Inequality and Economic Growth in Brazil

Bachelor's Thesis

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Abstract

This bachelor thesis gives an overview over Brazil's inequality and provides the economic theory and latest findings about the relationship between inequality and economic growth. In an empirical part the paper shows with newer data that a significant inequality-based Kuznets' curve exists for the case of Brazil and that the level of GDP alone can explain most of the variation in inequality. In a single-country growth regression the paper finds evidence that education was the main contributor to economic growth in the last half century and that the Gini coefficient is insignificant when it comes to its influence on growth in Brazil.

Contents

List of Figures

List of Tables

1 Introduction

Brazil's economic and political success in the last two decades, in which the country's GDP grew at an average rate of 3.2%, has fascinated researchers all over the world. Today, Brazil is the world's 8th largest economy (by PPP GDP) and has a GDP per capita of $ 11'600. [1] It is expected to have strong growth rates in the near future and is likely going to overtake even more countries in terms of economic power. Brazil also experienced political success, getting to host some of the world's biggest events in the future, e.g. the 2014 FIFA World Cup and the 2016 Summer Olympic Games.

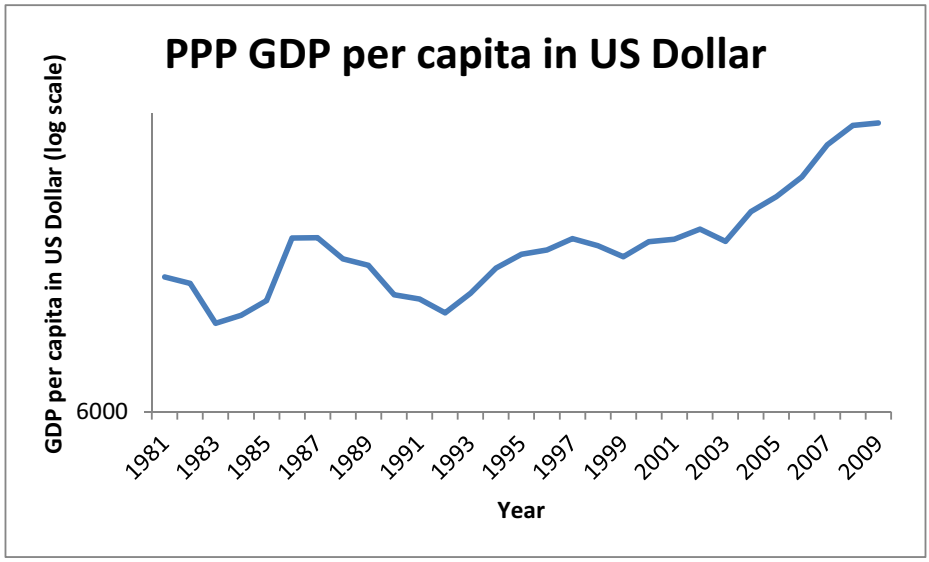

Figure 1: PPP GDP per capita in US Dollar for Brazil 1981-2009.
Source: Penn World Table 2012

Despite its recent economic success, Brazil has also one of the highest inequalities in the world. Its Gini index on income inequality of 51.9% is the 19th highest in the world and the highest of all the 20 biggest economies in terms of GDP. The data shows that inequality in Brazil has been relatively stable for a long period of time and only began to decline substantially in the last decade. It is still a very high value of inequality which is supported by other inequality statistics as well: The income share held by the lowest 10% is a mere 1.1% while

[1] 2011 est. (Source: CIA Factbook)

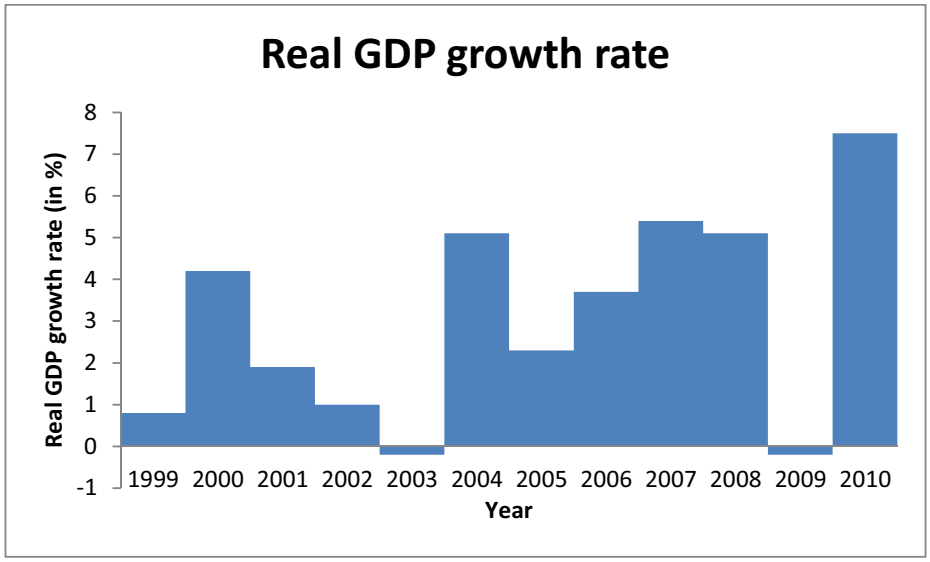

Figure 2: Real GDP growth rate for Brazil 1999-2010
Source: CIA Factbook

the highest 10% get 43.1%.[2]

The fact that Brazil has grown so fast and thus has become such a big economy in the last decades but still has one of the world's highest Gini coefficients makes it an interesting research topic to try to answer a question that has long been discussed by the best economic researchers: What effect does inequality have on country's economic performance? Kuznets (1955) was one of the first to present his theory to the audience. He argued that during a country's economic development, it first goes through a period where inequality increases and later declines. One possible reason might be the introduction of a new technology which first favours only a few and therefore increases inequality but as more people adapt to the new technology inequality decreases again over time. Williamson (1985), for example, showed that there is good evidence of a Kuznets curve in England and Wales during 1823-1915. In a cross-sectional approach (Deininger and Squire, 1998), however, the evidence of a Kuznets' curve is less clear. The data shows that most countries with very high Gini coefficients are in Latin America (Figure 3 in red dots), with Brazil as one of the most unequal.

This thesis aims to improve the understanding of the relationship between

[2] 2009 (Source: tradingeconomics.com)

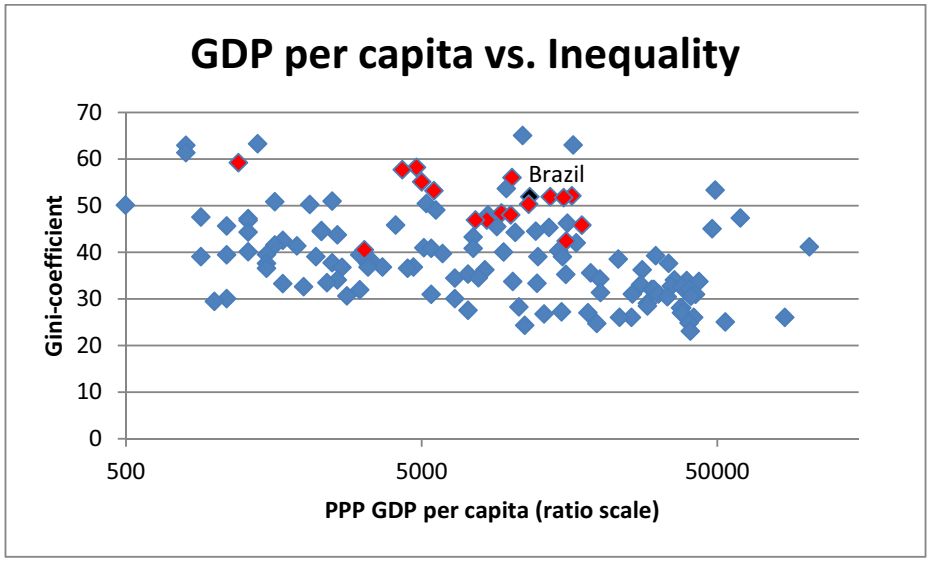

Figure 3: GDP per capita vs. Inequality
Source: CIA Factbook (GDP data from 2011, Gini data latest possible)

inequality and economic growth in a theoretical and empirical aspect and tries to give explanations for Brazil's enormous inequality and what effect it has on its economic growth performance. Section 2 will first present a few measures on how inequality can be assessed and what these numbers look like for Brazil. It also compares Brazil in a cross-country comparison and tries to explain why Brazil is such an unequally distributed country. Section 3 will explain possible theoretical channel on how inequality can actually affect growth. Following these theoretical aspects, the paper tries to quantify the importance of these possible channels for the case of Brazil. Section 4 will give an overview over the latest findings on the evidence of a Kuznets curve and on cross-country growth regressions that include inequality variables. In an empirical Section 5 the bachelor thesis proves with better and newer data the evidence of an inequality-based Kuznets curve in Brazil for the last 50 years. Results will support the existing research which has Brazil as one of only a few countries with such a relationship. Further, the section will carry out regressions about other possible determinants of inequality apart from the country's GDP and will present growth regressions for the single country of Brazil. Dummy variables for democratic circumstances as well as for the latest political party in charge, i.e. the Worker's Party, will be included in the regression. Section 6 concludes.

2 Inequality in Brazil

As described in the Introduction, Brazil is infamous for its extreme inequality with a Gini index on income inequality of 51.9%. However, there are more than one method to describe a country's inequality and some of them will be explained in the first subchapter. In a second part the results for Brazil are presented and put in a world wide context. In a final subchapter, I will summarize the findings in economic literature on why Brazil is so unequal.

2.1 Inequality measures

First and foremost it has to be said that there is no such thing as the right inequality measurement. The question which method should be chosen is dependable on what specific point the author wants to focus or on how suitable the method is in explaining the given problem. In addition, most of the time researchers have to rely on the available data collected by national and regional governments. Calculating inequality is something not only done by economists but also by scientists in many other fields, ranging from social sciences to natural sciences.

Properties

Despite different methods in calculating inequality, there are four properties that scientists can agree on (Cowell and Victoria-Feser, 1996): (1) it should make no difference in the calculation which person owns a specific income share, (2) richer countries should not by construction be labelled more unequal (scale independence), (3) a higher population should have no effect on the measurement (population independence) and (4) a transfer from a richer person to a poorer person while still preserving the order of income ranks should decrease and not increase inequality.

Gini index

By far the most famous and most used method in measuring inequality is the Gini index. Defining the area between the the line of perfect equality and the Lorenz curve as A and the area under the Lorenz curve as B (see also Figure 5 later in this chapter for the case of Brazil), the Gini index is given by:

$$Gini = \frac{A}{(A+B)}$$

$$Gini = \frac{A}{0.5} = 2A = 1 - 2B$$

If the Lorenz curve is given by a function $y = f(x)$, the Gini index can be found like this:

$$Gini = 1 - 2\int_0^1 f(x)dx$$

In reality, though, the Lorenz curve is almost always unknown and often only certain points on the curve, i.e. income shares of certain population shares, are aquired in surveys. This makes the calculation of the area B easier but it must be said that those results represent only approximations. Barro (2000), for example, uses that kind of approximation, a Gini index based on income quintile-shares first introduced by Theil (1967). A Gini index can take values from 0 to 1 with 0 being a total equal and 1 a total unequal society. For further research and more advanced methods one can have a look at Theil (1969), Ogwang (2000), Giles (2004) or Deaton (1997) who established a very simple formula for calculating the Gini index with only the mean of the distribution, the population and the income shares.

Hoover index

The Hoover index, also called Robin Hood index, is an other measure of inequality that is used by scientists (Hoover, 1936). It describes how much of a country's or region's income had to transferred from the rich segment to the poor one in order to have a community that is totally equal. Graphically, it is represented by the largest difference between the total equality curve and the Lorenz curve. As with the Gini index, the Hoover index can take values from 0 to 1 with 0 being a total equal community.

Further indexes

The Theil index (Theil, 1967) and the Atkinson index (Atkinson, 1970) are two more complex indexes which are both based on entropy indexes origing in information theory. These indexes are preferred when subgroup inequality, i.e. inequality among income share groups, should also be considered. However, for most economic research and also for this paper, such indexes are not often made use of and the Gini index is commonly preferred due to its simplicity and availability in statistical research.[3]

[3]For further study: Atkinson and Bourguignon (2000) and Sen and Foster (1996)

Income-share and ratios

An other well used method in describing a community's inequality is to take a look at income shares. Those shares explain how much a certain share of population gets from the total income. Usually, one is most interested in the highest- and lowest-income shares, usually with values that range from 0.1% to 20% of the population. For comparing those shares' income differences, researchers often build ratios to explain by how many times one group is better off than an other. Therefore, it's usually higher income groups over lower income groups. Those income shares can also be compared to mean or median values to get more comparable results. One huge disadvantage compared to the above stated indexes might be that ratios do not provide absolute measures of inequality.

After summarizing the most important ways how to calculate inequality, one important point should not be forgotten and starts before choosing an adequate method in analysing the inequality. That is the answer of which inequality should be measured. An economic researcher has to distinguish between income and wealth inequality; and if he chooses income inequality, does it include capital gains or not. He also has to decide whether to look at individuals or household and if he wants to focus on inequality before or after tax. The different methods for putting a number on inequality explain practically the same thing, but can sometimes vary a bit in their levels. For high inequalities, the Theil index is larger than the Hoover index, while for low inequalities, it is the other way round (Deaton, 1997). In general, most research done on the topic of inequality uses a second inequality measure to test their results' robustness. Barro (2000) used the Gini coefficient in his main regressions and tested his findings against the lowest and the highest income-quintile share to confirm his original regression results.

2.2 Facts and figures about Brazil's inequality

In 2012, Brazil was ranked 19th in world in income inequality measured by the most popular inequality index, the Gini coefficient. Its value was measured at 51.9%, approx. two points down since 2009. Over the course of the last half century, Brazil's Gini coefficient has been fairly constant with a peak of 63% in the late 80's. There has been a sharp decline in the beginning of the 90's, but the Gini coefficient stayed close to 60% until the new century. Since 2002, the decline of income inequality has accelerated, but is today still at closely over 50%

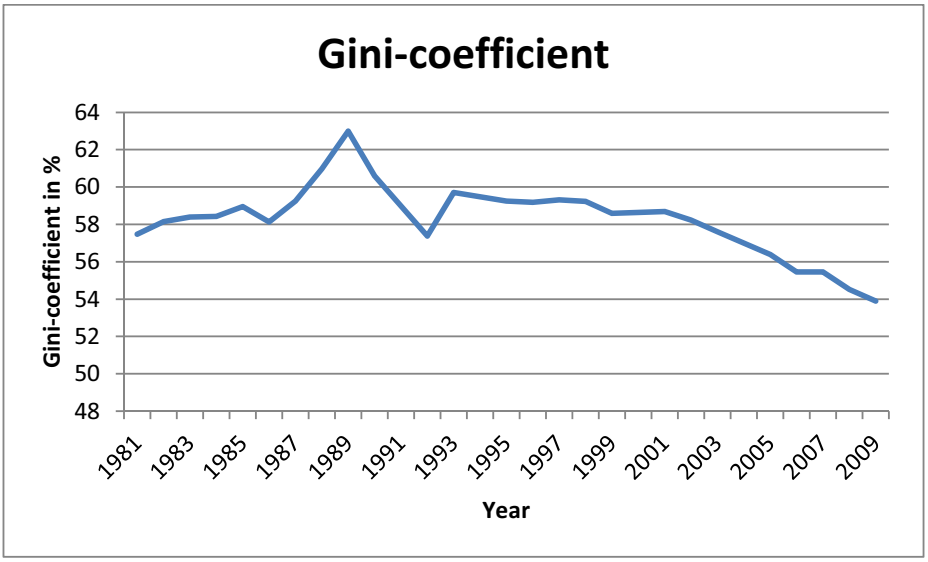

Figure 4: Gini-coefficient on income inequality in Brazil 1981-2009.
Source: Index Mundi 2012

Income group	Income share
lowest 20%	3.2
second 20%	7.1
third 20%	11.9
fourth 20%	19.4
highest 20%	58.5

Table 1: Income shares in Brazil 2009
Source: tradingeconomics.com 2012

(Figure 4). This makes Brazil, as seen in Figure 3 in the Introduction, the most unequal country of the 20 biggest economies in the world, with a significantly higher Gini coefficient than the current 6 larger economies, measured by PPP GDP (USA 45%, China 48%, India 36.8%, Japan 37.6%, Germany 27%, Russia 42%)[4].

Graphically, Figure 5 shows Brazil's income distribution as of 2009 while Table 1 presents the values for each income group. It shows that in the lowest income share, 20% percent of the population have to live with only 3.2% of the

[4] 2011 (Source: CIA Factbook)

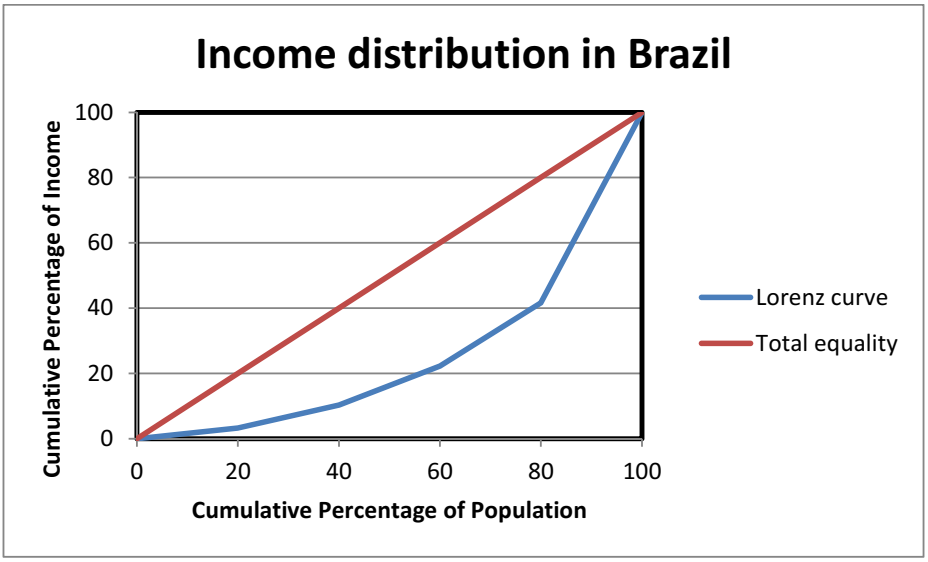

Figure 5: Income distribution in Brazil 2009
Source: tradingeconomics.com 2012

total income generated in the country. In contrast, in the richest group, 20% of the population accounts for 58.5% of all the income. Historic data from the last decade shows that the lowest income group has increased its income share from 2.7% in 2000 to 3.2% in 2009, a rise of 15.6%. On the other hand, the highest income group has lost some of its share, dropping 6.6% from 62.3% to 58.5% in those nine years.

2.3 Why is Brazil so unequal

Looking at the bare numbers in the preceding subchapter the question arises what could possibly be the reasons for Brazil's enormous inequality. Income inequality exists because people differ in all kind of aspects that are relevant to the income they achieve. What usually contribute most to income inequality are differences in human capital, i.e. education and health. Those differences in human capital will result in different returns on the labour market. The more unequal the distribution of human capital and the higher the return to education, i.e. a skill premium, the more unequal will also the income be distributed. Skill premiums are driven by supply and demand on the labour market and on productivity a worker can achieve (Weil, 2012). However, income inequality can also have different sources: there can be geographical differences, e.g.

Level of schooling	% attained (% completed)
No schooling	13
Primary schooling	39 (26.2 completed)
Secondary schooling	40.3 (25.1 completed)
Tertiary schooling	7.3 (5.2 completed)

Table 2: Education levels in Brazil 2010

Source: Barro and Lee (2010)

between urban and agricultural regions, gender- or race-discrimination, technology changes or international trade increases that favour the already skilled and high-earning share of the population or the role the government plays when it comes to inequality, mainly through its redistribution policies it will implement.

Differences in education and in the return to it

The data on education from Barro and Lee (2010) shows a very unbalanced distribution of human capital in Brazil. The numbers in Table 2 show the percentages of the population aged 25 or older who have attained (completed) primary, secondary and tertiary level of education in the year 2010.

Bourguignon et al. (2002) analysed the impact of such an unequal distribution of education, comparing it to other countries (Mexico, United States and Colombia). They found that differences in returns to schooling explain, together with work-experience, approximately 40% of the difference in inequality between Brazil and the United States. This proves to be one of the most important reasons why Brazil faces these kinds of inequalities on income.

As seen in Table 2, Brazil has an extremely skewed allocation of human capital. This will translate via the labour market into even higher income inequality in Brazil as opposed to somewhere else, because skill-premiums in Brazil are higher compared to the countries also analysed in Bourguignon et al. (2002). According to the paper, steeper returns to education constitute 20% of the excess inequality[5] compared to the United States.

Geography & Discrimination

Further, there can be income differences amongst different regions in a country. According to the Instituto Brasileiro de Geografia e Estatística, hereafter

[5] additional inequality when compared to an other country

IBGE, which categorizes the country into 5 big regions, there are minimal differentials in Gini coefficients among those regions. The centre-west region, including the capital Brasília, features the highest income inequality with a Gini index of 55.4%. The lowest Gini value is found in the south region (48.9%), which is also the smallest of the 5 big regions in Brazil.

Geographical differences in Gini coefficients can also be looked at from another perspective: One can distinguish between urban and rural areas. In 2005, the urban Gini of Brazil was 60%, while the rural Gini was 54%, both being significantly over the average of other Latin American countries (50% for both urban and rural Gini).[6]

Inequality can also have its sources from intended or unintended discrimination, either in the labour market or directly through the government, e.g. favouring a specific group of the population. Two forms of discrimination can be of importance in Brazil: Gender discrimination and racial discrimination. Barros (2002) published a study where racial discrimination contributed 5% to the inequality from changes in labour earnings. Gender discrimination on the other hand, had no contribution.

Historical distribution of assets and Opportunities

Economic inequality does not only show itself in income, but also in asset distribution, especially the distribution of land (Deininger and Squire, 1998)). The possession of land or other assets gives its owner the possibility to get a return on them. Further, such a land-owner is favoured by financial institutions to get his needed loans. Therefore, one can say that inequality in assets can translate into income inequality and is thus one of the sources of it. Assuncao (2006) calculated Land Gini coefficients for Latin America and compared them to Asia, Europe and the United States. Land distribution was the most unequal in Latin America (83% Gini coefficient), higher than in all other compared regions of the world (Asia 52%, Europe 64%, United States 75%). This is assumed to be one of the reasons why so many Latin American countries have such unequal distributions of income, also seen in Figure 3.

Roemer (2000) proposed to look at the contribution of unequal opportunities as a cause of inequality in earnings. He distinguished variables in to *circum-*

[6] Source: http://media.routledgeweb.com/pdf/9781844076963/1_gini_on_urban_and-ruralby_region_lac.pdf

stance and *effort*. *Effort* is something that an individual can control and change, as where *circumstances* cannot be controlled by the individual. Bourguignon et al. (2007) took this approach and applied it to the case of Brazil. Variables for *circumstances* were the father's and mother's education, the father's occupation, the individual's race and region of birth. Those factors accounted for 10-37% of the Theil index on income inequality. It depends whether one only accounts for direct effects of these uncontrollable variables or if one also takes the indirect effects in to the estimation. It turns out that the education of both parents is a significant contributor to inequality, while the father's occupation and race are less important but still significant. This shows that social mobility, i.e. moving up or down your income share group, is still pretty low. Improved schooling rates and education parameters in the last 20 years (Barro and Lee, 2010) should have helped to improve social mobility and will do that further in the future.

Government policies

In a final argument, I want to stress the importance of the role the government has when it comes to inequality. First, one should look at the form of government from a broader perspective, i.e. whether people in the society have a fair chance to express their opinions and make them count in the political process, for example through voting rights. This would be the case for a democratic government that has been elected through a fair voting process. The opposite of that would be a dictatorship government, where the population has no or very limited power to express their political goals. Political economic theory suggests that, facing the same amount of inequality, democracy-ruled states have larger redistribution programs in place than dictatorships due to the possibility of either directly voting for more redistribution programs or by selecting a government that promises more equalling policies (Barro, 2000). Section 3.2 focuses more on this mechanism and the possible effects redistribution programs can have on economic growth. As the Brazilian population has lived under a military dictatorship up until 1985, it is plausible that this period has been a cause of the high inequality Brazil still suffers today. But one would also suspect inequality to be reduced after the introduction of democracy as voting rights were expanded and people were able to vote for political parties in favour of income-equalling measures. After analysing the form of government from a purely democracy versus non-democracy standpoint, it can also be decisive to differ between different political parties and their intention to reduce inequal-

ity. Mainly through the degree of redistribution programs, the political party in power can affect the amount of inequality. In 2002, Luiz Inácio Lula da Silva, hereafter Lula, became the first Brazilian president belonging to the Partido dos Trabalhadores, hereafter Workers' Party or PT. With the intention to reduce poverty rates and inequality, the government introduced a family redistribution program called *Bolsa familia* which Lula hailed in a 2006 interview with The Economist[7] as "the most important income transfer programme in the world". A further measure to reduce inequality was a 25% rise in minimum wages. With programs like the *Bolsa familia* and the raise of the minimum wage by Lula, if implemented correctly, one should notice a decline in income inequality in the last few years. As seen before, inequality has experienced a sharp decline in the last decade. Whether this is caused by the stated policy measures or affected by other effects, like improved education and health conditions, is difficult to tell and will be looked at empirically in Section 5. There I will include dummy variables for democratically elected governments and for Workers' Party governments in my regressions to find out the determinants of inequality and the variables that effect economic growth.

3 Theoretical Channels on how growth can be affected

In modern economic literature there are many constructed theories on how inequality can affect the economic performance of a given country. Barro (2000) classified them into four categories: credit-market imperfections due to asymmetric information and the absence of legal institutions, the amount of redistribution programs, sociopolitical unrest and possible differences in saving rates among different income classes. In the following subsections I will analyze the four possible channels stated by Barro theoretically and add a few further channels that can be of any importance. In a second part I will apply those factors to the case of Brazil and evaluate their importance.

[7] http://www.economist.com/node/5578770

3.1 Credit-market imperfections

Due to credit-market imperfections, people with no or little assets tend to not receive loans and therefore often cannot invest in opportunities that would bring them a positive return. This might be the case for investments in human capital. Galor and Zeira (1993) explained that the difference in investing in human capital as opposed to physical capital is that the human capital is not transferable. As a result, the marginal product of a human capital investment is declining with the amount invested by a person. Physical capital on the other hand has a constant return independent of the amount already invested. At first the return on human capital is higher than on physical capital and thus the first amount of investment will be dedicated to human capital. But as the marginal product declines, there will be a point where the constant return on physical capital is higher so that a person will only invest in physical capital from that point on. In an economy where a poor person is not able to borrow from a bank or other institutions, he will not be able to make an investment in human capital. This situation of inequality cannot be economically efficient as marginal products of human capital investments are higher in the beginning as physical capital investments after the threshold point. A redistribution from the rich to the poor would in that case raise the quantity and average productivity of investment. Higher inequality through credit-market imperfections thus reduces the possible economic output. Reasons for credit-market imperfections might be because of imperfect law enforcement or insufficient laws to protect the assets of debtors. Those factors should improve though as an economy develops and therefore have a higher impact on poor economies (Barro, 2000).

3.2 Redistribution programs

In a society with majority voting rights, there is usually a strong favour for redistribution programs if the assets are heavily unequal distributed among the individuals. This may involve explicit transfer payments or public-expenditure programs with a progressive tax system (Barro, 2000). A bigger difference between the mean and the median income will tend to bring more redistribution as a result of the political process. More redistribution creates more economic distortions as rich people will be discouraged to work more if more of their income is redistributed or try to avoid those taxes. The individuals on the

receiving end of those redistribution payments also have fewer incentives to put in more effort at work. These factors tend to retard average productivity and lower investment which results in a negative effect on economic growth. In short, a greater amount of inequality will provoke a greater redistribution, so that initial inequality will reduce economic growth through the channel of redistribution politics (Barro, 2000).

3.3 Sociopolitical unrest

High inequality tends to increase crime and other unproductive activities and might even destabilize a country's institutions. Those actions are a waste of potential economic resources and could, in the worst case, bring down the investment in an economy as property rights are threatened (Barro 2000). Perotti (1995) also found that in more unequal societies individuals tend to engage in more rent-seeking activities or manifestations of socio-political instability. High inequality therefore is a cause of wasting resources and deterring potential investment and has thus a negative effect on economic growth.

3.4 Saving rates

By the assumption that individual saving rates rise with the level of income, a redistribution of wealth or income from the rich to the poor would lower the aggregate saving rate. In an at least partly closed economy that would lower investment which would shift the economy into a lower steady state, thus, reducing economic growth for the specific transition period from its original to the new steady state in the neoclassical growth model by Solow (1956). Contrary to the previous three possible channels, saving rates provide an explanation why inequality could have a positive impact on economic growth.

3.5 Further channels

Besides the four channels presented above, there are a number of other possible channels that might effect economic growth. De la Croix and Doepke (2002) argue that fertility should be considered as an important channel. By the as-

sumption that poorer parents tend to have many children and thus, and through the fact that they are poor, will invest only little in their education. Higher income inequality will therefore increase the fertility differential between the rich and the poor, which means that the amount of children with no or little education increases. Consequently, this effect lowers the average education and the average human capital endowments and therefore, lowers growth. De la Croix and Doepke (2002) make the case in their paper that this fertility differential effect accounts for most of the impact inequality has on growth. More general, the relationship between income inequality and health has been looked at. Subramanian & Kawachi (2004) and Ram (2006) found a negative impact of income inequality on general health in a society, especially significant for the poorest countries. Further, undesirable health conditions can translate into lower economic performance which lowers economic growth. There is even evidence that this channel might as well be active for economically advanced countries where social standing has become more and more important. Marmot (2004) showed that one's social standing can directly effect the person's health due to factors like stress and anxiety.

3.6 Net effect

As seen in the previous subchapters, there are many possible channels on how inequality might effect economic growth. Most of those channels have a negative impact on subsequent growth, but there are also other channels which tend to be the other way round, e.g. the effect that different saving rates can have. From a theoretical standpoint it is therefore almost impossible to estimate the net effect that occurs when combining all the single channels. It might also be necessary to analyze those channels in detail for any special case to get a more plausible picture of the importance of each channel. Subsection 7 will thus be a summary of how those possible channels could translate in the case of Brazil.

3.7 Situation in Brazil

When looking at possible channels that influenced Brazil the most, credit-market imperfections should probably be the one channel emphasized the most, especially in the pre-democracy era before 1985. During the period of military

dictatorship during 1964 until 1985 it is reasonable to presume some kind of favouritism towards a specific group that was leaning towards the rulers of this time. This alone might already be an inequality-augmenting fact, but further it's realistic to assume this in-favour group had better access to the credit-market, e.g. loans. After 1985 as institutions grew more reliable and democratic right came in to place, the number of loans in general probably went up. Whether it changed the situation for the poor with little or no assets to get their loans for investing in mostly their human capital or simple machines for agricultural activities is difficult to tell. However, with the emergence of micro-credits in the last couple of decades and the subsidizing of such micro-credits through the government since 2005 to bring interests rates down to 8%[8] it can be assumed that today more poor people can have access to credit-market institutions than in the past. Therefore, I would judge the channel of credit-market imperfections as important for Brazil but with declining importance in the last three decades and possible in the future as well.

Applying the logic from Chapter 3.2, considering the high income inequality and the democratic situation in today's Brazil, one might guess that huge redistribution programs were in place to partly balance out the country's income. Immervoll et al. (2005), though, provide facts that contradict that theory. At the time of their study, the tax-system in Brazil had a very little equalising effect on income inequality, mainly due to its regressive pension program. This signalises that the channel is of lesser importance although the tax revenue as percentage of GDP is at 39.9 [9] which is a high number in international comparison. This can provoke economic distortions and inefficiencies but high inequality is unlikely the sole trigger for the high tax revenue number.

Political unrest in Brazil today is not an issue that could have huge effects as a channel, even during and at the end of the period of military dictatorship there is no evidence of civil war-like circumstances with highly explosive political riots and excesses (Skidmore, 1990). Moreover, with the economic advances the country experienced in the last decade, political unrest seems even more unlikely. Although inequality has stagnated for a long period, wages for low-skilled workers, pensions and entitlements for the poor have still risen in absolute terms. This should also have an effect on poverty-based crime rates as the incentive

[8] Source: 2011 press release by the Brazilian government (http://www.brasil.gov.br/-para/press/press-releases/august-1/brazil-expands-federal-microcredit-program-lowers-interest-rates/br_model1?set_language=en)

[9] 2011 est. (Source: CIA Factbook)

for doing something illegal, e.g. for stealing, has decreased because of better outside opportunities, i.e. people who are considering illegal activities have now more to lose than before. Sachsida et al. (2010) have explored the connection between crime and inequality in Brazil and found that high inequality increases criminal behaviour but found no evidence on a relationship between inequality and strongly violent crimes. But again, it's very difficult to distinguish whether these criminal activities are induced by inequality or just absolute poverty levels. On one hand, it's hard to believe that when, in a theoretical approach, all people would have their income doubled over night (but prices on necessities remain constant), thus leaving inequality exactly the same, that no one changes his decision to enter in to illegal activities. On the other hand, several studies like Ravallion (2001) have showed that inequality and poverty numbers are heavily correlated.

To my knowledge, no data on income-group specific saving rates exist for the case of Brazil. But results from international research regarding the topic suggest that saving rates tend to rise significantly with income. Dynan et al. (2004) collected data for households in the United States where at least one member was aged 30-59. The results showed that the lowest income quintile saves only 9% of their income, while the rate of the highest income quintile is at 24.4%. It is plausible to assume a similar outcome in Brazil, especially because the poor in Brazil are in absolute terms worse off than in the United States and have therefore even less room to generate savings. After looking at the results from Dynan et al. (2004) and the suspicion that results could very well be more extreme for Brazil, the channel of different saving rates for different income groups can play a big role in the effect of income inequality on economic growth. However, with the trend of globalization and with economies getting more open to foreign investment, a country's saving rate has less effect in determining the country's amount of investment which will help produce economic growth.

With a rate of population living under the poverty line at 26%[10] there exists a considerable high number of people who can barely survive on their current economic situation. Such extreme conditions can lead to a *poverty trap* (Banerjee and Duflo, 2011) caused by insufficient nutrition or health conditions. The person who expierences such a *poverty trap* finds himself in a vicious cycle from which he is not able to escape, e.g. not being healthy leads to an inability to

[10] 2008 (Source: Index Mundi)

work, which prevents him to get the income needed to pay for adequate treatment of his health condition. As high inequality can be a cause of poverty or is at least strongly correlated to it, this channel could prove to be very important. A person who experiences the situation of being in a *poverty trap* will not contribute to any economic growth, so the more people that are able to escape those conditions, the more people will particape in economic activities, which will lead to higher economic growth.

From 1960 until 2000 Brazil experienced a sharp decline in fertility overall (Potter et al., 2010), but the development was not evenly distributed among different income groups (Muniz, 2009). Fertility first declined for the upper income groups, thus increasing the fertility differential between the rich and the poor. But in the last decade covered by the research of Potter et al. (2010) fertility has also started to decline for lower income groups which, together with stagnating number of fertility for upper income groups, has decreased the fertility differential again. Therefore, one can conclude that inequality has affected economic growth through the channel of fertility differential among the poor and the rich more in the past than it does now. Still, it is also today a factor that cannot be underestimated.

After analysing the importance of the different possible channels, it is hard to conclude which effects will have a dominating influence in the case of Brazil. Alone from this qualitative analysis it is impossible to guess the net effect that inequality has on growth. Therefore, in Section 5, the paper will assess the issue empirically and try to call the effect the Gini coefficient has on growth in the subsequent period.

4 Empirical findings on the effect on growth

Economic literature is full of studies concerning the relationship between inequality, the level of economic development and the effect inequality has on growth. A first part is dedicated to Kuznets' theory about the interaction between a country's GDP and its Gini coefficient. Secondly, the recent findings from cross-country growth regressions will be summarized which have resulted in sometimes contradicting results. A final subchapter will conclude about the problems and implications that occur while researching this topic.

4.1 Evidence of Kuznets curve

Kuznets (1955) said that during a country's economic development, inequality first rises and after a while declines again. Hence, we should have graph with the level of inequality as a function of the level of GDP per capita that shows an inverted U-shape. His primary example was the shift from the low-income agricultural sector to the high-income industrial sector but his theory can be applied to any major innovation or new technology. Assuming that at the beginning all people are in the same, low-income sector, inequality starts at a low point. If now people start moving in to the high-wage sector, inequality will rise as long as it is only a few workers that change the sector. With time and more people adapting to the change, inequality will decrease again as most of the people are now in the high-income sector and every worker that joins this sector will from now on lower inequality in the whole society. Kuznets hypothesis has been the basis for many economic researchers who tried to prove or disprove his theory. One can either try to find evidence on a possible Kuznets curve by looking at a single country over time or in a cross-country approach at a specific time.

There are many single country studies on whether there is an evidence of a Kuznets curve. To just quote two: Williamson (1985) found that during 1823-1915 there is good evidence of a Kuznets curve in England and Wales, while Piketty (2000) argues that wage inequality in France between 1901 until 1998 has been extremely stable with no evidence of a Kuznets curve. Deininger and Squire (1998) investigated the occurrence of a Kuznets curve for 49 countries. The only found 5 countries, including Brazil[11], with a significant Kuznets curve, 4 countries with a significant U-shape curve contrary to Kuznets' prediction and 40 countries with no significant association between inequality and income.

In a cross-country approach, Barro (2000) found out that the relation between the Gini coefficient and a quadratic in log(GDP) is statistically significant in a panel of Gini coefficients observed 1960, 1970, 1980 and 1990. His data implies that the Gini values rise with GDP for values of GDP less than $1636 (1985 US dollars) and declines afterwards when considering economic development as the only determinant of inequality. The R-squared values range from 0.12 to 0.22. Hence, although statistically significant, the level of economic development does not explain much of the variations in income inequality across countries. After including several other variables such as secondary and higher schooling,

[11] and Hungary, Mexico, Philippines, Trinidad

openness, democracy and rule-of-law indexes and dummies for Africa and Latin America, Barro (2000) gets very high R-squared values that range from 0.63 to 0.74. Considering all those variables, the GDP peak where inequality declines afterwards occurs at a value of $3320 (1985 US dollars).

4.2 Cross-country regressions

Apart from the simple relationship between GDP per capita and an inequality measure such as the Gini coefficient, economists are interested in the effect that inequality has on subsequent growth. Section 3 provided the theoretical channels on how growth can be affected by inequality, now I will focus on the empirical results from cross-country regressions. Most of the research evaluating the inequality effect on growth use 5 year averages for Gini coefficients and look at the effect it has in the subsequent time period, usually also 5 years. Most papers look at growth as a function of investment, initial GDP, years of schooling and the Gini index. Deininger and Squire (1998) differentiate also between Income and Land Gini and use different regional dummies in their regressions. Barro (2000) includes several other variables such as government consumption relative to the country's GDP, rule-of-law and democracy indexes, fertility rate, inflation rate and the growth rate of terms of trade. Forbes (2002) uses a simpler model which only includes the variables initial GDP, the Gini index, male and female education measures and a PPP index.

Deininger and Squire (1998) showed in their results that inequality reduces income growth for the poor but not for the rich countries. They also found that land distribution plays an important role, especially for poor countries, where land inequality has a strong negative effect on long-term growth. The regional dummies, e.g. for Latin American and African countries, included in the regression turned out to be negative and highly significant. Barro (2000), with all variables stated above included, found little overall prove whether inequality increases or decreases subsequent growth. However, if the fertility variable which is positively correlated with inequality is omitted from the regression, there is a negative overall effect on growth. Splitting the observations in to high and low GDP observations, one can see that the effect of inequality on growth is negative for values of per capita GDP below $2070 and then becomes positive. Forbes' (2002) results are in contrast to the previous findings of Deininger and Squire (1998), Barro (2000) and several other researchers. His results show a

significant positive effect in the short-term which is robust in various settings and models. Medium- and long-term effects tend to decrease and could even be negative.

4.3 Implications and problems

As seen in the previous two subsections, there is no clear consensus among researchers on whether the Kuznets curve is an empirical regularity and on the effects of inequality on subsequent growth. These differences mostly do not stem from different theoretical interpretations, but from different data sets, different statistical methods and different time horizons.

The first source of differences is mainly due to different data sets. All data sets used before Deininger and Squire (1998) cannot be considered as fully high-quality data material. Deininger and Squire (1998) may be better and more comprehensive, but the number of observations is still quite small and results can be skewed in one or the other direction when leaving out a few of those observations. Barro (2000), Banerjee and Duflo (2003) and Forbes (2002) use similar high-quality data sets but quite often differ in the observations they consider for their regressions. This makes it hard to compare those findings as differences could very well be from the data choice itself. Better quality of data today and in the future will help researchers find more precise and clear answers on these questions.

A second source of potential differences are different statistical methods and models. Which variables are included in the regression will have an impact on the predicted effect inequality has. Omitting just one variable might have the effect to make inequality significant in the given regression. This is a problem that cannot be easily solved as there is no consensus among economists what the real model is about. Each paper gives its own reasoning about why some variables are and some are not included in the regression analysis.

A third and final implication when comparing those papers is that they operate with different time horizons. Most papers seem to agree that the overall long-term effect of inequality on subsequent growth is negative and stronger for poorer countries than for the rich ones. However, for short-term implications, the support for a negative effect is less clear. Some, like Forbes (2002) argue that for rich countries, the short-term effect is even positive.

Despite having different methods, data sets and time horizons in their regres-

sions, researchers can broadly agree on a few subjects: First, short-term effects of inequality on growth are usually more positive or less negative as compared to medium- and long-term effects. Second, growth of low-income countries is more negatively affected by inequality than growth of high-income countries. And third, regional dummies for African and Latin American countries are in most studies highly significant variables in growth regressions as well as in regressions that look for the determinants of inequality.

5 Regressions

In an empirical part, I want to see whether I can answer one or possible more of the three following questions with the data I collected: Is there evidence in the data for the last four and a half decades for an income inequality based Kuznets' curve in Brazil? What else apart from the country's level of GDP determines income inequality in Brazil? And finally, what are the effects of income inequality and different forms of government/politics on economic growth? I use regression analysis technique as seen in Barro (2000) to measure the determinants of inequality and the impact on growth, but I only include data from one country, i.e. Brazil. The reason behind this strategy is the improved quality and quantity of the data available and maybe the possibility to explain some of the effects that were expressed in regional dummies in cross-country growth regressions. With high-quality data available back to 1966, there is now nearly half a century with consistent data to analyse these interesting questions.

In both regressions I use dummies for different forms of governments and politics. I include a dummy for democracy for the period after the end of the military regime in 1985. This radical change in the people's participation in politics could have had impacts both directly on inequality, maybe reducing a certain favouritism towards a specific group, and impacts through the channel "redistribution programs" on economic growth. During a time of dictatorship, where there are no voting rights to the public, a high number in inequality does not automatically translate into more redistribution programs towards the poor as there are no possibilities to express this postulation in the political process. However, the channel "sociopolitical unrest" might weaken the effect, because governments, facing election or not, could fear that high inequality brings up tensions in the public that could lead to a disempowerment of such a

government. The second dummy included in the regression is a dummy for the current political party, the Workers' Party, which is in power since 2003. Luiz Inácio Lula da Silva, known as Lula, was elected president in 2002 after winning the election against Fernando Henrique Cardoso, the former centrist-president. Lula was reelected for a second term in 2006 and ended his presidency in 2010. Since 2010, fellow party-woman Dilma Rousseff is in charge of the country. Lula and Rousseff, together, were in power for the last ten years, so it is particularly interesting how these ten years leadership of the PT have affected inequality on one hand and economic growth on the other hand.

5.1 Data set

For the following regressions, I use 5-year averages of the variables throughout all regressions to cover the short- and maybe some medium-term effects. For GDP data, I use the GDP per capita in US dollar from the Penn World Table for all the years covered in the regressions. The Penn World Table is one of the most used data sets when it comes to national-accounts data, provided by the University of Pennsylvania. As a variable for physical capital I took the Investment/GDP ratio, which is a common variable in growth regressions (Source: EconomyWatch.com). For education parameters, I use the data from the Barro-Lee dataset (Barro and Lee, 2010). There, I use average years of schooling for every type (primary, secondary and tertiary) of education to determine which level of education might influence the amount of inequality in Brazil. For the growth regressions, I use the more general average years of schooling number for all the population above the age of 25. Gini coefficient are taken from Deininger and Squire (1998) for the period of 1966 until 1980, which can be considered high-quality data material, and calculated from yearly Gini data from TradingEconomics.com for the time after 1980. Table 4 provides the basic information about the data set used in the following subchapters.

Data	Source
GDP per capita	Penn World Table
Investment/GDP ratio	EconomyWatch.com
Gini coefficients	Deininger and Squire (1998) for 1966-1980
	TradingEconomics.com for 1981-2009
Schooling data	Barro and Lee (2010)

Table 3: Data sources - Overview

Variable	Mean	Std. Err.	Min	Median	Max
GDP per capita	7056.8	1382.4	3985.7	7385.7	8606.5
Investment/GDP	21.1	2.9	17.0	20.4	25.8
Avg. years of schooling	4.41	1.76	2.57	4.08	7.17
Primary Education	3.39	1.40	1.80	3.33	5.19
Secondary Education	1.21	0.52	0.66	0.97	2.12
Tertiary Education	0.16	0.05	0.06	0.17	0.24
Gini coefficient	58.8	2.2	54.8	59.0	61.9

Table 4: Data information

5.2 Kuznets' curve in Brazil

As presented in Part 4, Deininger and Squire (1998) had very mixed results when the investigated several dozens of countries if there is proof of an inverse U-shaped relationship between the Gini coefficient and GDP per capita in a single country. Only a few countries actually proved to have such a shape in their relationship between inequality and economic levels, including Brazil. On the other hand, many countries had no significant relationship and some even had opposite results, i.e. a real U-shaped curve. With more and newer data available, I will test the Kuznets hypothesis once again to see whether the newest data agrees or disagrees with the findings of Deininger and Squire (1998).

5.2.1 Model

In a first empirical part, I examine the possible existence of an inequality-based Kuznets curve for Brazil during the period of 1966 until 2010. To determine the shape and significance of such a relationship, I use the following regression model:

$$GINI_t = \beta_0 + \beta_1 GDP_t + \beta_2 GDP_t^2 + \varepsilon$$

In this setup, there are four possible types of relationships between GDP per capita and income inequality that the regression can generate:

- (1) a positive linear relationship with $\beta_1 > 0$ and $\beta_2 = 0$
- (2) a negative linear relationship with $\beta_1 < 0$ and $\beta_2 = 0$
- (3) a U-shaped relationship with $\beta_1 < 0$ and $\beta_2 > 0$
- (4) an inverse U-shaped relationship $\beta_1 > 0$ and $\beta_2 < 0$

To prove the existence of a Kuznets' curve, results have to turn out like type (4), i.e. a relationship that looks like an inverse U-shape and the estimates for $\beta_1$and β_2 have to be statistically significant.

5.2.2 Results

Variables	**Estimate (Std. Error)**
Intercept	$2.599 \cdot 10^{1}$* $(7.680 \cdot 10^{0})$
GDPpc	$1.193 \cdot 10^{-2}$ ** $(2.563 \cdot 10^{-3})$
GDPpc^2	$-9.986 \cdot 10^{-7}$ ** $(2.052 \cdot 10^{-7})$
R^2	0.8151

Table 5: Results from Kuznets curve regression

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

Regression results prove the existence of an inequality-based Kuznets' curve for Brazil between 1966 and 2010 and are presented in detail in Table 5. Both β_1 and β_2 turn out to be highly significant and suggest strong evidence that the inverse U-shaped relationship Deininger and Squire (1998) is a long-term occurrence. Adding the latest data enforces the view that Brazil is one of only a few countries with a statistically significant Kuznets' curve when it comes to the relationship between economic development and inequality. The high significance for both β_1 and β_2, as well as the high R^2 value express that a lot of a country's inequality can be explained by their economic level alone. In Chapter 5.3 I will test whether there are other variables besides the GDP per

capita values that will prove to be statistically significant, especially education parameters.

Calculating with the results in Table 5, the tipping point occurs at \$5973, meaning income inequality rises before that level of GDP per capita and declines afterwards. Barro (2000), in a cross-country study, found tipping points of \$1636 (in 1985 dollars) and \$3320 (in 1985 dollars) after filtering out the estimated effects of other variables than the GDP and its square. Deininger and Squire (1998) calculated these peaks separately for each country. They found a value for Brazil of \$3117, which is about half of what my regression resulted in. This can most likely be explained with the longer time horizon I used in my regressions and the recent stronger decline in inequality in the last decade that probably shifted the tipping point up in the time scale.

5.3 Determinants of Income Inequality

The previous subchapter showed that a lot of the variation of Brazil's inequality, measured by the Gini coefficient, can be explained by its economic level of development. This was expressed by highly significant estimates that enforce the view of a Kuznets' curve in the case of Brazil and an R^2 value of 0.8151. Now in this section, it will be tested, whether there are other significant variables that can determine the level of inequality in Brazil.

5.3.1 Model

To determine whether any other variable is a significant contributor to Brazil's Gini coefficient, I use the following regression, including the log(GDP), the log(GDP) squared, three education measures for average years spent in Primary (PEDU), Secondary (SEDU) and Tertiary (TEDU) Education, as well as dummy variables for periods under democracy (DM) and periods under a Workers' Party government (WP). I use 5 year averages and regress them on 5 year averages from the same period to cover the short-term effects:

$$GINI_t =$$

$$\beta_0 + \beta_1 log(GDP_t) + \beta_2 (log(GDP_t))^2 + \beta_3 PEDU_t + \beta_4 SEDU_t + \beta_5 TEDU_t + \beta_6 DM_t + \beta_7 WP_t + \varepsilon$$

5.3.2 Results

Variables	Regression 1	Regression 2	Regression 3
Intercept	-2973.956 (1656.615)	-1525.605 (1934.187)	-3092.384 (2158.234)
log(GDPpc)	701.265 (379.259)	371.611 (441.849)	727.583 (492.289)
$\log(\text{GDPpc})^2$	-40.476 (21.669)	-21.817 (25.158)	-41.929 (28.016)
Pri Edu	1.397 (1.404)	3.854 (2.387)	1.326 (1.770)
Sec Edu	-2.065 (5.360)	-9.835 (8.041)	-1.005 (9.4803)
Ter Edu	-22.945 (78.419)	-38.550 (88.164)	-32.115 (112.481)
Dummy Dem		-3.891 (3.171)	
Dummy WP			-0.4769 (3.092)
R^2	0.8592	0.9197	0.861

Table 6: Results: Determinants of Income Inequality

Regression 1: no dummies

Regression 2: Democracy dummy

Regression 3: Workers' Party dummy

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

Table 6 presents the full results for the three regressions. `Regression 1` has no dummies included, while `Regression 2` has a dummy for democratic periods and `Regression 3` one for periods under governments of the Workers' Party. After a first look at Table 6 one will notice that significance levels have dropped to the point where no variable in the system is significant to a level between 0 and 0.1, not even the log(GDP) or the log(GDP) squared who were highly significant before. One possible reason for this to happen is that the GDP variables and the three education variables tend to be highly correlated as higher education brings about a higher level of economic development. Another explanation could be the relatively small sample size and the number of variables which makes it difficult to get highly significant results. However, in additional regressions where I included only one other variable aside from the GDP and

GDP squared, I found that none of the here suggested variables is significant. GDP and GDP squared remain significant in this one additional variable set-up, but its significance level drops when compared to the previous subsection. The dummy variable introduced in `Regression 2` for democratic periods turns out to be negative. A five-year period under democratic ruling correlates with a reduction of the Gini coefficient of 3.891%. `Regression 3` shows that periods under the Workers' Party government have a similar, yet less strong effect. One five year period under the ruling of the PT reduces the Gini index by 0.4769%. However, the levels of significance for the two dummies are quite low and one should be very cautious to interpret these results. The reason for these low significance levels is again to be found at the low number of observations in the regression.

5.4 Effect on Growth

In a last empirical part, I will carry out growth regressions similar to works like Barro (2000), but will do this only for the case of Brazil. The Gini coefficient will be included as an independent variable to determine the effect it has on subsequent growth.

5.4.1 Model

To determine what affects the subsequent growth, i.e. the growth in period t+1, I will include the following variables from period t in the regression: the GDP, the ratio between investment and the GDP (INV), the average years spent in school by all the population above 25 years (EDU), the Gini coefficient (GINI) as well as the two known dummy variables for democracy (DM) and the Workers' Party (WP). Like in the previous two subchapters I use 5 year averages on all variables. The regression looks like this:

$$g(GDP)_{t+1} =$$

$$\beta_0 + \beta_1 GDP_t + \beta_2 INV_t + \beta_3 EDU_t + \beta_4 GINI_t + \beta_5 DM_t + \beta_6 WP_t + \varepsilon$$

5.4.2 Results

Table 7 presents the results of the three growth regression. `Regression 4`

has no dummies included while `Regression 5` has a dummy for democracy and `Regression 6` a dummy for the Workers' Party. The results show that initial GDP is, through all three regressions, a significant negative influence to subsequent growth. This means, the higher the economic development, the harder it gets to achieve the same high growth numbers. One possible reason behind it might be that as a country develops and the technology gap to the technology-leading countries narrows, it gets more costly and more difficult to copy these technologies to use them in its own country. An other reason might be the declining marginal products of capital and labour. The investment share of the GDP is a positive, yet insignificant, contributor to growth through all three regressions. Education, here measured by the average years of schooling by all the population above 25, is also positively correlated to growth. Its significance level is the highest in `Regression 4`, where no dummies are included. The education's influence stays positive in the other two regressions but its significance level drops drastically. It has to be said that including both the investment share and an education parameter like average schooling years can have the effect of bringing both significances down as the two variables usually tend to correlate.

Now to the effect of inequality: The Gini index turns out to be negatively correlated, yet with low significance levels, through all regressions, meaning a reduction in inequality goes hand in hand with more economic growth. The values range from -0.003544 to -0.004519, i.e. a one point reduction in the Gini coefficient is correlated with 0.3544% to 0.4519% more economic growth. The fact, though, that the significance levels are low makes it difficult if not impossible to interpret these results. Again, the biggest problem for these low significance levels is relatively low number of observations as the focus is just on one country.

The dummy for democracy turns out to positive with a value of 0.00561 that says that the introduction of democracy helped growth on average by 0.561% per year compared to the time under the dictatorship. In the case of the Workers' Party, the value is even bigger. The periods under the PT government spurred growth by 2.455% a year. However, these variables are insignificant as well and should be looked at with caution.

Variables	Regression 4	Regression 5	Regression 6
Intercept	$-5.611 \cdot 10^{-2}$ $(2.898 \cdot 10^{-1})$	$-6.221 \cdot 10^{-2}$ $(2.985 \cdot 10^{-1})$	$-1.123 \cdot 10^{-1}$ $(2.390 \cdot 10^{-1})$
GDP	$-2.898 \cdot 10^{-5}$* $(7.231 \cdot 10^{-6})$	$-2.948 \cdot 10^{-5}$. $(9.103 \cdot 10^{-6})$	$-2.886 \cdot 10^{-5}$. $(6.905 \cdot 10^{-6})$
Investment share	$2.641 \cdot 10^{-4}$ $(3.833 \cdot 10^{-3})$	$5.026 \cdot 10^{-4}$ $(4.792 \cdot 10^{-3})$	$5.285 \cdot 10^{-4}$ $(3.667 \cdot 10^{-3})$
Average schooling	$1.350 \cdot 10^{-2}$. $(3.406 \cdot 10^{-3})$	$1.252 \cdot 10^{-2}$ $(1.162 \cdot 10^{-2})$	$1.099 \cdot 10^{-2}$ $(8.604 \cdot 10^{-3})$
Gini	$-3.544 \cdot 10^{-3}$ $(1.922 \cdot 10^{3})$	$-3.643 \cdot 10^{-3}$ $(2.342 \cdot 10)^{-3}$	$-4.519 \cdot 10^{-3}$ $(2.865 \cdot 10^{3})$
Democracy		$5.961 \cdot 10^{-3}$ $(4.934 \cdot 10^{-3})$	
Worker's Party			$2.445 \cdot 10^{-2}$ $(2.152 \cdot 10^{-2})$
R^2	$R^2 = 0.8826$	$R^2 = 0.8850$	$R^2 = 0.9287$

Table 7: Results: Effect on Growth

Regression 4: no dummies

Regression 5: Democracy dummy

Regression 6: Workers' Party dummy

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

5.5 Discussion

The results from the Kuznets' curve regression enforce the view from previous research that Brazil has experienced such a form of relationship between inequality and economic development in the last half century. Kuznets (1955) argued that the main reason for a country to go through such a development is the introduction of a new technology. A new technology at first favours only a few, therefore augmenting inequality in a first step, but as more and more individuals adapt to the new technology, inequality decreases in a second step. Looking at the development of Brazil in the last 50 years, there is no such thing as a revolutionary technology introduction that could explain such a specific development. However, I want to focus on two possible reasons that work in a similar way: the first is the increasing value in international trade and capital investment in to the country and the second one is better education numbers, especially for secondary and tertiary schooling. The introduction of international trade and capital investment can be looked at like a new technology. Just after the introduction, only few people in the economy will make use of it, i.e. increase their productivity and therefore also increase their income. As it's only

a few that profit at the start, inequality will rise at first. Over the course of time, more people will profit from trade or foreign investment, either directly or through indirect effects, e.g. domestic suppliers will up their productivity as well or will be able to profit from better infrastructure or already existing contacts and relationships to enter the business too. The effect of education can also be very similar. If only a low percentage of children get educated, through the process of supply and demand, skill premiums will be high and wage differentials therefore huge. When more children enter the schooling system, human capital endowments are more equally distributed. This will lower skill premiums and have an equalling effect on wages. This equalling effect can mostly be seen in `Regressions 1 to 3` where increases in average secondary, but mainly tertiary schooling attendance has a decreasing, yet insignificant, effect on the country's Gini coefficient.

In the analysis what determines income inequality, both dummies for democracy and the Workers' Party were said to be decreasing inequality, with democracy having a higher value. The introduction of democracy reduced the Gini coefficient by nearly 4 points in every 5-year period. Although the estimates are of low significance, looking at the theoretical channels and at some of the facts about Brazil's inequality, this could make sense. Dictatorships tend to favour certain individuals or groups being closely associated with the rulers, which brings up high inequality. Democracy has therefore an equalling effect or at least reduces the favouritism towards a specific group. A further effect to consider when distinguishing a dictatorship and a democracy are voting rights. Those voting rights should also have an equalling effect through the channel of redistribution politics (Barro, 2000). Even though the value was not as high as for democracy the years governed by the Workers' Party still had a decreasing effect on income inequality. Bjornskov (2008) found similar results in world-wide study that leftist leaning governments, like the Workers' Party, tend to reduce inequality more than rightist leaning governments. Again, those results have to be put in context. I regressed five-year period averages on the same five-year period Gini averages, so the analysis is again very short-term. As more data becomes available, medium- and long-term effects of various government parties should be more clear and more significant.

The growth regression results further emphasise the importance of education to the country's growth in the last half century. While the population aged 25 and above in 1966 had only spent a little more than two and a half years in school, it is in 2010 close to three times that amount. The question whether

income inequality contributed positively or negatively to subsequent economic growth cannot be fully answered as significance levels are too low. However, from the insignificant negative estimate the Gini coefficient has on growth and from the qualitative analysis conducted earlier in the thesis, I would judge that the influence of inequality in Brazil is negative on growth. It might well be that short-term effects are close to zero or insignificant like in this paper's growth regression, but it's very plausible to assume long-term effects of inequality to be a negative contributor to growth, especially for low- and middle-income countries in which Brazil was and is found in the last 50 years. The dummy variables positive estimates for growth go well with one's intuition but are statistically as well not significant. But from the analysis before and also based on cross-country studies it's probably right to say that dictatorships in general produce lower economic growth rates than democracies in the same situation, which is in line with economic and political theory and also with previous studies on that matter. To judge the performance of the Workers' Party from a larger perspective is difficult as the party is only in charge for the last ten years and results can be biased through business cycles and other distortions.

6 Conclusion

Inequality and its consequences on a country's economic performance are a topic widely discussed and researched all around the world. This paper tried to analyse the subject on a one country basis and showed that, for understanding a countries inequality and the possible effects it might has, a precise qualitative analysis is needed. It was able to show that an inequality-based Kuznets' curve with the newest data is highly significant and probably has a higher tipping point than previously thought. It will be interesting to see whether this kind of relationship that is quite rare will continue the same way as the last 50 years.

The paper also showed that it is practically impossible to get other significant variables apart from the country's level of GDP that determine inequality when one includes the GDP variable in the regression. For further research, it is possibly better to omit the GDP variable from the regression completely and only work with other variables, like education and investment parameters, as those are usually determining a country's level of GDP.

Another goal of the paper was to analyse the effect democracy had on both inequality and economic growth in this one country set-up. It is reasonable to assume from the qualitative analysis that democracy has decreased inequality

and increased economic growth as also the estimates from the regressions point that way, unfortunately though with very low significance levels. It was also the first time, to my knowledge, that a paper analysed the effect of one particular political party in such a one country regression system. Recent policies from the Workers' Party and their goal to reduce poverty have made them a good research subject to evaluate the growth performance under their regime and whether they were able to reduce inequality. Poverty-reducing measures, like the *Bolsa familia*, have definitely had an impact on poverty and thus also on inequality as the sharp decline of the Gini coefficient in the last decade showed.

It also has to be said that when it comes to inequality, there is often also a normative element to the discussion, especially in a country like Brazil where still a significant amount of people live in poverty. Political and social preferences play a role and have to be looked at aside efficiency discussions. Brazil was, is and will certainly be a case follow closely on this subject.

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