Income inequality and economic growth: an analysis for Brazil and its geographic regions

Desigualdade de renda e crescimento econômico: uma análise para o Brasil e suas regiões geográficas

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Abstract

This study sets out to analyze the relationship between economic growth and income inequality for Brazil, and for two groups of more developed and less developed states, over the 1997 to 2017 period, using a dynamic panel data estimation. Considering the country as a whole, the main results indicate that there is a bi-causal relationship between income inequality and economic growth. This relationship holds for less developed states, but for the more developed group of states only income inequality precedes economic growth. On the basis of these results, it is suggested that public policies which reduce income inequality in the country, particularly in the less developed states, be formulated and implemented.

Keywords: Income inequality. Economic growth. Panel data.

Resumo

O presente estudo tem como objetivo analisar a relação entre crescimento econômico e desigualdade de renda no Brasil e para dois grupos de seus estados, mais desenvolvidos e menos desenvolvidos, entre os anos de 1997 e 2017, através da estimação de um painel dinâmico. Considerando o país como um todo, os principais resultados apontam que existe uma relação bicausal entre desigualdade de renda e crescimento econômico. Essa relação se mantém para os estados menos desenvolvidos, mas para os estados mais desenvolvidos apenas a desigualdade de renda precede o crescimento econômico. A partir dos resultados, sugere-se a formulação e implementação de políticas públicas que diminuam a desigualdade de renda no país, particularmente nos estados menos desenvolvidos.

Palavras Chaves: Desigualdade de renda. Crescimento econômico. Dados em painel

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1 INTRODUCTION

Discussion on the subject of income inequality encompasses a global agenda. According to the FAO (2020), inequality within and between countries must be reduced if one of the goals for achieving sustainable development is to be met. In this regard, income inequality between all the people in the world has been decreasing since the 1990s, but within countries, especially developing countries, the situation is different. The focus of such countries, especially those with great disparities in income distribution, has been the reduction of poverty and the increase of economic opportunities for their entire populations (WORLDBANK, 2020).

Over the course of time, questions have arisen as to whether income inequality, which is generally measured through the Gini index[1], has led to an increase or reduction in the pace of a country's economic growth. When there is a positive relationship between income inequality and economic growth, it is mainly brought about by the savings rate, which is higher for the wealthier segment of the population than for the poorer; and also, via income redistribution (SHIN,2012; BRIDA, CARRERA, SEGARRA, 2020). On the other hand, a negative relationship is brought about by imperfections in the credit market, where individuals with lower income levels find it difficult to access credit; and it also arises out of political and social instability, which can be seen in the preference of the average elector without assets to vote for political parties which prioritize income redistribution programs (HELPMAN, 2004; TACHIBANAKI, 2005; WEIL, 2005; NEVES, SILVA, 2014).

The positive or negative relationships pointed out through the above-mentioned channels can be seen in several international studies. Some studies show that there is a negative relationship between economic growth and income inequality (MURPHY *et al.*, 1998; PEROTTI, 1993; ALESINA, RODRIK, 1994; PERSSON, TABELLINI, 1994; PEROTTI, 1996; ALESINA, PEROTTI, 1996; ACEMOGLU, 1997; HELPMAN, 2004, TACHIBANAKI, 2005; KNOWLES, 2005; VOITCHOVSKY, 2005; SUKIASSVAN, 2007; CASTELLÓ, 2010; CHAMBERS, KRAUSE, 2010; HERZER, VOLLMER, 2012). Other studies conclude that there is a positive relationship between economic growth and income inequality (OKUN, 1975; BOURGUIGNON, 1990; BENABOU, 1996; LI, ZOU, 1998; AGHION, HOWITT, 1998; FORBES, 2000; BARRO, 2000; CASTELLÓ, 2010). A non-monotonic inverted U-shaped relationship can also be found between income inequality and economic growth in studies by Chen (2003) and Bengoa and Robles (2005). The aforementioned relationship can also be inconclusive (AMOS, 1998; BARRO, 2000; BANERJEE, DUFLO, 2003; WEIL, 2005; SHIN *et al.*, 2009).

In the Brazilian case, the country is considered one of the most unequal in the world. Over the 2001-2004 period, income concentration in Brazil fell by 4%, which was reflected in a decline in poverty and in extreme poverty (BARROS, FOGUEL, ULYSSEA, 2006). However, more recently, between 2017 and 2018, almost 20% of all income received in the country was concentrated in the hands of just 2.7% of Brazilian families. According to a survey by the Brazilian Institute of Geography and Statistics (IBGE) for the above-mentioned period, 2.7% of all families, or in other words, 1.8 million families had an income greater than R$23,850.00. On the other hand, 23.9%, or in other words, 16.4 million families received incomes of just up to R$1,908.00 (OHANA, 2019).

In addition, in regional terms, according to data from the IBGE

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[1] It measures the concentration of income, and the closer its value is to 1, the greater the inequality; the closer to 0, the lower the inequality.

Continuous National Household Sample Survey (2019) inequality increased in the Northeast region, as shown by the Gini index going from 0.545 in 2018 to 0.559 in 2019. This can be explained by the fact that in the region there was an increase of about 14.9% in the income of the richest 1% of the population, with a concomitant decrease of approximately 5% among the poorest 10%, thereby indicating a concentration of income. In turn, in 2019 the index showed that of all the Brazilian regions, the North showed the drop trend, from 0.551 in 2018 to 0.537 (IBGE, 2019). The Southeast region also presented a reduction trend in the concentration of income over those years, given that the value of the Gini index going from 0.533 to 0.527.

The aforementioned great concentration of Brazilian income led to studies being undertaken, relating it to the pace of economic growth, and found very different results. In this respect, a study by Jacinto and Tejada (2009), which analyzed the relationship between income inequality and economic growth in Northeastern municipalities between the 1970s and 1991, indicated the existence of a *Kuznets curve*[2]. In turn, Castro and Júnior (2007) evaluated this relationship for the country as a whole by means of a non-linear analysis, and found a negative relationship, while Cruz, Teixeira and Monte-Mor (2015) showed that income inequality in Brazil had a positive effect on economic growth, which contradicted the conclusions of Santos, Cunha and Gadelha (2016) in terms of the existence of a bi-causal relationship.

On considering the above-mentioned great Brazilian income inequality, characterized, above all, by regional discrepancies, this study set out to analyze the relationship between income inequality and economic growth over the 1997-2017 period in Brazil. The study addresses this relationship by means of a

dynamic panel, which takes Brazilian regional dissimilarities into consideration. To do so, in addition to analyzing the country as a whole, the study divides Brazilian states into two groups: the more developed and less developed. This distinction takes into account the socioeconomic conditions of the states, according to variables such as literacy rate, human development index, Gini index and growth in Gross Domestic Product (GDP) (BERTUSSI, ELLERY JUNIOR, 2012). The first group corresponds to regions considered less developed, represented by the states in the North, Northeast and Midwest regions, including the Federal District. The second group covers states in regions considered most developed, the Southeast and South. The study contributes to the literature by extending the analysis carried out by Santos, Cunha and Gadelha (2016), by attesting to the causality between income distribution and economic growth for Brazil and groups of states, and also considering a more recent period.

After this introduction, the study is divided into four other sections. Section 2 deals with the empirical discussion which permeates the relationship between income inequality and economic growth. The third covers the methodological procedures adopted, while the fourth presents an analysis of results, which is followed by the final comments in Section 5.

2 EMPIRICAL EVIDENCE ON THE RELATIONSHIP BETWEEN INCOME INEQUALITY AND ECONOMIC GROWTH

As already noted, the literature which specifies the relationship between income inequality and economic growth presents very different results. Some studies which show the existence of a positive relationship conclude that it occurs by means of the savings rate (BRIDA, CARRERA, SEGARRA, 2020). Taking into account that the savings rate of the richest section of the population is higher

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[2] In the early stages of economic growth, income inequality increases, but over time it decreases.

than that of the poorest section, the redistribution of income reduces the pace of economic growth (SHIN, 2012).

The above-mentioned positive relationship between income inequality and economic growth can also occur as a result of the redistribution of income itself. In this case, the redistribution of income could reduce the incentive of that portion of the population which already held a higher level of capital to offer more work, which leads to a decline in the pace of economic growth (SHIN, 2012).

On the other hand, there is a set of studies which found that the relationship between income inequality and economic growth was negative, given the imperfections in the credit market in developing countries (HELPMAN, 2004; TACHIBANAKI, 2005; WEIL, 2005). Thus, as a large part of the population is unable to invest, either in physical or human capital, because it does not have access to credit, there is a decline in the pace of economic growth (BRIDA, CARRERA, SEGARRA, 2020).

Income inequality also compromises the pace of economic growth through political and social instability (NEVES, SILVA, 2014). In addition to that, the hypothesis for the above-mentioned negative relationship between income inequality and economic growth is the political economy approach. In this case, the counterpart of a government's redistributive policies aimed at improving the access of the poorest sector of the population to economic resources, could be an increase in taxation, thereby compromising the pace of economic growth (ALESINA, RODRICK,1994; PERSSON, TABELLINI,1994).

Further evidence pointing to the presence of a negative relationship between income inequality and economic growth involves social conflicts (ALESINA, PEROTTI, 1994). Such conflicts can be seen through an increase in crime and illegal activities, which threaten

investments and property rights, especially in developing countries.

Kuznets (1995) finds a different relationship between income inequality and economic growth, which seems to take the form of an "inverted U". He noted that at the start of the process of economic growth, income distribution changes from relative equality to inequality, and later goes back to being relatively equal as the country grows.

As seen so far, the literature highlights certain possibilities in terms of the relationship between income inequality and economic growth. For Barro (2000), such relationships vary according to countries' levels of economic development. According to him, income inequality in poor countries slows down the pace of economic growth, while on the other hand, it stimulates economic growth in a developed country.

On theoretically analyzing the relationship between income inequality and economic growth, Shin (2012) corroborates Barro's (2000) hypothesis. According to Shin (2012), depending on the level of economic development in a country, both results are possible, or in other words, greater income inequality can delay economic growth in the initial stage of development and stimulate it at a level considered almost stable.

Empirically, most studies show that there is a negative relationship between economic growth and income inequality in developing countries (KNOWLES, 2005; VOITCHOVSKY, 2005; CASTELLÓ, 2010; CHAMBERS, KRAUSE, 2010; KHALIFA, EL HAG, 2010; HERZER, VOLLMER, 2012). This relationship also proved not to be significant for certain studies applied to developing countries (PEROTTI, 1996; BARRO, 2000).

In terms of the Brazilian literature, the results are diverse. A study by Castro and Júnior (2007) evaluated the relationship between income inequality and economic growth in the country and

the results are in line with those of most of the international literature for developing countries, that is, the relationship between income inequality and economic growth is negative.

Jacinto and Tejada (2009), in turn, analyzed the aforementioned relationship for municipalities in the Brazilian Northeastern region between 1970 and 1991, and found results showing the existence of an "inverted U", as in Kuznets (1995). A study by Cruz, Teixeira and Monte-Mor (2015) showed that inequality exerted a positive effect on Brazilian economic growth over the 1990-2009 period, when higher levels of GDP *per capita* were seen, and the effect became negative when levels of GDP *per capita* were lower. Santos, Cunha and Gadelha (2016) found different results. They used the VEC and ADL models over the 1976-2012 period and found that income inequality and economic growth had a bi-causal relationship as Granger understood it.

3 METHODOLOGY

3.1 Econometric model

The statistical causal relationship between income inequality and economic growth can be established through different approaches with panel data. The approaches differ in terms of assumptions about homogeneity of the coefficients between the Brazilian states. One such approach treats the panel data as a stacked data set and carries out the Granger causality test in the standard way. Thus, the data in the cross-section will not have lagged values from the next cross-section, so it is assumed that all coefficients are equal in all cross-sections. However, the present study uses the Dumitrescu and Hurlin (2012) approach, which has a completely different assumption, where the coefficients are different in the cross-sections. In order to make this estimate, the values of income inequality and GDP growth rate *per capita* have been

transformed into index numbers, which allows for the standardization of these measures.

Then, to assess the effect of income inequality on the economic growth rate, a dynamic panel of the Brazilian states and Federal District for the 1997-2017 period is used. The criterion for choice of the period of analysis was data availability. In turn, the econometric model used is the generalized method of moments, *System* GMM, as expressed in studies by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The advantages of using this method as compared to others involve the absence of bias, derived from the time-varying fixed effects, and the consistency of the estimator in view of the possible relationship of endogeneity.

The dynamic panel proposed by Arellano and Bond (1991), called *difference* GMM, has the differential equation in first order and is, therefore, free of fixed effects. However, as the explanatory variables become weak instruments, there is a problem in using this estimator because if the instruments are asymptotically weak, the result is an increase in coefficient variance and in the specific case of small samples, the coefficients could be biased.

In order to reduce the potential bias and the problems of inconsistency, Arellano and Bover (1995) and Blundell and Bond (1998) proposed an additional moment to the GMM, so that there is now a system of regressions in differences and levels, when the original equation in level is added to the *difference* GMM, thereby increasing efficiency because of the presence of more instruments. The system with two equations was called *System* GMM. The basic idea behind this method is the combination of equations in first differences and in level. In the difference equation, the lagged levels are the instruments of the first differences. In turn, the instruments used in the level equation are the first lagged differences in the

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series. The equation of the model proposed in the present study is given by:

$$AGRGDPC_{it} = \beta_1 AGRGDPC_{i,t-1} + \beta_2 TI/GDP_{it} + \beta_3 \text{ Giniindex}_{it} + \beta_4 INCOME_{it} + \beta_5 LITRATE_{it} + \beta_6 TRADEOP_{it} + n_i + v_{it}$$
(1)

From Equation (1), i represents the 26 Brazilian states and Federal District; t the years of analysis, in this case from 1997 to 2017; and, *AGRGDPC* corresponds to the annual growth rate of GDP *per capita*. It is important to point out that the selection criterion for the explanatory variables was the literature on the theme. A brief discussion of the justification for introducing the explanatory variables follows. In this respect, the main explanatory variable of the study is income inequality, represented by the Gini index. The way in which this variable can influence the annual growth rate of GDP *per capita* has been explained in the previous section.

The other controls added are now presented. The *TI/GDP* variable corresponds to the share of total investment made by the government as a proportion of the GDP of each state and of the Federal District. There are innumerous studies in the literature which analyze the connection between public investments and economic growth. One inspiration for this connection was the study by Aschauer (1989). From these studies, several others can be found which suggestively correlate increases in economic growth result with public investments (EASTERLY, REBELO, 1993; POSE, TSELIOS, PYCHARIS, 2012; PALEI, 2015). Devarajan *et al.* (1996) even characterize productive public investment as that which leads to an increase in a country's growth rate.

Average household income (*INCOME*) is defined as the sum of household members' income from all sources divided by the number of household members. As the income is restricted to the home environment, it reflects the quantity of resources which a given family has for consumption. The purpose of this control is to indicate how household consumption in the state can influence economic growth.

Literacy rate (*LITRATE*) was included to capture the level of human capital. Thus, higher schooling levels mean people with greater skills in the labor market (DE SOUZA, 1999). In general, if individuals have low levels of qualification in schooling terms, the expected result is a greater probability of their being unemployed, which is consequently related to a lower income level (SATTI *et al.*, 2016).

In terms of the variable trade openness (*TRADEOP*), the literature points out that countries can benefit significantly from trade openness. For example, it has been widely discussed that a country's exports have an effect on its economic growth (BALASSA, 1978; DODARO, 1991; HERRERIAS, ORTS, 2010). For developing countries, such as Brazil, the benefits of trade openness have been seen since the 1980s (BURANGE, RANADIVE, KARNIK, 2019). For these authors, measures aimed at promoting exports influenced the allocation of domestic resources and the pursuit of efficient production, and led to increased productivity, industries with comparative advantages, and the pursuit of innovation. It is, therefore, expected that greater trade openness leads to an increase in economic growth.

Finally, it is important to define that n_i is a non-observable specific factor; and v_{it} is the residue.

To test the consistency of the *System* GMM estimator, two types of tests were considered. To certify the validity of the variables used as instruments, the Sargan Test, an over-identifying restrictions test, was applied. The null hypothesis of this test is that the instruments used are valid, which implies

that they are not correlated with the error term. The second test is the absence of autocorrelation in the error term. In other words, the null hypothesis of the test is the absence of serial correlation.

For greater robustness in the results, and given that in Brazil there are regions with different levels of development, the states are divided into two groups. These groups differ in terms of development levels, one more developed and one less developed.

3.2 Data base

The current GDP (millions of reals) and the Gini index were sourced from the *Banco Sidra* of IBGE, from the tables on the Gross Domestic Product of Municipalities, for the 2002-2017 period. Observations for these variables over the 1997-2001 period were taken from *Datasus* (social indicators). Quantitative data on population were also sourced from the IBGE.

For total investment (R$ - reals), data provided by the National Treasury Secretariat, Ministry of Finance, were used. In turn, average nominal household income was sourced from the National Household Sample Survey (PNAD) and the continuous PNAD from the *Banco Sidra* of the IBGE.

The literacy rate (%) was taken from *DATASUS* data (socioeconomic indicators). The trade openness variable (*TRADEOP*) consists of the sum of exports and imports divided by GDP. The free-on-board export (US$) and import data (US$) used refer to data available on the website of the Ministry of Development, Industry and Foreign Trade (MDIC).

Monetary variables were deflated according to the IBGE's National Consumer Price Index (IPCA), using 2017 as a basis. Table 1, below, presents descriptive statistics of the variables used in panel for all states and the Federal District.

Table 1 - Descriptive statistics

Variable	Mean	Standard Deviation	Minimum value	Maximum value
AGRGDPC	1.304151	1.286397	-0.9064666	11.21762
GINI Index	0.7443015	0.0808134	0.4439	0.907582
INCOME	419.1728	333.9959	65.4712	2474.988
LITRATE	87.19049	7.520584	63.75	97.5
TI/GDP	159580.2	1681790	0	2.98e+07
TRADEOP	0.1118997	0.8468095	1.00e-09	16.77835

AGRGDPC is the Annual Growth Rate of GDP *per capita*; *INCOME* represents average household income; *LITRATE* is literacy rate; *TI/GDP* is Total Investment as a proportion of the GDP of each state; *TRADEOP* is Trade Openness.
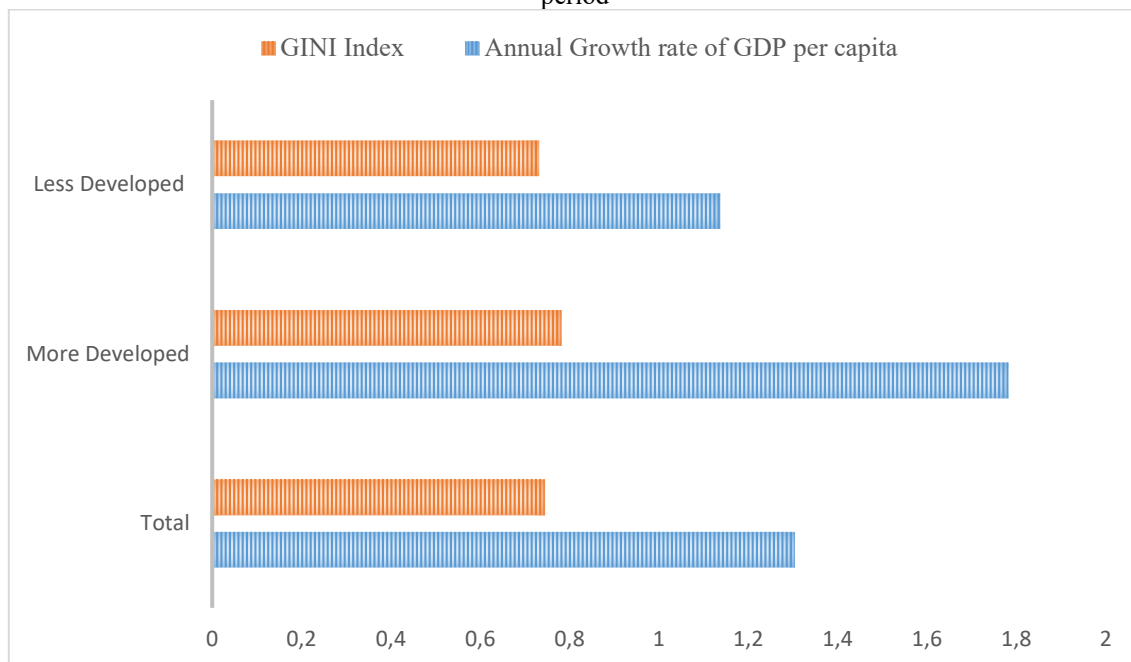Source: Drawn up by the authors.

In the general average, GDP growth *per capita* of Brazilian states from 1997 to 2017 was 1.304151, while income inequality, measured by the Gini index, was 0.7443015 in the period. In terms of the control variables included, in the general average, for the 1997- 2017 period, household income was R$419.1728, the literacy rate was 87.19%, and total investment/GDP was R$159580.20.

Figure 1 below presents the growth rate of GDP *per capita* and income inequality, in total (country as a whole), and by dividing states according to their level of development.

Figure 1 - General mean of the annual growth rate of GDP *per capita* and of the Gini index over the 1997-2017 period

Source: Drawn up by the authors.

As shown by Figure 1, the mean annual growth rate of GDP *per capita* for Brazil as a whole, between 1997 and 2017, was approximately 1.30%, while the mean of income inequality was 0.74. The more developed states presented a higher mean of economic growth then the less developed states. In this regard, for the former group of states, the mean annual growth rate of GDP *per capita*, over the 1997-2017 period, was around 1.78% while income inequality was approximately 0.78. On the other hand, in the lesser developed states, on average, the annual growth rate of GDP *per capita* for the period indicated was around 1.13%

while income inequality was approximately 0.73, slightly lower than that of the more developed states.

4 RESULTS AND DISCUSSION

Table 2 presents the results of the causality test used, namely that of Dumitrescu and Hurlin (2012), in which a more realistic approach is assumed, considering that all states have their own distinct behaviors. It is considered that Y *per capita* corresponds to the GDP *per capita* growth rate and G to income inequality.

Table 2 - Result of the Panel Granger causality test

Total			
Null hypothesis	**W-Stat.**	**Zbar-Stat**	**Prob.**
Granger Y *per capita* does not cause G	11.0285	29.352	0.0000***
Granger G does not cause Y *per capita*	3.03209	5.65231	0.0000**
More Developed			
Granger Y *per capita* does not cause G	0.44122	-1.03190	0.3021
Granger G does not cause Y *per capita*	2.43934	1.98348	0.0473**

Less Developed

Granger Y *per capita* does not cause G	14.7341	34.7148	0.0000***
Granger G does not cause Y *per capita*	3.23956	5.3934	0.0000**

*** significant at 1%, ** significant at 5%, * significant at 10%. The test considered 1 lag.
Source: Drawn up by the authors from research results.

According to the above-mentioned test, the hypothesis that economic growth does not cause Granger income inequality is rejected. That means that for the sample which encompasses the country as a whole, economic growth, in the Granger causality sense, causes income inequality. It can be seen that this relationship is bi-causal, or in other words, income inequality also impacts economic growth. This result is similar to that found in the study by Santos, Cunha and Gadelha (2016), which analyzed this relationship for Brazil over the 1976-2012 period, using time series data. According to these authors, economic growth positively affects income distribution, which in turn, negatively impacts economic growth. The results of Souza's (2019) study also showed that increases in economic growth rates between 2004 and 2014 resulted in falls in poverty levels in urban and rural areas in Brazil.

On the other hand, for more developed states, it was seen that the hypothesis of the test is rejected only in the sense that Granger inequality does not cause the GDP *per capita* growth rate. This shows that for those states, the relationship between the economic growth rate and income inequality is uni-causal. In this case, there is only causality in the Granger sense of inequality impacting economic growth. However, for the sample of less developed states, the results were similar to those of the total sample, which considers the country as a whole, showing that there is a bi-causal relationship between income inequality and economic growth.

Furthermore, the results of the temporal precedence between economic growth and income inequality seem to indicate a relationship of simultaneity between these variables, which is controlled by means of the dynamic panel estimation. Thus, Table 3 follows presenting the results of the econometric model estimation with dynamic panel data, whose central objective is to analyze the relationship between income inequality and economic growth.

Table 3 - Results of the Dynamic Panel Estimation

DEPENDENT VARIABLE: *AGRGDPC*- (Y)			
VARIABLE	TOTAL	DEVELOPED	LESS DEVELOPED
Y LAGGED	0.0445376**	2.942123	-0.1920023***
	(0.0130718)	(2.250578)	(0.0488275)
GINI Index	-3.977519***	115.5979	-3.094009***
	(0.195979)	(244.9606)	(0.4174453)
TI/GDP	3.62e-08***	-6.11e-07	2.33e-08**
	(5.07e-09)	(0.4.13e-07)	(7.82e-09)
LITRATE	0.0281261***	0.5435349	-0.0113062**
	(0.003722)	(0.4288458)	(0.0053437)
INCOME	0.0028881***	-0.0054649	0.004503***
	(0.0000515)	(0.0049542)	(0.0001927)
TRADEOP	0.0353928	71844.08	0.0001927
	(0.1100714)	(71844.08)	(0.1115365
CONSTANT	0.7306614	-144.543	3.026914
System GMM Consistency Test			
AR(2)	0.3542	0.9449	0.3759
SARGAN TEST	21.79513	7.42e-16	18.49638

AGRGDPC is Annual Growth Rate of GDP *per capita*; *INCOME* represents average household income*; LITRATE* is Literacy Rate; *TI/GDP* is Total Investment as a proportion of GDP *per capita* of each state, *TRADEOP* is Trade Openness. *** significant at 1%, ** significant at 5% and * significant at 10%.
Source: Drawn up by the authors from research results.

For the country as a whole, the results in Table 3 show that the relationship between income inequality and economic growth is negative and statistically significant. With respect to the other control variables, total investment as a proportion of GDP (*TI/GDP*), literacy rate, average income and lagged GDP *per capita* growth rate showed a positive relationship with the GDP *per capita* growth rate and were also statistically significant.

In terms of the consistency of the *System* GMM estimator, the Sargan Test verified that the null hypothesis was not rejected, and, thus, the instruments considered are valid. In addition, through the autocorrelation test, AR (2), there is no autocorrelation of the error term in all the estimated models.

With regard to the main result of the present study, which shows a negative relationship between income inequality and economic growth, the literature presents some explanations. One of these is due to credit restrictions (HELPMAN, 2004; TACHIBANAKI, 2005; WEIL, 2005). In this respect, with the imperfections of the credit market, poorer agents are severely limited in their access to the financing of activities which could yield a higher profit. Because of the above-mentioned difficulty of this segment of the population, the production level is below the potential of the economy.

Another hypothesis raised by the literature stems from the approach presented by political economy (ALESINA, RODRICK, 1994; PERSSON, TABELLINI, 1994). It holds that in a country with high inequality, the average elector, who does not hold any assets, is more likely to vote for political parties which have income redistribution programs, in order to obtain short-term gains. However, if income redistribution programs are carried out on the basis of an increase in taxation on returns from investments, the expected result could involve a reduction in the pace of economic growth.

In addition, another possibility discussed in the studies has to do with political and social instability, which could impact on property rights and discourage investments, thus leading to a negative relationship between income inequality and economic growth (ALESINA, PEROTTI, 2016).

Additionally, the results which take into account the division of states and the Federal District into groups according to level of development show clear differences. First, although the relationship between economic growth and income inequality in the more developed states is positive, it was not statistically significant. In this case, one possible explanation for the statistical non-significance has to do with the reduced number of states in that group, which excessively reduces the sample. On the other hand, for the group of lesser developed states, the results in Table 3 showed that the relationship between income inequality and economic growth is negative and statistically significant.

The relationship between economic growth and income inequality in Brazil and for the groups of states differentiated by their degree of development presented in the present study partially upholds the results presented by Barro (2000) and Shin (2012). As they highlight, in poor countries income inequality discourages economic growth, while in wealthy countries income inequality stimulates it. In this respect, the results of the present study maintain that in the less developed states of Brazil, income inequality can be associated with a slowdown in the pace of economic growth.

Furthermore, a study by Saad *et al.* (2020) which analyzed the country over

the 2011-2015 period showed that there was a reduction in the Gini index and that the sources of income namely, income from work, income from social programs, interest on investment, and pension contributions, contributed to this result. As they mentioned, income transfer policies in Brazil began to gain strength with the 2003 creation of the *Bolsa Família* Program (Family Allowance), which is a cash transfer program to families with extremely low incomes, so that its beneficiaries are inserted into society. Saad *et al*. (2020) also pointed out that although income transfer programs have had a positive effect on reducing inequality in all Brazilian states, they were more effective in the North and Northeast of the country.

It was also seen that other control variables were associated with economic growth. The literacy rate was positively associated with an increase in the growth rate of GDP *per capita* in Brazil and for the group of less developed states. De Souza (1999) states that with globalization and inclusion in new markets, a new worker profile with on-going and up-to-date education, would be required to generate skills in the work milieu. In this respect, investment in the country with a view to accumulating human capital leads to a boost in the pace of economic growth, especially investment in the fields of education and health (IBGE, 2012). As argued by Aghion *et al*. (2009), the main return from investments in the field of education is the qualification of individuals.

The positive relationship between the ratio of public investments/GDP and the economic growth of the country and of its less developed states reinforces what has been seen in the literature. This result is similar to those found by Aschauer (1989), Easterly and Rebelo (1993), Devarajan *et al*. (1996), Pose, Tselios and Pycharis (2012), and Palei (2015). In this respect, many of these studies confirmed the preponderance of public investment in infrastructure, classifying them as

productive and unproductive, and pointing out their effects on the private sector. Studies applied to the Brazilian case also showed that there was a positive association between government investments and economic growth (FERREIRA, MALLIAGROS, 1998; ROCHA, GIUBERTI, 2007; BERTUSSI, ELLERY JUNIOR, 2012).

There was also a positive association between the increase in average household income and the economic growth of the country as a whole and of the group of less developed states. In fact, increases in the average household income of the Brazilian population could mean an increase in purchasing power, extending to various economic activities, thereby making an increase in GDP in both Brazil and the less developed states, a possibility. As the study by Santos and Vieira (2016), which covered the Northeast region of Brazil over the 2003-2012 period showed, *per capita* household income led to a reduction in poverty and extreme poverty.

The dynamic term of the model, represented by the annual one-period-lagged growth rate of GDP *per capita*, presented distinct relationships for Brazil as a whole and for the group of less developed states. For the country as a whole, the past growth rate of product *per capita* positively influences the current growth rate of GDP *per capita*, while the opposite relationship was seen for the group of less developed states.

The present study also included the control variable referring to the degree of trade openness to control the effect that the foreign trade relations of Brazil and its regions had on economic growth. In this respect, as highlighted by Edward (1993), international trade allows for the transfer of technological innovations, and greater trade openness increases competition in the local market, and as a result, there is an increase in production efficiency and economic growth (BEATON *et al*., 2017). However, for this study, this variable was

not statistically significant, although the coefficient was positive in all models.

5 FINAL COMMENTS

This study analyzed the relationship between income inequality and economic growth in Brazil using information from its twenty-six states and the Federal District over the 1997-2017 period, by means of a dynamic panel. In particular, it investigated the intertemporal relationship between these variables, and then analyzed whether income inequality is positively or negatively associated with economic growth. In addition, this analysis extended into interstate inequality, on taking into account the division of the states into two groups: more developed and less developed.

The results point out that for the country as a whole there is a bi-causal relationship between income inequality and economic growth, subsequently controlled through the use of a dynamic panel data model. This relationship holds for the less developed states, but for the more developed, only income inequality precedes economic growth.

In addition, the results also show that income inequality is associated with a reduction in Brazilian economic growth,

and specifically for the group of less developed states. Various mechanisms, highlighted by the authors and presented in the second section, can explain this relationship, such as the fact that the poorer segment of the population has greater difficulty in accessing credit, which reduces their productive capacity and that of the country and the states analyzed. Additionally, in a country with great income inequality, at election time electors, without income or assets, have a greater incentive to vote for parties with income redistribution policies, which when associated with increased taxation, can slow the pace of economic growth in the long term. It should also be noted that great income inequality can generate political instability, which tends to impact property rights and discourage investments, which also occurs when crime increases.

Thus, on considering Brazil and especially its less developed states, these results represent an argument in favor of income transfer programs, which could reduce income inequality and guarantee higher rates of economic growth. As income inequality is a major determinant of poverty, future research is needed to analyze other consequences of increased income inequality, with a view to promoting policies to reduce it.

REFERENCES

ACEMOGLU, D. Matching, heterogeneity, and the evolution of income distribution, **Journal of Economic Growth**, v. 2, n.1, p. 61-92, 1997.

AGHION, P.; CAROLI, E.; GARCIA-PENALOSA, C. Inequality and economic growth: the perspective of the new growth theories. **Journal of Economic Literature**, v. 37, n.4, p.1.615-1.660, 1999.

AGHION, P.; HOWITT, P. **Endogenous growth theory**, MIT Press, Cambridge, 1998.

ALESINA, A.; RODRIK, D. Distributive politics and economic growth, **Quarterly Journal of Economics**, v. 109, n.2, p. 465-490,1994.

ALESINA, A.; PEROTTI, R. Income distribution, political instability, and investment, **European Economic Review**, v. 40, n. 6, p. 1203-1228, 1996.

AMOS, O.M. Unbalanced regional growth and regional income inequality in the latter stages of development, **Regional Science and Urban Economics**, v. 18, n.4, p. 549-566,1988.

ARELLANO, M.; BOND, S.R. Some test of specification for panel data: Monte Carlo evidence and an application to employment equations. **Review of Economic Studies**, v. 58, n.2, p. 277-297, 1991.

ARELLANO, M.; BOVER, O. Another look at the instrumental variable estimation of error-components models. **Journal of Econometrics**, v. 68, n.1, p. 29-51, 1995.

ASCHAUER, D. A. Is public expenditure productive? **Journal of Monetary Economics**, v. 23, n.2, p. 177- 200, March 1989.

BALASSA, B. Export incentives and export performance in developing countries: A comparative analysis, **Review of World Economics**, v. 114, n.1, p. 24-61, March 1978.

BANERJEE, A.; DUFLO, E. Inequality and Growth: what can the data say? **Journal of Economic Growth**, v. 8, n.3, p. 267-299,2003.

BARRO, R. Inequality and growth in a panel of countries. **Journal of economic growth**, v. 5, p. 5-32, 2000.

BARROS, R.P.; FOGUEL, M.N; ULYSSEA, G. **Desigualdade de renda no Brasil**: uma análise da queda recente, v. 1, Brasília: IPEA, 2006.

BEATON, K.; CEBOTARI, A.; KOMAROMI, A. Revisiting the link between trade, growth and inequality: lessons for Latin America and the Caribbean, IMF Working paper, WP/17/46, p. 1-42, 2017.

BENGOA, M.; SANCHEZ-ROBLES, B.; Does equality reduce growth? Some empirical evidence. **Applied Economics Letters**, v. 12, n.8, p.479-483, June 2005.

BERNANKE, B.S.; ROTEMBERG, J. (Eds.). **NBER Macroeconomics Annual**, MIT Press, Cambridge, 1996.

BERTUSSI, G. L.; JUNIOR, R. E. Infraestrutura de transporte e crescimento econômico no Brasil. **Journal of Transport Literature**, v. 6, n. 4, p. 101-132, Oct. 2012.

BOURGUIGNON, F.J. Growth and inequality in the dual model of development: the role of demand factors, **Review of Economic Studies**, v. 57, n.2, p. 215-228,1990.

BRIDA, J.G.; CARRERA, E.J.; SEGARRA, V. Clustering and regime dynamics for economic growth and income inequality. **Structural Change and Economic Dynamics**, v. 52, p. 99-108, March 2020.

BURANGE, L.G.; RANADIVE, R.R.; KARNIK, N.N. Trade openness and Economic growth nexus: A case study of BRICS **Foreign trade review**, v. 54, n.1, p. 1-15,2019.

CASTELLÓ, A. Inequality and growth in advanced economies: an empirical investigation. **The Journal of Economic Inequality**, v.8, p. 293-321, 2010.

CASTRO, R.S.; JÚNIOR, S.S. Efeitos da desigualdade de renda sobre o crescimento econômico no Brasil: uma análise não-linear. **Perspectiva Econômica**, v. 3, n.1, p. 27-61, jan. jun. 2007.

CHAMBERS D., KRAUSE, A. Is the relationship between inequality and growth affected by physical and human capital accumulation? **The Journal of Economic Inequality**, v. 8, p. 153-172, 2010.

CHEN, B.L. An inverted- U relationship between inequality and long-run growth, **Economics Letters**, v. 78, n.2, p. 205-212,2003.

CRUZ, P.B.; TEIXEIRA, A.; MONTE-MOR, D.S. O efeito da desigualdade da distribuição de renda no crescimento econômico. **Revista Brasileira de Economia**, v. 69, n.2, p. 163-186, abr. jun. 2015.

DEVARAJAN, S.; SWARROP, V.; ZOU, H.-F. The composition of public expenditure and economic growth. **Journal of Monetary Economics**, v. 37, p. 313-344, 1996.

DODARO, S. Comparative advantage, trade and growth: Export-led growth revisited. **World development**, v.19, n.9, p. 1153-1165, Sept. 1991.

DUMITRESCU, E; HURLIN, C. Testing for Granger non-causality in heterogeneous panels, **Economic Modelling**, v.29, n.4, p. 1450-1460, 2012.

EASTERLY, W.; REBELO, S. Fiscal policy and economic growth: an empirical investigation. **Journal of Monetary Economics**. v. 32, p. 417-458, 1993.

EDWARDS, S. Openness, trade liberalization, and growth in developing countries. **Journal of Economic Literature**, v. 31, n.3, p. 1358-1393, 1993.

FAO, 2020. Available at: http://www.fao.org/sustainable-development-goals/goals/goal-10/en/. Accessed 01/05/2020.

FERREIRA, P. C.; MALLIAGROS, T. G. Impactos Produtivos da Infraestrutura no Brasil – 1950/95. **Pesquisa e Planejamento Econômico**. v. 28, n.2, p. 315-338, 1998.

FORBES, K. J. A reassessment of the relationship between inequality and growth. **American Economic Review**, v.90, n.4, p. 869–887, 2000.

HELPMAN, E. **The Mystery of Economic Growth**. Belknap Harvard, 2004.

HERRERIAS, M.J.; ORTS, V. Is the export-led growth hypothesis enough to account for China's growth? **China & World Economy**, v.18, n.4, p.34-51, 2010.

HERZER, D.; VOLLMER, S. Inequality and growth: evidence from panel cointegration. **The Journal of Economic Inequality,** v.10, n.4, p. 489-503, 2012.

IBGE- Instituto Brasileiro de Geografia e Estatística. Available at: https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/27596-nordeste-e-unica-regiao-com-aumento-na-concentracao-de-renda-em-2019. Accessed: 25/25/2020.

KNOWLES, S. Inequality and economic growth: The empirical relationship reconsidered in the light of comparable data. **J. Dev. Stud., v.** 41, n.1, p. 135-139,2005.

KONG, Q.; PENG, D.; JIANG, X.; WANG, Z. Trade openness and economic growth quality of China: Empirical analysis using ARDL model. **Finance Research Letters**, March 2020.

LI, H.; ZOU, H. Income inequality is not harmful for growth: theory and evidence, Review of **Development Economics**, v. 2, n.3, p. 318-334,1998.

MURPHY, K.M.; Shleifer, A.; Vishny, R. Income distribution, market size, and industrialization, **Quarterly Journal of Economics**, v. 104, n.3, p. 537-564, 1989.

OHANA. Available: https://www.cartacapital.com.br/sociedade/ibge-27-das-familias-ganham-um-quinto-de-toda-a-renda-no-brasil/. Accessed 01/05/2020.

OKUN, A.M. **Equality and Efficiency:** the Big Trade-Off**.** Brookings Institution, Washington, DC, 1975.

PALEI, T. Assessing the impact of infrastructure on economic growth and global competitiveness. **Procedia Economics and Finance**, v. 23, p. 168-175, 2015.

PANIZZA, U. Income inequality and economic growth: Evidence from American data. **Journal of Economic Growth**, v. 7, n.1. p. 25–41, 2002.

PEROTTI, R. Growth, income distribution, and democracy: what the data say. **Journal of Economic Growth**, v.1, n.2, p. 149-187, 1996.

PEROTTI, R. Political equilibrium, income distribution, and growth. **Review of Economic Studies**, v.60, n.4, p. 755-776, 1993.

PERSSON, T.; TABELLINI, G. Is inequality harmful for growth? **American Economic Review**, v.84, n.3, p. 600-621,1994.

POSE, A. R.; PSYCHARIS, Y.; TSELIOS; V. Public investment and regional growth and convergence: Evidence from Greece. **Papers in Regional Science**, v. 91, n. 3, Aug. 2012.

ROCHA, F.; GIUBERTI, A. C. Composição do Gasto Público e Crescimento Econômico: um estudo em painel para os estados brasileiros. **Economia Aplicada, São Paulo**, v. 11, n. 4, p. 463-485, out.-dez. 2007.

SAAD, M.G.; BORTOLUZZO, A.B.; FILHO, N.A.M.; KOMATSU, B.K. Os determinantes da queda da desigualdade de renda nas regiões brasileiras entre 2001 e 2015. **Revista Brasileira de Ciências Sociais**, v. 35, n.104, 2020.

SANTOS, M.P.; CUNHA, M.S.; GADELHA, S.R. Distribuição de renda e crescimento econômico no Brasil: Uma análise econométrica do período 1976-2010. **Revista de Economia**, v. 43, n.1, jan. abr.2016.

SANTOS, V. F.; VIEIRA, W.C. Crescimento econômico e desigualdade de renda: uma análise sobre pobreza e extrema pobreza na região Nordeste do Brasil. **Indicadores Econômicos**, v. 44, n.2,2016.

SATTI, S.L.; HASSAN, M.S.; HAYAT, F.; PARAMATI, S.R. Economic Growth and inflow of remittances: Do they combat poverty in an emerging economy? **Social Indicators Research**, v.127, p.1119-1134, 2016.

SHIN, I. Income inequality and economic growth, **Economic Modelling**, v.29, n.5, p. 2049-2057, set. 2012.

SHIN, I.; KIM, H.; YAMAMURA, J.E. Technological Progress and the Future of Kuznets Curve's, *MPRA (Munich Personal RePEc Archive) Paper* no. 18866 (2009).

SOUZA, H.G. Efeitos do crescimento econômico e da desigualdade de renda sobre a pobreza no Brasil. **Economía, sociedad y territorio**, v.19, n.60, 2019.

SUKIASSYAN, G. Inequality and growth: what does the transition economy data say? **Journal of Comparative Economics**, v.35, n.1, p. 35-56, 2007.

TACHIBANAKI, T. **Confronting income inequality in Japan – a comparative analysis of causes, consequences, and reform**, MIT Press, 2005.

VOITCHOVSKY, S. Does the profile of economic inequality matter for economic growth? Distinguishing between the effects of inequality in different parts of the

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income distribution. **Journal of economic growth**, v. 10, p. 273-296, 2005.

Weil, D. N. **Economic Growth**, Addison-Wesley, 2005.

WOOLDRIDGE, J. **Econometric analysis of cross section and panel data**. 2. ed. Cambridge: MIT Press, 2010.

WORLDBANK,2020. https://www.worldbank.org/en/topic/isp/overview#2. Accessed: 20 maio 2020.

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