Globalization and Income Inequality in Brazil

How might economic globalization influence income inequality in Brazil?

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Aarhus
2011
Abstract

In the last year, many studies have been performed in order to expose the impacts of globalization on the economic behaviors across several countries and regions. Different authors have explored whether globalization reduces or raises poverty, widens or shrinks the wage gap, improves or worsens the environment, etc.

In this thesis the effects of economic globalization (which includes the openness to trade and foreign direct investment (FDI) inflows) on income inequality are analyzed through a panel dataset which comprises the 27 Brazilian states in three different periods. The Gini coefficient is the dependent variable of the model and the data is referred to 1997, 2002 and 2007. While the independent variables which are the trade openness ratio, the FDI ratio and the other control variables are lagged 2 years.

The results suggest a negative and significant relationship between trade liberalization and income inequality, whereas the relationship between FDI inflow ratio and inequality is positive and significant for the random effects model. The jackknife technique, which identifies potential outliers, shows that the model is robust.

Furthermore, the regional disparities are analyzed by the division of data into South/North and Coastal/In-land regions. In the former analysis it is demonstrated that openness to trade may have a stronger effect on reducing inequality in Southern states than in Northern states and more FDI inflows in Southern states increase inequality significantly. Finally, the latter analysis suggests that FDI in coastal states increases inequality significantly and openness to trade reduces income inequality more considerably in in-land states than in coastal states.
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0 – Introduction

In the last 30 years, a great deal of empirical and theoretical academic research has been conducted on how globalization affects the social welfare and the economic performance. There are no doubts that globalization has enhanced international competitiveness through the increasing flows of productive resources and knowledge around the world. Firms, individuals and states have new opportunities and have expanded their ambitions not only economically, but also socially. Developing countries encounter an imperative challenge because they must find solutions to global issues, as well as keep their economic growth in order to have a sustainable development.

Globalization is a complex concept to compute due to its subjectivity and it may be defined in countless ways. In economic studies there is a special attention to the role of economic globalization, specifically to the openness of the economy and foreign direct investment (FDI) inflows. Openness to trade is considered one important driving force of globalization because as trade barriers decrease, there will be higher exchange flows of goods, services and capital among several countries. Higher cost competitiveness in the goods market and a general improvement of domestic competitiveness are also consequences of trade liberalization, which decreases costs and increases revenue and profits.

On the other hand, FDI makes possible the technological transfer of know-how; it improves productivity, increases exports and consequently increases profits. Besides economic concerns, there is the social and economic relation which is an essential issue when boosting a sustainable growth. Governments must be aware that long term policies are crucial to keep (or achieve) equality within a country.

The question of how globalization has affected income inequality has been discussed by several authors. The authors’ findings can be significantly different or even contradictory. Baddeley (2006), Benar (2007), Pradhan (2009), Wan, Lu & Chen (2007) and Alderson & Nielsen (2002) argue that there is a positive relationship between inequality and globalization. Their conclusions suggest that higher inflows of FDI and increasing openness to trade lead to a higher level of income inequality within the regions of their studies.
In contrast, Jensen & Rosas (2007) and Adams (2008) observed that FDI inflows in Mexico and in developing countries, respectively, have a negative relationship with inequality. Additionally, Das (2005), Lee (2006), Silva (2007) and Tisdell & Svizzero (2004) argued that there is a negative correlation between international integration and inequality.

Moreover, the Stolper-Samuelson theorem, which is based on the Heckscher-Ohlin (HO) model, also makes the connection between inequality and globalization. Brazil has high endowments of labor when comparing to capital endowments. In spite of the capital intensive industries that have been emerging in Brazil, such as the aviation industry (Embraer), siderurgy industry (Usiminas) or oil industry (Petrobras); the large dimension of the country does not allow the inference that it has high endowments of capital, since the majority of industries are still labor intensive. Furthermore, the literacy level is considerably low when comparing to developed countries. Thus, the majority of the Brazilian work force is unskilled.

As a result of the theorem, it is expected that Brazil specializes in the production and exportation of unskilled labor-intensive commodities since it demonstrates a comparative advantage in this branch. Therefore, the demand of unskilled workers may increase as well as their wages. Hence, it is predictable that the wage gap between skilled and unskilled workers in Brazil decreases and the overall level of inequality is reduced.

Notwithstanding the existence of all these studies, few have been researched in developing countries with high and persistent rates of income inequality. Brazil has one of the highest levels of the Gini coefficient in the world, which means that the Brazilian Lorenz curve is far away from the equality line. According to UN data, from 2000 to 2010 Brazil had a Gini coefficient of 55% which compared with euro zone countries (32.3%) is a very high value.

Moreover, Brazil is a BRIC (Brazil, Russia, India and China) country and it is believed that by 2050 it will be one of the most powerful economies in the world. Its role in the world economy has been growing significantly due to the high levels of FDI inflows and outflows, its openness to international trade and its participation in the process of globalization. It is also the fifth most populated country in the world, counting with 190 million of inhabitants (Population Census, 2010). This is a strong argument to believe that Brazil’s income inequality might influence the global inequality.
This thesis exposes more insights about the possible impacts of economic globalization on the distribution of income within a country. Through a panel data, each Brazilian state is taken into consideration; therefore, it will be possible to get a deep understanding of the effect of globalization on regional income inequality in Brazil. The research question that will be explored is:

How might economic globalization influence income inequality in Brazil?

To answer this question an econometric model will be drawn in order to compute the relationship between income inequality and globalization in the 27 Brazilian states. Clearly, the dependent variable is the Gini coefficient which is a response to the independent variables in the model. This means that oscillations in the country’s inequality are not from immediate policies. Instead, it is a long-term process which might be related to globalization.

On the other hand, the independent variables used to compute economic globalization are FDI inflows and states’ openness to international trade. Moreover, the control variables are: years of schooling, gross domestic product per capita (GDPpc) divided by US$ 1000, total population divided by 1 million inhabitants and political idealism.

The thesis is organized in the following way: in the first chapter a literature review of globalization and globalization in Brazil is presented. Secondly, a theoretical review of inequality, the empirical evidence of Brazil and the main causes of inequality in Brazil are discussed. Then, the overview of how globalization affects income inequality is exposed in order to give more insights on the possible reasons to explain the final results of this study.

In the fourth chapter the description of the data used for the variables in the main model are exposed. The chapter also encloses the methodology applied in the econometric model, which is the pooled OLS, the random and fixed effects models. Subsequently, the model is computed and the results are described in detail. The Jackknife technique is executed with the purpose of verifying the robustness of the results. Moreover, the division of data into North/South and Coastal/In-land regions gives more insights about the regional differences in Brazil. Lastly, the final conclusions of this thesis are presented, reviewing the results and comparing them to other studies.
1 – Globalization

Globalization is a very broad concept which has been frequently mentioned by economists and politicians when they refer to the intense transformations that the world has been experiencing in the economic and political environment. It implies a greater level of economic interdependence among countries due to the increasing integration of goods, technology, labor and capital. This has been possible as a result of the increasing flows of international trade, financial capital and factors of production, as well as the development of international transportation, communication and information connections (Slaughter & Swagel, 1997). As a consequence, the movement of individuals, goods, services and capital has increased considerably, which allowed the enhancement of firms’ competitiveness, knowledge sharing and diffusion of technology, culture and information across states.

Two different points of view have emerged about the possible consequences that globalization might bring to the world.

To begin with, there is a group of scholars who believe that globalization has generated numerous benefits to the global wellbeing by increasing the countries’ openness to the exchange of commodities, services, technology, labor and capital. Moreover, the world population is more conscious about the global issues such as the human rights, there is an improvement of individuals’ access to culture and a positive evolution of human development and gender equality (Bhagwati, 2004).

On the other hand, it is argued that the increase of international flows raises the level of global inequality. Firstly, the demand of skilled workers increases and as a result the wage gap between skilled- and unskilled-workers grows significantly (Slaughter & Swagel, 1997). Moreover, the global financial development also increases discrepancies between powerful markets or influential nations over weak institutions. This occurs due to the fact that developed countries decide their macroeconomic strategies according to their domestic conditions; this creates a substantial uncertainty and economic volatility in developing countries which do not see their interests being fulfilled (Ocampo & Martin, 2003).

Furthermore, there are few other risks that nations must deal with due to the increasing geographic exposure that they face nowadays: the increase of terrorism particularly in developing countries, the lost of sovereignty, the spread of international crime, the
emergence of infectious diseases, the climate change and the increasing levels of air and water pollution (Dreher, Gaston & Martens, 2008).

1.1 – Economic Globalization
Nations have gone through several stages to achieve the present situation where the world is considered a “global village”. In the 19th century and beginning of the 20th century the main evidence of globalization was the increasing flows of goods, people, services and capital due to the considerable reductions of transport costs. This period finished when the First World War started and subsequently there was a conversion of globalization’s previous trend of international integration.

The second stage began after the Second World War, when there was a new urge of internationalization. It was characterized by the regulation of the international monetary and financial system in the Bretton Woods conference, which included the creation of several international institutions for international cooperation such as the General Agreement on Tariffs and Trade (GATT), presently the World Trade Organization (WTO). These efforts contributed to the expansion of manufacturing goods exchange in industrialized countries.

Finally, the third stage initiated after the first oil crisis in 1973. This phase is distinguished by the immense establishment of multinational corporations (MNC), which has allowed the massive use of new technologies, the increase of capital mobility and the integration of production structures (Dowrick & DeLong, 2003; Ocampo & Martin, 2003).

The increase of competition across nations is one of the most significant features of globalization. There was an expansion of international trade opportunities and an increasing easiness for multinational corporations to expand internationally. The latter feature was achievable due to the development of new technologies and new opportunities to achieve temporary monopolies which enhance firms’ investments and profits. Krugman (1995) revealed that several manufacturing products (i.e. garment industry) represent a large fraction of the international trading flows. Namely, the components of a single manufacturing product may be vertically specialized (the products are assembled in different parts of the globe) or horizontally specialized (trade of finished products). Consequently, the two structures of specialization generate more international-intraindustry trade flows or even more intra-firm flow to achieve the final
product. Hence, there will be a tendency to segment the value chain where countries or firms specialize in specific products rather than entire sectors.

1.2 – Globalization in Brazil
After the Second World War and until the late 80s, the Brazilian economy was characterized by the imports substitution policy which implied high levels of protection and insignificant exposure to the international competition. Later on, in the 90s, there was a profound transformation of the Brazilian external sector. The new measures consisted in more liberalization of the commodities market, further incentives to attract FDI, less market regulation, firms’ privatization and economic stabilization policies. The main goal was to insert and integrate Brazil in the international scene through the modernization of the productive system and, consequently, increasing the international competitiveness.

According to Arbache (2002), the success of Brazil in international markets was vulnerable due to several factors which affected its competitiveness internationally. The factors are the large amount of taxes, logistic problems, high transportation costs, the short amount of exportation incentives and the obstacles to the competitiveness of the Brazilian product.

From 1988 to 1993, the average tariff rate was reduced from 52% to 14% and the non-tariff barriers to trade such as quotas and import licenses were abolished. In 1994, president Cardoso introduced a plan called “Plano Real” to reduce the inflation rate; nevertheless, it caused the overvaluation of the exchange rate. As a result, the external sector in Brazil changed its pattern and the international trade balance was deteriorated. In numbers, the trade surplus was US$ 85,9 billions between 1980-1989 and US$ 60,4 billions between 1990-1994; however, from 1995 to 2000 the trade deficit summed US$ 24,3 billions.

Since the outcome did not represent the initial ambition, the government increased its efforts and negotiated with numerous organizations in order to obtain from GATT-OMC a multilateral system with clear, fixed and fair rules.

This unfavorable picture forced the Brazilian government to change its approach to the external sector, adopting more realistic policies in order to balance the risks (Cervo, 2002).
On the other hand, FDI inflows may be divided in two different phases: pre-90s and post-90s. This period of change is characterized by the Brazilian import substitution policy, followed by its openness to international markets. In the 80s, foreign firms established subsidiaries, production points and strengthened bilateral or multilateral relationships in Brazil, in order to expand market opportunities, increase profits and escape from the protectionist policies which caused a considerable bias between the prices of imported goods in Brazil and international prices. Thus, foreign firms avoided the Brazilian trade barriers.

Nevertheless, after the economic openness in the 90s, firms would not be sufficiently competitive whether they did not decrease their production costs. Therefore, foreign firms increased their production in Brazil to beneficiate from economies of scale. As a result, these firms took advantage not only from the Brazilian market, but also from low production cost that the country offered (Amatucci & Avrichir, 2008). It was possible to observe that in the 90s the propensity to export of a MNC was largely superior when compared to Brazilian firms (Moreira, 1999).

FDI inflows in Brazil presented an exponential growth in the 90s. The statistics reveal that in 1991 the FDI inflows were US$ 1,1 billions, while in 2000 this value increased to US$ 33,5 billions. From 1996 to 2000 the FDI inflows had its origin mainly from the USA (24,8%), Spain (17,4%), Holland (9,3%), France (8,1%) and Portugal (7,9%) (Cervo, 2002).
2 – Income Inequality

2.1 – Measuring inequality
Income inequality consists of the different distribution of income or economic assets within a group of individuals, a region or a country. According to Goldberg & Pavcnik (2007), the most appropriate variable to measure inequality would be consumption because it presents some advantages when comparing to income. The first apparent advantage is that households can borrow or lend capital in large amounts, thus their income might show a percentage that does not belong to them or vice-versa. Secondly, consumption, when reported, is more accurate than income since the report of high income households is usually biased, the answer rate is low and the respondents usually misreport part of their total income. Lastly, some policies have impacts on relative prices of consumption goods; therefore, they influence consumers’ income and also their present purchasing power.

However, data from household consumption is not usually reported accurately or not reported at all. Therefore, researchers frequently use labor income (income- or wage-based measurement) instead of consumption to compute inequality in a country, state or region.

According to Hoffmann (2000), there are three possible income dimensions such as income from economically active citizens, income from households in private residences and income per capita from households in private residences. The researcher must decide the population which is more interesting, according to the social phenomenon that he or she intends to study. The first dimension is used when the researcher wants to investigate the labor market. Alternatively, the other two are employed when the main goal is to explore the welfare and the standard of living in countries or regions.

2.1.1 – Lorenz Curve
The Lorenz curve is defined through the cumulative function (F(x)) of the population who has an income equal or lower than x.

In the graph below are shown the Lorenz curves from 1995 and 2005 in Brazil.
To draw the curves the population was organized depending on the level of the households’ income. In the x-axis it was introduced the cumulative percentage of population and the y-axis depicts the percentage of income that a certain percentage of the population owns. Evidently, the percentage varies from 0 to 100 percent due to the fact that the entire population and the total income are included.

Subsequently, several points in the graph are identified and they mean that a certain percentage of the population possesses a certain percentage of the total income in Brazil (Soares, 2006). For instance, the point represented in the graph for 1995 means that the poorest 20 percent of the population earned only 1,71 percent of the total income in Brazil. In 2005 the percentage is slightly higher (2,98 percent) which means that the poorest 20 percent are better off 10 years later.

The straight line which divides the graph in two is called equality line. Hence, with the increase of inequality, the Lorenz curve falls below the egalitarian line, always to the right side of the graph.

The Lorenz curve presents some limitations when comparing two different years, countries, regions, etc. The curve is just a visual image; therefore, there is no numerical expression to compare the levels of inequality in two different situations. Besides that, when two curves intersect each other, the ranking of income distributions it is no longer
valid. The following graph illustrates this situation with two countries which present similar levels of the Gini coefficient.

Figure 2 – The intersection of the German and Spanish Lorenz curves in 2002

![Lorenz curves graph]

Source: UNU-WIDER World Income Inequality Database (2008)

It is possible to observe that the proportion of income in the bottom 10 percent and in the top 10 percent is higher in Spain. Therefore, the inequality ranking may not be defined between these two countries by the Lorenz curve chart.

To overcome this obstacle there are a number of measures which help ranking analytically the different levels of inequality.

One of the most widely used indexes is the Gini coefficient, which is described as the average difference between all the possible pairs of income in the population, articulated as a percentage of the region’s total income. Analytically, it can be computed through the following formula:

\[ G = \frac{1}{2n^2m} \sum_{j=1}^{m} \sum_{k=1}^{m} n_j n_k |y_j - y_k| \]  

(Ray, 1998)

The coefficient may fluctuate from 0 percent, which means perfect equality, and 100 percent, which is perfect inequality. These two values are extreme situations which do not illustrate the reality of a country. A country is considered highly unequal when the value lies between 50 to 70 percent and relatively equal when the Gini coefficient lies between 20 and 35 percent.
The Gini coefficient satisfies the four criteria: anonymity principle, population principle, relative income principle and the Dalton principle. Firstly, the anonymity principle is satisfied since the result of the Gini coefficient is not influenced by who has higher or lower income. Secondly, the Gini coefficient value does not change depending on the size of the population (population principle) or the way income is measured (relative income principle). Finally, the Dalton principle is also satisfied due to the fact that if all other incomes are kept constant and there is a transfer from an individual in a richer quintile to an individual in a poorer quintile, the new result of the Gini coefficient demonstrates that the population is more equal (Smith & Todaro, 2009).

2.1.2 – Limitations of the Gini Coefficient

The Gini coefficient satisfies the property of decomposability only when it regards inequality between subgroups. As a result, inequality in the entire society is known; however, inequality of a group of citizens who belongs to the same income quintile is not measurable since it is not possible the observation of the individuals’ income within-groups. Consequently, contradictory situations might emerge, such as: an increase of inequality in every subgroup may decrease simultaneously the overall inequality of a society. If this is the case, the evolution of inequality is impossible to be computed consistently within a section through the Gini coefficient.

As mentioned before, the Dalton principle is satisfied by the Gini coefficient. However, this principle is considered a weak principle of transfers, in the sense that the strong principle of transfers considers that a transfer from a rich individual to a poor reduces more or less the level of inequality depending on the distance. The Gini coefficient fails in this principle since transfers between two individuals depend on their relative position, not on their absolute amount of income or their income share. Therefore, two couples of individuals in different absolute positions (4th and 5th or 1.000.004th and 1.000.005th) who make a transfer between each other will produce the same effect on the Gini coefficient even though their incomes are not the same. Consequently, if transfers occur in a society, the Gini coefficient may not express correctly the development of inequality (Cowell, 2011).

Moreover, there are general issues which might influence the calculation of inequality through the Gini coefficient.
Firstly, income sources and taxes tend to vary across countries, regions or years, generating problems to researchers since the long-term inequality and the comparison of inequality among different places may not represent the correct variation. Furthermore, income from state transfers, state donations, rents, capital and profits are complex to determine due to the fact that income owners do not declare the overall income earned, generating a bias in the calculation of the coefficient. To overcome this barrier, many studies have focused on wage inequality to avoid subjective information (Goldberg & Pavcnik, 2007).

The biased data is an even more frequent phenomenon in developing countries; therefore, many researchers have determined inequality as the difference among salaries. For instance, Tomohara & Takii (2011) explored the wage differentials between multinational enterprises and country’s based firms to identify the impact of globalization on the level of inequality in developing countries. Moreover, Dreher & Gaston (2008) investigated the consequence of the several proxies of globalization on industrial wage inequality. The authors argue that income inequality and earning inequality are highly correlated; however, economic globalization may affect more the wage premium since there is a focus on labor earnings inequality. Whereas political and social globalization may affect more significantly income since they affect social policies.

An additional limitation is the incompatibleness of data across years due to the removal of the upper bound data, to protect the anonymity of individuals who took part in the survey.

Finally, the dimension of the data is constant a query; it can be the households or individual’s income. On one hand, the studies intend to explore the individual’s welfare; hence, it would seem sensible to use individual’s data. Nevertheless, as individuals live in communities and share costs and incomes, the household’s data can be accurately used to measure inequality in a society (Goldberg & Pavcnik, 2007).

### 2.2 – Empirical Evidence of Income Inequality in Brazil

Brazil is a very diverse country in many aspects. Several economic, demographic and social indicators demonstrate serious discrepancies which often affect the Brazilian development and progress. In the figure below a geographic notion of Brazil is
presented showing the overview of the states inequality computed through the Gini coefficient in 2007.

Figure 3 – Gini Coefficient in Brazilian states 2007.

Income inequality among regions and states is another concern due to its heterogeneous evolution over the past years; therefore, it has been analyzed by different authors. One possible analysis is the Theil’s coefficient, which computes the distribution of income per capita in a country or among states along with the intraregional and the interregional inequality. The intraregional coefficient exposes inequality among states in the same region (North, Northeast, Center West, Southeast and South), whereas interregional computes inequality among the 5 regions in Brazil.
Azzoni (1997) analyzed the Brazilian inequality and the regional differences in among the Brazilian states and regions from 1939 to 1995 through this method. His results demonstrate that the dispersion of state per capita income increased in the early 50s, presenting its highest value in 1956. Subsequent to these years, there was a global tendency to decline in the way that the dispersion among states presented a significant reduction until 1995 (apart from some years in 1966, 1968, 1970 and 1975). On the other hand, it was observed that intraregional and interregional evolution of inequality show opposing evolutions. Intraregional inequality declined over time, which means that the regions are more homogeneous internally, while interregional inequality had an overall tendency to increase between 1939 and 1995; therefore, the five Brazilian regions were more unequal among them.

More recently Neto & Azzoni (2011) studied the apparent inequalities within Brazil, suggesting that regions have converged in terms of income in the period 1995-2006. The authors performed a common β-convergence test which took into consideration the consequences of labor productivity and minimum wage or income transfers on the evolution of regional disparities. The test was performed by this formula:

\[ \frac{\ln(y_{T_i}) - \ln(y_{0i})}{T} = \alpha + \beta \ln(y_{0i}) + \varepsilon_i \]

Where \( y_{T_i} \) and \( y_{0i} \) are labor productivity or per capita income values in state \( i \) in the final and initial periods respectively, \( \alpha \) and \( \beta \) are the estimators of the regression, \( T \) is the time period and \( \varepsilon_i \) is the error term. In the model several dependent variables were considered in order to measure income in terms of production (GDP per capita and GDP per worker) and income (income per capita – all sources, labor income per capita and income per capita – excluding minimum wage and “Bolsa Família” income). The model demonstrated that the estimator \( \beta \) is negative and statistically significant, which means that income inequality in Brazil has been reduced since low income states grow faster than high income states.

Although this study demonstrates a tendency to a deconcentration of income in Brazil in the last decades, it is still possible to observe high levels of regional inequality in Brazil. In table 1 a comparison between 1995 and 2005 was exposed in order to account the differences of the regional share of income and population in Brazil. The discrepancies are very significant. For instance, the Southeast region accounts 43% of the Brazilian
population and presents a GDP per capita of US$ 12261.5 in 2005. Whereas in the Northeast region the percentage of population is 28% and the GDP per capita corresponds to US$ 4358.7 in 2005.

What is even more evident is the discrepancy between the wealthiest state, São Paulo, which reports a GDP per capita of US$ 14248.6 and the poorest state, Piauí, with a GDP per capita of US$ 2933.8 in 2005.

Moreover, it is possible to observe that the Northeast region accounts with only 13% of the national income and Southeast with 57%. In 10 years the Southern east region reduced only 2 percentage points of its income share while the Northern east region kept the same value. In the general picture, it is possible to observe that the Brazilian regions are still very unequal among them.

Table 1 – Population and income in Brazilian regions, São Paulo and Piauí

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Southeast</td>
<td>0.43</td>
<td>0.43</td>
<td>0.59</td>
<td>0.57</td>
<td>10642.8</td>
<td>12261.5</td>
</tr>
<tr>
<td>São Paulo</td>
<td>0.22</td>
<td>0.22</td>
<td>0.36</td>
<td>0.34</td>
<td>12655.6</td>
<td>14248.6</td>
</tr>
<tr>
<td>South</td>
<td>0.15</td>
<td>0.15</td>
<td>0.18</td>
<td>0.17</td>
<td>9277.6</td>
<td>10467.9</td>
</tr>
<tr>
<td>Center West</td>
<td>0.07</td>
<td>0.07</td>
<td>0.06</td>
<td>0.09</td>
<td>6933.1</td>
<td>11577.5</td>
</tr>
<tr>
<td>Northeast</td>
<td>0.29</td>
<td>0.28</td>
<td>0.13</td>
<td>0.13</td>
<td>3471.6</td>
<td>4358.7</td>
</tr>
<tr>
<td>Piauí</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>2224.3</td>
<td>2933.8</td>
</tr>
<tr>
<td>North</td>
<td>0.07</td>
<td>0.08</td>
<td>0.05</td>
<td>0.05</td>
<td>4931.3</td>
<td>5740.1</td>
</tr>
</tbody>
</table>

Source: Institute for Applied Economic Research (Ipea)

2.2.1 – Reasons for the Brazilian Inequality and its decline in the last decades

The explanations to describe the high and persistent levels of income inequality in Brazil may have its origin in the nature of the Brazilian economic system, which has shown a serious wage gap between skilled and unskilled workers and in historical factors.

One common characteristic of developing countries is the high level of labor supply that they present. Brazil is no exception and this was a more serious issue after 1945, when the population growth rate increased significantly. The excess of population (in the case of Brazil the excess of unskilled workers) brought the unskilled workers’ salary down, which accentuated the wage gap; therefore, income inequality has presented high values across the years.
An additional reason was the fast industrialization that Brazil experienced in the last decades. This industrialization was mainly capital-intensive instead of labor-intensive. As a result, capital owners have been better off than workers due to the uneven distribution of productivity gains.

Moreover, the primary sector in Brazil has always presented a high percentage of the economic activity in the country. This sector also exhibits a labor surplus, high levels of uncertainty and low value-added products. Hence, wages are relatively low and unstable when comparing to wages of the other two sectors.

The next group of factors which explain the high level of income inequality is the historical legacy left by Brazilian leaders and Portuguese settlers who gave a tremendous power to elites. The origin of such legacy goes back to the time when Portuguese colonized Brazil (Skidmore, 2004). During that time, education was entirely neglected by governors: Brazil had no superior education and the printing press was prohibited, leaving no opportunities to publish books, newspapers or magazines in that country. Consequently, in the present time, the distribution of educational endowments is more unequal and the wage differentials by education are higher when comparing to the United States, Mexico and Colombia (Velez, Barros & Ferreira, 2004).

Furthermore, Portuguese had a very hierarchical society where the clergy was on top of the pyramid, in the middle it was the aristocracy followed by the bourgeoisie and finally, at the bottom, were ordinary workers and slaves. The royal family was influenced by the aristocracy wills, which were essentially to export the maximum amount of gold, diamonds and other valuable goods, thus creating a trade monopoly between Brazil and Portugal. This did not allow Brazil to compete efficiently with other nations; therefore, the international sector was rudimentary, based on agriculture and mining and kept this stagnation for numerous years.

In addition, the high number of slaves in Brazil at that time also influenced the income inequality presently. The population whose descendents were slaves has been discriminated socially and economically and their incomes have been relatively low comparing to other ethnic groups.
Besides that, family was the most important social unit followed by friends; therefore, the most influential individuals would beneficiate their closest fellows, thus making the society not reward oriented (Skidmore, 2004).

Moreover, there are several examples which show how tax transfers, benefits and pensions have been biased in order to beneficiate the most influential individuals in Brazil.

Retirement pensions are the most appalling example to illustrate how transfers are highly regressive – in the sense that high- and middle-income households receive more benefits than low-income households in Brazil. On the other hand, the pension system presents high deficits and, in spite of Brazil has half the number of retired individuals than US, it allocates a higher share of resources to cover the total cost of pensions (Velez, Barros & Ferreira, et al, 2004).

An additional issue that Brazil faces is the constant measures implemented to stabilize the economic indicators which consume plenty of energy and resources, leaving in second plan policies to reduce inequality. One example is “Plano real” (Real Plan), a strategy designed by Fernando Henrique Cardoso’s government (elected in 1994) which intended to reduce the inflation rate. It was a successful measure to reduce inflation (its average level declined 8,4%), however, it lead to an overvaluation of real and consequently a deficit in the current balance of payments (Gordon, 2001).

Currently, the political parties on power demonstrate several weaknesses, being influenced most of the times by the elite. As a result, there are several well-paid jobs, and firms contribute considerably to political campaigns in order to induce some influence in the political decision (Skidmore, 2004).

Nevertheless, in the last decade the general level of income inequality has been falling not only in Brazil but also in all Latin America. Cornia (2011) identified several factors which explain this phenomenon in Latin America.

The first factors are related with globalization and how it has affected the terms of trade, the rising of migrant remittances and the increase of external finance. The international trade between Latin American and Asian countries has grown in the past decades, since Asian countries have experienced a fast expansion which has increased the exports value in Latin America. There is an improvement in the balance of payments due to the
increase in prices and volume of products exported, particularly in labor-intensive industries. Moreover, the interest rates decreased because of the money expansion in foreign countries; therefore, the exports increased beneficiating households and firms’ income.

Additionally, the raise of international funding from migrant remittances and foreign direct investment (mainly from purchases of shares and securities in regional stock markets) increase the capital inflows and the accumulation of foreign funds, which decrease the spread of international loans and benefit mainly middle-income households, capital- and skilled-intensive firms.

Other factor suggested to explain the reduction of inequality is the growth of GDP in Latin American countries, which generated new jobs, reduced unemployment and improved of the education distribution, which consists in a higher rate of enrollments in different levels of education and higher rates of school accomplishment.

Cornia (2011) emphasizes the decrease of income inequality under Latin America’s left-of-center (LOC) regimes, considering that democratization was one of the main factors to explain the reduction of inequality. The author mentions several policies which were implemented by these regimes and had a positive impact on decreasing inequality. The policies are the following: (1) fiscal policy to balance the national budgets, (2) rising tax/GDP ratios in order to finance public commodities which generate growth, (3) monetary policy with the purpose of controlling inflation and interest rates, and reducing the use of dollar in parallel with the national currency (dollarization) in the financial system, (4) the decrease of international dependence by reducing the amount of external loans, and, finally, (5) the creation of some exchange rate policies to protect the tradable products.

Furthermore, social policies were based on labor market policies with the aim of reducing unemployment, informalization, instability, increasing the wages of unskilled workers and empowering social security. In Brazil a new committee called Economic and Social Development Council was created with the intention of clarifying and advising economic and social issues in the society. Other social policies were the increase of public expenditure on social concerns and the improvement of transfer programs such as “Bolsa Família” in Brazil in order to strengthen the social security plan.
3 – Inequality and Globalization

Globalization may affect individuals’ income, conducting to fluctuation on income inequality in countries, states or regions.
This section will present factors and theoretical models which have been developed in order to explain the connection between globalization and income inequality.

3.1 – Social, Political and Economic Globalization

In the last decade the concept of globalization has attempted to be computed resulting in many indices, such as the Maastricht Globalization Index (MGI) (Martens & Zywietz, 2006), the World Market Research Center Index (WMRC), the A.T. Kearney/Foreign Policy Globalization Index (ATK/FP), etc. One of the most noteworthy indices is the KOF Index (Dreher, 2006), which divides globalization into three proxies: economic globalization, social globalization and political globalization. Within each proxy there are several variables which have different weights depending on how important they are defining globalization (Dreher, Gaston & Martens, 2008). Dreher & Gaston (2008) examined the three proxies of globalization on income inequality and the conclusions demonstrate that globalization has raised income inequality, with more prominence in OECD countries. On the other hand, Tayebi & Ohadi (2009), applying the same index, argue that globalization has reduced inequality worldwide.

3.2 – Economic Globalization

The majority of the authors has explored the effects of economic globalization due to the lack of data on social and political globalization. The most common variables to compute globalization are trade liberalization and FDI inflows; however, some studies have employed variables such as the percentage of individuals employed in exporting firms, the percentage of individuals employed in firms that are foreign owned, FDI outflows, etc. (Borraz & Lopez-Cordova, 2007; Çelik & Basdas, 2010).

The increase of FDI has been motivated mainly by market imperfections and/or the MNCs’ possession of intangible assets which are complicated to transfer from the country of origin to a foreign market. Factor endowments or higher returns within the foreign countries are not the main incentives to establish subsidiaries overseas.
Furthermore, the choice of the locations across boarders is based on the maximum profit
that MNC may achieve instead of the exporting possibilities or potential licenses that the MNC could obtain in the foreign country (Hymer, 1976).

According to these factors, the MNCs in general present different characteristics when comparing to domestic firms. At the outset, they use a higher percentage of skilled labor and more advanced technology. Moreover, MNCs offer a wage premium which is largely motivated by the fact that the most common locations of MNC are in urban areas where the average salaries are higher than the country’s average wage (te Velde, 2003).

Jensen & Rosas (2007) investigated the impact of FDI on income inequality in Mexico (considering also the distance to US borders), which is driven by two main factors. To begin with, FDI generates more capital within the host country, which reduces the returns to capital and increases the returns to labor. The domestic firms would be worse off since the workers’ salaries increase and the returns to capital decrease. Its profits would be lower; however, as the returns to labor are higher, the level of income inequality may decrease.

Lastly, MNCs offer a wage premium to skilled labor, thus, the wage differentials between skilled- and unskilled-workers could increase. However, this wage premium may also reduce income inequality since income dispersion between skilled-workers and owners of capital is lower due to the increasing demand of labor in the foreign country.

An additional situation that could also decrease the income inequality would be in the case that the foreign firm employs unskilled-workers, paying a wage premium to these workers, reducing the wage gap in the host country.

In this study it was found out that income inequality has decreased within Mexican states. However, it does not mean that the country is more egalitarian. In fact, it may indicate that some states are more equal and prosperous opposing some other states which are relatively unequal and not so wealthy.

As stated above, the relationship between FDI and inequality can be paradoxical and inconclusive. Basu & Guariglia (2007), Lee (2006), Portes (2008) and te Velde (2003) demonstrated that FDI inflows endorse higher levels of income inequality. On the other hand, Chintrakarn, Herzer & Nunnenkamp (2010); Figini & Gorg (2006) and Pan-Long (1995) have proven that, depending on the regions or their level of development, income inequality can be reduced by increasing the FDI inflows.
The augment of international trade has been driven by a number of factors that allow an effortless exchange of commodities, services and capital across countries. These factors are the decrease of protectionism policies and transportation costs. It has been observed a tendency of decreasing tariffs and quotas across states. International institutions such as WTO, EU, Mercosul, etc. have boosted this evolution in order to reduce trade barriers among countries. Moreover, transport costs are lower due to the shorter travel time, the improvement of transport logistics, the increasing capacity and the efficiency of the present vehicles, etc.

An additional factor is that as economies develop and become more similar in size, the possibility of trading among countries is higher. This occurs since smaller states expand their production capacities and consequently export and import larger amounts of commodities and services.

Finally, the last factor is the disintegration of production, which enhances the production of intermediate products. Firms search for more specialized products, which may be found overseas, boosting the exchange of intermediate products (Feenstra, 1998).

International trade will have an impact on the wage differentials between skilled- and unskilled-workers. However, these impacts can be contradictory or inconclusive, depending on the methodology used by different authors, by the regions where the study was applied, by the several factors considered to define globalization, etc. In the following sections the various theoretical models and studies are described to clarify the effects of globalization in the states’ income inequality.

3.3 – Stolper-Samuelson

One possible model which explains the link between globalization and income inequality is the Stolper-Samuelson model. The theorem is based on the general equilibrium model of international trade, the Heckscher-Ohlin (HO) model. The fundamental idea of the model is that: under free trade, countries with high endowments of unskilled labor will specialize in the production of unskilled-labor intensive goods, thus these countries will export unskilled-labor intensive goods and import skilled-labor intensive goods. Conversely, countries relatively rich in skilled labor will specialize in skilled-labor intensive goods.

Stolper & Samuelson (1941) derived from HO model the connection between income variation of unskilled and skilled workers in countries with high endowments of skilled
or unskilled labor by analyzing the effects of changes in product prices on factor returns. The theorem considers that trade openness in developing countries, which have an abundant supply of unskilled workers and consequently specialize in this branch, will expand the demand of unskilled workers in the exporting sector and consequently it will increase their wages. As a result, the returns to unskilled labor increase, in contrast to the returns to skilled labor, which diminish in developing countries. The main finding of the model states that income inequality decreases in developing countries which are open to the international trade.

Furthermore, Galiani & Porto (2010) constructed a theoretical model which links the neoclassic model of international trade (the HO model) and the wage premium. The model proposes to analyze the connection between trade liberalization and skilled premium. It considers the role of unions on bargaining the unskilled workers wages in the import sector in order to raise them and reduce the wage disparities between skilled and unskilled workers. There are several assumptions taken into consideration:

- There are two factors of production – the skilled (S) and unskilled labor (U), which are abundant and completely mobile among sectors; and three sectors - the exportable (1), the importable (2) and the non-tradable (0) sector;
- In sector 2 the wage-setting is not determined competitively;
- The country is small in the international scene, hence the prices of the tradable commodities are given by the international market \((p_1^t)\); on the other hand, the prices on the non-tradable sector are established endogenously;
- Sector 2 is skilled labor intensive while sector 1 is unskilled labor intensive. As a result, sector 2 requires more skilled labor technology \((a_{2s})\) conversely with sector 1, which requires more unskilled labor technology \((a_{1u})\):
  \[
  \frac{a_{2s}}{a_{2u}} > \frac{a_{1s}}{a_{1u}},
  \]
- The domestic country regarded has an abundant unskilled labor force; thus, by the HO theorem, the country exports commodities from sector 1 and imports commodities from sector 2.
- The markets of skilled labor in every sector and unskilled labor in sector 0 and 1 are competitive, hence the following perfect competition expressions are fulfilled:
  \[
  p_0 = w_s a_{0s} + w_u a_{0u} \\
  p_1 = w_s a_{1s} + w_u a_{1u}
  \]
Where $w_s$ is the competitive wage of skilled workers in every sector, and $w_u$ is the competitive wage of unskilled workers in sector 0 and 1.

On the other hand, the market of unskilled labor in the importable sector performs differently since it is protected by a tariff $t$ and there is a labor union to protect the salaries of unskilled workers. In the case of free trade (no tariffs) the price is determined similarly to the previous markets; however, in the presence of a tariff, the price for sector 2 is $p_2 = p_2^*(1 + t)$ and the firm’s tariff rent is $p_2^*t$ (profits earn by the domestic firms operating in the importable sector).

Labor unions are able to get part of this rent, and redistribute a parcel $\alpha$ to unskilled workers in sector 2 – in order to reduce the wage premium in this sector. Therefore, it is considered a non-competitive wage-setting mechanism. Analytically, the wage expression of unskilled workers in sector 2 is present below:

$$w_{2u} = w_u + \frac{p_2^*t}{a_{2u}}$$

The profits obtained from the tariffs (the parcel not captured by the unions) will attract new entrants in sector 2; thus, in case the free entry condition is satisfied, the demand and the wages of skilled and unskilled workers increase, until the zero profit condition is achieved: $p_2 = w_s a_{2s} + w_{2u} a_{2u}$.

The assumption that the importable sector requires more skilled labor technology ($\frac{a_{2s}}{a_{2u}} > \frac{a_{1s}}{a_{1u}}$) implies: $B = \theta_{1s}\theta_{2u} \frac{w_u}{w_{2u}} - \theta_{1u}\theta_{2s} < 0$ (where $\theta_{1s} = \frac{a_{1s}w_s}{p_i}$, $i = 1,2$; $\theta_{1u} = \frac{a_{1u}w_u}{p_1}$ and $\theta_{2u} = \frac{a_{2u}w_{2u}}{p_2}$). Therefore, the changes in wages through the changes in the amount of tariff can be explained by the following expressions:

$$\frac{\bar{w}_s}{t} = -\frac{1}{B} \tau \theta_{1u} (1 - \alpha) > 0$$

(1)

Where $\tau = \frac{t}{1 + t}$ and $\bar{x} = dx/x$. In words, when the tariff increases, the wage of skilled workers raises.

$$\frac{\bar{w}_u}{t} = \frac{1}{B} \tau \theta_{1s} (1 - \alpha) < 0$$

(2)

On the other hand, if protection increases, the wage of unskilled workers in sector 0 and 1 decreases.

$$\frac{\bar{w}_{2u}}{t} = \frac{1}{B} \tau \theta_{1s} \frac{w_u}{w_{2u}}\left(1 - \alpha \frac{a_{1u} a_{2u}}{a_{1s} a_{2s}}\right) \approx 0 \quad 0$$

(3)
Finally, the effect of the wage of unskilled workers in the importable sector is ambiguous, since it depends on the amount confined by labor unions.

In the case that \( \hat{t} > 0 \) (the level of protection increased), it is possible to observe that \( \hat{w}_{2u} > \hat{w}_u \) (the increase of the wage of unskilled workers in sector 2 is higher than the increase of the wages of unskilled workers in sector 0 and 1). Conversely, when \( \hat{t} < 0 \), this equality is applicable \( \hat{w}_{2u} < \hat{w}_u \).

To facilitate the understanding of the model the following graph was drawn, in order to observe the potential effects of trade policies on the wages of skilled and unskilled workers in every sector:

Figure 4 – Graphical representation of the model

As seen in the graph, the initial equilibrium is represented by the letter a. When the tariff increases, sector 2 expands in the domestic country (consumption of domestic commodities from sector 2 increases) and the demand of factors of production increases, shifting the curve \( p_2^*[1 + \tau(1 - \alpha)] = c_2(w_u, w_u) \) upwards. From the previous to the new equilibrium, point b, the wage premium enlarged (increase of skilled wage, \( w_s \), and decrease of unskilled wage, \( w_u \)). Therefore, trade protectionism (augment of the average tariff) generates an increase of wage inequality.

Moreover, from equation 3 it may be observed that the unskilled wage in sector 2 (\( w_{2u} \)) has an ambiguous effect once the tariff is increased. This occurs since the wage depends on the level of labor unions’ protection and the progress of the competitive wage. In the extreme situation when the labor union captures the total amount of tariff rents (\( \alpha = 1 \)),
the skilled and unskilled wage do not alter, though the unskilled wage in sector 2 increases by the same amount as the rent captured.
From this model it is anticipated that the unskilled wages in the protected sector (2) are higher than in sectors 0 and 1, namely, there is an enhancement of the gap between \( w_u \) and \( w_{2u} \), once the tariff is raised.

### 3.4 – Outsourcing and trade of intermediate commodities

Outsourcing has gained a significant importance in the international scene. Firms are more specialized in their core activities in order to minimize costs, consequently there is a growing global production sharing. Generally, the products produced in developing countries are considered unskilled-labor-intensive product by a developed country. However, for a developing country the same product is seen as skilled-labor-intensive product. Thus, outsourcing increases the demand of skilled products and consequently raises the wage differentials between skilled and unskilled workers (higher income inequality) in both developing and developed countries (R. C. Feenstra & Hanson, 1996).
Contradictorily, Yomogida & Zhaot (2010) argue that outsourcing in unskilled-labor activities has raised due to the factor endowment differences. This has caused a raise of unskilled wages and consequently the wage gap has shrunk.

Regarding trade in intermediate commodities, there are two situations considered: (1) on one hand, the technology of intermediate good is symmetric in both developed and developing countries, and on the other hand, (2) the production technology is asymmetric. In the first case, the HO model is consistent since more efficiency in the transaction of intermediate goods modifies the demand of skilled and unskilled workers – in developed countries higher demand of skilled labor and in developing countries the demand of unskilled labor increases. As a consequence the wage disparities are higher in developed countries and lower in developing countries. Alternatively, in the second situation, it is observed an augmenting of wage differentials in both countries (Cheng & Zhang, 2007).

### 3.5 – Technological progress

Firms which present high levels of technological progress typically have a higher number of skilled workers who are able to implement all the changes inside the firm. The increase of competition from abroad or from foreign firms within the country
encourages the domestic corporations to invest more in research and development (R&D) and adopt new technologies in order to enforce higher efficiency. Therefore, openness to trade enhances the worldwide skill bias, in developed and developing countries, widening the wage gap of skilled and unskilled workers (Wood, 1995). Nowadays, there is a considerable concentration of technological progress in developed countries, which precludes the technical growth and consequently the general development of developing countries. The main factors associated with this phenomenon are the low spread of technology and the considerable number of patents attributed to multinational corporations. The first factor arises due to the rigid demand of raw materials (the main commodity exported by developing countries) and the low entry costs which increase the supply and consequently reduce profits. Firms in developing countries deal with low margins of earnings which do not allow them to invest in R&D or new Information and Communication Technologies (ICT). Furthermore, the large amount of regulation regarding property rights hinders the possible transfer of knowledge and technical skills from developed to developing countries and increases considerably the fixed costs (which are too high if firms do not have an increasing scale production). Consequently, underdeveloped nations depend on low-skilled areas of production which are characterized by stagnation and low productivity (Ocampo & Martin, 2003).

3.6 – Product differentiation
Export firms are usually characterized by their higher levels of productivity and product quality. The latter is a result of further competition that companies must face from firms in developing countries where the operational costs are lower and consequently the final product is cheaper. If firms did not invest in product quality, there would not be differentiation from the other firms; therefore, they would compete through prices, which is not sustainable principle for firms in more expensive countries. Thus, these exporting firms require skilled workers in order to be more productive and upgrade their products frequently. In middle-income countries, firms are in a transition position where they aim to have more differentiated products due to their openness to trade. As a result, they must hire more skilled employees, hence the demand increases followed by a raise of their salaries and increase of income inequality between skilled and unskilled workers (Goldberg & Pavcnik, 2007).
3.7 – Industry wage premia

The industry wage premia is the fraction of the employees’ wage that is not explained by their own experiences or characteristics. Its oscillations may be caused by changes of trade policies, sector features, economic fluctuations, etc.

There are three valid reasons to comprehend how trade liberalization influences income disparities by changes on industry wage premia:

Firstly, in the short- and medium-term, trade liberalization reduces protection of the domestic production, conducting to a decrease of the demand. As a result, industry wage premia and employment decrease. This phenomenon is even more evident in sectors where employees are unable to move freely among sectors. The majority of developing countries present labor market rigidities, which may accentuate the likelihood of having a wage reduction in some sectors and consequently an increase of inequality (Feliciano, 2001).

Moreover, models of union bargaining and imperfect competition also explain declines on industry wage premia. In the case that there is union bargain power, domestic firms redistribute their profits with their workers. If trade is more liberalized, profits from these firms decrease since there is more competition from foreign firms; therefore, wages decrease in industries which are not so protected by trade policies (Goldberg & Pavcnik, 2007).

The final reason is related to the productivity level of a certain industry. In developing countries it has been observed a productivity enhancement in countries with less protective trade policies. The gains from a higher productivity may be translated in an increase of wage premia among firms. This occurs since firms with higher levels of productivity (due to trade liberalization in their industry) will raise their workers’ wages, while firms which did not experienced an enhancement of productivity will keep the same wages as before. Therefore, the wage gap between a less and a more protected industry widens due to the different levels of productivity (Verhoogen, 2008).

3.8 – Uncertainty

Uncertainty is another cause to explain higher levels of income inequality when countries are more integrated in the world economy. When there is uncertainty in a state’s economy, individuals are more susceptible to unstable employment and higher volatility of income.
It is argued that economic integration might lead to an increase of wage and employment uncertainty due to the higher volatility of prices and demand, the increasing possibility of productivity shocks and the superior price elasticity of labor demand (Goldberg & Pavcnik, 2007).

3.9 – Informal economy
The informal economy is a part of the economy where employers do not follow the labor market legislation such as the tax payment; therefore, it does not take part in the computation of GNP and it is commonly associated to the idea that workers are worse off due to the lack of labor security and regulations. In 1999/2000, the informal sector in Brazil represented 39.8% of GNP, which is a large proportion when compared to the European average of 18% of GNP (Schneider, 2002).

Openness to international trade and increase of FDI inflows usually imply a greater share of the informal sector due to the growing competition from foreign firms and markets which pressure firms to cut costs. As the informal sector employs mainly unskilled workers, it would mean that these workers are more susceptible to precarious working conditions, which lead to lower salaries and less social and economic benefits. Consequently, countries with a considerable proportion of informal sector might demonstrate higher levels of income inequality. When firms start to gain market share and competitiveness, this tendency converts; hence, they increase the percentage of workers employed in the formal market who receive all possible benefits (Goldberg & Pavcnik, 2007).

3.10 – Inter-regions
Finally, inter-regional inequality is another aspect which must be investigated in order to observe whether globalization has increased the income gap within countries. The first feature that leads to inter-region inequality is related to geographic factors such as the distance from inland regions to coastal areas. This feature hampers the access of inland locations to harbors and international markets precluding inland firms to export and expand business. As a result, the opportunities to export are lower and income inequality between inland and coastal areas increases.

Moreover, natural factors of specific regions are also associated with regional disparities. For instance, the inland-coastal inequality in China may be explained by the harsh natural conditions that some Chinese regions present, such as saline soil, high
elevation and bad weather conditions which have a significant impact on the agriculture productivity.

Another feature regards the isolation of inland regions, which show lower levels of education due to the lack of information and knowledge spillovers.

Hao & Wei (2010) demonstrated empirically that, due to the features mentioned above, income inequality between coastal and inland regions has been increasing in the past three decades in China.

Furthermore, it has been observed enormous discrepancies of FDI inflows in certain regions. This occurs due to policies applied in these regions which favor their openness to international markets and improve their conditions to assimilate the investment from foreign firms. As a result, the growth rate of these regions is more expressive than in other smaller urban or rural areas, augmenting income disparities within a country. The results are consistent with Jones, Li & Owen (2003) findings in Chinese in-land and coastal areas. Particularly, the policies adopted by Chinese authorities have benefited certain coastal cities which offer better conditions to attract FDI; consequently, these cities have guaranteed higher levels of growth and development which result in larger income discrepancies between Chinese in-land and coastal cities.

In Mozambique, the Northern and Southern regions are also significantly unequal. Globalization has had a positive social impact, which is shown in the Northern region where in the past years the levels of inequality have decreased due to an export-oriented trade on cash cropping. On the other hand, the South has focused on the domestic trade through the harvesting of vegetables; thus, inequality has risen considerably (Silva, 2007).

The results presented above, from different groups of countries and regions, from various levels of development and from several concepts of globalization, are contradictory or unsatisfactory; therefore, there are plenty of incentives to do more research in this area.
4 – Methodology and Data

4.1 – Methodology

The dataset of this thesis is a panel data which combines a time series with each cross-sectional (states). As follows, multiple observations improve the efficiency of the estimators due to the increase of degrees of freedom. This data structure is often employed for the reason that it may be very useful determining the effects of a policy or a certain event on the outcomes of a region (Koop, 2008).

In the following model:

\[ y_t = \beta_0 + \beta x_t + c + u_t, \]

\( y_t \) is the dependent variable, \( x_t \equiv (x_{1t}, x_{2t}, ..., x_{kt}) \) are the independent variables, \( c \) is the unobservable random variable, \( \beta_0 \) and the 1xK vector \( \beta \) are the parameters and \( u_t \) is the error term. The pooled OLS model may be used when the assumption \( E(x_t'c) = 0 \) is considered. On the other hand, when the independent variables and \( c \) are correlated (\( E(x_t'c) \neq 0 \)), the pooled OLS model is inappropriate since the estimators are biased and inconsistent.

Furthermore, for a robust estimation it is essential to consider the composition of the error term which is \( E(x_t'u_t) = 0 \). In addition, to have a valid model the assumptions of homoskedasticity and no serial correlation of the error term must be satisfied. If autocorrelation or heteroskedasticity are observed the robust standard errors must be estimated to have valid standard errors and test statistics. As a final point, the assumption of no perfect collinearity among the independent variables must be also fulfilled.

Nevertheless, even if \( E(x_t'c) = 0 \), another problem might occur. When \( c \) is considered part of the composite error, problems of serial correlation might emerge, leading to incorrect computations of standard errors (Wooldridge, 2002).

Thus, to overcome this limitation, the individual effects models (fixed effects and random effects models) are commonly used in the presence of panel data. These models recognize the different patterns that the data might exhibit; namely, it defines an unobserved effect (\( c_t \)) which is a random variable (not another estimator in the
regression) that influences the dependent variable. Therefore, the model is computed accurately by the regression below:

\[ y_{it} = \beta_0 + \beta x_{it} + c_i + u_{it}, \quad t = 1, 2, ..., T \]

\( x_{it} \) is 1xK independent variables which vary across i and/or t, \( c_i \) is the individual effect (which may be a fixed or a random effect) and \( u_{it} \) is the idiosyncratic error term which varies over time and sections (Wooldridge, 2002).

For a deeper understanding, the two models are described in the following sections.

### 4.1.1 – Fixed effects model

Within the fixed effects model there are two methods to estimate the unobserved effect: the fixed effects and the first differencing. If N is large and T is small, which is the case of this thesis: \( N = 27 \) and \( T = 3 \), the choice of the method depends on the serial correlation of the idiosyncratic error.

Under a serial uncorrelated \( u_{it} \), the fixed effects method, also known as the dummy variable regression or the least-squares dummy variables (LSDV), is the most efficient method. As the idiosyncratic error term is commonly serially uncorrelated, this model is used more frequently than the first differencing.

This method ponders that all the different sections and years are associated with a dummy variables by the model below:

\[ y_{it} = \theta_1 + \theta_2 d2_t + \cdots + \theta_T dT_t + z_i y_1 + d2 z_i y_2 + \cdots + dT_i z_i y_T + w_{it} \delta + c_i + u_{it} \]

\( d2, \ldots, dT \) are the year dummy variables, \( z_i \) is the vector of the independent variables which are constant over time (for instance gender, education, race, etc.) and \( w_{it} \) is the vector of explanatory variables which vary over time.

On the other hand, when \( u_{it} \) has a considerable positive serial correlation (follows a random walk), the most efficient method is the first differencing due to the fact that the difference \( \Delta u_{it} \) is serially uncorrelated (Wooldridge, 2008).
One of the main disadvantages of fixed effects model is the fact that the estimators of time-constant variables cannot be computed since \( \theta_1 + z_i y_1 \) may not be differentiated from \( c_i \) (Wooldridge, 2002).

### 4.1.2 – Random Effects model

The main difference between the previous model and this model is the fact that, in the random effects model there is strict exogeneity between the individual effect and the explanatory variables (\( E(c_i | x_i) = E(c_i) = 0 \)). In other words, the unobserved effect and the independent variables are uncorrelated. It is a strong assumption, and when it is not fulfilled the estimators computed may be biased and inconsistent.

The model may be represented by the subsequent regression for all time periods \( T \):

\[
y_i = X_i \beta + v_i \quad \text{where} \quad v_i = c_i j_T + u_i \quad \text{and} \quad E(v_i | x_i) = 0
\]

\( j_T \) is the vector for the different years (T).

Furthermore, when the idiosyncratic errors have a constant variance and are not serially correlated \( (\text{cov}(u_i, u_{is}) = 0; i \neq j) \), the OLS estimators are still unbiased; however, they are not the best linear unbiased estimators (BLUE), since the OLS present a larger variance than the generalize least squares (GLS) or Feasible GLS (FGLS) estimators. Considering this, when applying the random effects model, the GLS or FGLS estimators must be applied, depending on whether the variance structure is known or not, respectively.

Since the variance is often unknown, the FGLS are used more frequently rather than GLS estimators (Wooldridge, 2002).

### 4.1.3 – Breusch-Pagan test

The inference test Breusch-Pagan follows the Lagrange Multiplier (LM) principle and it is the first test to be described in this section.

The utility of this test is to define whether the pooled OLS model is adequate, or whether the random effect model is necessary to compute the estimators, detecting any linear form of heteroskedasticity.

\[
H_0: \text{Var}(u_t) = \sigma_t^2 = h(z_i^t \alpha)
\]
\( h(\cdot) \) is a function of \( z^*_t \), whose first element is unity, and \( \alpha \), which is a 1 x p vector of estimators. These estimators are not associated to the \( \beta \) parameters. Thus, the null hypothesis may be expressed by the following formula:

\[
H_0: \alpha_2 = \cdots = \alpha_p = 0
\]

Where \( z_t \alpha = \alpha_1 \), thus \( \sigma^2_t = h(\alpha) = \sigma^2 \) is constant (Breusch & Pagan, 1979).

When the p-value is below a certain level of significance the null hypothesis of homoskedasticity is rejected, in favor to heteroskedasticity (the individual effects are different). In this case, the random effects model is preferred to the pooled OLS. On the other hand, when the p-value is higher than the level of significance stated, the null hypothesis is accepted and the pooled OLS model may compute unbiased and consistent estimators (Wooldridge, 2002).

### 4.1.4 – Hausman test

The decision of choosing the fixed effects or random effects model is through the Hausman test. Since the two models differ form each other by whether or not \( c_i \) is correlated with \( x_t \), this approach tests the significance of the correlation between the unobserved factor and the regressors. The null hypothesis states that there is no correlation between \( c_i \) and \( x_t \).

Hence, in the case that the null hypothesis is rejected, the random effects estimators will be inconsistent, thus the fixed effects will be preferred. On the other hand, if there is no rejection of \( H_0 \), it will be indifferent to choose the random or the fixed effects estimators.

The random effect model presents more advantages when compared with the fixed effects model, such as the fact that time-constant variables may be computed and the parameters calculated are less, since the number of dummy variables can be reduced. Therefore, once the null hypothesis is not rejected, it will be preferred to choose the random effects model (Wooldridge, 2002).

### 4.2 – Data Description

This thesis wants to explore the relationship between globalization and income inequality in the 27 Brazilian states. To compute the econometric model, a balanced panel data set takes into account three years and the 27 states.
The dependent variable of this model is the Gini coefficient which measures income inequality within each state. The coefficient can be computed through the Lorenz curve, which is drawn by the placement of each household in quintiles depending on their incomes. This diagram shows how far the state’s distribution of income is from the egalitarian line.

The coefficient can vary from 0 (perfect equality, everyone has the same income) and 1 (perfect inequality, one person has the whole income); hence, if the level of income inequality increases, the value of the coefficient is higher (Ulubaşoglu, 2004).

The years in the analysis are 1997, 2002 and 2007 and the values vary between 0.632762 in 1997 in Paraiba and 0.443103 in Roraima in 1997.

These values were collected from the Institute for Applied Economic Research (Ipea) through the surveys reported by Pesquisa Nacional por Amostra de Domicílios (Pnad/IBGE).

Ipea is a federal public foundation, which gathers data from several economic, social, and political fields in a regional and macro scale. It is associated with the Strategic Affairs Secretariat of the Presidency; therefore, it supports the government, planning the public policies and development programs.

Whereas Pnad is a national household sample survey associated with the Brazilian Institute of Geography and Statistics (IBGE), which reports annually data regarding the Brazilian welfare. The sample of this survey is approximately one thousand Brazilian households, and the main areas of interest are population, migration, education, labor, income and fertility.

Moreover, the definition of economic globalization is computed by FDI inflows and openness to trade, which are the main variables to observe the progression of this phenomenon (Tisdell & Svizzero, 2004). To measure these two components, researchers encounter a major problem which is the data availability. In order to overcome this obstacle, they compute trade openness indirectly, through the quantification of the trade volume (e.g. the subtraction between exports and imports divided by the total GDP: \([\text{EXP-IMP}] / \text{GDP}\)).

On the other hand, FDI calculates the intensity of multinational corporations’ activity in a certain region. There are two main limitations for this dataset: (1) the data is susceptible to subsidiaries in other states/regions from the same firm; hence, the value
may not demonstrate the real FDI oscillation of the region into the analysis; and (2) the wages and characteristics of a certain region may be unavailable for MNCs; therefore, the selection of a new location or expansion might be negatively or positively influenced (Goldberg & Pavcnik, 2007).

In the model these variables were lagged 2 years to avoid endogeneity and reverse causality (Adams, 2008). Thus, the data from 1995, 2000 and 2005 of FDI inflows was found in the census of foreign capitals on the Brazilian Central Bank website, and the values fluctuate from US$ 87,569,350 thousands in 2005 in São Paulo and US$ 303 thousands in Tocatins in 1995. It is possible to observe that there is a data limitation to analyze this variable, due to the lack of statistical information covering a reasonable historical period.

To introduce FDI in the regression, the absolute values where divided by the total GDP of each state (FDI/GDP), thus the relative values can be analyzed.

The data of the integration in the world economy was obtained in the Brazilian ministry of development, industry and foreign trade and it ranges from 14,89% in Para in 2005 and -18,55% in Amazonas in 1995.

The econometric model incorporates some other control variables, which were also lagged two years, in order to describe more significantly the oscillations of income inequality.

The first control variable is the average years of schooling per state which intends to measure the endowments of human capital. According to Velez, Barros & Ferreira (2004), one of the main factors to explain income inequality in Brazil is the less equitable distribution of education. Brazil has an immense skill gap in the labor force, when compared to developed countries or even some Latin American countries such as Mexico and Colombia. The existence of this gap is due to the reduced access to education, especially in peripheral regions. Ipea has published the average years of schooling, which oscillate between 3,21 years in Maranhão in 1995 and 8,97 years in Distrito Federal in 2005. Maranhão is one of the poorest states in Brazil presenting low values of GDP per capita. On the other hand, Distrito Federal had the highest level of GDP per capita in 2005. Thus, this data demonstrates that poorer states have a low amount of educational opportunities for underprivileged children.
The next explanatory variable is the government ideology. It is a dummy variable which considers 1 if the government is left-wing or 0 if it is right-wing. The government ideology is introduced in the model since it may influence income inequality by the fact that:

- The amount of redistributive policies employed to reduce inequality might vary depending on the supporters’ ideology
- Or in the case that the median voter requires more redistributive policies (Bjørnskov, 2008).

According to Cornia (2011), democratization and election of governments with left-of-center ideology (which emphasize distributive policies and social concerns) are one of the main factors to describe the observed reduction of income inequality in Latin America since 2002.

In Brazil the main right-wing politic parties are: PFL (Partido da Frente Liberal) or Democratas, PP (Partido Progressista), PPB (Partido Progressista Brasileiro) or PPR (Partido Progressista Reformador), PSL (Partido Social Liberal) and PTB (Partido Trabalhista Brasileiro). On the left-wing the main parties are: PDT (Partido Democrático Trabalhista), PMDB (Partido do Movimento Democrático Brasileiro), PPS (Partido Popular Socialista), PSB (Partido Socialista Brasileiro), PSDB (Partido da Social Democracia Brasileira) and PT (Partido dos Trabalhadores).

Gross Domestic Product (GDP) per capita was also introduced in the model, in order to identify whether the macroeconomic performance affects inequality. The value is referred to US dollars and it was divided by US$ 1000 to facilitate the interpretation of the estimators.

The majority of politicians are interested in improving the economic performance and decreasing the levels of income inequality. However, in most of the cases these two ideals are difficult to fulfill.

Many authors have tried to formulate hypothesis in order to comprehend the relationship between economic growth and income inequality. One of the most famous studies was completed by Kuznets (1955), who found an inverted-U relationship between these two variables. This hypothesis means that low levels of income per capita in a certain country are associated with low levels of income inequality. As countries start to develop and increase their national income, inequality increases until the turning
point, where income increases and income inequality decreases. Therefore, countries in the process of expansion tend to have higher levels of income inequality. Although the Kuznets curve was tested in the model of this thesis, the results were not significant and influenced the significance of other control variables. Therefore, the squared GDP per capita was removed from the model.

Finally, the last variable is population which is the number of residents per state in 1995, 2000 and 2005 divided by 1.000.000 inhabitants. Nielsen & Alderson (1995) suggested that population growth might increase income inequality since low-income households are worse off. This happens due to the fact that the supply of labor changes considerably. Firstly, there is a higher supply of active young individuals who are in the bottom of the hierarchy and earn significantly less than experienced workers. Additionally, the wages of unskilled workers decline because there is a larger supply of young workers who did not completed their education.

In order to have a numerical overview of the Brazilian records, the following table presents the descriptive statistics of each variable in the model.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini</td>
<td>0,565</td>
<td>0,0395</td>
<td>0,443</td>
<td>0,633</td>
<td>81</td>
</tr>
<tr>
<td>Trade</td>
<td>0,0095</td>
<td>0,042</td>
<td>-0,177</td>
<td>0,142</td>
<td>81</td>
</tr>
<tr>
<td>FDI</td>
<td>0,024</td>
<td>0,037</td>
<td>0,0001</td>
<td>0,233</td>
<td>80</td>
</tr>
<tr>
<td>School</td>
<td>5,548</td>
<td>1,191</td>
<td>3,212</td>
<td>8,965</td>
<td>81</td>
</tr>
<tr>
<td>GDPpc</td>
<td>6,677</td>
<td>4,089</td>
<td>1,814</td>
<td>27,359</td>
<td>81</td>
</tr>
<tr>
<td>Population</td>
<td>6,248</td>
<td>7,525</td>
<td>0,262</td>
<td>40,443</td>
<td>81</td>
</tr>
</tbody>
</table>
5 – Econometric analysis

In this section the results from the econometric analysis are presented in detail. In the first part, the correlation between the main variables which define economic globalization and the dependent variable (the Gini coefficient) are analyzed to have an overview of the possible final results. Then, the main regression is computed and the estimators of the three models (pooled OLS, fixed effects and random effects) are revealed, analyzed and tested.

Moreover, the Jackknife test is formulated to identify whether there are outliers within the dataset. Finally, for a deeper analysis, the data is divided between Northern and Southern states and between Coastal and In-land states in order to observe the potential differences among regions.

5.1 – Globalization and Inequality

To begin with, it is important to have a general overview of the relationship between Gini coefficient and one of the variables to measure globalization: trade openness ratio or FDI inflows. The scatter below shows that the link of trade openness in 1995 and the Gini coefficient in 1997 (holding all the other estimators constant) was basically inexistent.

Figure 5 – Gini coefficient and Trade Openness
Clearly, it is possible to identify two outliers which are Amazonas and Roraima. In Amazonas the most exported commodity are technical devices for mobile phones and its main export partners are Mercosul countries. However, the state is still high dependent on industrialized products, coming from China, Japan and South Korea, which are essential in the production of the main manufactured goods that Amazonas exports.

On the other hand, Roraima reveals a low value of the Gini coefficient which might have been computed erroneously.

The following scatters present the same relationship but now it is ten years after and also for FDI inflows. It is apparent that states with lower levels of income inequality, such as Mato Grosso and Pará, may be influenced by their higher trade ratio. On the other hand, Paraíba and Piauí with high levels of income inequality may be influenced by lower trade ratios.

The correlation is evidently negative, which gives the first insight about how globalization may affect income inequality.

Figure 6 – Gini coefficient and Trade Openness
The previous analyzes are simple correlations that must be explored in depth through the econometric model below:

$$Gini_{it} = \beta_0 + \beta_1 Trade_{it} + \beta_2 FDI_{it} + control\ variables_{it} + u_{it}$$

The control variables added in the model have the purpose of ensuring significance to the overall regression. That is, by including them, the model becomes more accurate since they strongly influence the dependent variable.

To observe the relationship between every variable in the model and taking into consideration every year, a correlation matrix is computed below in order to exhibit the correlation coefficients for each combination of pairs of variables:

Table 3 – Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Gini</th>
<th>Trade</th>
<th>FDI</th>
<th>School</th>
<th>GDPpc</th>
<th>Population</th>
<th>Politics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td>-0.26</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDI</td>
<td>-0.3</td>
<td>-0.02</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>-0.53</td>
<td>-0.08</td>
<td>0.41</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDPpc</td>
<td>-0.28</td>
<td>-0.1</td>
<td>0.38</td>
<td>0.83</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>-0.25</td>
<td>0.05</td>
<td>0.67</td>
<td>0.22</td>
<td>0.35</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Politics</td>
<td>0.06</td>
<td>0.21</td>
<td>0.05</td>
<td>0.19</td>
<td>0.22</td>
<td>0.12</td>
<td>1</td>
</tr>
</tbody>
</table>
Undoubtedly, the correlation matrix shows that the variables are not highly correlated among them. This is a positive indication, since it appears that the model does not have autocorrelation problems. Therefore, the estimators are less likely to be biased once the regression is computed.

The econometric model defined includes the variables above mentioned in the correlation matrix, plus year dummy variables for 2000 and 2005 and it is represented by this equation:

\[
Gini_{it} = \beta_0 + \beta_1 Trade_{it} + \beta_2 FDI_{it} + \beta_3 School_{it} + \beta_4 GDPpc_{it} + \beta_5 Population_{it} + \beta_6 Politics_{it} + \beta_7 yr2000 + \beta_8 yr2005 + u_{it}
\]

This regression is based on panel data; therefore, as mentioned in the methodology section, the three models – Pooled OLS, Fixed Effects and Random Effects – are computed in order to estimate the parameters of the model. Furthermore, the Breusch-Pagan LM test and the Hausman test are calculated with the purpose of defining the most suitable model for this dataset and the coefficient of determination \(R^2\) is presented to observe the goodness-of-fit of the model.
Table 4 – Results from the econometric model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade</td>
<td>-0.233***</td>
<td>-0.317*</td>
<td>-0.249***</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.147)</td>
<td>(0.085)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.126*</td>
<td>0.13*</td>
<td>0.136**</td>
</tr>
<tr>
<td></td>
<td>(0.076)</td>
<td>(0.102)</td>
<td>(0.066)</td>
</tr>
<tr>
<td>School</td>
<td>-0.029***</td>
<td>-0.017**</td>
<td>-0.022***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.008)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>GDPpc</td>
<td>0.005**</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Population</td>
<td>-0.002***</td>
<td>0.001</td>
<td>-0.001**</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Politics</td>
<td>0.02***</td>
<td>0.02**</td>
<td>0.019**</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Year 2000</td>
<td>0.002</td>
<td>-0.006</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.007)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Year 2005</td>
<td>-0.015</td>
<td>-0.026***</td>
<td>-0.019***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.011)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.694***</td>
<td>0.631***</td>
<td>0.671***</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.044)</td>
<td>(0.024)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observations</th>
<th>80</th>
<th>80</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>R²</td>
<td>0.555</td>
<td>0.73</td>
<td>0.724</td>
</tr>
</tbody>
</table>

| Breusch-Pagan LM | \( \chi^2 (1) = 31.46 \) |
| Hausman          | \( \chi^2 (8) = 2.19 \) |

Notes: Heteroskedasticity-corrected standard errors in parentheses for Pooled OLS model and robust standard errors in parentheses for Fixed and Random effects models; *** indicates significance at p<0.01; ** p<0.05; * p<0.1.

After running the regression in Stata 10.0 the estimators and their significances where calculated as it is shown in table 4. Firsty, the results show that openness to trade influences negatively income inequality and it is significant. Therefore, it can be stated that an increase of trade of ten percentage points, decreases the Gini coefficient by 2.33 points; 3.17 or 2.49, holding all the other variables constant, according to the Pooled OLS, Fixed effects or Random effects models respectively.

Regarding FDI, it has a positive association with the Gini coefficient; whether FDI increases ten percentage points, the Gini coefficient augments by 1.26; 1.3 or 1.36 percentage points respectively. Every estimator is significant at least at p-value less than 10%. For trade the p-values are 0% (t = -4.07), 7.1% (t = -1.85) and 0.3% (t = -2.94) and for FDI they are 9.5% (t = 1.67), 9.2% (t = 1.72) and 3.8% (t = 2.08) respectively.
In reference to the control variables in the model, years of schooling is negatively correlated with the Gini coefficient, which means that inequality decreases whether the level of education improves in Brazil. In numbers, an increase of one year of the average years of schooling decreases the Gini coefficient by 2.9, 1.7 and 2.2 percentage points respectively. It is in line with what was described in the literature, and it occurs due to the fact that if years of schooling increase, the number of skilled workers in the economy increases relatively to unskilled workers. As skilled workers earn higher salaries, income disparities diminish since the number of poorer people (unskilled workers) is reduced.

The estimators of population and GDP per capita have a small effect on the Gini coefficient; however, they are considered within this regression since they are important to give significance to the overall model. Moreover, the estimator of GDP per capita is 0.005 and it is significant at 5% for the pooled OLS model. Hence, the compensating income variation may be computed in order to understand how changes of independent variables may cost as a fraction of the GDP per capita when the level of income inequality is desired to be the same.

In the case that there is the intention of doubling the average trade ratio, the amount of dollars as a fraction of the GDP per capita necessary to keep the same income inequality is US$ -885.4. This means that the compensating income variation is -0.8854 \(^1\) and in order to have the same Gini coefficient, the income of each individual should be reduced by that amount. The same logic may be applied to the other independent variables in the model.

Politics is a dummy variable which accounts the evolution of inequality depending on the political idealism within the state. The possible values are 1, when the government is left-wing and 0, when it is right-wing. The results are significant and similar in the three models. The estimators predict that whether the government follows a left idealism (politics = 1), the Gini coefficient is 2 percentage points larger than when it is a right-wing government. Therefore, it is demonstrated that governments, which theoretically apply more distributive policies in order to achieve a more egalitarian

\[^1\text{Average trade ratio} = 0.0095 \quad \text{Double trade ratio} = 0.019\]
\[DZ = \frac{-0.233}{0.005} \times 0.019 = -0.8854 \quad -0.8854 \times \text{US$} 1000 = \text{US$} 885.4\]
society, are in practice harming the level of inequality in Brazil. This contradicts the findings from Cornia (2011), mentioned in section 2.2.1, which explained the reduction of income inequality through the distributive policies applied by left-of-center regimes.

The dummy variables for years are defined as year2000 and year2005 and the base year is 1995. Therefore, to observe the level of the Gini coefficient in 1995, the year dummy variables equal zero; in 2000 year2005 = 0 and year2000 = 1 and in 2005: year2005 = 1 and year2000 = 0. The estimators for year2005 are lower when comparing to year2000, showing that the level of income inequality in Brazil has decreased in the past decade. Regarding the significance of these two variables, it is possible to observe that year2005 gains significance since in 2005 there is a larger difference to the base year.

The coefficient of determination, $R^2$, is also presented in the table for each model and it is a criterion to measure the goodness-of-fit. The $R^2$ values do not differ significantly between fixed and random effects model and they are rather high ($=0.724$ for random effects and 0.73 for fixed effects) giving an optimistic indication of how good the variables presented, explain well the variations of the Gini coefficient in Brazil. More specifically, in the random effect model, the value 0.724 means that 72.4% of the Gini coefficient variations are explained by this model. However, it must be noticed that $R^2$ cannot be the only method to measure the goodness-of-fit, since it is sensitive to the amount of variables included in the model. Meaning that, as the number of variables in the model increases, $R^2$ is artificially higher.

Finally, the Breusch-Pagan LM and Hausman tests were computed to decide which model fits better with this dataset. The Breusch-Pagan LM tests homoskedasticity in the model which facilitates the choice of pooled OLS estimators or the random effects estimators. The test statistic was computed and the chi-squared value is 31.46 with a p-value of 0.00. In view of that, the result is evidently straightforward, since with a significance level of 1%, the null hypothesis is rejected. In other words, homoskedasticity is rejected in favor of heteroskedasticity; thus, the random effects model is preferred rather than the pooled OLS.

Furthermore, the decision between fixed effects or random effects model is conducted through the Hausman test, which presents a chi-square of 2.19 with a corresponding p-
value of 0.975. The null hypothesis, which states that there is no correlation between $c_i$ and $x_i$ (the estimators from both models have similar and consistent values), is clearly not rejected since the p-value is close to 1. Therefore, the random effects model is preferred, and it will be applied in the following analysis. The reason is the fact that in the random effects model the estimators present higher levels of significance, and besides that, the model presents more benefits when compared to the fixed effects model as mentioned in the methodology section.

5.1.1 – Jackknife technique
The Jackknife technique is a simple method to identify certain segments of the dataset, which might influence the statistical measures within the model. The technique is based in the detection of outliers and bias, by analyzing the significance of the parameters in the regression after eliminating one state each time.

The steps of this technique are the following: (1) compute regression without one state from the dataset each time. For instance, the first regression does not include the state Acre; therefore, it is possible to identify whether this state is a potential outlier. (2) Indentify the lower and the upper bound of the estimators from the main variables, which are being analyzed. In the case of openness to trade, the model without the state Mato Grosso presented the lowest possible change of the Gini coefficient, and without Amazonas the highest; finally, (3) the significance of parameters is observed to capture possible outliers.

Table 5 – Jackknife technique

<table>
<thead>
<tr>
<th></th>
<th>Lower bound</th>
<th>Upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade</td>
<td>-0.185**</td>
<td>-0.306**</td>
</tr>
<tr>
<td></td>
<td>(0.088)</td>
<td>(0.123)</td>
</tr>
<tr>
<td>Mato Grosso</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazonas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDI</td>
<td>0.096</td>
<td>0.176**</td>
</tr>
<tr>
<td></td>
<td>(0.072)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>São Paulo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distrito Federal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Robust standard errors in parentheses; *** indicates significance at $p<0.01$; ** $p<0.05$; * $p<0.1$. 

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The parameter of trade openness is significant at 5% for the upper bound and the lower bound; FDI is not significant for the lower bound and significant at 5% for the upper bound. Moreover, the ratio between upper and lower bound is just 1.65. Therefore, it may be stated that the trade estimator does not present bias since there are no outliers indentified.

5.1.2 – Divided Data – North and South
The economic growth in Brazil is characterized by its disorganization and concentration in certain regions, which increased the development discrepancies within the country. This process was mainly in Southern and Southern East states, specially in São Paulo state, where the basic infrastructures, education, health system, etc. developed more rapidly and efficiently. This legacy has its origins in the production of coffee, which was particularly intense in the South. In this region the railway network, ports and roadway plan expanded, enabling higher export volume of coffee, and consequently, privileged the growth of this region.
Presently, the decentralization of the economic activity is a reality. This has been driven by the government, through the exploitation of vacant places, where the natural resources may be used more efficiently and the establishment of large projects (such as the construction of basic infrastructures and mineral extraction) may boost the development of peripheral regions.
The following figure illustrates the Human Development Index (HDI) in 2000 computed by Ipea which considers three proxies – life expectancy, education and income.
The map has the purpose of showing regional discrepancies in Brazil. After an elementary analysis, it is clear that the South presents a higher human development when compared with the North. Therefore, a line was drawn in order to divide the data, and observe the differences of the previous model in the two regions. According to Çelik & Basdas (2010), the relationship between globalization and inequality may vary depending on the level of development of the regions. The authors separated developed, developing and miracle countries to observe the different effects over time. They found out that FDI inflows are beneficial to reduce the level of income inequality in developed and developing countries; however, the opposite effect was observed in miracle countries. Moreover, the openness to trade has a positive relationship with the Gini coefficient in developed and developing countries, whereas in miracle countries this relationship is negative; thus, freer trade in miracle countries reduces inequality. The most important conclusion of the paper is that: globalization may have different effects on income inequality, depending on economic and social infrastructures that a certain region presents.

The results for Northern and Southern regions in Brazil are shown in the following table:
The results demonstrate that in the South an increase of one percentage point of the trade ratio may have a more significant influence on the Gini coefficient when compared to the North. In numbers, in the North, an increase of ten percentage points of trade decreases the Gini coefficient by 2.53 percentage points; whereas in the South this decrease reaches 4.59 points.

In spite of both estimators are significant, it must be noticed that the size of the sample is rather small. Therefore, analysis and conclusions of the divided sample must be computed cautiously.

FDI in the South shows similar results when compared to the main model. If FDI inflows increase ten percentage points, the Gini coefficient augments 1.65 percentage points. On the other hand, in Northern states, FDI could reduce income inequality; however, the variable is not significant and this conclusion is not valid.

Moreover, it must be noticed that the dummy variable for 2005 demonstrates that inequality has been comprehensively reduced in recent years. This is a positive sign that shows an improvement in the Brazilian overall disparities. However, it must be
remarked that the reduction of the Gini coefficient is more pronounced in the South (-3 against -1.9 percentage points in the North), implying that the regional inequality is not decreasing.

In fact, it may be observed that regional inequality is decreasing more considerably in the South, suggesting that there is a divergence between these two regions. That is to state that, in spite of the general reduction of income inequality and apparent economic and social prosperity, Brazilian regions are diverging in terms of income disparities, since South is getting more rapidly equal than the North.

An additional analysis which took into consideration the interaction effect between trade and the dummy variable South (South = 1 and North = 0) was computed. The results achieved were not significant; therefore, no remarkable conclusion may be defined.

One of the reasons for the lack of significance is the fact that in the model the control variables are not constant over time and across states. Hence, the divided data was the approach chosen to observe the differences between North and South.

5.1.3 – Separated Data – Coastal and In-land regions

Hao & Wei (2010) demonstrated that globalization in coastal and in-land Chinese regions may affect differently income inequality. The authors provided several reasons for this phenomenon: (1) in-land regions are distant from essential infrastructures which boost international exchange, such as seaports, (2) in coastal areas there are more possibilities to access populations, firms, resources, etc.; thus, the share of knowledge is easier, education is more accessible, firms may bargain more efficiently, etc.

Following the same line, an analysis, which divides the Brazilian states between the ones which have access to the ocean, and the ones which do not have, was performed and the result are presented in the table below.
The results demonstrate that FDI in coastal regions is significant at 1%. The positive parameter indicates that the increase of ten percentage points of FDI, increases the Gini coefficient by 2,08 points; thus, more FDI inflows harm income equality in coastal regions. In in-land regions, the parameter is negative, which could be an indication that FDI is beneficial to reduce inequality in this region; however, this conclusion is not valid, since the estimator is not statistically significant.

Moreover, trade also varies between in-land and coastal regions. In the former region, freer trade decreases more significantly the level of inequality than in the latter region. In numbers, an increase of ten percentage points of the trade ratio reduces the Gini coefficient by 2,19 and 3,14 percentage points in coastal and in-land regions respectively.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade</td>
<td>-0.219**</td>
<td>-0.314**</td>
</tr>
<tr>
<td></td>
<td>(0.091)</td>
<td>(0.123)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.208***</td>
<td>-0.318</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>School</td>
<td>-0.02***</td>
<td>-0.016</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>GDPpc</td>
<td>-0.004</td>
<td>0.004***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Population</td>
<td>0.000</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Politics</td>
<td>0.023***</td>
<td>0.022**</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>Year 2000</td>
<td>-0.005</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Year 2005</td>
<td>-0.017**</td>
<td>-0.025*</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.681***</td>
<td>0.63***</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>Observations</td>
<td>51</td>
<td>29</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.763</td>
<td>0.707</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors in parentheses; *** indicates significance at $p<0.01$; ** $p<0.05$; * $p<0.1$. 
6 – Conclusion

In 1955 Kuznets published the first study about the relationship between economic development and the evolution of income inequality. The author demonstrated that a country’s income inequality increases as its economic performance improves. Subsequently, when the country attains a certain level of development, inequality starts to decline.

Since then, numerous studies have been performed with the purpose of comprehending whether inequality is affected by globalization, poverty, level of education, government ideology, etc. Nevertheless, researchers have not been able to reach a consensus on how globalization affects income inequality; therefore, it is apparent that income inequality fluctuations differ depending on regions, time periods, methods of computation, etc., considered in the research.

Moreover, globalization is a prominent topic nowadays which has increased its importance since nations are progressively more economic, financial, cultural and political inter-dependent. It is a subjective concept which includes several dimensions of the society; therefore, its quantitative computation is difficult to be completed due to the lack of data in certain regions.

In the first model defined in this thesis the results achieved reveal that economic globalization has affected significantly income inequality in Brazil. In particular, augmenting trade openness decreases significantly income inequality for further welfare. The Stolper-Samuelson theorem derived from the Heckscher-Ohlin framework is then verified by the empirical results in Brazil. Particularly, Brazil is a middle income country, where the abundant factor of production is labor – more specifically, unskilled labor; therefore, it specializes in the production and exportation of unskilled labor-intensive commodities, since it demonstrates a comparative advantage on this branch. Along these lines, freer trade generates a more equal society, since the demand of unskilled workers who are employed in the exporting sector increases, augmenting their salaries and reducing the overall level of income inequality in Brazil.

Moreover, Das (2005) and Silva (2007) also identified that a middle income country may benefit from openness to trade. Therefore, in accordance with the model defined by Galiani & Porto (2010), liberalization policies such as tariff reductions and strengthen
the bilateral or multilateral relationships should be encouraged in order to equalize the society and improve the Brazilian welfare.

Contradictorily with the results from the Brazilian analysis, Çelik & Basdas (2010), Carneiro & Arbache (2003), Savvides (1998) and Baddeley (2006) demonstrated that the increase of international trade has harmed income inequality in developing countries. It may be the case that trade liberalization improves the general economic level of developing countries; however, authors have argued that the group which benefits more from openness to trade is the one of skilled workers who earn higher wages, increasing the wage gap between skilled and unskilled workers.

Another feature that may explain the decrease of income inequality is the rise of outsourcing worldwide. As mentioned in section 3.4, outsourcing in unskilled-labor activities has increased in international markets. Therefore, the demand of unskilled workers has expanded and their wages as well (Yomogida & Zhaot, 2010). Consequently, the wage premium and income inequality have decreased in Brazil.

Regarding FDI, it is demonstrated a positive relationship with inequality and it is a significant variable in the model, meaning that more investment from foreign firms accentuates income inequality in Brazil. This finding goes in line with research made in developing countries, such as Benar (2007) who argues that one of the reasons for the increase of income inequality in North African countries is related to the augmenting of FDI. Correspondingly, Baddeley (2006) found out that globalization beneficiated rich countries and deteriorated the conditions in poorer countries; more specifically, in developing countries, the increase of FDI is associated with the enlargement of income inequality and economic divergence.

As stated in chapter 3, the reasons which may justify these findings are the fact that foreign firms in Brazil pay a higher wage premium, since they require a higher amount of skilled workers and more advanced technology. These firms need a larger number of skilled employees to keep their product differentiated and consequently compete in international markets. On the other hand, the technologic progress allows a higher efficiency and competitiveness which is essential for international firms to increase or maintain their profits. As a result, the demand of skilled workers increases in Brazil, as well as their wages, hence, wage differences between unskilled- and skilled-workers widens.
Moreover, due to the high fixed costs of R&D, the large amount of regulation regarding property rights and the high cost of patents, the potential knowledge and technical skills transfer from foreign firms to Brazilian firms is difficult. This feature hampers high rates of technologic progress in domestic firms, increasing the overall income inequality in Brazil (Ocampo & Martin, 2003).

Nevertheless, contradictory to the Brazilian results, the main findings of FDI in Mexico demonstrated different outcomes (Jensen & Rosas, 2007). The model showed that FDI may decrease the general income inequality in Mexican states due to the increasing returns to labor, when compared to returns to capital. This has been generated by new entrants from foreign countries which are capital intensive firms; thus, as capital is abundant its returns decrease. Additional factors are the higher demand and employment of unskilled workers, which consequently increase their wages; and the decreasing wage premium between owners of capital and owners of labor.

The next analysis took into consideration the regional disparities, which are noteworthy among the Brazilian states. The economic, social and educational development, measured by the HDI per state, has enormous discrepancies between the South and the North, wherein the South infrastructures, agriculture, industry, etc., are more developed than in the North.

Therefore, the two regions were divided in this model and it was demonstrated that an increase of international trade in Southern regions has a more pronounced effect on reducing inequality than in the North. Moreover, it is apparent the comprehensive reduction of income inequality in Brazil; however, the regional analysis must be computed carefully since the reality may indicate that some states are more equal and prosperous, opposing some other states which may have kept high levels of inequality and low economic development. Namely, the parameters computed showed that inequality may be reduced more significantly in Southern states, implying that the South has the prospect to reduce more considerably inequality than the North, increasing even more regional disparities.

FDI in the South shows similar results when compared to the main model. On the other hand, in the North the variable is not significant but it shows that an increase of FDI could reduce income inequality.
Although the dataset is reduced once the data is divided between coastal and in-land states, FDI inflows in coastal states have affected positively and significantly income inequality in this region. In other words, the increase of international capital flows has been harming the Brazilian welfare in this region. Moreover, enormous discrepancies of FDI inflows among states in Brazil were observed. São Paulo and Rio de Janeiro capture the highest FDI inflow rate in Brazil by far when comparing to other states. As cited in section 3.10, this occurs due to policies applied in these regions which favor their openness to international markets and improve their conditions to assimilate the investment from foreign firms. As a result, the growth rate of these regions is more expressive than in other smaller urban or rural areas, enhancing income disparities among Brazilian states (Jones, Li & Owen, et al, 2003).

In addition, international trade in in-land regions presented higher efficiency on reducing income inequality than in coastal areas. This is again in line with the Stolper-Samuelson theorem, since in-land states present lower levels of skilled labor. More specifically, under free trade, in-land states specialize in unskilled labor-intensive industries, boosting the demand of unskilled workers. As a result, their wages increase and income inequality decreases more significantly than in coastal states.

In spite of the positive evolution of welfare in Brazil due to the decrease of income inequality, the country still presents high levels of the Gini coefficient. In section 3.3 it is mentioned, in the model derived by Galiani & Porto (2010), that trade reforms (which could be the reduction of import tariffs in certain industries in Brazil) would reduce the wage gap between skilled- and unskilled-workers. Therefore, it is crucial to implement liberal trade policies and enhance regional and international cooperation with other countries in order to improve the Brazilian integration in international markets and consequently reduce the overall income inequality in Brazil.

Summing up, this thesis found out valuable evidence about how economic globalization affects income inequality in a country where income disparities are severe and affect other social and economic features. Expectantly, in a near future more data about FDI inflows may be available for every Brazilian state, which will allow an increase of the significance in the model and clearer conclusions. In addition, variables from the KOF index (section 3.1) which describe social globalization, such as the number of internet users, the number of McDonald’s restaurants, the percentage of foreign population, the
amount of international transfers, etc., may become accessible for each state, permitting the extension of the study by defining more meticulously the concept of globalization. On the other hand, the political proxy might be more difficult to define once the analysis is restricted to a single country. The three variables to describe political globalization in the KOF index (number of embassies, membership in international organizations and participation in UN Security Council missions) are country related. Therefore, it is not possible to define them at state or region level. For instance, in Brazil all the embassies are located in Brasília (the capital) and the membership with Mercosul is at national level (not state level). The limitations presented above might give a direction and motivation to future research, not only in Brazil, but also in other countries or regions with high levels of income inequality.
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