**AMERICAN UNIVERSITY OF NIGERIA DEPARTMENT OF ECONOMICS**

#### Senior Research Project

**ECONOMIC GROWTH AND INCOME INEQUALITY THE CASE OF BRAZIL**

#### by

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**CERTIFICATION**

#### This is to certify that this research project “ECONOMIC GROWTH AND INCOME INEQUALITY: THE CASE OF BRAZIL” was conducted by Fatima Abubakar Jauro, of the Department of Economics, School of Arts and Sciences, American University of Nigeria.

#### Professor John Leonard Date

#### (Project Supervisor)

#### Fatima Abubakar Jauro Date

**DEDICATION**

#### This project is dedicated to my beloved parents. I am who I am today because of them.

**ACKNOWLEDGEMENT**

#### I wish to thank the Almighty for granting me the strength, wisdom, and perseverance to undertake and complete this project.

#### To my beloved parents, no amount of words can express my gratitude. Thank you for being the pillar of my strength. I wish to express sincere thanks to my siblings and friends who have been by my side throughout this process. I would have not made it this far without their kindness and support.

#### I also want to extend many thanks to the Economics department of the American University of Nigeria. I owe a great debt of gratitude to my supervisor, Dr. John Leonard, our dear chair, Dr. Natina Yaduma who has also been my advisor for this project, Dr. Wasiq Khan, and Dr. Sicy Francis. Thank you for all the support and encouragement. I am extremely glad to have been taught by such amazing experts throughout my undergraduate years.

### ABSTRACT

##### The research aims to find the relationship between income inequality and economic growth in the Brazilian economy. Economic growth and income inequality are defined in the light of academic literature and their varied effect on wellbeing are explored. The research methodology selected is deductive. The data have been collected through secondary sources and a multiple regression model is used to study the relationship between the economic performance and income inequality in Brazil. Contrary to many previous studies, the findings of the research suggest a significant positive relationship between these two variables. Newer and reliable data were used for these estimations. Other findings of the study are that human and physical capital have significant positive effect on growth. It was also concluded that, unlike many recent country and cross-country studies, Brazil’s income inequality does not hinder its growth.

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# CHAPTER ONE

## Introduction

Brazil is a developing Latin American country. Its political and economic growth over the past three decades, in which annual GDP growth rate averaged 3.2% has spurred research worldwide. Today, Brazil ranks as the 7th largest economy in the world (by PPP GDP) with a per capita GDP of $15, 390 (World Bank, 2017). Despite the recent economic turndown, the growth rate is expected to increase in the near future and its economic power is likely going to overtake even more countries. Politically, the economy has experienced tremendous success and international recognition. It has hosted some of the world’s biggest events. Among these are the FIFA World Cup in 2014 and most recently, the 2016 Summer Olympic Games. Figure 1 shows Brazil’s GDP per capita trend from 1980 to 2016.

**GDP Per Capita (PPP)**

18,000.00

16,000.00

14,000.00

12,000.00

10,000.00

8,000.00

6,000.00

4,000.00

**Year**

**GDP Per Capita**

Figure 1: GDP per capita (PPP) in US Dollars for Brazil 1980-2016 Source: (World Data Atlas, 2017)

Brazil has one of the highest income inequalities in the world despite its impressive growth rates. This is evident in its Gini coefficient. The United Nations Department of Economic and Social

Affairs (2015) defines Economic or income inequality as “how economic variables are distributed among individuals in a group, among groups in a population, or among countries”. The Gini coefficient measures the extent to which household or individual income in a country deviates from perfectly equal distribution (World Bank, 2017). This coefficient lies between 0 and 1; with 1 meaning perfectly unequal income distribution and 0 meaning perfectly equal distribution of income. The Gini index is the Gini coefficient expressed as a percentage. Brazil has a Gini index of 51.48% as of 2014. This makes it one of the highest in the world and ranks it the highest among the twenty biggest world economies in GDP terms. Patterns in the data show that the economy has had a relatively stable income inequality for a long time and this only started to drop slightly in the last decade. Other inequality metrics like the income share of the highest and lowest 20% in the economy supports the fact that Brazil has very high income inequality. As of 2014, the bottom 20% (the poor) held 3.62% of total income compared to a 56.25% held by the top 20% (World Bank, 2017).

**GDP Growth (annual %)**

10

8

6

4

2

0

-2

-4

-6

**Year**

**GDP Growth (annual %)**

Figure 2: Annual GDP growth for Brazil 1980 – 2015 Source: (World Bank, 2017)

Many researchers since the nineteenth century have attempted to study the relationship between growth and income inequality. Majority of the studies conducted recently have found that income equality propels, while income inequality hurts growth. However, it is quite surprising that Brazil still experiences high growth despite its high income inequality. This fact makes this empirical research an interesting topic. Most of these recent researches use cross-sectional approach or cross-country analysis to study this relationship. The objective of this paper is therefore, to improve understanding of the effect income inequality has on the economic performance of Brazil. Unlike successive studies, it will make use of data on Brazil over a long- time period to study this relationship. The research hopes to find answers to the following questions:

* Is income inequality actually related to economic growth in Brazil?
* If there is truly a relationship, is it a positive or an inverse relationship?

Hence, the hypotheses formulated for this study are:

H0: There is no significant relationship between income inequality and economic growth in Brazil.

HA: There is a significant relationship between income inequality and economic growth in Brazil.

This chapter looks at a brief overview of inequality in Brazil, its causes, and how it is measured. Chapter two discusses some old and recent studies conducted by economic researchers on the impact of income inequality on economic growth. The third chapter looks at a couple of theories that try to explain this relationship. The following chapter analyses and explains the methods used in the empirical part. Using recent Gini index data on income inequality, chapter five

empirically studies the impact Brazil’s income inequality has on its economic performance. The chapter uses regression analysis to estimate the relationship. The discussions of the findings are also contained in the chapter.

## Measures of Inequality

There are different measures that describe a country’s income inequality but the Gini index is the most commonly used. This index takes on a number between 0 and 1, with 0 being perfectly equal society and 1 being perfectly unequal. Another method, mostly used by scientists to calculate income inequality is the Hoover index (Hoover, 1936). It is also called Robin Hood index. This measure describes how much of a society’s income has to be transferred from the hands of the rich to those of the poor in order to get a perfectly equal society. It can be represented graphically as the area with the largest difference between the Lorenz curve and the total equality curve. The Hoover index, just like the Gini index takes values between 0 and 1, with 1 being a total unequal society. Other indexes used to measure inequality are the Theil index, the Atkinson index and the income shares. These indexes are mostly used when analyzing income inequality among subgroups. Most economic research use the Gini index because it is more readily available and simpler than other indexes. This paper would also make use of the Gini index.

## Brazil’s Inequality Facts and Figures

Among world’s most unequal countries, Brazil ranks 4th (Withnall, 2016). The Gini index over the past century has been quite steady before it peaked in the late 80s. In the early 90s, it began to fall drastically and not long enough, went up sharply. It has been a bit stable ever since until in 2002 when the fall accelerated. Figure 4 shows Brazil’s income inequality trend from 1970 to 2014. Over this period, its Gini index has not gone below 50, which is why it has been

considered as one of the world’s most unequal societies since the last century. Table 1 shows the income share of the highest 20 percent of the population in Brazil compared to the share of income held by the lowest 20 percent. Although there has been an improvement in income distribution, a lot still needs to be done.

**Gini Index**

66.00

64.00

62.00

60.00

58.00

56.00

54.00

52.00

50.00

48.00

**Year**

**Gini Index**

Figure 3: Brazil’s Gini Index 1970 – 2014

Source: (World Bank, 2017) and ( World Income Inequality Database, 2017)

Table 1: Income share of the highest and lowest 20% in Brazil for selected years

|  |  |  |
| --- | --- | --- |
| Year | Income share of top 20% | Income share of bottom 20% |
| 1990 | 64.61 | 2.33 |
| 1995 | 63.83 | 2.44 |
| 2000 | 63.38 | 2.45 |
| 2005 | 61.03 | 2.90 |
| 2010 | 57.95 | 3.21 |
| 2014 | 56.25 | 3.62 |

Source: (World Bank, 2017)

## Why is Brazil’s Inequality Level So High?

Looking at this incredibly high unequal income distribution, the question that comes to mind is why does Brazil have this high inequality? There is no single answer to this question; so many factors are involved. All around the world, the major contributor to income inequality is the differences in human capital. This has to do with individuals’ health and education. These differences lead to variations in the labor market’s returns. As inequality in the acquisition of human capital increases so does the returns to education. This results to a skewed income distribution in the society (Weil, 2012). Another source of income inequality is geographical differences. For instance, this involves inequality between urban and rural settlers, race or gender discrimination and a new technology that favors the few skilled workers in a society, among others. The government also plays a role through its policies regarding income distribution. A study conducted by Bourguignon et al. (2002) compared Brazil and other countries (Columbia, United States, and Mexico) with regards to the impact of an unequal distribution of education. Their findings showed that the differences in returns to schooling, coupled with work experience explain about 40% of the variation in inequality in Brazil and the United states. In terms of geographical differences, urban Brazil had a Gini index of 60% in 2005 compared to 54% in the rural region, which were way above the average in other Latin American countries (Banerjee & Duflo, 2003). Government policies in Brazil also contribute to the country’s inequality.

## Economic Growth, Income Inequality, and Poverty

The whole essence of studying inequality and economic growth is to raise a case for the poor and marginalized people. In highly unequal societies like Brazil, while the rich are very wealthy that they are comparable to those in developed countries, the poor keep getting poorer and their numbers keep increasing. The welfare of the people is the sovereign duty of the government.

Therefore, studies like these inform policymakers the extent to which the society is unequal and the plight of the poor in meeting their basic needs of life. In recent times, the debate surrounding the development experience, available policy options, and future prospects of Brazil has been dominated by the country’s inequality and poverty. Extensive literature on the distribution of wellbeing in Brazil exists. Most of these studies try to describe levels and dynamics of poverty and inequality outcomes, analyzing sectorial and regional gaps, studying the links to human capital outcomes and labor markets, spending patterns of the public, and so forth. From the body of research, this fact about Brazil seems to be worth reiterating: compared to other countries, Brazil is a clear outlier inequality wise, and accounts for the majority of Latin America’s poverty rate (Elbers, Lanjouw, Lanjouw, & Leite, 2004). Earlier sections of this paper looked at a background on the economic growth and income inequality facts and figures in the Brazilian economy. What effect then, do these two variables have on poverty in the country? Brazil is one of the emerging economies (BRIC countries) due to its rapid economic growth. However, this growth has had little effect on the wellbeing of Brazilians at the bottom of the income pyramid over the years. In 1990, 17.4% of the Brazilian population lived below the poverty line while the growth rate during the same year was around – 3.1% (World Bank, 2017). By 2005, the economy had recovered and growth increased to about 3.2% and as one would have expected, poverty rate did not fall, rather it increased to 31%. Growth increased dramatically by 5.1% in 2008 but poverty still remained at 26%, fell to 21.4% in 2009 and remained the same through 2014. One would expect that since growth increases rapidly in the economy, poverty would be reduced by a considerable extent, but that is not the case. Figure 4 shows the relationship shared by economic growth and poverty in Brazil.

Year

-8

0

-6

5

Population below poverty

line, %

GDP per capita growth (annual %)

-2

-4

10

0

15

2

20

6

4

25

Poverty and Economic Growth

8

30

Figure 4: Poverty and Economic Growth in Brazil Source: (World Bank, 2017)

The figure illustrates that there has been some progress in reducing poverty from the mid 90s as compared to the 80s, through the early 90s. Nonetheless, being that Brazil is an emerging economy that is growing very fast, this progress is far below expectations. A message for policymakers; more needs to be done to reduce poverty. What this trend represents is that economic growth is relatively ineffective in reducing poverty. Perhaps the reason why the economic growth is not impacting on the poor is due to the country’s high income inequality. It makes sense to think of it this way; any growth achieved by the economy is pocketed by the rich and thus, never gets to the poor. The little reduction in poverty has been largely attributed to government policy (The Economist, 2011). With this, there has also been a fall in income inequality, though it still remains high compared to levels prevalent in developed countries and some developing countries. Figure 5 shows the trend in the Gini index and poverty in Brazil.

From the pattern exhibited by this figure, the questions that come to mind are: Can this high inequality rate be the reason for Brazil’s continued growth? Will a reduction in the poverty rate slow Brazil’s economic growth? and is it possible for Brazil to have more income equality and thus low poverty rate yet, continue to grow? This paper hopes to answer some or all of these questions.

Year

0

0.00

Population below poverty

line, %

5

10.00

10

20.00

 Gini Index

30.00

15

40.00

20

50.00

25

60.00

Poverty and Inequality

30

70.00

Figure 5: Poverty and Inequality Trend in Brazil Source: (World Bank, 2017)

It is important to note that in any given region or country, poverty reduction is closely linked to mean income levels and income inequality (Tabosa, Castelar, & Irrfi, 2016). Determining the type of policy that will be most effective in reversing poverty as quickly as possible is an important issue in any country. The question is, therefore: Should policies aimed at reducing poverty focus on reducing income inequality or increasing average income levels? Various studies have shown that economic growth in itself has been ineffective in reducing poverty in many countries and regions of the world (Tabosa, Castelar, & Irrfi, 2016). Although it is obvious

that changes in poverty rates are a result of income redistribution or economic growth (or both), it is not quite clear what effects the changes in each of these variables have on poverty rates (Ravalion, 1997). Ravallion and Chen (2003), in their study of some developing countries based on some number of people living on less than $1 per day discovered that there is a negative relationship between average income levels and people with income below the poverty line. Nonetheless, a consensus about the nature of the interrelationship between economic growth, income inequality, and poverty is still nonexistent. Most of the empirical evidence suggest that countries or regions with low income and low levels of inequality tend to respond better to economic growth policies while countries with high incomes and high income inequality will be less responsive to such policies (Tabosa, Castelar, & Irrfi, 2016). Therefore, inequality reduction policies will be more effective in the latter countries.

Studies on the Brazilian economy indicate that poverty levels are more responsive to income inequality-reduction policies than those aimed at boosting average income level (Tabosa, Castelar, & Irrfi, 2016). There is substantial evidence proving that compared to other countries with similar income levels, the poverty-reduction effect of economic growth is weaker in Brazil. This explains and confirms the trend exhibited in figure 4 above. Because policies aimed at reducing income inequality, and/or stimulating economic growth as an increase in the average income level or a combination of both have different effects on poverty, it is important to gauge the weight that should be apportioned to each strategy, both at the state and regional levels.

# CHAPTER TWO

## Literature Review

The topic of how inequality affects economic growth has been a major economic debate for centuries. Extensive literature on this topic exists. While some economists argue that inequality in any economy is a disease that affects growth, others argue that some level of inequality is required for economic growth. This chapter discusses some of these counter arguments from those of the past century to the most recent.

## Early Studies

Economists say some degree of inequality is required in any society to promote growth. An American author, Arthur Okun (1975) argued that it is impossible for nations to have both perfect efficiency and perfect equality, a tradeoff must be made. He believed that some inequality is integral to a market economy because it ensures its effective functioning and propels economic growth by serving as the needed incentives. Financial reward motivates entrepreneurship and without some inequality in the society, it would not be worth the risk. Classical economic thinking has always been that higher income equality dampens economic growth. It was believed that higher regulations and taxes on the rich discourage investment and work (Okun, 1975). Tax rates are likely to have a positive relationship with private sector losses given the convexity of deadweight cost. When tax rates are low, losses to redistribution are less and rise steeply with the high tax rate. Many economists today still hold this view.

Before the great depression and the two world wars, inequality in most developed countries of the world kept rising (Price & Boushey, 2014). The trend reversed in the mid-twentieth century as inequality began to decline in the developed world. This led many economists like Nobel

Laureate, Simon Kuznets to reason that income inequality was inherent in early stages of development. As economies mature economically, the level of inequality declines.

Kuznets writes:

One might thus assume a long swing in the inequality characterizing the secular income structure: widening in the early phases of economic growth when the transition from the pre-industrial to the industrial civilization was most rapid; becoming stabilized for a while; and then narrowing in the later phases (1955).

Kuznets cited possible reasons why early stages of development are accompanied by increasing inequality and later stages by falling inequality. A possible reason, according to him might be the introduction of a new technology that favors a few people at first, hence, increasing inequality. Eventually, inequality decreases as more people begin to adapt to the new technology. Based on Kuznets’ analysis, the narrowing of income inequality in economically advanced countries of the world meant that poorer countries with high income inequalities were in a transitional stage, which would reverse once they start to become economically developed. Just as it did in wealthy countries, poorer countries would also witness a declining income inequality as they became richer. This led many economists to think the income inequality in many less developed countries was necessary for economic growth. They believed that this would help the economy generate select persons who are wealthy enough to propel investment-led growth by providing the necessary savings (Price & Boushey, 2014).

The world today looks very much different from Kuznets’ when he made this assertion. Several decades ago, the United States and other wealthy nations have seen a sharp rise in income inequality. This has spurred the question of how and whether changes in income distribution

have any impact on economic wellbeing. During the same period of time, poorer countries have witnessed persistent and even growing income inequality. These trends have stimulated interests in economists to find out whether economic growth has a direct relationship with income inequality through empirical studies, often analyzing data across countries and states. In the mid- 90s, Benabou (1996) had a thorough study of this association between economic growth and income inequality. He concludes that: “these regressions, run over a variety of data sets and periods with many different measures of income distribution, deliver a consistent message: initial inequality is detrimental to long-run growth” (Benabou, 1996). Despite the confirmation of Benabou’s conclusion by many subsequent studies, others have challenged it. For instance, Barro (1991) did his study and found no general association between growth and inequality. When he split his sample into poorer and richer countries, he finds that while income inequality enhances growth in rich economies, it inhibits growth in poor economies. More so, Perroti (1996) concludes based on his study that although income inequality has a negative impact on growth, this impact is not as pronounced in poorer countries as it is in richer countries. On the other hand, significant growth-retarding impact of income inequality on economic growth was found by Deininger and Squire (1998).

Aside from Kuznets and authors of his time, some twenty-first century authors have shown that income inequality and growth are positively related. Among these authors are Saint-Paul and Verdier (1993) who have argued that “in more unequal societies, the median voter will elect a higher rate of taxation to finance public education, which will increase aggregate human capital and economic growth”. On the other hand, two theories explaining why income inequality and growth could have a positive association were developed by Oded Galor and Daniel Tsiddon

(1997). One of the theories explained that in less developed countries, a person’s level of human capital can be determined by a home environment externality. For growth to take-off in such countries, higher levels of inequality may be necessary if the externality that exists is strong enough. The second model is argued based on the fact that income inequality increases at times of major technological innovation. High growth rates and technological progress would be achieved at times like these since they enhance the concentration and mobility of highly skilled workers in sectors that are technologically advanced.

## Newer Studies

In a recent cross-country analysis, Dabla-Norris, et al. (2015) of the International Monetary Fund (IMF) found that greater income inequality reduces economic growth. c thus, suggesting that the benefits do not reach those at the base of the income pyramid. Conversely, if the share held by the bottom 20 percent (the poor) increases, growth rate in GDP actually increases. For the middle class, this positive relationship between income share and higher growth holds. They conclude that income distribution itself is a requisite for growth. Hence, the middle class and the poor matter the most for growth. The Organization for Economic Co-operation and Development (OECD) (2014) also had a look at this topic. Using data on all its member countries over a period of 30 years, its analysis demonstrated that economic growth is negatively affected by income inequality. Moreover, Akpoilih and Farayibi (2012), believe that: “although most of these papers focus on theories establishing a negative effect of inequality on growth, a careful reading of this literature suggests that this negative relationship is far less definitive than generally believed”. They argue that a lot of these models predicting inverse relationships depend on exogenous elements like political institutions, development level, and aggregate wealth. The papers often predict more than one equilibrium so that economic growth and income inequality would have a

positive relationship under certain initial conditions. Furthermore, in Samanta and Heyse’s (2006) exclusive study of developing and less developed countries, they found that in such countries, growth is not hampered or slowed by income inequality. They conclude that “developing countries with higher income inequality do not grow at a slower rate than developing countries with a more equal income distribution” (Samanta & Heyse, 2006).

Literature on the relationship between income inequality and economic growth in Brazil is quite scanty. Most of the empirical studies focus on how economic growth is affected by inequality in general, that is, they include factors like education, gender, and race inequality. Nonetheless, a few studies, which are related to the objective of this paper exist. For instance, Araujo and Cabral (2014) in their study tried to prove the Kuznets inverted U hypothesis in Brazilian states. Their study covered the period from 1995 to 2012. Using dynamic panel data econometrics and inequality indicators including the Theil indices and Gini coefficient, they find that the Kuznets inverted U relationship exists in Brazil. Meaning that income inequality was high in the early stages of development and now in the later stages, it is beginning to fall.

# CHAPTER THREE

## Theoretical Framework

Having looked at an extensive survey of economic literature, it is now clear that there are many ways inequality can affect economic growth. While some studies focus on income inequality, some look at inequality in its entirety, including wealth, social, capability, and political

inequality among others. It is from this bigger picture that income inequality can be singled out and studied. It is important to look at it from that perspective first before narrowing down to income because most or all other inequalities are related to income in one way or the other. For instance, political inequality emerges when particular groups in a region or country are excluded from participating in the decisions that affect them. Often times, the victims to this are the poor because they do not have enough income or resources to fight for their rights. With capability inequality, those that are not able to economically and intellectually compete are the low-income people. For this reason, understanding the bigger picture is also as important. There are many theories on how inequality affects the economic performance of a country. One of the most popular ones is fertility rate, which was postulated by De la Croix and Doepke (2003) and the general health in a society by Subramanian & Kawachi (2004). Some important theories were also presented by Barro (2000). In his view, there are four channels on how inequality can impact on the economic growth of an economy. These include credit-market imperfections, sociopolitical unrest, possible differences in savings rate, and redistribution programs. These channels are explained in more detail in the following subsections.

## Fertility Rate

De la Croix and Doepke (2003) were the first to propose the fertility theory, which assumes that fertility rate is higher among poorer families than rich families. When poor parents have many children, they tend to invest only little in their education, given that they are poor. As a result of higher income inequality, the fertility differential between the poor and rich will increase. This implies that there will be a large number of children with little or no education. With this, average education and human capital endowment in the society will be lowered and thus, the

economy’s performance falls. In their paper, De la Croix and Doepke (2003) argued that most of the impact inequality has on growth is accounted for by the fertility differential effect.

## General Health in a Society

Subramanian & Kawachi (2004) argued that it is a known fact that an individual’s income is a strong determinant of that individual’s health. They presented evidence that this is also the case on the society level. Higher income inequality has an inverse relationship with the general health of the society. Whereas, economic growth and the average health status of a society share a positive relationship. This means that when there is high income inequality, the general health in the society will be low, which in turn, will affect the performance of the economy. Poor individuals often lack basic healthcare and nutritious food, which create a health status differential between them and the rich. Thus, the greater the income inequality levels in an economy, the greater the number of unhealthy people. Having a large number of unhealthy people in an economy means less productive workers, which will lead to low aggregate output. Consequently, economic growth will be deterred. After studying some countries, Subramanian & Kawachi (2004) discovered that this income inequality and society’s general health issue is more prominent in the poorest countries.

## Credit Market Imperfections

The rationale behind the credit market hypothesis is that people who have no or little assets are less likely to acquire loans and thus, cannot invest in opportunities with positive returns. Human capital investment might be one of such investments. As explained by Galor and Zeira (1993), unlike physical capital, human capital is not transferable. For that reason, investment in human capital has a declining marginal product with the amount invested by a person. On the other hand, physical capital has a constant return irrespective of the amount invested. Because the

initial return on investment is higher on human capital than physical capital, the first amount of investment will be dedicated to human capital. Eventually, the marginal product will begin to decline until it gets to a point where the constant return on physical capital is greater, causing a person to invest only in physical capital from that point on. In an economy where it is impossible for the poor to obtain bank loans, investments in human capital will be low. In such situations of inequality, economic efficiency cannot be reached because the marginal products of human capital investments are higher in the beginning like that of physical investments after it passes the threshold limit. To raise the quantity and average productivity of investment, redistribution from the rich to the poor is required. High inequality rates caused by credit-market imperfections therefore, reduce economic output. Some of the factors that lead to imperfections in the credit market include insufficient or imperfect laws to protect debtors’ assets and poor law enforcement. It is however, expected that those factors would improve as an economy develops. Hence, this phenomenon is more prominent in poor economies (Barro, 2000).

## Redistribution Programs

There is usually a strong preference for redistribution programs in societies with majority voting rights if there is a very skewed distribution of assets among individuals. This entails extensive government spending, including transfer payments and public investment programs with an effective tax system (Barro, 2000). If there is a large gap between the mean and median income, the political process may bring about more redistribution. With redistribution comes economic unrest, as the rich try to evade those taxes or become discouraged from working more if their income is redistributed. On the part of the individuals at the receiving end of the redistribution payments, there will be fewer incentives for them to work hard. Such issues lower average productivity and investment, and thus, negatively affect economic growth. In essence, as

explained by Barro (2000), greater redistribution is ignited by greater inequality so that the inequality in the beginning will negatively impact on economic performance via the channel of redistribution policies.

## Sociopolitical Unrest

Inequality can also cause sociopolitical unrest and therefore, affect the economic performance of an economy. Economies with high inequality tend to have high crime rates, high engagement in unproductive activities, and destabilized institutions. These actions are a waste of productive time and other economic resources, which can immensely impact on an economy’s performance. They can also hinder domestic and foreign investment due to property rights and personal security threats. In his study, Perotti (1996) found that manifestations of socio-political instability and more engagement in rent-seeking activities are more common in unequal societies. Therefore, high inequality causes resource wastage, deters potential investment, and hence, negatively affects economic performance.

## Savings Rate

Another channel through which inequality can affect growth is the savings rate. Based on the assumption that individual savings rate rises as income increases, an income or wealth redistribution to the poor from the rich will reduce the total savings rate in the economy. In a closed or partly closed economy, that would lower investment and hence, the economy’s performance. Unlike the earlier discussed channels, this is the only channel that explains why inequality could be positively related to economic growth.

## Overall Effect

The previous subsections showed that there are many channels on how inequality affects the economic growth of an economy. While most of them suggest a negative effect on subsequent performance, others demonstrate the possibility of a positive impact. It is therefore, impossible to estimate the net effect from a theoretical standpoint. For a better picture of each of these channels, it might be necessary to analyze each of them in detail.

# CHAPTER FOUR

## Methods and Materials

In this chapter, the methodology of study and materials are analyzed in details. There are four sections in total. The first section discusses the design adopted for the study and the population of study. The dataset, including the time period, sources of the data used for the regression, and the reasons for selecting them are discussed in the next section. The section also explains the explanatory variables adopted for the model. Section 4.3 explains the model that establishes the relationship between economic growth and income inequality. The last section in the chapter looks at the data processing aspect, where the ordinary least squares (OLS) method is used to find how economic growth relates to income inequality.

## Research Design and Population of Study

A research design as defined by Bakare A. S. is “the structure and strategy for investigating the relationship between the variables of the study” (2012). This research would make use of the experimental and descriptive research design. The descriptive aspect makes it possible to describe data using diagrams such as charts and graphs. In this work, we use the Gini index and the GDP per capita to explain how income inequality is related to the economic growth of Brazil. The experimental research design is useful because it enables us to combine empirical observations and theoretical considerations. With this research design, a researcher can observe how dependent variables are affected by the explanatory variables. Additionally, the study will use data on Brazil for the years 1970 to 2015, which is a period of forty-five (45) years. Because this work is a time series analysis for a single country, this period is appropriate. Besides, data for earlier years are unavailable.

## Dataset

All data used for this study were obtained from secondary sources. The Gini index is used as a proxy for income inequality. Data for the years 1970 to 1980 were gotten from the World Income Inequality Database (WIID) while for the period between 1981 and 2014 were obtained from the World Bank data. For growth performance, I use GDP per capita in constant 2010 USD. This data was acquired from the Federal Reserve Economic Data. For all the years covered in the regression, the data on trade openness index was gotten from TheGlobalEconomy.com. This index is a measure of a country’s total trade divided by the country’s GDP. I use the index of human capital per person as a parameter for human capital: it was gotten from Feenstra, Inklaar, & Timmer (2013). This variable is an indicator that was recently introduced to measure the state of human capital development in a country. There are three main features associated with it. The World Economic Forum reports:

The Index is based on four pillars: three core determinants of human capital (education, health and employment) plus those factors that allow these three core determinants to translate into greater returns. Second, the Index takes a long–term approach to human

capital. In addition to providing a snapshot of the state of a country’s human capital today through measures that reflect the results of a country’s past practices, it includes indicators resulting from practices and policy decisions impacting the children of today and which will shape the future workforce. Third, the Index aims to take into account the individual life course (World Economic Forum, 2013).

As a proxy for physical capital, I use data on gross capital formation as a percentage of GDP. This indicator is more like investments. The World Bank’s definition of this indicator is as follows:

Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and “work in progress.” According to the 1993 SNA [System of National Accounts], net acquisitions of valuables are also considered capital formation (World Bank, 2017).

Table 2 shows all the variables used in the regression and their respective sources. Table 3 provides a summary of the information, including the standard deviation, minimum, mean, and maximum of each variable.

Table 2: Data Sources

|  |  |
| --- | --- |
| **Data** | **Source** |
| Gini index | World Income Inequality Database (WIID) for 1970 - 1980World Bank data for 1981 - 2014 |
| GDP per capita | Federal Reserve Economic Data |
| Trade openness | TheGlobalEconomy.com |
| Index of human capital per person | Feenstra, Inklaar, & Timmer (2013) |
| Gross capital formation (% of GDP) | World Bank data |

Table 3: Data information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **Std. Dev.** | **Min** | **Max** |
| GDP per capita | 7627.67 | 2367.967 | 3402.469 | 11797.45 |
| Gini index | 57.42947 | 2.73658 | 51.48 | 63.3 |
| Trade openness | 18.88291 | 5.056026 | 9.03 | 29.67 |
| Human capitalper person index | 1.803636 | 0.3918019 | 1.4 | 2.75 |
| Gross capitalformation index | 20.33797 | 2.482496 | 15.74056 | 26.90279 |

## The Model

To determine the model that establishes a relationship between economic growth and income inequality, we state a functional relationship between these variables. However, knowing that GDP does not only depend on income inequality, I introduce other variables to form the relationship.

GDPPC = f(GINI, TO, HCPP, GCF) [1]

Where GDPPC denotes GDP per capita, GINI the Gini index, TO; trade openness, HCPP; human capital per person index, and GCF gross capital formation as a percentage of GDP. The equation suggests that the growth in GDP per capita depends on all the aforementioned variables.

Representing equation 1 in a linear form

GDPPC = β0 + β1GINI + β2TO + β3HCPP + β4GCF [2]

Econometrically, the model is transformed to include the random error term

GDPPC = β0 + β1GINIt + β2TOt + β3HCPPt + β4GCFt + ui [3]

To get a more meaningful interpretation, equation 3 can be rewritten as

log(GDPPC) = β0 + β1GINIt + β2TOt + β3HCPPt + β4GCFt + ui [4]

This model implies that all the right-hand variables or explanatory variables will each be related to economic growth either positively or negatively.

## Data processing

To measure the impact of income inequality on economic growth, I use the ordinary least squares regression analysis. Gross domestic product per capita, which will serve as proxy for economic performance will be regressed against the four economic indicators mentioned earlier. The result will show how the explanatory variables, Gini index (X1), trade openness (X2), index of human capital per person (X3), and index of gross capital formation (X4) are associated with GDP per capita (Y).

# CHAPTER FIVE

## Results and Discussion

As discussed in the previous chapter, the OLS method was used to estimate the relationship between economic growth and income inequality in Brazil. The results of the regression are summarized in section 5.1. The next section discusses the results including the relationship and significance level. It also tries to explain the possible reasons for the type of relationship and some policy recommendations. Section 5.3 tests the model for heteroskedasticity while section

5.4 tests it for serial correlation. The purpose of doing this is to ensure that all estimates are unbiased.

## Results

Table 4 presents the results of the regression.

Table 4: Results

|  |
| --- |
| Dependent variable: log(GDPPC) |
| **Variable** | **Coefficient** | **Std. Err.** | **t-value** | **p-value** |
| GINI\*\* | 0.02161 | 0.0099295 | 2.18 | 0.035 |
| TO | 0.0017074 | 0.0078209 | 0.22 | 0.828 |
| HCPP\*\*\* | 0.6230051 | 0.0950165 | 6.56 | 0.000 |
| GCF\* | 0.0183071 | 0.0095274 | 1.92 | 0.061 |
| Intercept\*\*\* | 6.169868 | 0.7205511 | 8.56 | 0.000 |
| R2 | 0.6782 |
| F-stat | 22.13 |

Key: \*\*\* 99% level of significance. \*\* 95% level of significance. \* 90% level of significance.

The fitted model is therefore:

log(GDPPC) = 6.169 + 0.022 GINIt + 0.002 TOt + 0.623 HCPPt + 0.018 GCFt

## Discussion

The result suggests that all the explanatory variables are positively related to economic growth. However, their significance level will give clues as to whether any of these values are actually related to the dependent variable as hypothesized. To the effect of income inequality, Gini index turns out to be positively related to economic growth. The result shows that a one-point increase in the Gini index is associated with a 2.2 percent rise in economic growth. This means an increase in income inequality goes hand in hand with greater economic performance. This may be an indication that the country’s output is concentrated at the top and this class is also responsible for most of Brazil’s income. Hence, increasing inequality may lead to more output. This finding may be particularly worrisome to policymakers aiming for a more equal distribution in the society. The finding suggests the goals of increasing economic equality and output are contradictory. This is a puzzle for Brazilian policymakers judging by this finding. Thus, the null hypothesis which states that there is no significant relationship between income inequality and economic growth in Brazil is rejected. As such, there is evidence to reject the null hypothesis and go with the alternative hypothesis which states that there is a relationship between growth and income inequality. The t-value of 2.18 shows that the relationship is statistically significant, meaning an increase in income inequality actually increases economic growth in Brazil.

Now to the effect of the remaining explanatory variables on growth. Trade openness positively affects economic growth. The model predicts that every 1 point increase in trade openness is associated a 0.2 percent growth in GDP per capita. However, owing to the fact that the t-value is low (0.22), it is difficult, if not impossible to make conclusions with the result. Hence, this variable is statistically insignificant. A widely-held view about openness to international trade is

that it increases economic growth. This has been true for many countries. In a study of how trade openness contributes to the growth of some 82 developing countries, Fenira (2015) found that trade openness does not necessarily increase growth. His result showed that openness to international trade weakly contributed to growth in developing countries in the period between 1996 and 2012. This could be the case for Brazil. The index of human capital per person is also positively related to growth. The result shows that a 1 point increase in the human capital per person index in Brazil increases growth rate by 62.30 percent. This is an interesting and logical result explaining that investments in human capital – education, health, and employment – generate high returns to income. This result is not surprising given the findings of Frank (1960), Fernande & Mauro (2000), and Borojo & Yushi (2015). The high t-value of 6.56 indicates that this relationship is actually significant. Many researchers have found that human capital development has increased growth tremendously in Brazil. For instance, Awan’s (2012) study of human capital trend in BRIC countries (Brazil, Russia, India, and China) found that human capital development has tremendously contributed to growth in these economies. Gross capital formation index also positively affects growth rate. The model estimates that every 1 percent increase in this index is associated with a 1.8 percent rise in GDP per capita. Meaning increase in economic growth goes hand in hand with capital formation or investment. This variable has a t- value of 1.92 and a p-value of 0.061. Therefore, it is significant at the 90% level of significance instead of the 95% level criterion. The R-squared in this regression indicates that the explanatory variables used in the model explain 67.82% of the variation in GDP per capita. Additionally, although some of the explanatory variables are individually insignificant, the F-stat of 22.13 indicates that all of them combined together are significant and two-thirds of the variation is explained very well.

## Testing for Heteroskedasticity

In order to obtain unbiased estimates of the ceteris paribus effect of economic growth (GDPPC) on Gini index (X1), trade openness (X2), human capital per person (X3), and gross capital formation (X4), the assumption E(u| X1, X2, X3, X4 ) = 0 was made. This implies that

E (GDPPC| X1, X2, X3, X4) = β0 + β1GINIt + β2TOt + β3HCPPt + β4GCFt [5]

The analysis in the previous section was also made based on the assumption that the variance of the error term conditional on all the independent variables, is homoscedastic (constant). To test whether or not there is heteroskedasticity in the model, two tests are employed: The White and The Breusch-Pagan/Cook-Weisberg Test for Heteroskedasticity. The White test is better for nonlinear forms of heteroskedasticity (where error variances get larger as the explanatory variables get more extreme in either direction) (William, 2015). The Breusch-Pagan test on the other hand, is a good test for linear forms of heteroskedasticity where, as the dependent variable increases, the error variances also increase. The White test has been in existence for a very long time and many concerns have been raised about it therefore, the Breusch-Pagan test is more frequently used in recent times. This section compares results from both methods. The null and alternative hypothesis of these tests are:

HO: Homoscedasticity HA: Heteroskedasticity

Table 5: White Test for Heteroskedasticity

|  |  |
| --- | --- |
| chi2 (14) | 30.71 |
| p-value | 0.0061 |

Table 6: Breusch-Pagan Test for Heteroskedasticity

|  |  |
| --- | --- |
| Chi2 (1) | 30.27 |
| p-value | 0.0000 |

A higher chi-square indicates the presence of heteroskedasticity and a lower p-value provides strong evidence against the null. In both tests, chi-square was greater than 30 and p-values were very small. Hence, both tests reject the null at 1% level of significance, suggesting the presence of heteroskedasticity in the model. This means that the earlier regression was a biased estimator of the ceteris paribus effect of economic growth (GDPPC) on Gini index and all the other explanatory variables. Perhaps, the model left out some important independent variables explaining economic growth. This is most likely the reason for having heteroskedasticity in this model. Economic growth depends on so many factors other than inequality rate, trade openness, capital formation, and human capital. The assumption made before estimating the model was that all other things are not as important and as such, should be captured by the error term. Other variables that could be important such as natural resource endowments, government spending, and technological advancement were not included in the model because of unavailable data. Perhaps if more data are available in the future, the model could be re-estimated to see what the result would be. Another possible reason for heteroskedasticity in the model is that the population of Brazil increases overtime. Because heteroskedasticity causes standard errors to be biased, a way to deal with this problem is to use standard errors robust to heteroskedasticity. This will address the problem of errors that are not independent and identically distributed. The use of this method will not change the estimated coefficients provided by OLS but they will affect the standard errors and hence, the significance test. However, it cannot be used in this case because it is more efficient with a large sample size.

## Testing for Serial Correlation

In estimating time series multiple regression models, serial correlation is a usually encountered problem; for time series data, a variable at time t is related to the variable at time t-1, for example, data on GDP or inflation rate. This occurs where the errors in one time period are correlated to the errors in another time period. Errors will not be serially correlated if the dynamics of a model have been specified completely. Therefore, testing for serial correlation allows the detection of dynamic misspecification. To test for this correlation among the errors, the Durbin-Watson test was used. The table 7 summarizes the result of the test.

Table 7: Durbin-Watson Test for Serial Correlation

|  |  |
| --- | --- |
| Time Variable | 1960 – 2015 |
| Durbin-Watson d-statistic | 0.1781142 |

In time series analysis, serial correlation is almost always inevitable. It is important to recognize that in the social sciences, the past can affect the future, but not the vice versa. This is because GDP for the present year, for instance, is a function of GDP in the previous year. It is often assumed that the existence of serial correlation in a time series regression invalidates the usual goodness-of-fit measures and R-squared. Provided the data are weakly dependent and stationary as it is the case here, this assumption is false (Wooldridge, 2012). The ultimate conclusion therefore, is that the results of the regression are still consistent estimators of the population parameter.

# CHAPTER SIX

## Conclusion

Researchers all over the world are interested in studying income inequality and its consequences on the economic performance of countries. The aim of this research was to analyze the subject empirically, on a one country basis. It looked at the literature on this topic, measures of inequality, a brief overview of the causes of income inequality, and the impact economic growth and income inequality have on the wellbeing of Brazilians. Using a multiple linear regression model that included the Gini index as one of the explanatory variables, it was able to show that income inequality in Brazil does not hinder growth. Rather, they share a significant positive relationship. Other findings of the study were that increases in human capital increase GDP per capita tremendously, gross capital formation has a statistically significant positive relationship with growth, and trade openness has an insignificant relationship with growth in Brazil. To some extent, this result is not surprising given that Brazil has had high income inequality for decades, yet it keeps growing economically.

As a common fact, there is no perfect research in the social sciences. Having that in mind, the regression model in this research was tested and heteroskedasticity and serial correlation were found to be present. Although serial correlation poses no threat to the estimations, heteroskedasticity does. One of the setbacks encountered in this research is the unavailability of data. This is possibly the reason why heteroskedasticity was present in the model as some important variables were excluded. Perhaps if more data are available in the future, the model

could be re-estimated to see what the result would be. For further studies, I suggest the use of a model that has the Gini index as the dependent variable so as to see what factors are causing it. I also suggest that another measure of income inequality, say, the income share of the top and bottom 20% of the population be used to support or refute the findings of this research. Overall, the findings of this study suggest that the goals of increasing economic equality and output are contradictory. The economic growth of Brazil has proven to be ineffective at reducing inequality and its inequality rate seems not to affect its performance. Therefore, to promote equality in the Brazilian economy, government policies should be targeted at redistribution of income rather than increasing average income levels or economic growth. It is also possible that the economy can do better than it is now, with increased income equality.

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