EFFECTS OF FISCAL INTERVENTIONS ON POVERTY AND INEQUALITY IN BRAZIL: A NATIONAL AND REGIONAL ANALYSIS, 2017-2018

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The CEQ logo is a stylized graphical representation of a Lorenz curve for a fairly unequal distribution of income (the bottom part of the C, below the diagonal) and a concentration curve for a very progressive transfer (the top part of the C).

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Victor Bridi[1], *Graciele Guedes*[1], *Claudiney Pereira*[2], *Fabio Waltenberg*[1]

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ABSTRACT

In Brazil has high rates of taxation and large social spending, which, combined, reduce inequality by up to 22 per cent and poverty by up to 65 per cent. Although these results are considerable achievements for a Latin American country, yet, by Western European standards, the effectiveness of its fiscal policies in reducing inequality and poverty is not impressive. We estimate the redistributive effect of fiscal policy on income distribution and poverty in Brazil at national and regional levels using household survey data (2017-2018) that contain detailed information about many labor and non-labor income sources, direct taxes paid, contributions to the pension system, transfers received, use of public education and health services, and consumption. Our results show that inequality in Brazil is still high compared to other countries in Latin America. At the national level, inequality and poverty reductions are low relative to Brazil's spending, similarly to the results found by Higgins and Pereira (2014). The effectiveness indicators for direct transfers and all transfers, respectively, are 0.48 and 0.40 in the scenario in which pensions are treated as market incomes and 0.24 and 0.32 in the scenario in which pensions are treated as government transfers. These indicate relatively low effectiveness of the transfer system. At the regional level, the fiscal system plays a significant role in reducing inequality in all five regions, but more so in the North and Northeast, the two most unequal ones. Poverty is significantly reduced in all five regions up to disposable income, but as in Higgins and Pereira (2014), we also found that indirect taxes paid by the poor often surpass the direct transfer and indirect subsidy they receive. A reform of the indirect tax system is a high priority.

JEL Codes: D31, H22, I32, R50

Keywords: fiscal policy, poverty, inequality, Brazil, regional.

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Effects of Fiscal Interventions on Poverty and Inequality in Brazil: a National and Regional Analysis, 2017-2018[*]

Victor Bridi,[1] Graciele Guedes,[1] Claudiney Pereira,[2] Fabio Waltenberg[1]

Abstract: Brazil has high rates of taxation and large social spending, which, combined, reduce inequality by up to 22 per cent and poverty by up to 65 per cent. Although these results are considerable achievements for a Latin American country, yet, by Western European standards, the effectiveness of its fiscal policies in reducing inequality and poverty is not impressive. We estimate the redistributive effect of fiscal policy on income distribution and poverty in Brazil at national and regional levels using household survey data (2017-2018) that contain detailed information about many labor and non-labor income sources, direct taxes paid, contributions to the pension system, transfers received, use of public education and health services, and consumption. Our results show that inequality in Brazil is still high compared to other countries in Latin America. At the national level, inequality and poverty reductions are low relative to Brazil's spending, similarly to the results found by Higgins and Pereira (2014). The effectiveness indicators for direct transfers and all transfers, respectively, are 0.48 and 0.40 in the scenario in which pensions are treated as market incomes and 0.24 and 0.32 in the scenario in which pensions are treated as government transfers. These indicate relatively low effectiveness of the transfer system. At the regional level, the fiscal system plays a significant role in reducing inequality in all five regions, but more so in the North and Northeast, the two most unequal ones. Poverty is significantly reduced in all five regions up to disposable income, but as in Higgins and Pereira (2014), we also found that indirect taxes paid by the poor often surpass the direct transfer and indirect subsidy they receive. A reform of the indirect tax system is a high priority.

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1. Introduction

Brazil is an upper-middle income country well-known for its high levels of inequality. With a peak of 0.63 in 1989, its Gini coefficient was higher than that of any other Latin-American country (Lustig 2020) and second only in the world to that of Sierra Leone (Ferreira, Leite, and Litchfield 2008). Following a trend that was observed throughout Latin America in the 21st century (Lustig, López-Calva, and Ortiz-Juárez 2013, Lustig 2020), inequality diminished steadily in Brazil, with the Gini coefficient descending to 0.58 in 2001 and to 0.52 in 2015.[3] The decline is due to various factors, including larger and more progressive public cash transfers (Barros et al. 2010, Silveira et al. 2011, Lustig 2020), a more equal distribution of educational attainment resulting from expanded access to education since the 1990s (Gasparini and Lustig 2011, Lustig 2010) and an increase in the real value of minimum wage (Brito, Foguel, and Kerstenetzky 2017, Lustig 2020, Bruno 2021).

Poverty has followed a similar trend, decreasing from 41.3 in 2001 to 17.7 in 2015 when measured as headcount at the $5.5 PPP per day poverty line, and from 11.6 in 2001 to 2.7 in 2015 as headcount at the $1.9 PPP per day threshold.[4] The effectiveness of Brazil's conditional cash transfer program, the Programa Bolsa Família (Bolsa Familia Program, PBF), at reducing poverty is well-known (Soares 2012), especially in rural areas (Higgins 2012). Economic growth accompanied by increased wage levels and a larger share of formal sector jobs were also important drivers of the reduction of poverty (Kerstenetzky 2012). Consistent rises of the real value of the minimum wage played a major role too, operating through at least three channels: (i) directly raising wages at the bottom of the wage distribution in the formal sector, (ii) indirectly putting upward pressures on wages in the informal sector, and (iii) directly raising the value of the lowest contributory and non-contributory social security benefits, which are indexed to the minimum wage in Brazil (Brito and Kerstenetzky 2019).

As compared to other countries in Latin America, Brazil has high rates of taxation and large social spending. Subnational governments play a particularly important role in the spending end, such that social spending by the federal government represents only around 3/5 of the total. In 2019, social spending by the federal government alone amounted to 17.6% of Brazil's GDP, a fraction which is similar to that of Uruguay and higher than other 20 Latin American countries (CEPAL 2021). Brazil has well-targeted antipoverty programs, albeit some of which with low per capita

[3] The World Bank: <http://data.worldbank.org/indicator/SI.POV.GINI>. Accessed on March 30th 2021.
[4] The World Bank: <http://data.worldbank.org/indicator/SI.POV.DDAY> and <http://data.worldbank.org/indicator/SI.POV.UMIC>, respectively. Accessed on March 30th 2021.

amounts. The country also provides universal and free-at-the-point-of-delivery in-kind services, such as primary and secondary education and health care, all of which are progressive in absolute terms. Programs such as unemployment compensation, special circumstances pensions,[5] or generous contributory social security cash benefits are progressive only in relative terms. The same holds for public tertiary education, although to a much lesser extent in recent years as compared to what it was in the turn of the century (Costa et al. 2021).

On the tax side, total fiscal revenues from the three levels of government have oscillated in the range 32-35% of GDP in recent years, a level which is comparable to that of OECD countries, but high for a developing country. The Brazilian tax system is complex, inefficient, and inequitable, relying too much on indirect taxes and too little on direct taxes, being especially lenient on capital, wealth and inheritance (Gobetti and Orair 2017). As a result, inequality and poverty reduction are not impressive, at least by Western European standards.

Overall, previous studies have reinforced the redistributive role of the tax and transfer system at the national level (Silveira and Ferreira 2011, Silveira et al. 2013, Higgins and Pereira 2014, Hoffmann and Vaz 2020, Silveira et al. 2020, Silveira et al. 2021, Bridi et al. 2021). However, while these investigations conducted at the national level are elucidative, they are not enough to depict the large disparities among regions. Brazil has a broad history of regional development initiatives, which have been materialized over the decades in a myriad policies and institutions - the Superintendence for the Development of the Northeast (SUDENE), created in 1959, for instance. This aspect was reinforced in the constitutional text of 1988, from which the reduction of regional inequalities became a fundamental objective of the Brazilian State. As Williamson (1965) points out, when compared with countries of similar GDP per capita, it can be concluded that Brazil showcased an outstanding concern with regional disparities in the first half of the last century.

Overall, over the last decades, an erratic trajectory for regional disparities can be noted. However, two clear patterns can be observed at the turn of the 20th century to the 21st century: the 1990s up to the 2000s are marked by an increase in inter-regional disparities, whereas in the 2000-2010 period the reduction of disparities between regions stands out (Monteiro Neto 2014). Indeed, at the end of the 2000s, a positive trajectory of regional deconcentration could be noted, combined with low unemployment rates in regional labor markets (Monteiro Neto 2014). This positive convergence was noticed even in the Northeast region. This region,

[5] We define special circumstances pensions as a row of insurance benefits paid by Brazilian social security, such as illness and accident aids, and maternity leave salary.

historically characterized by its low level of economic development compared to other regions, increased its share in the national product over the 2010 decade (Monteiro Neto 2014).

However, despite this upward trend, the strong discrepancy in terms of income inequality and poverty between the different regions of the country remains a solid feature. The evidence of a strong inequality between Brazil's regions was corroborated by a recent analysis carried out by IMF analysts (Gbohoui, Lam, and Lledo 2019). In a group of 20 countries, Brazil is the one with the greatest inequality levels between regions.

Supporting the abovementioned point, changes in the coverage and volume of national cash transfer programs have a different impact depending on the region under analysis. For example, in 2019, when there was a reduction in the number of beneficiaries of the Bolsa Familia program in the Northeast region of Brazil, it was observed a subsequent increase in the levels of poverty and income inequality, in a movement opposite to that observed in other regions of the country, as showcased by the results presented by Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics, IBGE). Thus, it seems appropriate to also assess on a regional level basis the effects of spending and tax policies.

We make two main contributions in this paper. Our first contribution is to estimate the redistributive effect of fiscal policy in Brazil using POF 2017-2018. We are able to estimate the effects of direct and indirect taxation, cash transfers, indirect subsidies, and in-kind benefits on income distribution and poverty. Most taxes and benefits are based on what individuals report they actually pay and receive, rather than on microsimulation models, or on taxes or programs official rules. This comprehensive incidence analysis has the advantage that it "keeps the use of secondary sources to a minimum" (Lustig 2018). Another advantage is that, by using a consistent methodology developed by the Commitment to Equity Institute (see Lustig, Pessino, and Scott 2014, Lustig 2018), the set of results is comparable to that of dozens of other countries, as well as to previous studies which focused on Brazil (e.g., Higgins and Pereira 2014). The second contribution is to analyze how these social policies and taxes affect poverty and inequality across Brazil and its five regions (Center-West, North, Northeast, South, and Southeast). To the best of our knowledge, this is the first attempt to perform such comprehensive regional analysis in Brazil.

Our results show that inequality in Brazil is still higher compared to other countries in Latin America. Similarly to the results found by Higgins and Pereira (2014), inequality and poverty reduction are low relative to Brazil's spending. Through all taxes and transfers (direct and

indirect taxes, direct and in-kind transfers, and indirect subsidies), Brazil reduces inequality by 22 percent in a scenario in which pensions are considered a transfer – Pensions as Government Transfer (PGT) and 17 per cent in a scenario in which contributory pensions are considered a deferred income – Pensions as Deferred Income (PDI). The effectiveness indicators for direct transfers and all transfers, respectively, are 0.48 and 0.40 in the PDI scenario and 0.24 and 0.32 in PGT scenario. These indicate relatively low effectiveness of the transfer system. At the regional level, fiscal policy reduces inequality in all five regions, but the highest decreases happened in the North and Northeast. Poverty is also reduced in all five regions. However, as Higgins and Pereira (2014), we also found cases in which the indirect taxes paid by the poor often surpass the direct transfer and indirect subsidy they receive.

This paper is organized as follows. The next section describes the social spending in Brazil. The third section turns to the country's tax system. The fourth section describes the data and the methodology. The fifth section summarizes the main results of our incidence analysis both at the national and regional level. Then, we present our conclusions.

2. Social spending in Brazil

Over the 2017-2018 period, social spending in Brazil represented 16.9% of its GDP (Table A1) when pensions are not counted. If pensions are included, social spending as a percentage of GDP amounts to 27.4%. It includes direct cash and food transfers, other social assistance programs, in-kind benefits (education and health care expenditures), and contributory pensions. Truly, the expenditure on pensions remains as the backbone of the Brazilian social protection system (10.5% of its GDP) – a Brazilian unique feature in Latin America and the Caribbean, where contributory pensions commanded only 3.1% of the GDP around the 2010s (The World Bank 2014).[6]

Within the category of cash transfers, the Bolsa Familia program (or PBF) remains the Brazilian flagship. However, as a conditional cash transfer program, and restricted to a fixed budget, its room for maneuver is limited. In December of 2018, the number of Bolsa Familia household beneficiaries was 14.1 million, and this program's total expenditure amounted to 29.4 billion reais (0.4% of Brazilian GDP). It is worth highlighting that throughout the period under investigation the PBF rationale and operation were at stake – if, so far, the political discourse

[6] Historically, Brazil was one of the first countries to create a social insurance system in the region. Also, it is in Brazil that social insurance covers one of the highest percentages of employees among the countries of the region (Mesa-Lago 2006, Bértola and Ocampo, 2015).

hinged on reaffirming the commitment of including a greater number of beneficiaries, since 2016, news about families that were cut off from the program were largely broadcasted. This trend gained ground in tandem with the adoption of more strict rules regarding conditionalities control. Despite these caveats, the program continued being an important national income transfer program. This assessment is validated by its impact on poverty and inequality measures, despite the low average value of the benefit (Higgins 2012, Barros et al. 2010, Soares, Ribas, and Osório 2010).

The PBF covers extremely poor and poor families, according to the PBF poverty lines, since there is no official poverty line in Brazil. Poor families are eligible for the benefit as long as there are children or adolescents under 18 or pregnant/nursing women in the household. Extremely poor families are eligible for the benefit regardless of having individuals in the household attending to these criteria. All beneficiary families must be enrolled in CadUnico, a national register of poor individuals eligible for the government's social programs.

Two are the kinds of benefits a family may be eligible for: the fixed benefit and the variable benefit. The variable benefit spams from 41 reais per child/adolescents 0-15, and pregnant woman or nursing woman (up to 205 reais per household per month) to 48 reais per adolescent 16-17 (up to two adolescents or 96 reais) for families with income below 178 reais per capita per month and at least one child/adolescent under 18. The fixed benefit amounts to 89 reais for extremely poor households.

The year 2013 brought a brand-new innovation to the Bolsa Familia program: recipient families who, after having received the benefit, did not reach a per capita income level enough to surpass the extreme poverty line, could receive an additional benefit, named *Benefício para superação da extrema pobreza* (Benefit aimed at overcoming extreme poverty). This benefit is limited to one by household, and the additional amount is calculated on a case by case basis, as it regards the difference between the extreme poverty line of 89 reais and the household monthly per capita income after having received all benefits, multiplied by the number of family members.

Beyond contributory pensions, there is also a non-contributory pension system, flagship of which is the BPC (*Benefício de Prestação Continuada*, or Continued Payment Benefits). The BPC is a benefit introduced in the group of Brazil's social rights by the Constitution of 1988, assigning to recipients a monthly income equivalent to a minimum wage. In 2018, the Brazilian minimum wage was equivalent to 954 reais. According to its legislation, the elderly over 65 years old, and the disabled in families whose household per capita income amounts to one-fourth of the

minimum wage (238.50 reais in 2018) are eligible for this benefit. Differently from the PBF and other government transfers, that are restricted to the budget, and, consequently, to the economic cycle, the BPC is a constitutional right, not inflicted by changes in political coalitions in power, for example. The only caveat is that disability is recurrently verified by medical staff to prove beneficiaries' incapacity to work. In 2018, the number of BPC beneficiaries was 4.7 million, according to official figures.

Following Higgins and Pereira (2014), we adopt the terminology "special circumstances pensions" for a category, which may be considered a hybrid between the two systems alluded to above, the contributory and non-contributory pensions. This definition relies on the fact that, despite being funded by the contributory pension system, their provision hinges on leaner criteria, as shorter durations of the contribution period. Furthermore, their goal boils down to smoothing the impact of shocks. Transfers considered within this group cover accidents at work, sickness, and maternity leave, to mention a few. Our results, following Lustig (2020) and others, will treat contributory pensions as deferred income (PDI) as well as a government transfer (PGT). In Higgins and Pereira (2014), pensions are not treated as part of social spending in the benchmark scenario and treated as a government transfer in the sensitivity analysis. In table 1, we keep same classification for comparison purposes.

As a common feature, access to the transfers previously described is conditioned on being poor or having participated in the labor market and contributed to social security. In this regard, unemployment insurance differs from the transfers previously explored. It refers to a transfer related to layoffs of the labor force, under some eligibility requirements. Among them, having worked continuously for twelve months or over if this is the first application, and nine or six months, in a second and third applications, respectively. In 2018, this policy commanded 0.5% of GDP, a fall of 0.1 percentage points in comparison with the 2009 period (see Table 1 in Higgins and Pereira 2014). Against the backdrop of economic recession and its echo on unemployment figures, this result may be underpinned by more strict rules to access the unemployment insurance that have gained ground since 2015.

Besides cash transfers, another component is related to food transfers, of which the *Programa de Aquisição de Alimentos* (PAA, Food Acquisition Program) is the main program. It was created in 2003 aiming at promoting access to food and encouraging family farming. To achieve these two goals, the government purchases food produced by family farmers and donates it to people in a situation of food and nutritional insecurity. Those served by the social assistance network, by the public food and nutritional security equipment, and by the (public and philanthropic)

education network, may also be beneficiaries. In one of its modalities (PAA *Leite*, or PAA Milk), the program donates milk to beneficiary families in the Northeast region and the North of Minas Gerais state. The eligible groups are families enrolled in CadÚnico and with pregnant or breast-feeding mothers, children from 2 to 7 years old, and elderly persons over 60 years old.

Turning to the subsidies, the *Tarifa Social de Energia Elétrica* (TSEE, Electricity Social Tariff) is the main national indirect subsidy. Low-income households are eligible for this subsidy as long as they attend one of the following criteria besides being enrolled in CadÚnico: being a beneficiary of one of the Brazilian social assistance programs (Bolsa Familia or BPC, for example), or belonging to one of the following groups: indigenous, *quilombolas*,[7] and disabled people whose treatment demands continued use of equipment or instruments which require electricity consumption. Also, beneficiaries' monthly electricity consumption in kWh must fall in one of the following three brackets: under 30 kWh, between 30 kWh and 100 kWh, and between 100 kWh and 220 kWh. For the first bracket, eligible families receive a 65% discount, for the second bracket, a 40% discount, and for the last bracket, a discount of 10%. Furthermore, the subsidy is applied in a stepwise fashion. For example, if a certain household consumes 70 kWh per month, over the first 30 kWh the discount will be 65%, and over the remaining 40 kWh, it will be 40%.

Regarding in-kind provision (health care and education), despite a great increase in private offer, especially since the 1990s, the public component is still prevailing. In 2018, figures showcase that 65.6% of students in early childhood education are enrolled in the public system. For the remaining educational levels, except the tertiary one, figures are even higher: 77.0% for the preschool level, 82.8% for the primary level, 87.9% for the secondary level, and 24.6% for the tertiary level. When it comes to health care, since the 1988 Constitution, health is provided free of charge through the *Sistema Único de Saúde* (SUS, Unified Health System). This is valid for all types of care, basic, in-patient, and preventive care. All Brazilian citizens and residents in the country have access to health facilities and care regardless of monetary income or other criteria.

3. The Brazilian tax system

The Brazilian tax system is recognized for its complexity, as it has about 90 taxes, fees and contributions (Portal Tributário 2020). Its structure is given by the National Tax Code, promulgated in 1966 and reaffirmed with few adjustments by the 1988 Constitution. The tax collecting responsibility is shared among all federal entities, with the federal government

[7] *Quilombolas* are Afro-Brazilian residents of *quilombo* settlements, first established by runaway slaves.

concentrating a large volume of tax revenues. The Union (i.e., the federal government), states and municipalities collected, respectively, 67.5%, 25.9% and 6.6% of the total revenue in 2018 (RFB 2018).[8]

Most of the Union's taxes are allocated between the Fiscal Budget and the Social Security Budget. In the first, taxes are used to finance public administration expenses, the main taxes being the Individual Income Tax (IRPF) and the Corporate Income Tax (IRPJ), the Tax on Industrialized Products (IPI), the Tax on Financial Transactions (IOF), Taxes on Foreign Trade (II/IE) and the Tax on Rural Property (ITR). The second budget includes social contributions, such as the social security contribution, a contribution to finance social services for workers (PIS/PASEP), a contribution on goods and services to finance social security (COFINS) and a contribution on net profit (CSLL), being used to finance social security, health care and social assistance. In addition, parafiscal revenues, such as a payroll tax collected from employers (FGTS), and other less important taxes are also collected and administered by the Union.

States are responsible for collecting the Tax on Trade of Goods and Services (ICMS), the Tax on Vehicles (IPVA) and the Tax on Inheritance and Donations (ITCD), in addition to other taxes and contributions social security borne by state civil servants. Municipalities collect the Real Estate Tax (IPTU), the Property Transfer Tax (ITBI), and the Tax on Services (ISS), as well as some taxes and social security contributions borne by municipal civil servants. The taxes mentioned here represent more than 90% of the Brazilian tax revenue. The data can be seen in Table A2.

In 2018, total tax revenue was 33.3% of GDP, being mainly composed of taxes on goods and services (44.8% of the total), suggesting regressiveness. Income-related tax revenue was only 21.6% of the total. For comparison, in 2017, the average tax revenue in the OECD was similar to Brazil's, at 34.5% of GDP (RFB 2018), but the composition is contrasting – while Brazil gives significant weight to the taxation of consumption, OECD countries favor the taxation of income: this category is responsible for about 33% of the revenue, while consumption taxes contribute to 32% of the total collected.

A series of distortions reinforces the regressive character of the Brazilian tax system. From the perspective of indirect taxation, there is a range of taxes on consumption belonging to different federal entities, triggering cascade effects. The tax that registers the highest total revenue is the

[8] However, there are constitutional and voluntary transfers between federal entities. For example, part of the federal taxes is passed on to states and municipalities. States also share a portion of their tax revenue with municipalities.

ICMS, responsible for about 21% of the collected volume. The tax is levied on trade of goods and certain types of services, such as transportation and communication, with rates that can reach up to 35%. The ISS, levied on the remaining services not covered by the ICMS, is relevant for municipal tax collection, and its rate varies between 2% and 5%. The share of this tax in the total revenue was 2.7%. The IPI is levied on industrialized products, such as vehicles, appliances and electronics, with rates varying between 0% and 30%, and representing 2.4% of the total revenue.

Income taxation is of exclusive competence of the federal government. Taxation of individuals is carried out through the IRPF, which, since 2009, has four rates (7.5%, 15%, 22.5% and 27.5%), in addition to a range of income exemption up to twice the minimum wage in 2018. However, a significant portion of the population is employed in informal jobs, implying a narrow taxable income base: in 2018, only 31 million Brazilians filled in tax reports (RFB 2019), an amount equivalent to 30% of the economically active population of the same period. Weak progressivity – beyond the foregone effects on reducing income inequality – also limits the potential for raising revenues, since the higher rate of the IRPF is low when compared to the average of OECD countries, and even to Latin American neighbors. It is worth noting that the highest rate is paid by Brazilians who earn about five minimum wages, a little less than $5,000 Brazilian reais in 2018. In addition, a series of exemptions on dividends and financial investments compromise the full progressiveness of the IRPF, since such kinds of income are typically earned by the richest strata of the population.

Property taxes are also underused in Brazil, foregoing an opportunity to expand both the volume of revenue and the global progressivity of the system. The ITR, under federal jurisdiction, contributes to only 0.06% of the total collected revenue. The rates vary between 0.03% and 20%, depending on the productivity of the rural area. Due to inspection difficulties, it is popularly known as the "tax of ten *reais*", the minimum legal value of ITR charged to rural properties. States are responsible for the collection of IPVA and ITCD. The former taxes motor vehicles, with rates between 1% and 4%; the latter charges inheritances and donations, with rates between 4% and 8%. The values are set by each State within these ranges[9]. These taxes raise respectively 1.9% and 0.3% of the total revenue. Finally, the IPTU is levied on urban property and collected by the municipalities. Its participation in the total revenue is 1.9%.

The taxation of profits is the responsibility of the federal government, being carried out through the IRPJ and CSLL. The former is levied at an average rate of 25%, while the latter is 9%, totaling

[9] When it comes to ITCD, since a decision of the Federal Supreme Court in 2013, states are also allowed to adopt progressive rates.

34%. However, there are a number of simplified tax regimes that aim to mitigate the costly corporate taxation. Two examples are *Simples Nacional* and *SIMEI*. *Simples Nacional* was implemented in 2006 with the aim of granting tax relief to micro and small businesses. *SIMEI*, on the other hand, is a tax collection system aimed at individual microentrepreneurs, defined as those who have annual gross revenue of up to 81,000 Brazilian *reais*.[10]

Social security is funded through social contributions, following a tripartite model, including employers, employees and the government (to fund eventual deficits). Employers pay a rate of 20% on the employee's gross salary; workers pay a rate between 7.5% and 14% of their salaries, depending on their income bracket.[11] In addition, employers are also urged to finance the FGTS (a severance pay) by depositing 8% of the worker's gross monthly salary in a savings account in their name. This savings can only be withdrawn by the worker in the face of labor contingencies (unemployment, retirement) or for acquiring real estate. In the event of "unjustified dismissal", employers pay an additional fine of 40% of the amount they deposited in the employee's FGTS account.

Finally, another relevant contribution is the PIS/PASEP, which are poured into the *Fundo de Amparo ao Trabalhador* (FAT, Workers' Support Fund). Its rates vary between 0.65% and 1.65%. FAT finances important social policies, such as unemployment compensation and the *abono salarial* (workfare-like program), in addition to economic development policies. COFINS, with rates varying between 3% and 7.6%, is used to finance social programs in general.

4. Methodology

4.1 Income stages

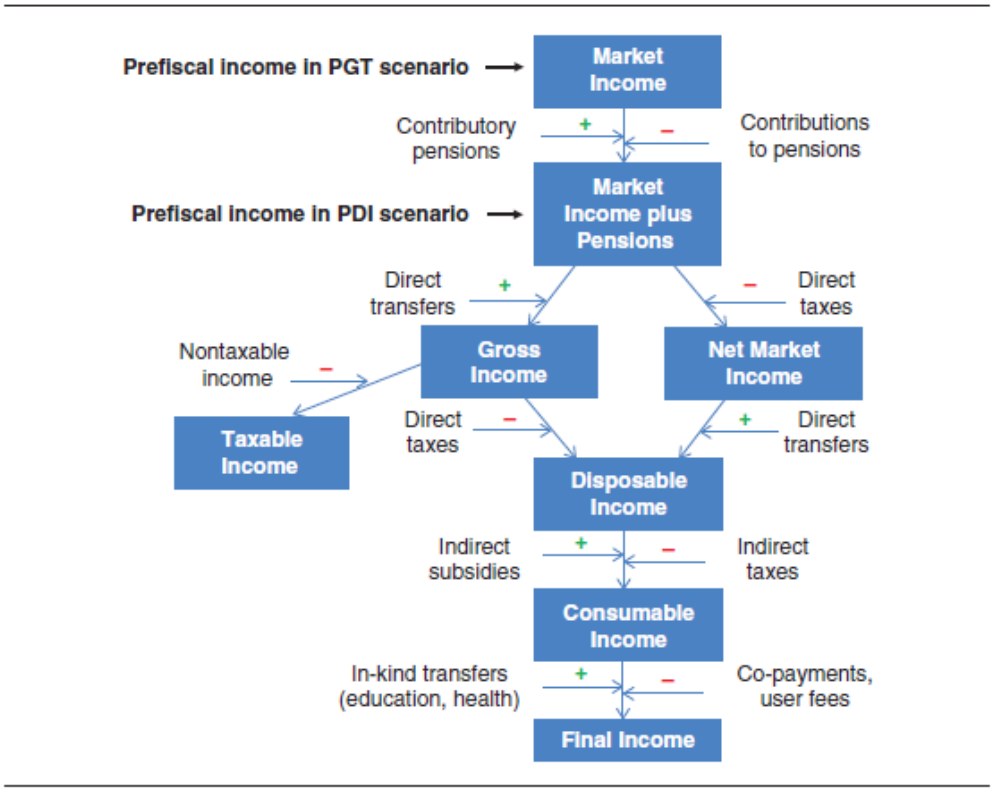
Following the CEQ assessment methodology (Lustig 2018), the analysis is undertaken by income stages (Figure A1). That is, market income, or market income plus pensions – depending on the scenario under investigation –, gross income, net market income, disposable income, consumable income, and final income.

[10] The calculation of the contribution due by individual microentrepreneurs (MEIs, in Portuguese) is the sum resulting from 5% of the minimum wage (social security quota), plus 1 *real* if MEIs operate in the trade sector (ICMS quota) or 5 *reais* if they operate in the service sector (ISS quota). In 2018, the maximum amount paid by MEIs was 53.70 *reais* per month. *Simples Nacional* rates vary between 4% and 33% for micro and small companies whose annual gross revenue is between 81 thousand and 4.8 million *reais*.

[11] However, the calculation basis is limited by the highest salary paid by the social security institute, commonly called the "INSS ceiling", which was equivalent to approximately six minimum wages in 2018. Workers who earn more than the maximum benefit will only pay the highest rate on the ceiling.

For the Brazilian case, available data allows all the stages to be computed. From the first stage until the disposable income stage, the direct identification methodology is applied. From the disposable income stage to the final income stage, we use imputation and inference techniques, as properly described in section 4.2.

Figure A1. Definitions of Income Concepts: A Stylized Presentation



Source: Lustig (2018).

4.2. Data sources and methods

4.2.1. Baseline assessment

The fiscal incidence analysis makes use of the *Pesquisa de Orçamentos Familiares* (POF, national household budget survey), which collects data on income, consumption, taxes, and transfers. The most recent wave – used throughout the analysis – investigates the 2017-2018 period. Over this period, it sampled 57,920 households and 178,431 individuals, being representative nationally, at the regional and at the state level.

The survey allows the direct identification of income related to labor and nonlabor sources, direct taxes paid, governmental transfers, and the use of in-kind transfers, such as public education. In the absence of other data, we resort to secondary sources, by making use of imputation and inference techniques. An imputation approach was carried out in the case of measuring access to public healthcare facilities, data which are not directly provided by the POF. To cover this part of the analysis, we made use of the *Pesquisa Nacional de Saúde* 2019 (PNS, National Health Survey), a survey that offers an in-depth investigation of the national health system in terms of access to, and use of, available health care services, and the health status of the population. PNS 2019 has national coverage, sampling 108,525 households.[12] The remaining not-directly identified data, concerning the government revenue and spending, comes from the National Treasury. This data is used to scale-up household survey data, following CEQ standard procedures (Lustig 2018).

Although the POF allows assessing the number of PBF beneficiaries, figures are distinct from official records. According to the *Ministério do Desenvolvimento Social* (MDS, Social Development Department), in 2018, 14.1 million households received PBF transfers. In the survey, only 9.2 million households were identified as recipients. To overcome this underrepresentation, we follow Higgins e Pereira (2014) strategy, based on Souza, Osório, and Soares (2011), that proposed a method through which benefits are imputed to likely beneficiaries. Based on some individual characteristics, such as access to piped water or homeownership, the method identifies non-beneficiaries whose profile matches the one of PBF recipients. In POF 2017-2018, they were 4.9 million. As pointed out by Higgins and Pereira (2014), this method has the advantage of producing a small impact in inequality measures while providing a great approximation to the official figures.

An inference analysis is applied to identify milk transfers from *PAA Leite*. In POF it is possible to identify households whose milk consumption was reported as being donated. Hence, all households living in the Northeast and the North of Minas Gerais whose milk consumption falls into this category are inferred to be beneficiaries from this program. The same methodology was previously applied by Higgins and Pereira (2014) using POF 2008-2009 data.

[12] The PNS was launched in 2013, and the second and latest round took place in 2019. PNS replaced health and health care surveys conducted in 2003 and 2008 as companion surveys to another large national household survey, the PNAD.

POF 2017-2018 survey also allows us to directly identify the payment of individual income tax (IRPF) and property taxes (IPTU, ITR, ITBI, ITCD, and IPVA). We follow the methodology of Higgins and Pereira (2014) by assuming that: (i) the IRPF is entirely levied on labor since the value used for the calculation is the discount reported by workers; and (ii) the property taxes are paid by the owners themselves, that is, those individuals who reported this type of payment. On the other hand, FGTS discounts are not included in the survey. Therefore, we also follow the simulation made by Higginsand Pereira (2014), by assuming that FGTS values are paid by formal workers.[13,14] We suggest that the reported value of labor income is net of contributions to the FGTS account. Since the FGTS rate is 8%, we inflate the wages of formal workers by multiplying their values by a factor of 1.08 to obtain pre-FGTS market income variable, which is used to construct the aggregate market income.

The strategy adopted for consumption taxes was to apply effective rates on goods and services purchased by survey respondents. For the calculation of ICMS and IPI, the items reported were grouped into nine categories: food, alcoholic beverages and tobacco, clothing, household fuels and electricity, recreation and culture, and other goods and services. Based on that, the amount spent in each of those categories was multiplied by the effective rates calculated by Nogueira, Siqueira, and Souza (2011).[15]

As documented in Section 2, part of the analysis investigates the indirect subsidy applied over the electricity consumption, the TSEE. Information concerning TSEE beneficiaries is not directly identified in POF, only the monthly consumption in KWh. To arrive at total gross expenditure on electricity consumption, we make use of the electricity rates practiced by each national energy company. This information is obtained from the National Electric Energy Agency (ANEEL, *Agência Nacional de Energia Elétrica*). Within each state, we average electricity rates across companies. Illustratively, in Rio de Janeiro, one of the twenty-seven Brazilian states, there are six energy companies. Hence, data for this state is composed of the average electricity rates for the six companies. The same applies to the remaining states.

[13] The existence of deductions (from income tax, social security contributions, etc.) is the criterion adopted by Higgins and Pereira (2014) to determine whether the worker is formal or not.

[14] As pointed out in section 3, FGTS is a savings account established by the employer on behalf of his or her formal employees. We assume that this discount would be credited entirely to the worker's salary in the absence of FGTS legislation.

[15] Effective rates were calculated using the 2005 input-output matrix for Brazil. Siqueira et. al. (2021) released new estimates of effective rates using the most recent (2015) input-output matrix, however, the level of aggregation was not comparable.

In-kind health care and educational benefits were also included in the fiscal incidence analysis. Education benefits are obtained by averaging the total expenditure per pupil or per student, available in national accounts. The average benefit is calculated for each of the following educational levels: preschool, primary, lower secondary, upper secondary, tertiary, and young and adults education (EJA). The amount generated is imputed to pupils or students who reported being enrolled in public institutions. Health care expenditure is also obtained from administrative accounts, but there is no information about the use of public health facilities in POF. Therefore, we included data from the 2019 National Health Survey (PNS), also conducted by IBGE, which contains information on the consumption of public health services. These services were divided into three categories, namely: primary care, inpatient care and preventative care. Spending is available at the state and municipal levels. Thus, the average benefit is calculated for each state and for each type of care. We attribute this benefit to individuals who used public health care services based on PNS. Then we follow the methodology of Higgins and Pereira (2014) to imput the benefits into POF databases according to the average benefit by ventiles of income distribution found in PNS. Table 1 depicts the secondary sources of data incorporated into the analysis for each component of social expenditure.

Table 1. Sources of the secondary data

Expenditure/Tax	Source	Period of reference
Official figures for Bolsa Familia Beneficiaries	Ministry of Social Development (MDS, *Ministério do Desenvolvimento Social*)	2018
Public social expenditure (Health)	National Treasury	2018
Public social expenditure (Education)	Ministry of Education (*Inep* and *Fundeb*)	2018
Public Health attendance	National Health Survey (PNS, *Pesquisa Nacional de Saúde*)	2019
Electricity rates by company	National Electric Energy Agency (ANEEL, *Agência Nacional de Energia Elétrica*)	2018
IPI effective rates		2005

ICMS effective rates	Nogueira, Siqueira, and Souza (2011)	

Source: authors' elaboration.

5. Summary of Results

5.1. CEQ Assessment at the National Level

To assess the impact of taxes and social spending, we use a variety of measures of inequality and poverty, the concentration of benefits received and taxes paid with respect to market income, and effectiveness indicators. Contrasting with Higgins and Pereira (2014), we also include recently developed fiscal impoverishment and fiscal gains to the poor indices (Higgins and Lustig 2016).

5.1.1. Effects of fiscal policy on inequality

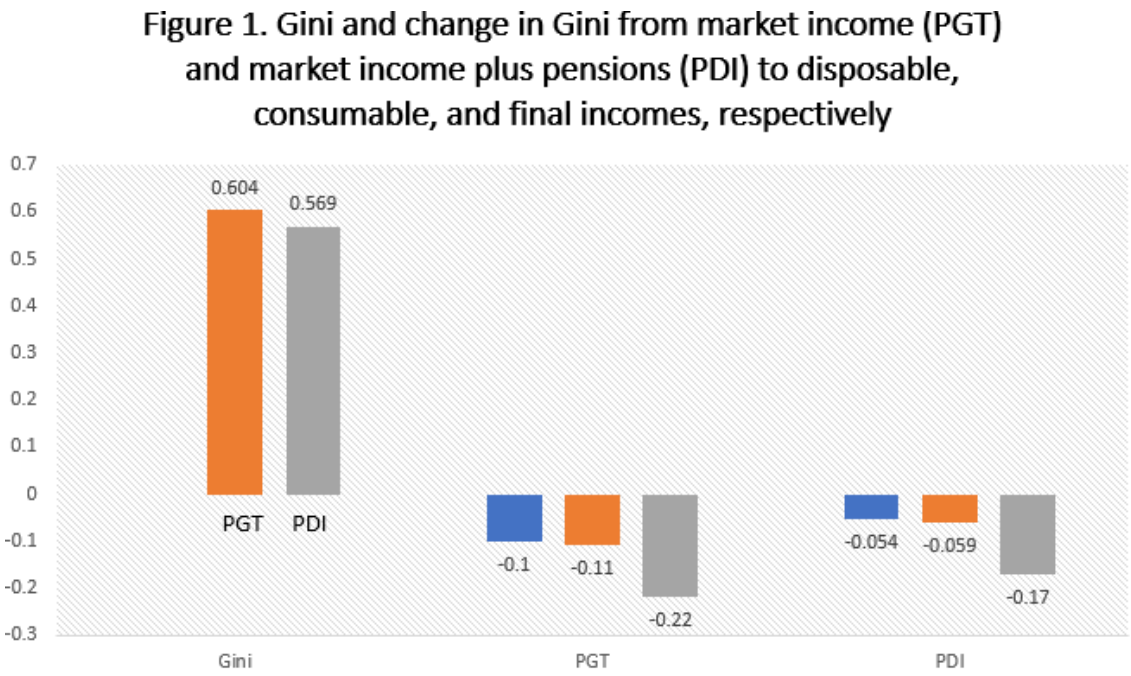
To measure the impact of fiscal policy on inequality, we first compare the Gini coefficient for disposable income with the Gini coefficient for market income using two scenarios: in a scenario in which contributory pensions are considered a transfer (PGT) and a scenario in which contributory pensions are considered a deferred income (PDI). Our results show that market income inequality is very high in Brazil, with a Gini coefficient of 0.604 considering PGT and 0.569 in a scenario in which contributory pensions are considered a deferred income.

These results are similar to Higgins and Pereira (2014) using POF (2008-2009). Through direct taxes and transfers, Brazil is able to reduce inequality by about 10% percent, which is impressive by Latin American but not Western European standards (Lustig 2020). Spending on highly redistributive programs is low, while programs that are much less redistributive are larger.

Through all taxes and transfers (direct and indirect taxes, direct and in-kind transfers, and indirect subsidies), Brazil reduces inequality by 22 percent using PGT and 17% using PDI. The effectiveness indicators for direct transfers and all transfers, respectively, are 0.48 and 0.40 in the PDI scenario and 0.24 and 0.32 in PGT scenario. These indicate relatively low effectiveness of the transfer system.

The marginal contribution of education and health spending to the total redistributive effect is about 2% for education and 3% for health in both PGT and PDI scenarios.

Figure 1. Gini and change in Gini from market income (PGT) and market income plus pensions (PDI) to disposable, consumable, and final incomes, respectively



5.1.2. Effects of fiscal policy on poverty

To measure the impact of fiscal policy on poverty in a middle-income country, we use the international poverty lines proposed by the World Bank of US$1.9 PPP per day (extreme poverty line), US$3.20 PPP per day (poverty line of lower-middle income countries), and US$5.5 PPP per day (poverty line of upper-middle income countries). The results for both scenarios are available in table A8.

First, we show poverty reduction on comparing market income with disposable income. Using all three poverty lines and considering contributory pensions as a transfer (PGT), poverty is reduced by 65%, 52% and 34% respectively. If we use contributory pensions as deferred income (PDI), poverty is reduced by 47%, 25% and 11% respectively.

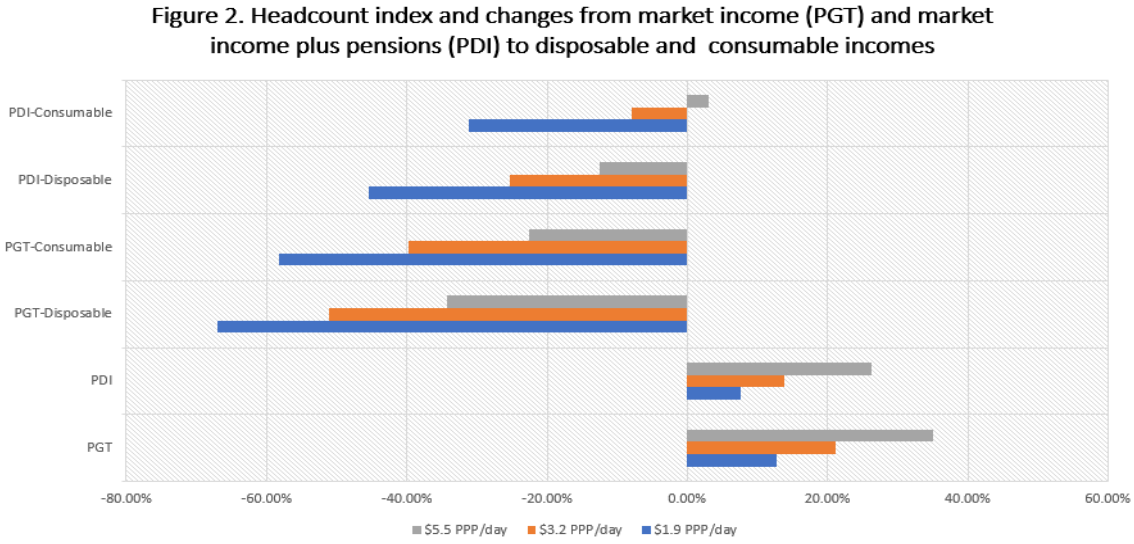
As discussed by Lustig (2020), to capture the effect of the fiscal system on poverty, we need to measure poverty using the concept of consumable income. In addition, Inchauste and Lustig (2017) and Lustig (2018) showed that even if a fiscal system is equalizing, a country's fiscal policy can increase poverty. In our case, when indirect taxes are taken into account, the reduction in

poverty is significantly tempered and, in one case, moderate poverty using PDI, the incidence of poverty for consumable income is greater than the incidence for market income (plus pensions).

In other words, the number of near-poor who are pushed into moderate poverty by paying more in taxes than they receive in benefits (i.e., direct transfers and indirect subsidies) is higher than the number of poor who escape poverty by receiving more in transfers and subsidies than they pay in taxes.

The fact that poverty is not reduced further despite Brazil's high spending on direct transfers is due to high leakages to the non-poor (in addition to the deleterious effect of indirect taxes): 64 percent of total direct transfer benefits go to the non-poor. As a result, the amount remaining to transfer to the poor is spread thinly: the average transfer size of Bolsa Familia, for example, is just US$0.53 PPP per day in household per capita terms.

Figure 2. Headcount index and changes from market income (PGT scenario) and market income plus pensions (PDI scenario) to disposable and consumable incomes



5.1.3. Fiscal Impoverishment and Fiscal Gains to the Poor

We summarize in Table 2 main results of the analysis suggested by Higgins and Lustig (2016) to capture the proportion of the poor made poorer by the fiscal system. They showed that the tax and transfer system can be progressive but still cause fiscal impoverishment. As in Higgins and Lustig (2016), our results are reported for consumable income.

Table 2. Fiscal Impoverishment and Gains of the Poor, Brazil, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	19.72%	1.01	0.0%
PDI	19.75%	3.16	0.0%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	40.57%	4.79	0.4%
PDI	42.89%	0.00	0.4%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	60.19%	17.85	4.60%
PDI	66.43%	90.78	4.50%

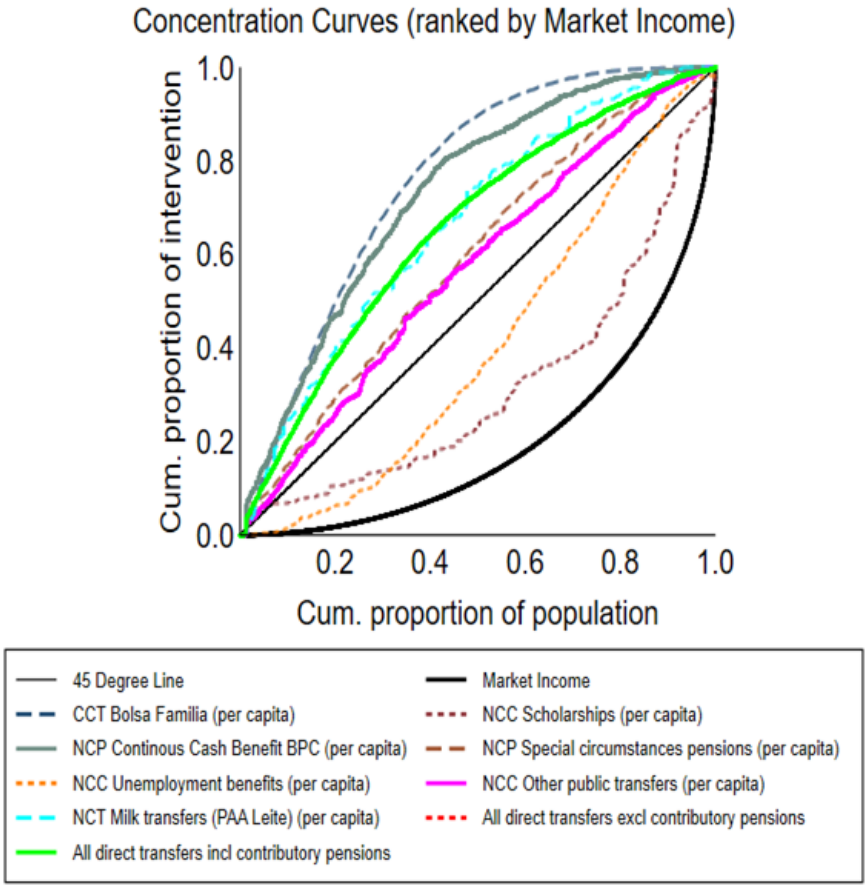
Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

As showed in Table 2, the proportion of fiscal impoverishment increases as we move the poverty line up. In Higgins and Lustig (2016) with $2.5 PPP/day poverty line and POF 2008-2009, FI was found to be 34.9%. In our case, with a $3.2 PPP poverty line, FI was 29.93% and 34.14%, using PGT and PDI respectively. If we use the current World Bank country classification, Brazil as an upper-middle income country should be analyzed using a poverty line of $5.5 PPP. As in Higgins and Lustig (2016), FI increases substantially and headcount poverty may increase as a result of the fiscal system if we use higher poverty lines.

Table 3 shows concentration coefficients and budget sizes for different programs. Bolsa Familia, BPC, milk transfers, and special circumstances pensions are well targeted to the poor, with concentration coefficients of -0.51, -0.45, -0.33, and -0.18, respectively. However, unemployment benefits, scholarships, and other direct transfers are progressive only in relative terms (i.e., their concentration curves with respect to market income lie everywhere between the market income Lorenz curve and the 45-degree line and, thus, are equalizing). As a result of these opposing forces, the concentration curve of direct transfers as defined in the benchmark case crosses the 45-degree line (see figure 3), implying that they are progressive, but not everywhere progressive in absolute terms. The curve is initially concave and above the 45-degree line; the bottom two quintiles receive a larger share of direct transfers than their population share. However, a large chunk of transfers (relative to population shares) is

concentrated at the top of the distribution as well. The shape of the curve is not surprising, as highly progressive programs like Bolsa Familia are concentrated on the bottom quintile while other direct transfers are concentrated at the top.

Figure 3. Concentration Curves with respect to Market Income (PGT). Brazil, 2017-2018



Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Table 3. Concentration Coefficients and Budget Sizes for Selected Programs, Brazil, 2017-2018.

Program	Concentration coefficient with respect to PGT market income	Concentration coefficient with respect to PDI market income	Budget size (% of GDP, 2018)
Bolsa Familia (CCT)	-0.51	-0.60	0.4
BPC (Non-contributory pensions)	-0.45	-0.45	0.8

Unemployment benefits	0.19	0.08	0.5
Special circumstances pensions	-0.18	-0.22	0.5
Scholarships	0.36	0.33	0.1
Milk transfer program	-0.33	0.23	0.1
Other public transfers	-0.13	-0.17	0.1
Preschool	-0.22	-0.33	0.6
Primary Education	-0.27	-0.36	2.1
Secondary Education	-0.14	-0.22	0.4
Tertiary Education	0.27	0.24	0.7
Net Education	-0.15	-0.23	5.4
Net Health Benefits	-0.11	-0.16	5.3

Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Indirect subsidies are progressive in absolute terms, with a concentration coefficient of -0.46. Education spending is progressive in absolute terms overall; its only component that is not progressive in absolute terms is tertiary education. It is worth noting that the concentration coefficient of tertiary education, at 0.27, makes Brazil one of the worst performers in Latin America in terms of providing tertiary education access to the poor (Lustig et. al, Ano?). Health spending and all of its components are progressive in absolute terms. Overall social spending is progressive in absolute terms—this is a robust result that holds for the different definitions of social spending that arise in both PGT and PDI analyses, as shown in table 3.

5.2. CEQ Assessment at the Regional Level

5.2.1. A brief introduction on regional disparities in Brazil

Brazil, which was at one time the world's second most unequal country (Ferreira, Leite, and Litchfield 2008) and is still among the twenty most unequal countries (Alvaredo and Gasparini 2015), unsurprisingly has a high degree of spatial disparity. The country's richest state, São Paulo, accounts for 32% of the country's gross domestic product (GDP) and has an average income five times larger than that of the poorest state, Piauí. Nearly one-fourth of people living in the Northeast—the poorest of Brazil's five official geographic regions—is poor, compared to just 5 to 6 percent in the richer Center-West, South, and Southeast. Illiteracy rates in the Northeast are twice the national average and four times higher than in the Southeast and South; life expectancy and infant mortality measures show similar disparities.

Regional disparities in Brazil are strongly associated with population densities in 1872 (Maps A1 and A2 in the appendix), which Acemoglu et al. (2002) use as a proxy for development, and with railroad networks in 1910 (Reis 2014). Furthermore, industrial policy adopted after World War II was largely biased towards the South and Southeast regions, exacerbating regional inequality (Baer 1964, Williamson 1965); indeed, inequality in municipal GDP per capita increased significantly in 1949 relative to 1919 (Reis, 2014). The persistence of regional disparities has been explained by geography (Azzoni et al. 2000), education and local differences (Pessoa 2001, Ferreira 2004, and Barros 2011) and economic and political institutions (Monasterio 2010, Nakabashi et al. 2013, and Musacchio et al. 2014).

Nevertheless, regional disparities have declined recently, with some degree of per capita income convergence occurring between regions, albeit at a slower pace than in some other countries (Ellery and Ferreira 1996, Azzoni 1997, Ferreira 2000, among others). In this paper, we ask how social spending contributes to the reduction of spatial disparities and regional inequality in Brazil.

Differently from other countries in Latin America, Brazil has a long history promoting regional development with explicit spatial policies and transfer mechanisms. Brazil's concern with its North-South disparity was highly unusual relative to other countries at similar levels of income per capita and development: Brazil devoted more attention to regional inequality at the expense of other national goals (Williamson 1965). Spatial policies were adopted as early as 1904 and regional inequality was declared in 1959 the most serious national problem (SUDENE 1967). In addition, Brazil even added explicit transfer mechanisms to its Constitutions (in 1946 and 1988) and declared the reduction of regional inequalities a fundamental objective of the country. The 1988 Constitution states as "fundamental objectives of the Federative Republic of Brazil to

eradicate poverty and substandard living conditions and to reduce social and regional inequalities." As a result, Constitutional funds are still used for spatial development policies (Cravo et al. 2014).

Non-spatial social policy targeted to the poor can also influence regional disparities by reducing poverty and increasing incomes in poorer areas. Silveira Neto and Azzoni (2011) find that increases in the minimum wage and the government's large-scale conditional cash transfer program Bolsa Familia played an important role in reducing between-region income inequality from 1995 to 2006. The recent decline in inequality in Brazil documented in Lustig et al. (2013) is largely due to increased government cash transfers (Barros et al. 2010) and expanded access to education (Gasparini and Lustig 2011). These non-spatial policies are particularly important given their size: in 2009, total social spending including pensions accounted for 25 percent of GDP and substantially reduced inequality (Higgins and Pereira 2014). Social spending has also become larger and more progressive over time (Silveira et al. 2011).

To analyze public spending on non-tertiary education and health, we merge data on the use of public education and health services from two household surveys with data on average spending by state on each level of education and type of health service.

5.2.2. A Brief Description of Brazil's Regional Policies

Differently from other countries in this study, Brazil has a long history promoting regional development with explicit policies and transfer mechanisms. As early as 1904, programs were created to mitigate regional differences. In particular, the Department of Public Works against Droughts in the Northeast was created in 1904, and the Superintendency of Rubber Defense in the Amazon in 1912. From 1939 to 1958, several initiatives as March to the West, Plan of Economic Valuation of the Amazon and National Department Against the Drought (DNOCS), Development Company of the Saint Francis Valley (CVSF, later CODEVASF). The 1946 Constitutional Reform stipulated revenues from the Union should be used to make investments in the North and Northeast and the Bank of the Northeast of Brazil (BNB) was created in 1952.

A relevant effort to discuss regional inequalities in Brazil is dated of 1958 in the Working Group for the Development of the Northeast led by Celso Furtado. According to the report, regional inequality was considered the most serious problem in Brazil (SUDENE, 1967).

Most of the earlier (and even current) initiatives were inspired by CEPAL's Structuralist school (e.g., Prebish 1949). The North-South imbalance was explained using the concept of center-periphery. In 1959, Brazil created the Superintendency for the Development of the Northeast (SUDENE in Portuguese) to manage all efforts from the federal government to foster economic growth in the poorest region of the country. The main policy instruments included infrastructure projects (roads, energy, and sanitation), long-term financing, and tax breaks. Other initiatives followed with the creation in the North region of the Bank of the Amazon (BASA) in 1996, the Free Economic Zone of Manaus (ZFM) in 1967, and the Superintendency of Development of the Amazon (SUDAM). They also contributed with the occupation of the least populated region in Brazil. Many other programs were instituted as the Superintendency of Development of the South (1967), Investment Fund of the Amazon (FINAM, 1969). A gap on regional policies happened with the crises of the 1980s (sometimes called "Brazil's lost decade") and most of the incentives were based on state taxes (ICMS), which created a fiscal war among the states to attract investments. The development agencies (Northeast, North, Central-West) were renamed, became extinct, and were then recreated in the 1990s.

The National Constitutional Funds were created for Brazil's poorer regions (FNE-Northeast, FNO-North, FCO-Central-West) with permanent resources from three percent of income and industrial taxes that are automatically allocated to the regions with the Northeast receiving sixty percent of resources and the remaining forty percent evenly split between the North and Central-West. The resources are transferred from the National Treasury to the operating banks via the Ministry of National Integration and provide subsidized loans to rural and urban producers. From its creation to 2013, the National Constitutional Funds invested more than US$75 billion and it represented almost 1% of the regions' GDP per year, and more than 6.5 million operations were completed (National Integration Ministry 2014). Today, Brazil's regional policies are administered by the Ministry of National Integration as part of the National Policy for Regional Development (PNDR) instituted in the early 2000's. The PNDR was designed to create a coordinated effort to deal with inter and intra-regional inequalities.

In addition, especially in the last two decades, the focus on policy is not only on mitigating regional inequalities as well social inequalities. The amount of resources devoted to non-spatial policies to alleviate poverty and reduce income inequality has increased.

5.2.3. A Brief Review of the Literature on Regional Inequality in Brazil

There is a vast amount of literature on regional inequality in Brazil. Baer (1964) made an account of the regional inequalities in Brazil and assessed policies made after World War II. On his account, private capital moved to the Center-South, the internal balance of trade was unfavorable to the Northeast and migration to the Center-South, despite its benefit to the Northeast, also implied brain drainage. In sum, the main industrialization policies (mostly based on import substitution) concentrated in the Center-South mitigating any redistributive effect from fiscal benefits to the Northeast and many of the governmental funds were used mostly for emergency drought relief purposes. In a broader cross-sectional study, Williamson (1965) found Brazil with the highest regional inequality measures compared to other twenty-three countries – Brazil's data on his study range from 1939 to 1959 – but with a decline in the late 1950s. His results are consistent with Baer finding an increase in inequality due to the industrial policy adopted after WW II. More recently, Shankar and Shah (2003) cross-country study estimated Brazil to be the third most unequal country among the eight largest countries in the world.

The revival of growth theories in 1980s and the convergence controversy (Baumol 1986, Mankiw et al. 1992, and others) led to multiple studies on regional inequality. The first group estimated convergence for different periods that range from 1939 to 2008 (Ellery and Ferreira 1996, Azzoni 1997, Ferreira 2000, Maia Gomes 2002, Lima et al. 2010, Galeano 2014) and using different estimation methods. The main result is regional (or interstate) income per capita convergence (sometimes in clubs), at slower rates (or non-convergence) for earlier periods but at faster rates after 1995. For example, Ferreira (2000) shows that the coefficient of variation of insterstate output falls considerably from 1970 to 1995.

Other studies accounting for spatial dependence and heterogeneity find mixed results. Magalhães et al. (2005) suggest the existence of convergence clubs (one rich in the Southeast and South and one poor in the Northeast). Brauch and Monasterio (2009) use contemporary spatial analysis applied to the GDP per capita of regions and minimum comparable areas (MCAs)—a concept developed by IBGE to allow comparison over time of new municipalities. They find that MCAs tended to converge to their neighbors' classes, with higher probability in upper classes, and divergent trajectories were frequent. The North and Northeast presented the highest intra-regional mobility and the Southeast was quite stable. Fifty percent of the municipalities in the South remained in the same category against twenty-seven percent in North. The great frequency of divergent trajectories was showed as evidence on uneven movements and that divergence, in both directions, is a common phenomenon in all of the

Brazilian regions. Similarly, Ribeiro and Almeida (2012) find multiple equilibria; Lima et al. (2010), however, use a time-series approach (ARFIMA) and find non-convergence.

In a broader study, Magalhães and Miranda (2005) analyze the evolution of income per capita, literacy rates, years of study, and longevity in Brazilian municipalities in 1970, 1980, 1991, and 2000. They find convergence in education, but convergence in clubs for per capita income (one rich in the Southeast, South, and Central-West and one poor in the North and Northeast) and longevity (a higher level in the South and Southeast, an intermediary level in the Central-West and North, and low level in the Northeast).

A second group of empirical studies attempts to explain the effects of regional policies on reducing regional inequality. Despite the lack of more comprehensive studies, according to Diniz (2001), regional policies had a positive effect, reducing inequalities. In Maia Gomes (2002), the extent to which regional development policies have been responsible for convergence is unclear. Silveira Neto and Azzoni (2011) showed that non-spatial government policies, mainly minimum wage appreciation and government transfer programs to poor families, played an important role in the reduction of regional income inequality from 1995 to 2006. In particular, they were responsible for more than one-quarter of the total regional inequality reduction.

The effects of the National Constitutional Funds (NCF) reducing regional income inequality are mixed, but in general are small or nonexistent. As shown earlier, there are three funds: FNE (Northeast), FNO (North), and FCO (Central-West). Oliveira et al. (2006) find a very low impact in the growth differential of states in the three regions recipients of those funds between 1991 and 2000. Almeida et al. (2007) found that the constitutional funds were not directed to the poorest states. Silva et al. (2009) evaluates the efficacy of the NCF during the period 2000-2003 and found a positive effect only on the growth rate of the employee number in the FNE. Similar results are found in Resende (2014) for industrial loans in the FNO. Galeano and Feijó (2012) found a positive effect only for the Northeast's NCF (over the period 2000-2008).

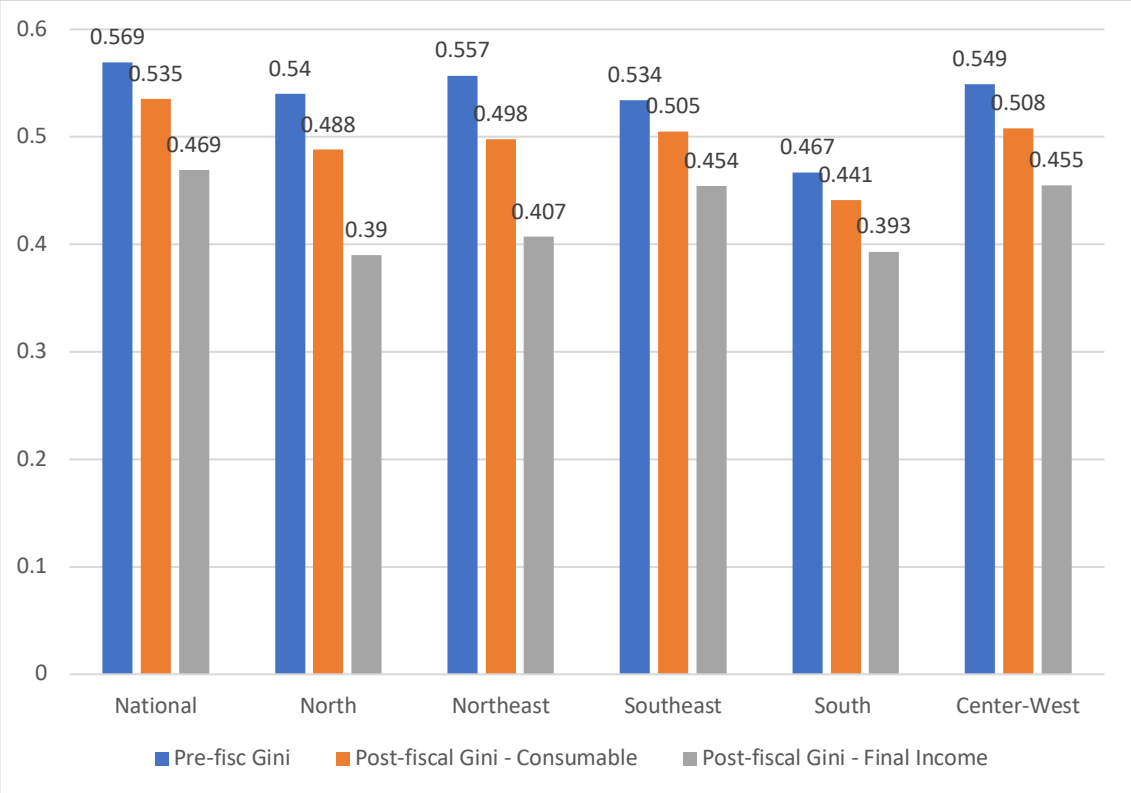
Cravo et al. (2015) evaluate the impact of the NCF between 2004 and 2010 using different spatial scales of municipalities and micro-regions. Accounting for spatial dependency, they find that different modalities of these funds affect regional growth differently. Furthermore, they do not find the existence of spatial spillovers stemming from the constitutional funds. Except in one case, the results at the micro-regional level show that constitutional funds do not promote

regional growth in any of the regions. The effect of the funds is restricted to a smaller geographic area.

5.2.4. Effects of fiscal policy on regional inequality

Similarly with the national analysis, we first compare the Gini coefficient for disposable income with the Gini coefficient for market income using two scenarios: in a scenario in which contributory pensions are considered a transfer (PGT) and a scenario in which contributory pensions are considered a deferred income (PDI).

Figure 4. Inequality (Gini coefficient) at pre- and post-fiscal income concepts, regions of Brazil, 2017-2018



Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018 (IBGE).

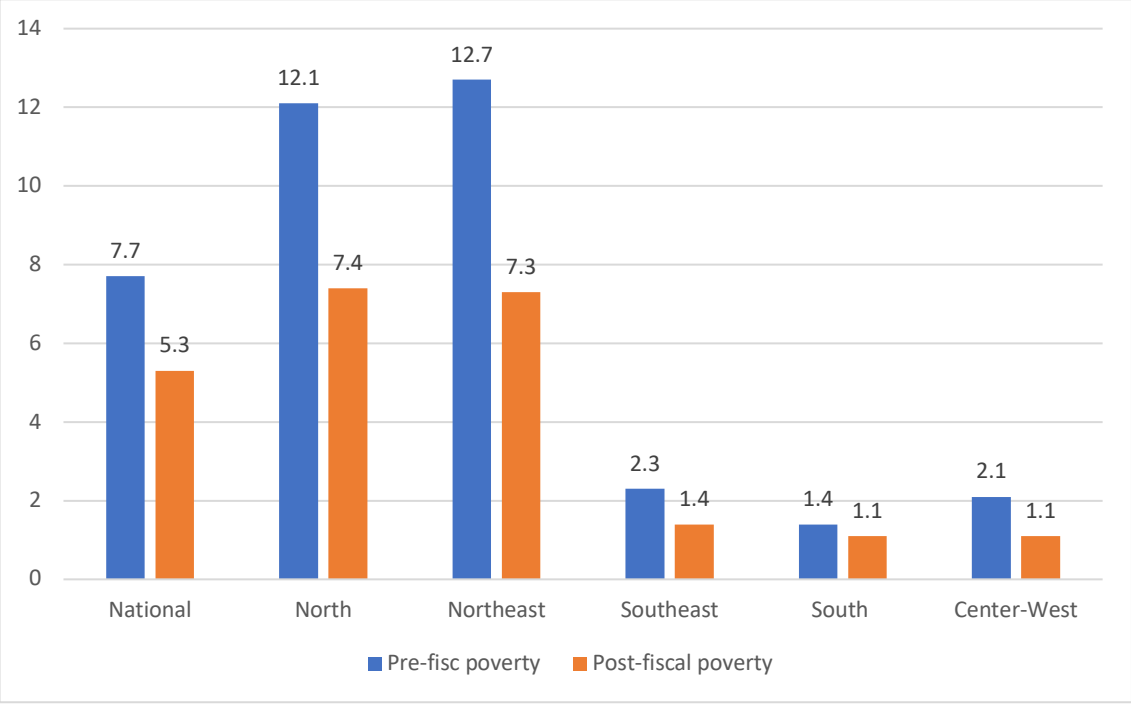
The level of regional inequality is high across all five regions with the South having the lowest Gini (0.467) and the Northeast with the highest one (0.557). The post-fiscal Gini, including all taxes and transfers, is significantly reduced in all regions, but noticeably more in the North and Northeast. The effectiveness indicators for direct transfers and all transfers, respectively, are 0.48 and 0.40 in the PDI scenario at the national level. These indicate relatively low effectiveness

of the transfer system, but they are higher in both the North and Northeast regions. The marginal contribution of education and health spending may explain the higher redistributive effect in the two poorest regions in Brazil.

5.2.5. Effects of fiscal poverty on regional poverty

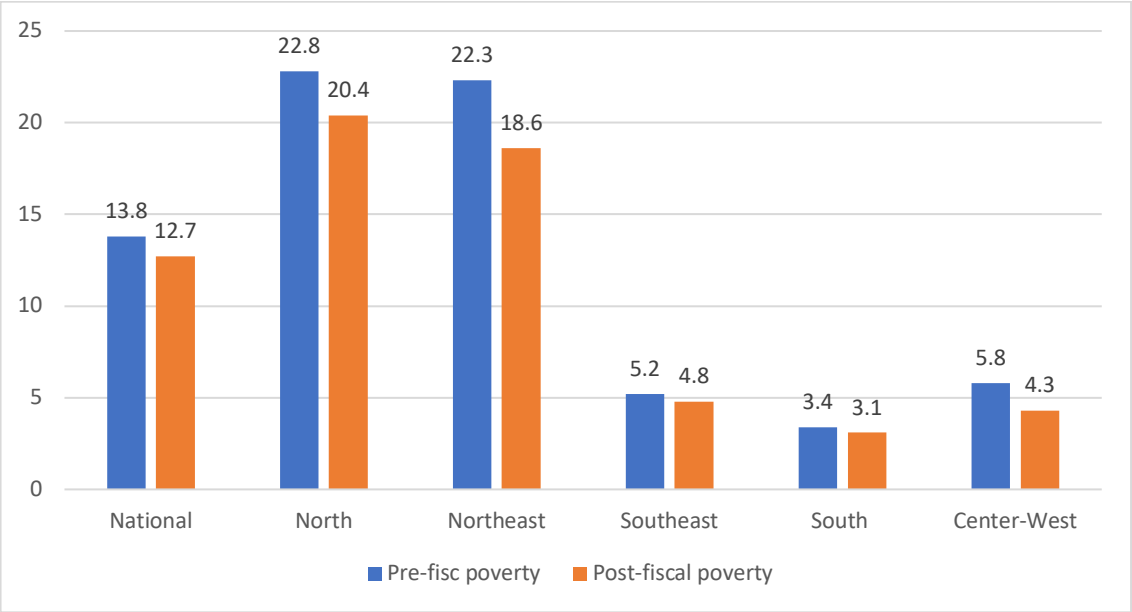
Figures 5 to 7 (tables A3 to A8 in the appendix) show poverty rates before and after all taxes and transfers (consumable income) by region. The North and the Northeast have the highest poverty rates regardless the poverty line ($1.9 PPP, $3.2 PPP, and $5.5 PPP) and are higher than the national average. The effect of the fiscal system is to reduce ultra-poverty ($1.9 PPP) and extreme poverty ($3.2 PPP), with the highest reductions for ultra-poverty and in the poorest regions. However, when we consider a $5.5 PPP poverty line, the fiscal system is increasing poverty in all regions.

Figure 5. Share of population living in poverty (headcount ratio, % from total), $1.9 PPP 2011 poverty line, PDI scenario, 2017-2018



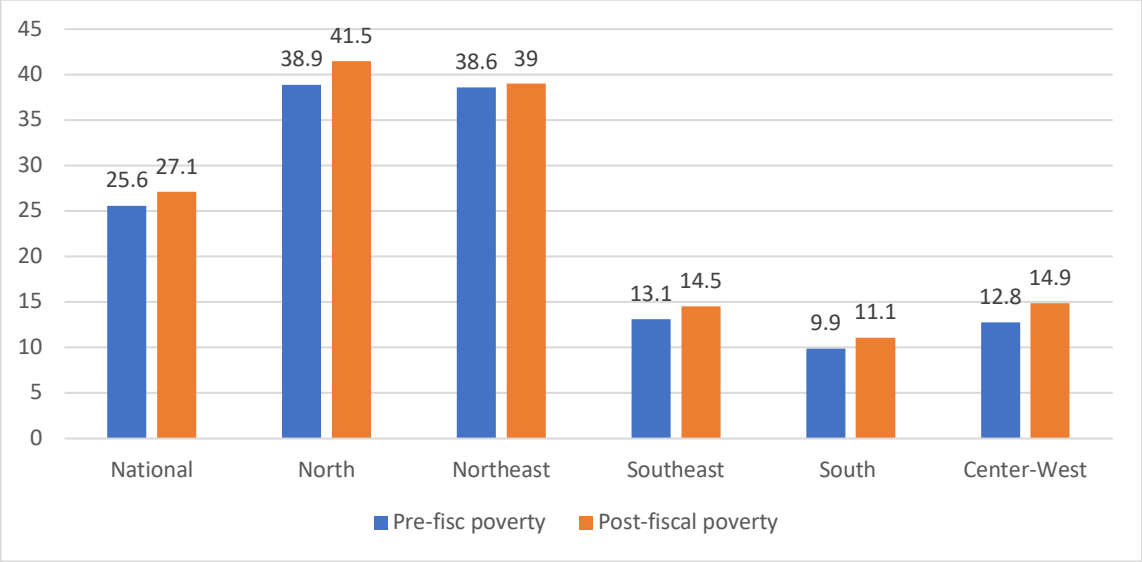
Source: Authors' calculation based on Pesquisa de Orçamentos Familiares, 2017-2018.

Figure 6. Share of population living in poverty (headcount ratio, % from total), $3.2 PPP 2011 poverty line, PDI scenario, 2017-2018



Source: Authors' calculation based on Pesquisa de Orçamentos Familiares, 2017-2018.

Figure 7. Share of population living in poverty (headcount ratio, % from total), $5.5 PPP 2011 poverty line, PDI scenario, 2017-2018



Source: Authors' calculation based on Pesquisa de Orçamentos Familiares, 2017-2018.

5.2.6. Fiscal Impoverishment and Fiscal Gains to the Poor

We summarize in tables 5A to 5E the main results of the analysis suggested by Higgins and Lustig (2016) to capture the proportion of the poor made poorer by the fiscal system. They showed that the tax and transfer system can be progressive but still cause fiscal impoverishment. As in Higgins and Lustig, our results are reported for consumable income.

Table 5A. Fiscal Impoverishment and Gains of the Poor, Center-West region, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	17.39%	0.72	0%
PDI	17.39%	1.45	0%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	44.52%	4.66	0.4%
PDI	44.74%	0.00	0.4%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	58.73%	19.42	4.40%
PDI	67.39%	65.73	4.40%

Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Table 5B. Fiscal Impoverishment and Gains of the Poor, North region, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	14.64%	1.68	0.1%
PDI	15.67%	2.59	0.1%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	26.25%	6.33	1.3%
PDI	28.54%	0.00	1.3%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	41.61%	17.87	7.40%
PDI	47.15%	44.97	7.70%

Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Table 5C. Fiscal Impoverishment and Gains of the Poor, South region, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	30.85%	1.94	0.0%
PDI	48.64%	16.83	0.1%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	44.44%	4.60	0.3%
PDI	57.67%	0.00	0.4%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	64.96%	15.94	3.6%
PDI	74.14%	98.70	3.7%

Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Table 5D. Fiscal Impoverishment and Gains of the Poor, Southeast region, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	19.72%	1.01	0.0%
PDI	19.75%	3.16	0.0%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	40.57%	4.79	0.4%
PDI	42.89%	0.00	0.4%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	60.19%	17.85	4.60%
PDI	66.43%	90.78	4.50%

Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

Table 5D. Fiscal Impoverishment and Gains of the Poor, Northeast region, 2017-2018

Panel A: Poverty Line of $1.9 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	6.15%	0.32	0%
PDI	6.79%	0.80	0.1%

Panel B: Poverty Line of $3.2 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	12.09%	1.06	0.4%
PDI	15.20%	0.00	0.5%

Panel C: Poverty Line of $5.5 PPP/day

Income concept	FI	FI as % of FGP	FI per capita
PGT	27.40%	5.48	4.20%
PDI	36.77%	22.90	5.00%

Note: FI = Fiscal Impoverishment, FGP = Fiscal Gains to the Poor
Source: Authors' calculations based on Pesquisa de Orçamentos Familiares, 2017-2018.

As showed in the tables above, the proportion of fiscal impoverishment increases as we move the poverty line up. If we use the current World Bank country classification, Brazil as an upper-middle income country should be analyzed using a poverty line of $5.5 PPP. As in Higgins and Lustig (2016), fiscal impoverishment increases substantially, and headcount poverty may increase as a result of the fiscal system if we use higher poverty lines. Nonetheless, fiscal impoverishment is less dramatic in the North and Northeast regions, the two poorest regions in Brazil.

6. Conclusions

We calculated the effects of fiscal policy on income distribution and poverty in Brazil at the national level and its five geographical regions (Center-West, North, Northeast, South, and Southeast). In terms of direct transfers, at the national level, Brazil has relatively high spending and low effectiveness. Bolsa Familia, BPC, and milk transfers are well-targeted to the poor and highly progressive in absolute terms, but other much larger direct transfers are progressive only in relative terms.

Similarly to Higgins and Pereira (2014), with the exception of tertiary education, all components of public health and education spending are progressive in absolute terms. On the tax side, there is a negative effect of indirect taxes on poverty. Using PDI and poverty line at $5.5, the benefits of transfer programs and indirect subsidies are offset by indirect taxes.

The regional analysis showed that fiscal policy reduced inequality in all five regions, but the highest decreases happened in the North and Northeast. The North and Northeast are the poorest regions in Brazil and fiscal policy interventions led to a larger reduction on both regions despite their post-fiscal poverty are still more than five times larger than in the other three regions (Center-West, South, and Southeast). Fiscal impoverishment, concept developed by Higgins and Lustig (2016), is present in all five regions if we use a $5.5 poverty line. Nonetheless, fiscal impoverishment is less dramatic in the North and Northeast regions.

Our results are consistent with the related literature in Brazil. Neri et al. (2018) analyzed fiscal redistribution from 2003 and 2015 and found the official cash transfers accelerated the growth of social welfare while direct and indirect taxes changes operated in the opposite direction. Bolsa Família, the main direct cash transfer program, had a 119.7% higher impact on poverty than the second-best targeted cash transfer program. Oliveira and Silveira Neto (2019) found regional inequalities in wages to be higher at the highest quantiles and education as the main factor explaining the inequality. Azevedo et al. (2014), using data from 1995 to 2011, did not find that fiscal consolidation was not associated with a deterioration in inequality measures. More recently, Araujo (2017) found that fiscal decentralization has been an important instrument for reducing income inequality among Brazilian states (1995-2014). And, Freitas et al. (2019) found a small crowding-out effect from the main cash transfer program, Programa Bolsa Família, on local governments spending on social programs. However, they also found an expansion of Bolsa Família led to an increase in spending on education at the local level.

We can conclude that the fiscal system is playing an important role to reduce regional poverty and inequality in Brazil. A reform of the indirect tax system, as recommended by Higgins and Pereira (2014), must be a priority —especially with respect to taxes on basic food items—or larger, well-targeted compensating transfers to offset the costs of indirect taxes for the poor.. This is especially true once we remark the poorest deciles pay about 45% of their income in indirect taxes compared to 13% paid by the richest decile (Ibarra et al. 2021). According to the authors' simulations, a value-added tax reform could reduce inequality.

7. References

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APPENDIX A

Table A1. Brazilian Social Spending, 2018

Spending Component	Included in Analysis	Billions of reais	% of GDP	Notes and Source
Direct Cash and Food Transfers				
Special circumstances pensions	Yes	37.1	0.5%	h
Unemployment benefits	Yes	33.0	0.5%	e
BPC (Non-contributory pensions)	Yes	52.6	0.8%	a
Bolsa Familia (CCT)	Yes	30.6	0.4%	a
Assistance from PIS/PASEP	Yes	16.9	0.2%	e
Scholarships	Yes	2.2	0.0%	f
Scholarships (Higher-Education Permanence)	No	0.2	0.0%	f
Other food access programs	No	0.0	0.0%	f
Child Labor Eradication	Yes	0.0	0.0%	f
PAA (Programa de Aquisição de Alimentos, in Portuguese)	Yes	0.1	0.0%	f
Minimum Income Programs[1]	Yes	0.2	0.0%	f
Social Assistance (not direct transfers)				
Assistance to the elderly and disabled	No	56.0	0.8%	i
Community assistance	No	42.8	0.6%	i
Other	No	8.8	0.1%	i
Assistance to children and adolescents	No	3.8	0.1%	i
Education				
Primary education[2]	Yes	145.4	2.1%	i
Other[3]	Yes	109.4	1.6%	i
Tertiary education	Yes	45.0	0.7%	i
Secondary education*	Yes	26.9	0.4%	i
Early childhood education**	Yes	42.2	0.6%	i
Health				
In-patient care***	Yes	180.7	2.6%	i
Other****	Yes	83.1	1.2%	i
Primary care*****	Yes	77.1	1.1%	i
Preventative care#	Yes	24.8	0.4%	i
Social Spending Analyzed (Benchmark)	Yes	1044.5	15.3%	
Total Social Spending (Benchmark)	Part	1155.9	16.9%	
Contributory Pensions				

Federal contributory pensions (INSS)	Yes	450.6	6.6%	j
State contributory pensions	Yes	159.9	2.3%	i
Other federal contributory pensions	Yes	58.7	0.9%	c, i
Municipal contributory pensions	Yes	47.4	0.7%	i
Survivors	Yes	136.9	2.0%	h
Social Spending Analyzed (Sensitivity Analysis)	Yes	1761.1	25.8%	
Total Social Spending (Sensitivity Analysis)	Part	1872.5	27.4%	k

Source: Bridi et al. (2021).

Notes and sources: All spending totals include spending at the federal, state, and municipal levels, unless otherwise specified. (a) Amount paid in transfers; see http://aplicacoes.mds.gov.br/sagi/miv/miv.php. (b) Ministério do Trabalho (2011). (c) Calculated as a residual by the authors. (e) Ministério do Trabalho (2011). (f) Portal da Transparência, Controladora Geral da União. (g) Programa de Aquisição de Alimento, Companhia Nacional de Abastecimento (Ministério da Agricultura, Pecuaria e Abastecimento). (h) This is the total for pensões and outros benefícios from Relatório de Gestão do Instituto Nacional do Seguro Social (Ministério da Previdência e Assistência Social). (i) Balanço do Setor Publico Nacional, Secretaria do Tesouro Nacional (Ministério da Fazenda). (j) This is the total for aposentadorias and benefício mensal from Relatório de Gestão do Instituto Nacional do Seguro Social (Ministério da Previdência e Assistência Social). (k) POF 2017-2018 update: Previously, this number could be compared with Brazil's total social spending as a percent of GDP according to the UN Economic Commission for Latin America and the Caribbean. However, data regarding general government expenditure for the 2017-2018 period is no longer available for Brazil.

Notes: [1]It regards Bolsa Verde and Garantia-Safra. For Bolsa Verde, data is only available for 2017.

[2]This amount also considers part of the total described as Educação Básica by the STN. For so, an apportionment based on enrolment levels was applied.

[3]It takes into account overall administration, other subfunctions, special education, vocational education, and young and adults education.

*This amount also considers part of the total described as Educação Básica by the STN. For so, an apportionment based on enrolment levels was applied.

**This amount also considers part of the total described as Educação Básica by the STN. For so, an apportionment based on enrolment levels was applied.

***It regards Assistência Hospitalar e Ambulatorial, in Portuguese.

****It regards Vigilância Sanitária, Vigilância Epidemiológica, Alimentação e Nutrição, Administração Geral, and Demais Subfunções, in Portuguese.

*****It regards Atenção Básica, in Portuguese.

#It regards Suporte Profilático e Terapêutico, in Portuguese.

Table A2. Brazilian Fiscal Revenue, 2018.

	Included in analysis	Billions of Reais	Percentage of total	Percentage of GDP
Taxes				
Federal				
Corporate income tax (IRPJ)	No	119,1	5,2	1,7%
Tax on goods/services to finance social security (COFINS)	No	244,3	10,7	3,5%
Individual income tax (IRPF)	Yes	196,3	8,6	2,8%
Payroll tax collected from employers (FGTS)	Yes	125,9	5,5	1,8%
Contribution on net profit (CSLL)	No	75,8	3,3	1,1%
Tax on industrialized products (IPI)	Yes	54,0	2,4	0,8%
Tax to finance social services for workers (PIS/PASEP)	No	66,5	2,9	1,0%
Tax on financial transactions (IOF)	No	36,6	1,6	0,5%
Imported goods	No	40,6	1,8	0,6%
Tax on technical services (CIDE)	No	8,0	0,4	0,1%
Tax on rural properties (ITR)	Yes	1,4	0,1	0,0%
Others	No	166,8	7,3	2,4%
States				
Tax on movement of goods and services (ICMS)	Yes	479,3	20,9	7,0%
Tax on vehicles (IPVA)	No	43,1	1,9	0,6%
Tax on inheritance and donations (ITCD)	No	7,3	0,3	0,1%
Others	No	27,5	1,2	0,4%
Municipal				
Tax on services (ISS)	No	62,1	2,7	0,9%
Real estate tax (IPTU)	Yes	43,5	1,9	0,6%
Tax on real estate transfer (ITBI)	No	11,0	0,5	0,2%
Others	No	22,0	1,0	0,3%
Contributions				

Contributions to federal pension funds	Yes	412,2	18,0	6,0%
Contributions to state pension funds	Yes	36,1	1,6	0,5%
Contributions to municipal pension funds	Yes	12,0	0,5	0,2%
Total	Part	2.291,4	100,0	33,3%

Source: RFB, 2018.

Table A3. Gini coefficients and poverty rates, Center-West

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.569	3.70	8.80	18.80
Market Income + Pensions	0.549	2.10	5.80	12.80
Net Market Income	0.527	2.10	5.80	13.80
Gross Income	0.534	0.70	2.80	10.80
Disposable Income	0.511	0.80	3.10	11.50
Consumable Income	0.508	1.10	4.30	14.90
Final Income	0.455			

Table A4. Gini coefficients and poverty rates, North

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.563	15.90	28.20	46.30
Market Income + Pensions	0.540	12.10	22.80	38.90
Net Market Income	0.525	12.30	23.00	39.90
Gross Income	0.507	5.70	16.30	34.10
Disposable Income	0.492	5.80	16.50	35.20
Consumable Income	0.488	7.40	20.40	41.50
Final Income	0.390			

Table A5. Gini coefficients and poverty rates, South

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.493	3.20	7.20	17.40
Market Income + Pensions	0.467	1.40	3.40	9.90
Net Market Income	0.454	1.40	3.60	10.50
Gross Income	0.457	0.80	2.10	7.80
Disposable Income	0.444	0.80	2.30	8.40
Consumable Income	0.441	1.10	3.10	11.10
Final Income	0.393			

Table A6. Gini coefficients and poverty rates, Southeast

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.565	4.60	9.30	20.60
Market Income + Pensions	0.534	2.30	5.20	13.10
Net Market Income	0.520	2.40	5.40	13.70
Gross Income	0.523	1.00	3.30	11.10
Disposable Income	0.508	1.00	3.50	11.70
Consumable Income	0.505	1.40	4.80	14.50
Final Income	0.454			

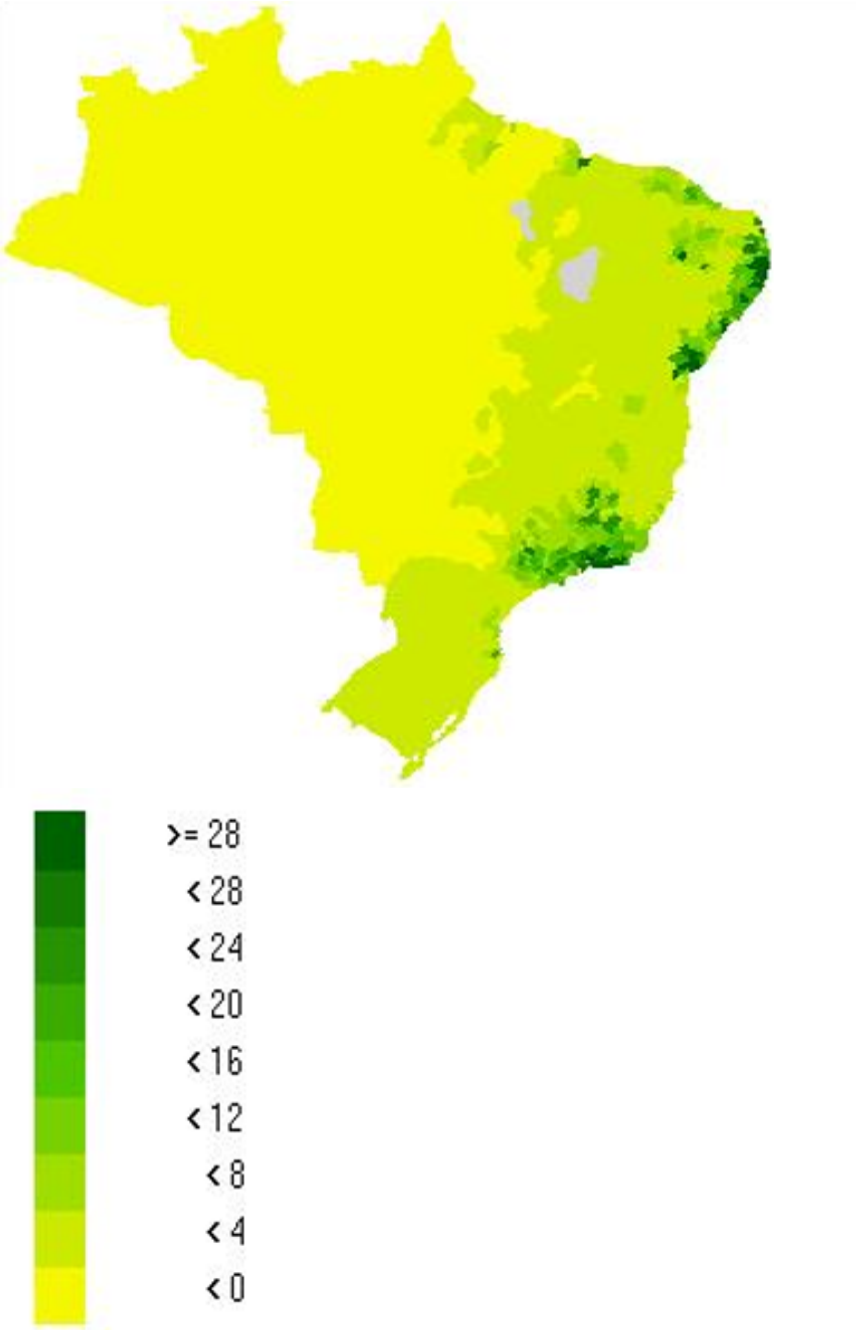
Table A7. Gini coefficients and poverty rates, Northeast

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.608	22.10	35.20	52.20
Market Income + Pensions	0.557	12.70	22.30	38.60
Net Market Income	0.543	12.90	22.80	39.40
Gross Income	0.518	5.80	15.10	32.50
Disposable Income	0.503	5.80	15.40	33.40
Consumable Income	0.498	7.30	18.60	39.00
Final Income	0.407			

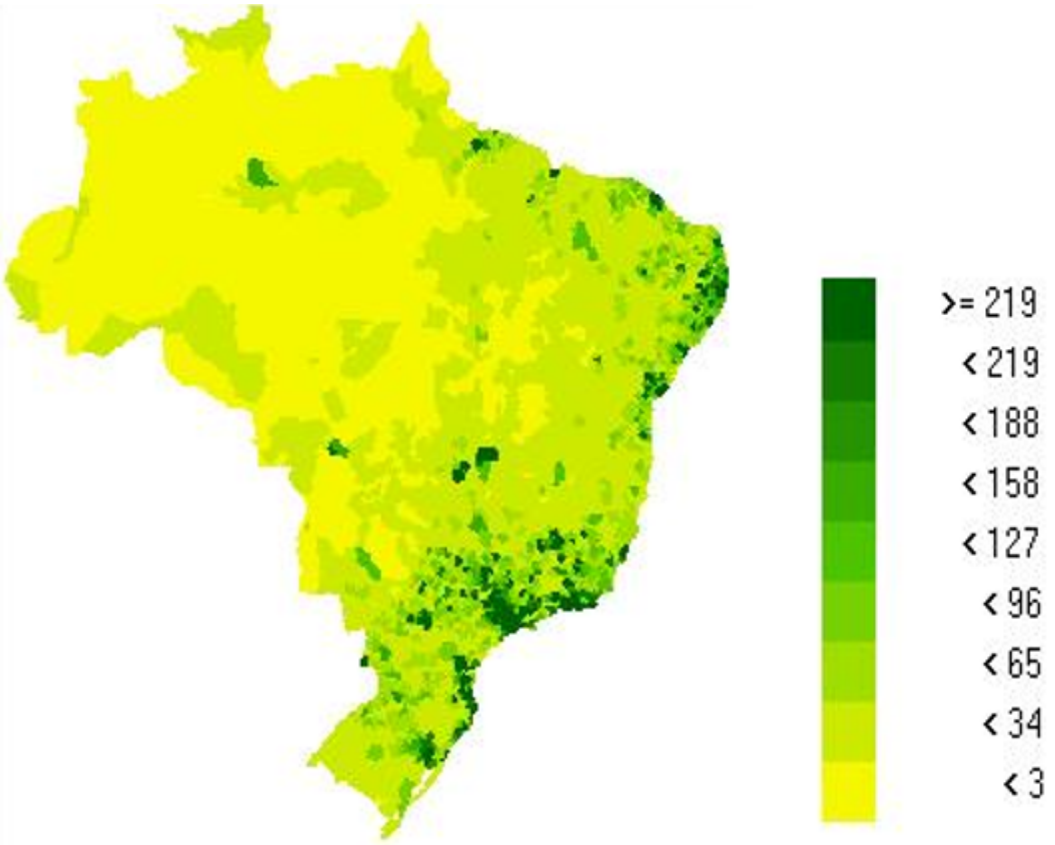
Table A8. Gini coefficients and poverty rates, National

	Gini	USD 1.9 PPP	USD 3.2 PPP	USD 5.5 PPP
Market Income	0.604	12.70	21.10	35.00
Market Income + Pensions	0.569	7.70	13.80	25.60
Net Market Income	0.557	7.80	14.20	26.30
Gross Income	0.551	4.10	10.00	22.40
Disposable Income	0.538	4.20	10.30	23.00
Consumable Income	0.535	5.30	12.70	27.10
Final Income	0.469			

Map A1. Population density, 1872. Source: IPEADATA.



Map A2. Population density, 2010. Source: IPEADATA.



Map A3. Brazil's Regions and States. Source: IPEADATA.