use the estimation by fixed effects. As we have mentioned previously, choosing the estimate for fixed effects in our model can be somewhat contradictory or confusing and may be due to the limitation we have for the period of time analyzed. Surely if we choose data that cover a greater number of years the choice of estimation by fixed effects would change.

5. Conclusion

In recent years, inequality has become a central issue in international conversations, calling it the challenge of our era. Inequality has a huge amount of negative consequences when it exceeds certain levels, such as: environmental degradation, the malfunctioning of political systems, lower economic growth, less freedom, poor health, among other socio-economic problems. However, a certain level of inequality is necessary to keep growing, keeping prizes for those who are more productive and rewards for effort. However, each time the wealth is worse redistributed, which leads to a division between increasingly pronounced social classes and an increase in global inequality. To introduce it in the subsequent empirical analysis, we use the Gini index in representation of inequality, since it is the most used measure.

On the other hand, we find formal institutions, the rules of the game, of a society. In order to carry out the analysis about the influence that these institutions have on inequality, we have used the data provided by The Worldwide Governance Indicators (WGI), which divides the quality of government into six indicators. Together with the control variables introduced, we carry out the analysis to see how they influence inequality levels. Through three methodologies, Pooled Ordinary Least Squares, Fixed Effects and Random Effects, we analyze the influences and significativities.

To carry out the analysis, we used data from the aforementioned variables from countries around the world from 2011 to 2016. Through the different regressions that we have carried out we have been able to check the influence of each variable individually with respect to the index of Gini and also by groups of independent variables. Thanks to this, we can affirm that our variables of interest contrasted individually, those of government quality, are highly significant and reduce inequality as the coefficients of these variables increase. However, in the regressions by groups of variables we have not obtained the expected results, probably due to the temporal limitation of our study.

There is an important issue, which is necessary to mention. It could be said that it is a historical issue: what came before, the chicken or the egg? In our case we vary a little the question: what appeared before, inequality or corrupt, violent and unstable governments? That is, we are talking about the direction of the causality of the existence of inequality. It is quite complex to be able to affirm if inequality is what has led governments to act in a wrong way, or if the existence of inequality is due to the bad performance of governments. In our model we have chosen to think that inequality is caused, among other causes, by bad government. For example, if a government of a developing country receives money in the form of aid to build schools, hospitals, distribute food and water, etc., but that money is never used for loyal purposes since the leaders take it for their own benefit, it is clearly the cause of inequality since the less rich are not being offered the opportunity to grow.

It is logical to think, and certain results of our analysis have already hinted, that there are high levels of inequality that have been conditioned by the quality in the way of governing, and it is also necessary to add that there is a very primary tendency in Capitalism, which is that the stock of wealth and income flow tend to be concentrated in a few hands, knowing that capitalism does not have a mechanism to prevent this and that

income distributions are not evenly balanced (Morgan, 2015) . So, the first thing that should improve and evolve is the way of governing, in the sense of having: a government that is not corrupt, transparent, safe, with the capacity to redistribute wealth, that thinks of the common good and not of individual interest and impartial (Rothstein and Teorell 2008). In this way, the levels of inequality would be reduced, thus achieving greater well-being in the entire population. It is what sums up that countries with a high "quality of government" will bring greater welfare to the population (Holmberg, Rothstein and Naghmeh, 2009). A possible solution based on two measures exposed in the work of (Derek and Borghetto, 2018) to the problem of inequality is that, on the one hand, there is a need for governments to focus and address the problem of inequality, since They are much more attentive to other scenarios such as immigration. On the other hand, the ability of wealthy elites to influence political agendas is necessary since people with great wealth are the ones who can do the most to help reduce inequality, but in many cases these forces may not be in force. In the case of competition and by simple self-interest, the elites will be less enthusiastic about political solutions to inequality.

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7. Apendix

Image 1. Test for heteroskedasticity (1) and test for autocorrelation (2), example with de variable "Control".

(1)

```
34 Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
    Ho: Constant variance
    Variables: Control

    chi2(1)      =    39.75
    Prob > chi2  =    0.0000
```

(2)

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F( 1,      39) =    12.779
    Prob > F =    0.0010
```