DISCUSSION PAPER

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THE BRAZILIAN STATE'S REDISTRIBUTIVE ROLE: CHANGES AND PERSISTENCE AT THE BEGINNING OF THE 21ST CENTURY

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ABSTRACT

This paper examines the evolution of the redistributive role of the State in Brazil at the beginning of the 21st century. For this purpose, we compute the marginal effects of the cash transfers, taxes, and in-kind benefits on inequality using the Lerman-Yitzhaki progressivity index. Our main results are: i) the Brazilian tax system as a whole remains regressive, with heavily regressive indirect taxes and slightly progressive direct taxes; however, ii) the expansion of social spending in this period introduced significant progressive gains, leading to an iii) increase in the redistributive role of the State and to a net reduction in the final income Gini index by 15.9%. We conclude by arguing that further advancements towards a more progressive tax system could be achieved by reducing the weight of indirect taxes and increasing the taxation of the richest.

Keywords: fiscal redistribution; cash transfers; taxation; in-kind benefits; income inequality.

1 INTRODUCTION

The top 1% of the population concentrates 28.3% of the income in Brazil, making it one of the most unequal countries in the world (UNDP, 2020). Because Brazil is an upper-middle income country, this figure implies that a small population fraction has average income levels similar to (or even higher than) top-income earners in high-income countries,[1] while a significant portion faces food insecurity and poverty.[2] This explains why Brazil's high inequality is considered unfair by a large portion of its population.[3]

Furthermore, evidence suggests that inequality is negatively related to economic growth through several channels, such as a greater sociopolitical instability and disbelief in institutions (Alesina and Perotti, 1996; Keefer and Knack, 2002), under-investment in human capital (Galor and Zeira, 1993; Galor and Moav, 2004) and support to an inefficient organization of the state (Acemoglu, Ticchi and Vindigni, 2011). Therefore, redistributive policies leading to lower levels of inequality could drive faster and more sustainable growth in the long run (Cingano, 2014; Halter, Oechslin and Zweimüller, 2014; Berg et al., 2018).

The levels of inequality in Brazil remained relatively constant or even increased for much of the 20th century (Alvaredo and Gasparini, 2015; Souza, 2016), but this trend changed from the 1990s onwards, and particularly in the first decade of the 21st century, with a large reduction in inequality (Barros et al., 2006; Hoffmann, 2006a; Foguel and Azevedo, 2007; Gasparini et al., 2011). The main explanatory factors behind this change are the government transfers (Barros et al., 2006; Hoffmann, 2006b) and transformations in the labor market, with the latter due largely to improvements in the Brazilian educational system (Barros, Franco and Mendonça, 2007; Menezes-Filho, Fernandes and Pichetti, 2007) and the increase in the minimum wage (Firpo and Reis, 2007). On the other hand, more recent studies, which emphasize the concentration of income at the top, find a very small decrease (Morgan, 2017) or even relative stability (Medeiros, Souza and Castro, 2015; Souza, 2016) in inequality in the 21st century.

Fiscal incidence studies indicate that public transfers contribute more than taxes to the reduction of the Gini index in Latin America (Goñi, López and Servés, 2011; Ocampo and Malagón, 2013;

1. Morgan (2017) shows that the top 1% in Brazil have higher average incomes than the same group in France.

2. 36.7% of the Brazilian families reported some degree of food insecurity in the Consumer Expenditure Survey (*Pesquisa de Orçamentos Familiares* – POF) 2017-2018.

3. According to the survey *Nós e as Desigualdades* 2021, carried out by Oxfam in partnership with the Datafolha institute, 86% say that the country's progress is conditional on reducing inequality between rich and poor, and 84% defend taxation of the richest to ensure health, housing, and education.

Lustig, Pessino and Scott, 2014; Hanni, Martner and Podestá, 2015; Lustig, 2016), especially in Brazil (Silveira, 2012; Souza and Medeiros, 2013; Higgins and Pereira, 2014; Higgins et al., 2016). The international comparisons also reveal that Western European countries engage more in redistributive policies than Latin American countries (Goñi, López and Servés, 2011).

Following this literature, the present study analyzes the redistributive role of the Brazilian State in a broader sense by examining the impact of cash transfers, taxes, and public services on the national inequality level in the first decades of the 21st century. For this purpose, we use the POFs 2002-2003, 2008-2009, and 2017-2018, which is better suited to this measurement exercise than the other national surveys usually adopted in the literature.[4] We find two complementary results. On the one hand, the Brazilian tax system as a whole remains regressive. Indirect taxes are heavily regressive and contributed to an increase of 3.9% in the Gini index between 2002-2003 and 2017-2018, offsetting the 2.1% decrease in inequality from the slightly progressive incidence of direct taxes. On the other hand, the expansion of social spending via cash transfers, public education, and public health contributed to sizeable net progressive gains, reflected in a 15.9% reduction in the Gini in the period. In summary, social expenditures more than compensated for the general regressiveness of the tax system, showing a strengthening in the redistributive role of the State in Brazil, which makes the country a reference case in Latin America in the first decades of the 21st century.

The rest of this paper is organized as follows. Section 2 discusses the data and evaluation methods employed. Section 3 explores the role of each cash transfers, tax, and in-kind benefits in greater detail, based on the most recent data from POF 2017-2018. Section 4 analyzes the evolution of the redistributive role of the Brazilian State in the early 21st century, highlighting changes and persistence observed in the period. Finally, section 5 contains some concluding remarks.

4. Most studies pointing to a reduction in inequality in the country use the Brazilian National Household Sample Surveys (*Pesquisas Nacionais por Amostra de Domicílios* – PNADs) as their main data source. However, PNAD has limited information on non-labor income and tax expenditures, and uses the previous month as the reference period. In this sense, POFs capture household income in much more detail and with a reference period of the previous 12 months.

2 DATA AND METHODS

2.1 Data

The data used in this study come from the three most recent waves of the POF, from 2002-2003, 2008-2009, and 2017-2018. The main goal of these surveys is to provide information on the composition of the different income sources and expenses of Brazilian households, which is used to update the consumption basket that is the reference for the price indexes, and to measure the population's living conditions. Furthermore, the survey's sample design is meant to offer representative results at the national level, for rural areas in great regions, for urban areas in states, and for metropolitan regions.

Regarding cash transfers, POF offers the most detailed information source for households at the microdata level. Since the POF 2008-2009, it has been possible to identify the two main contributory social security pensions systems separately: the general system, which is mandatory for all formal workers in the private sector (*Regime Geral de Previdência Social* – RGPS), and the system that covers public servants (*Regime Próprio de Previdência Social* – RPPS). From now on these transfers will be called private sector and public sector public pensions, respectively.

POF also identifies government transfers aimed at social assistance, worker protection, and research promotion. The first group includes a non-contributory pension aimed at the elderly or disabled individuals with low income (*Benefício de Prestação Continuada* – BPC); the income transfer programs aimed at the poorest, the largest of which is the conditional cash transfer *Bolsa Família*; and other kinds of public aid, including assistance for accident and illness and destined to food, transportation, fuel, among others. The other categories include, respectively, unemployment insurance, and higher education grants and scholarships from federal funding agencies.

It is also possible to identify direct taxes on property, such as the real estate tax (*Imposto Predial e Territorial Urbano* – IPTU) and the vehicle tax (*Imposto sobre Propriedade de Veículo Automotor* – IPVA), as well as taxes on income, such as the social security contributions, the personal income tax (*Imposto de Renda da Pessoa Física* – IRPF), other deductions, and other direct taxes, including taxes on financial operations and union contributions, for example. Furthermore, the other deductions can be split into two categories: those related to labor income and non-related to labor income, as the ones deducted from pensions and aid.

Unfortunately, it is not possible to directly identify indirect taxes using household survey data. To overcome this limitation, we apply indirect tax rates to the monetary expenditures on

goods and services that we observe in the POF, assuming that the tax burden is entirely on the consumers. For 2002-2003 and 2008-2009, we adopted the rates estimated by Silveira (2012), applying the legal rates of each Brazilian states on POF products.[5] Using a different methodology, Siqueira, Nogueira and Souza (2010) calculate the effective rates through an input-output matrix and argue that the results concerning the distribution of the global indirect tax burden are very similar to that from Silveira (2012).[6] The rates used for the POF 2017-2018 were those estimated by Silveiro et al. (2022), also applying an input-output matrix framework.

Lastly, we incorporate in-kind benefits, that is, expenditures on public education and health. As the objective here is to evaluate the Brazilian State's redistributive role and identify the beneficiaries of these expenditures, both services are evaluated in terms of government costs. For public education, the total values published by the research agency of the Ministry of Education (*Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* – Inep) are allocated to public students from preschool, elementary school, high school, and higher education. Such estimates are developed from administrative sources of government educational expenditures considering the municipal, state, and federal levels.

Estimates concerning public health, free of charge and universal according to the Brazilian 1988 Constitution, come from two different sources. First, for the POFs 2002-2003 and 2008-2009, we used the health supplement of the PNAD, carried out in 2003 and 2008, to obtain information about access and use of services and health goods, such as vaccines, medicines, hospital admissions, outpatient procedures, among others. This questionnaire later became an independent household survey, the National Survey on Health (*Pesquisa Nacional de Saúde* – PNS), carried out in 2013 and 2019. Thus, for the POF 2017-2018, we use the data of PNS 2019. Second, we also rely on administrative records of health expenditures in different categories from Brazil's System of Health Accounts (SHA) and, for previous POFs, from the System on Public Health Budgets (*Sistema de Informações sobre Orçamentos Públicos em Saúde* – Siops) and other administrative records of the Ministry of Health. By associating these two types of sources, it was possible to measure in-kind public health expenditures made by families and associate them with the POF, considering the heterogeneity of these expenditures across the different geographic regions of the country.

5. For a recent application of this method for Brazil, see Ibarra, Rubião and Fleury (2021).

6. As Siqueira et al. (2017) argue, the estimates by Silveira (2012), based on the legal rates, and those by Siqueira, Nogueira and Souza (2010), using an input-output matrix, are largely similar in terms of the global indirect tax burden distribution. Differences could arise only when the incidence is separated into groups of family expenses or indirect taxes. However, as the present study focuses on the global indirect tax burden and not on its composition, these possible differences should not affect our estimates.

2.2 Methods: income stages, the decomposition of the Gini index, and marginal effects

The distributive impacts of different types of cash transfers, taxes, and in-kind benefits on household income are assessed using the usual income concentration indicators: the Gini index, the concentration coefficients, and the decomposition of the Gini index by income sources.

For this analysis, we adopt five income stages. The first one, named market income, consists of the income earned on the labor market, plus rents, sales, donations, alimony, and gains from savings and financial markets. In other words, all the income earned by households before adding benefits or deducting taxes. By adding public cash transfers – such as public pensions and higher education grants – we obtain the gross income. By deducting direct taxes from the gross income, it becomes disposable income, and by subtracting indirect taxes from disposable income we obtain the post-tax income. Lastly, the final income is defined as the sum of the market income with all net benefits and taxes, including the in-kind benefits (i.e., public education and health). These income stages can either be measured in monetary terms or in total terms, with the latter including the so called by POF of non-monetary income, mainly composed by the imputed rent for owner-occupied housing. From now on, non-monetary income will be called imputed rent.

There is a debate in the literature on whether pensions should be classified as market income, with the argument that they are deferred income, or as a governmental transfer. However, some features of the Brazilian public pension system make the latter definition preferred over the former. First, Social Security contributions are mandatory for all formal workers in the country, but the benefit's value is not deterministically linked to the contribution's value. This difference is even greater when we consider exceptional cases, such as rural pensions for rural workers, with lower contributions and retirement age. Furthermore, although most of the elderly population in the country receives pensions, less than half of the working-age population contributes to social security. [7] In fact, the Brazilian pensions system has an intergenerational character, running a deficit of almost 5% of the GDP in 2020, financed by taxes and public debt and, thus, by governmental transfers. For these reasons, the present study allocates public pensions as cash transfers, as done by Gõni, López and Servén (2011).

7. According to the PNADC 2021, 64% of the working population, or 40% of the working-age population, is affiliated with social security. However, 83% of the elderly in Brazil receive a pension. It is also important to note that the minimum value of pensions is linked to the country's minimum age, which has considerably increased in real terms, especially in the last two decades.

As a starting point, we estimate the Gini index for each of these different definitions of income and compare the results. However, it is important to note that changes in the inequality index between these different income stages result from two components: the degree of progressivity or regressivity of the income source weighted by its share in the final income, and the reordering that such interventions cause in the income rank of households. Because of this second component, the before and after analysis is not robust, in the sense that the global effects of these policies depend on the order that they are applied in the income stages, as noted by Lerman and Yitzhaki (1995). Another difficulty is that this analysis ignores behavioral effects.

A way to overcome these problems is to measure the impact of a marginal increase in a source of income on inequality, as developed by Lerman and Yitzhaki (1985). Rather than grasping the impact on inequality from the elimination of a tax or a benefit, as intended by the before and after analysis, this method gives the marginal effects of an income source's proportional changes on inequality. Considering that most changes in fiscal systems occur through reforms, the marginal effects analysis addresses an important issue in terms of public policy and has the advantage of being independent of the order that the income sources enter in the stages, thus eliminating the reranking problems.[8]

Finally, we use the progressivity measure from Hoffmann (2013), as presented in the equation below. This measure, named the Lerman-Yitzhaki progressivity index, is the difference between the final income's Gini index (G) and the concentration coefficient of the h_{th} income source (C_h), multiplied by the sign of its share in final income (φ_h). Therefore, a benefit is progressive ($\Pi_h > 0$) when the Gini is greater than the concentration coefficient ($G > C_h$) and regressive ($\Pi_h < 0$) when it is less than it. For taxes, as their sign in the final income is negative, the analysis is reversed: a tax is progressive when the concentration coefficient is greater than the Gini ($G < C_h$) and regressive when it is less than it. Formally:

$$\Pi_h = [sign(\varphi_h)](G - C_h). \quad (1)$$

It is important to highlight that the Lerman-Yitzhaki progressivity index differs from the Kakwani index, which is widely applied in the literature (e.g., Cabrera, Lustig and Morán, 2015; Higgins et al., 2016; Lustig, 2016). For the former, the Gini and the concentration coefficients are defined in terms of the final income, while for the latter, it is defined in terms of market income. This implies, as argued in Hoffmann (2013), that the Kakwani index is associated with the marginal effect of the "initial" dollars of the benefit or tax, and the Lerman-Yitzhaki index is associated with their "last" dollars. Also, Hoffmann (2013) demonstrates that under some circumstances, the Kakwani index leads to inaccurate results regarding a source's progressivity. Thus, considering this

8. See appendix A for a formal derivation of the Gini decomposition and the marginal effects.

previous problem and our interest in the marginal effect of the last dollars, the Lerman-Yitzhaki index is preferred.

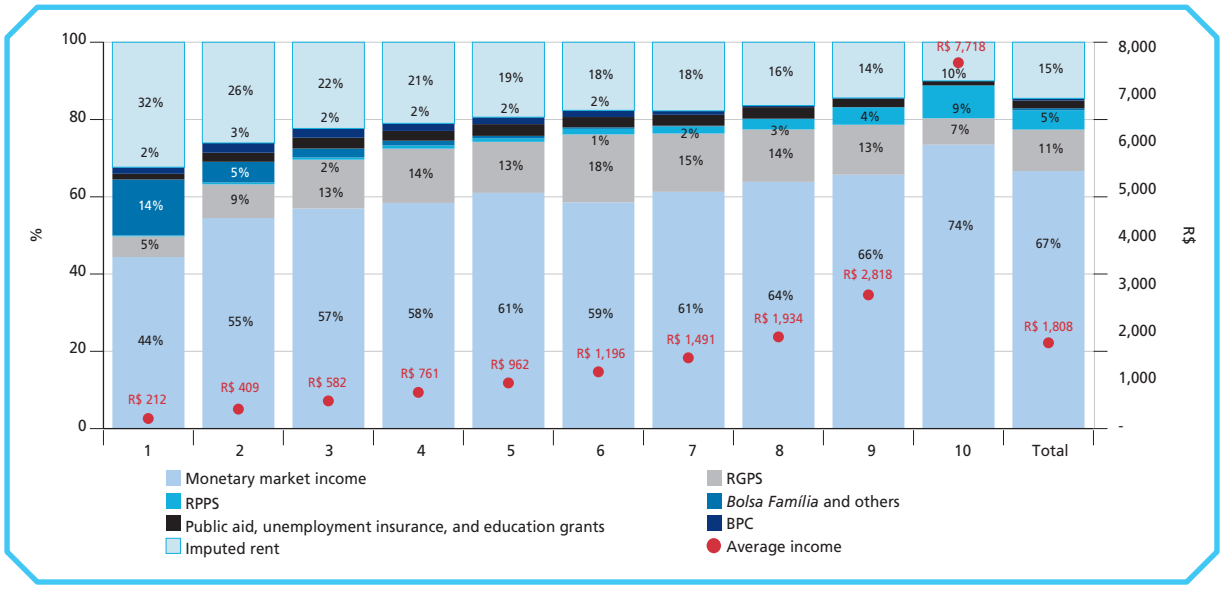
3 THE BRAZILIAN STATE'S REDISTRIBUTIVE ROLE: CURRENT PANORAMA

3.1 Cash transfers

In this section, we describe the current panorama of the Brazilian State's redistributive role based on the most recent data, the POF 2017-2018. Starting with the cash transfers, in figure 1 we observe the composition of the gross income by tenths. As stated earlier, one of Brazil's most distinctive features is its high level of inequality, as the average gross income of the bottom 10% represents only 2.7% of the top 10% average.

FIGURE 1

Composition of the gross income per capita by tenth – Brazil (2017 and 2018)



Source: POF 2017-2018 microdata/Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE).

Authors' elaboration.

In contrast to the monetary income distribution, the imputed rent has outstanding participation in the lower and intermediate income strata. The component accounts for almost ⅓ of the total gross income in the bottom 10% and ⅙ of the income for the whole distribution.

Regarding cash transfers, we stress the regressivity of the public sector public pensions (RPPS). The share of these benefits in income increases closer to the top, accounting for 9% of total income in the top 10%. To a large extent, this is linked to the lack of a ceiling for public servants, combined with the generosity in the rules for defining the values of benefits, and a number of extraordinary components granted.

The private sector public pensions (RGPS) exhibit a different pattern. These contributory benefits are directly linked to the labor market earnings, which explains their small importance for the poorest and greater participation for the middle-income groups. As households at the lower strata present high rates of informality, unemployment, and job instability, they are less likely to achieve the minimum contribution period required for retirement in this system. The same explanation is also valid for public aid and unemployment insurance distributions.

The group composed mainly by the *Bolsa Família* plays a great progressive role here. This component corresponds to 14% of the gross income in the bottom 10%, a share that decreases monotonically in the other tenths.[9] Another outstanding progressive transfer is the non-contributory pensions (BPC), which represents about 2% of gross income up to the sixth tenth and, from that point on, it decreases in the other tenths of income.

Looking now at the Gini index, we note that the income inequality decreases after the cash transfers. As presented in table 1, the Gini index for the monetary income decreases by 11.3%, from 0.640 to 0.567, as we add public cash transfers to the market income. In terms of total income, this effect is less pronounced due to the redistributive impact of the imputed rent, which plays a significant role for the poor. For this stage, the Gini's reduction is 7.3%, from 0.577 to 0.535.

9. Despite the recognition by the economic literature of its importance (e.g., Glewwe and Kassouf, 2012; De Brauw et al. 2015), the *Bolsa Família* program was phased out in 2021 and replaced by a temporary program, the *Auxílio Brasil* transfer. However, despite higher values and coverage than the previous program, its critics point to the unsustainability of those in the long term and to failures such as not considering the size and characteristics of families (e.g., Paiva et al., 2021).

TABLE 1

Gini index, extreme poverty and poverty headcounts, and the top 10% income share of household income per capita, by income stages – Brazil (2017 and 2018)

Income level		Gini	Extreme poverty headcount[1] (%)	Poverty headcount[1] (%)	Share top 10%
Monetary	Market	0.640	19.5	38.8	50.2
	Gross	0.567	5.7	23.1	45.2
	Disposable	0.557	6.1	24.7	44.1
	Post-tax	0.586	10.7	32.3	46.2
	Final	0.473	1.0	8.4	39.8
Total	Market	0.577	6.8	26.0	45.8
	Gross	0.535	1.9	14.8	42.7
	Disposable	0.523	2.1	15.8	41.6
	Post-tax	0.541	4.2	21.3	42.8
	Final	0.451	0.3	3.6	37.9

Sources: For cash transfers and direct taxes, POF 2017-2018 microdata/IBGE; for indirect taxes, Silveira et al. (2022); for public education expenses, Inep; and, for public health expenses, PNS and SHA.

Authors' elaboration.

Note: [1] Extreme poverty and poverty are measured using the World Bank poverty lines of US$ 1.90 PPC and US$ 5.50 PPC per day, respectively.

In table 1, we also note the impact of the cash transfers in reducing poverty and the share of income appropriated by the top 10%. Using the monetary stages of income, the reduction in extreme poverty and poverty headcounts is 13.8 p.p. and 15.7 p.p., respectively. And, concerning the top 10% share, the reduction is 5 p.p. More importantly, we find that the large reduction in inequality in the final monetary income relative to the inequality in monetary market income is due primarily to the redistributive effects of public health and education, followed by public cash transfers.

For a closer analysis, table 2 shows the decomposition of the Gini index of final income according to income sources. In the case of benefits, the lower the concentration coefficient, the greater its progressivity. In addition, the source of income for the benefit can be classified as regressive, neutral, progressive, and progressive pro-poor. When the concentration coefficient exceeds the Gini index, implying a negative Lerman-Yitzhaki index, the transfer has regressive effects, such as monetary market income, RPPS, and higher education grants. Neutral transfers are those with a concentration coefficient equal to or very close to Gini, with the progressivity index close to zero. Furthermore, progressive benefits are those whose Lerman-Yitzhaki index is positive, i.e., the concentration coefficient is lower than Gini, with progressivity increasing the lower the concentration coefficient. When these last rates are negative, these sources of income

are called progressive pro-poor. In this way, it is worth noting that when a high level of income concentration is observed, many transfers are progressive, even though they present relatively high concentration rates.

TABLE 2
Decomposition of final income Gini index, concentration coefficients, and marginal effects by income components – Brazil (2017 and 2018)

Component of total final income	Concentration coefficients	Final income (%)	Lerman-Yitzhaki index	Marginal effects
Monetary market income	0.558	71.3	-0.107	0.078
Imputed rent	0.379	15.5	0.072	-0.011
Cash transfers				
RGPS	0.440	11.5	0.011	-0.001
RPPS	0.816	5.3	-0.365	0.020
Bolsa Família and others	-0.440	0.5	0.891	-0.005
Public aid	0.388	1.8	0.063	-0.001
BPC	-0.065	0.6	0.516	-0.003
Higher education grants	0.624	0.1	-0.173	0.000
Unemployment insurance	0.198	0.2	0.253	-0.000
Taxes				
Social security contributions	0.531	-3.1	0.080	-0.003
IRPF	0.831	-2.4	0.380	-0.009
Other labor income deductions	0.731	-0.1	0.280	-0.000
Other non-labor income deductions	0.741	-1.2	0.290	-0.003
IPTU	0.520	-0.7	0.069	0.000
IPVA	0.329	-1.3	-0.122	0.002
Other direct taxes	0.532	-0.1	0.081	0.000
Indirect taxes	0.359	-12.0	-0.092	0.011
Public education and health				
Preschool	-0.227	1.0	0.678	-0.006
Elementary school	-0.235	3.9	0.686	-0.027
High school	-0.087	1.5	0.538	-0.008
Higher education	0.632	1.6	-0.181	0,003
Medical appointment	-0.108	3.9	0.559	-0.022
Hospitalization	-0.134	1.7	0.585	-0.010
Medication and others	-0.076	0.3	0.527	-0.002
Total final income	**0.451**	**100.0**		

Sources: For cash transfers and direct taxes, POF 2017-2018 microdata/IBGE; for indirect taxes, Silveira et al. (2022); for public education expenses, Inep; and, for public health expenses, PNS and SHA.
Authors' elaboration.

When ordering cash transfers by their progressiveness, we see that RGPS are the least progressive – which can be classified as neutral –, followed by public aid, imputed rent, and unemployment insurance. BPC and *Bolsa Família* are progressive pro-poor transfers, the latter being the most progressive source of income, with a Lerman-Yitzhaki index of 0.891. Together they account for 1.1% of the final income, contributing, on the other hand, to -0.6% of Gini. At the other extreme, RPPS account for 5.3% of income, but have a regressive effect on inequality, as seen by its negative progressivity index. As for the RGPS, the index is close to zero, showing their neutral effect on inequality.

Finally, table 2 also reports the estimated changes on inequality from marginal increases in each income component, using the methodology that avoids the reranking problem. Intuitively, the marginal effects depend on two main factors: the progressivity of the income source and its weight in the final income. This last factor explains why the two main sources of income - the monetary market income and the imputed rent – also exhibit large marginal effects in absolute terms.

Interestingly, we find that a marginal increase in monetary market income would increase income inequality, while the opposite happens for imputed rent. As the latter is composed mainly of imputed rents, it reflects the redistributive role of public policies for urban infrastructure in poor areas.

Among the transfers, the public sector public pensions is associated to the highest marginal increase in inequality, while the *Bolsa Família* group has the largest contribution in reducing it. Although BPC and *Bolsa Família* are very progressive, their marginal effect on inequality is substantially reduced due to the lower weight of these programs on the final household income. Therefore, an increase in the programs' value could explore more of their inequality reduction potential.

3.2 Direct and indirect taxes

We now analyze the redistributive role of the Brazilian State regarding the tax system. Figure 2 shows the incidence of direct and indirect taxes by total income strata. We document that direct taxation exhibits a small progressive effect, with an incidence of 3.1% for the bottom 10% and 10.6% for the top 10%, while the opposite holds for indirect taxation, whose incidence for the same income groups goes from 21.2% to 10.2%. In the aggregate, the progressiveness of direct taxes is insufficient to compensate for the regressive effect of indirect taxes: the total incidence is 5.9 p.p. higher in the bottom 10% than in the top 10%.

The composition analysis of direct taxes reveals that some taxes proportionally burden some groups of the population more than other ones. In the bottom 10%, the share of IPVA and IPTU –

both property taxes – in total direct taxes paid is 41% and 19%, respectively. On the other hand, for the top 10%, these proportions are 9% and 7%. Following the labor market income distribution, we see that the most important direct tax for the intermediate strata is the social security contributions, corresponding to an average of 45.8% of the direct taxes paid for the second to ninth tenths.

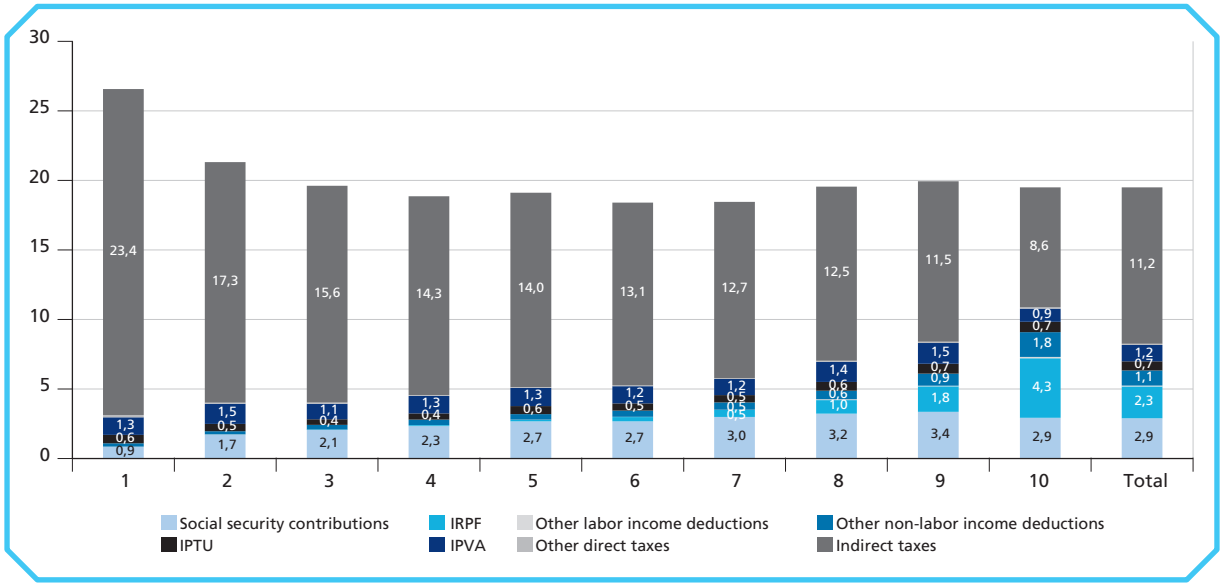
The direct tax that stands out in terms of its incidence in the richest is the IRPF. This tax prevails in the top 10%, responsible for collecting 79.9% of its total revenue. This behavior can be understood in light of the Brazilian income distribution: as members of households in the intermediate strata are more likely to earn lower values of income from work, they are often exempt from this tax. Therefore, personal income tax collection is concentrated in the higher strata. However, as Gobetti and Orair (2016) show, this progressivity drops considerably at the top of the pyramid, thanks to tax exemptions and deductions obtained by declaring private expenditures and the non-taxation of dividends.

The redistributive effect of direct taxes is relatively lower, with the inequality between the gross and total disposable income measured by the Gini index falling only by 2.1%, from 0.535 to 0.523. Considering only the monetary portion of rents, the reduction in the Gini is 0.567 to 0.557 or -1.9%, in relative terms, as shown in table 1. Again, focusing on the monetary part, the extreme poverty and poverty headcounts increase slightly, by 0.4 p.p. and 1.6 p.p., respectively, and the top 10% share decreases by 1.1 p.p. These results show the low impact on inequality from the main redistributive tax instrument.

For the indirect taxes, the Gini between disposable and post-tax income increases substantially, by 5.2% for the monetary income and by 3.4% for the total income. As before, the extreme poverty and poverty headcounts for monetary income increase, but now to a greater extent, by 4.6 p.p. and 7.6 p.p. On the other hand, the top 10% share increases by 2.1 p.p. Considering the high inequality observed in Brazil, these results highlight the great regressiveness of the indirect taxes and the importance of reforms to reduce their weight in the income.

FIGURE 2

Percentage share of direct and indirect taxes on total gross income per tenth – Brazil (2017-2018)



Sources: For direct taxes, POF 2017-2018 microdata/IBGE; and, for indirect taxes, Silveira et al. (2022).
Authors' elaboration.

To better capture the effect of each tax, we look again at table 2. Unlike before, taxes are negative income sources; therefore, progressive taxes are those whose incidence is proportionally higher for the wealthiest. In this way, the higher the concentration rate compared to the Gini index, the more progressive the tax is, with its final effect depending on its weight on income.

The most progressive taxes in terms of their concentration coefficient are the IRPF, with a Lerman-Yitzhaki index of 0.380, followed by other deductions. As mentioned, the incidence of IRPF is concentrated in the top 10%, explaining its high progressiveness. The low weight of -2.5% of this tax in final income considerably reduces its redistributive impact. However, it still has the largest marginal effect on inequality reduction among cash transfers and taxes.

Therefore, an increase in income taxes for the richest has considerable potential for reducing Brazilian inequality. In the current system, there are multiple opportunities for progressive reforms, e.g., via an increase in the maximum marginal tax rate – today at 27.5%, compared to 35% in neighboring countries such as Mexico, Argentina, and Chile – and the extinction of the profits

and dividends exemptions as well as in the deductions for private health and education expends, which favor mainly the top of the pyramid.[10]

In a static exercise, given the actual concentration coefficients, if the weight of IRPF in income reaches 5% and the *Bolsa Família* group increases by the same amount, the Gini index would be reduced by 7.2% – from 0.451 to 0.418. This simple exercise shows a considerable reduction in inequality from exploring the potential of the most progressive cash transfer and direct tax.

In addition, the values of the concentration coefficients of property taxes are relatively low, characterizing the IPVA as regressive and the IPTU as progressive. Considering that it is usual for wealth inequality to be much higher than income inequality, which should imply greater progressivity of these taxes, this result is even more worrying. In the case of the IPTU, the current scenario could improve with the constant updating of property value plans to fit market values, the application of progressive rates,[11] and exemption rules aimed only at low-value properties in locations with poor infrastructure.

For the social security contributions, we observe a concentration coefficient very close to the one for market income. This behavior reflects, as seen in the case of RGPS pensions, the close relationship between social security contributions and the labor market. The formal workers in Brazil contribute to social security, and, in return, they receive these public pensions after retiring. Furthermore, the impact of direct taxes is mitigated as this group represents less than 10% of the final income, which helps to explain most of their marginal effects close to zero.

Thus, in light of the framework outlined in this section, we better understand the low progressivity of direct taxation in Brazil. Additionally, the great regressiveness of the indirect ones leads to the contribution of the Brazilian tax system in increasing inequality. These taxes have one of the lowest concentration coefficients for taxes and significant participation in income, of -12.0%. These two factors lead to a marginal effect of 0.011, representing an increase in inequality arising from a marginal increase in indirect taxes.

10. It is important to highlight that reforms in the Personal Income Tax should be accompanied by changes in the Corporate income tax to harmonize the system and guarantee the principles of equity. See Orair, Palomo and Carvalho (2022) for a more detailed analysis regarding the Income Tax in Brazil and a reform proposition in this terms.

11. The implementation of progressive rates depending on the property value and localization were allowed under Constitutional Amendment nº 29, from 2000.

3.3 In-kind benefits: public education and health

In this subsection, we evaluate the changes introduced at last stage of income by adding public expenditures on education and health to the post-tax income. The distribution of these components in the income tenths is shown in table 3, where the highly redistributive role of public expenditures is evident: their weight on income monotonically decreases as one moves towards the richest, going from 169.5% at the bottom 10% to just 1.8% in the top 10%.

Concerning educational expenditures, we observe the high weight that public education has on the poorest tenths. This income source represents 104.9% of the total income of the bottom 10%, with an emphasis on elementary education, whose participation varies from 70.1% for the first tenth to 0.1% for the latter. In terms of composition, they are also relevant differences. On the one hand, spending on elementary education predominates in the bottom 70%, rising from 66.8% of total education spending in the first tenth to 40.5% in the seventh. On the other hand, in the top 30%, the primary spending is on higher education, representing 37.6% of total spending on education in the eighth tenth to 83.5% in the top 10%.

TABLE 3

Percentage share of public education and health on total gross income per tenth – Brazil (2017 and 2018)

Tenth	Preschool	Elementary school	High school	Higher education	Medical appointment	Hospitalization	Medication and others	**Total benefits**
1	14.5	70.1	16.6	3.7	41.0	20.2	3.4	**169.5**
2	6.9	29.5	9.2	2.6	20.2	9.3	1.6	**79.2**
3	4.2	17.3	6.4	2.6	13.4	6.1	1.1	**51.1**
4	2.6	10.2	4.5	2.2	9.6	4.3	0.8	**34.2**
5	1.8	6.8	3.0	2.6	7.1	3.1	0.6	**25.0**
6	1.1	4.2	1.9	2.0	5.6	2.5	0.5	**17.9**
7	0.8	2.7	1.3	1.8	4.2	1.8	0.4	**13.0**
8	0.4	1.6	0.9	1.8	2.9	1.2	0.3	**9.2**
9	0.2	0.6	0.5	1.6	1.8	0.7	0.2	**5.5**
10	0.0	0.1	0.1	0.8	0.5	0.2	0.0	**1.8**
Total	**0.9**	**3.6**	**1.4**	**1.5**	**3.7**	**1.6**	**0.3**	**13.0**

Sources: POF 2017-2018 microdata/IBGE and Inep.
Authors' elaboration.

As for preschool and high school, we observe a certain consistency in the income participation of these levels for the bottom 90%, around 12.0% for preschool, and 19.6% for high school. However, this composition changes significantly in the top 10%, with these shares at 1.7% and 6.2%, respectively.

These differences arise due to two distinct effects. The first is related to the demographic composition of each income stratum. The average number of children and young people in lower-income families is significantly higher than in the richest. While children and young people under 18 years represent 46% of the members of the bottom 10%, this group represents only 13% of the top 10%.

The other explanatory factor is related to access to public and private services. The public education network is responsible for most enrollments for the first three levels, with 72.7% of total preschool enrollment, 83.4% in elementary school, and 88.3% in high school. However, for the richest strata, the proportion of enrollments in the private system increases significantly. While only 2.5% of elementary school enrollments and 1.6% of high school in the bottom 10% are in the private system, these values are 80.9% and 65.9%, respectively, for the top 10%.

As for higher education, there is a discontinuity in this pattern. At this level, the supply of enrollment by the private sector is more relevant than in the others, representing 76.0% of total enrollments. In distributive terms, there is also a reduction in the public enrollment' share from the base to the top, from 43.8% for the poorest tenth to 25.1% for the richest tenth. However, the number of enrollments differs substantially: 2.9% of total enrollments in public higher education are occupied by the bottom 10%, while this percentage is 23.9% for the top 10%. These numbers are very similar for private higher education, respectively 1.2% and 22.5%.

The share of the expenses in public health for the poorest is also pronounced, corresponding to 64.6% of the bottom 10%'s income and just 0.8% for the top 10%. In addition, the bottom 50% receives 59.0% of the total health expenses, while the top 10% receives only 5.8%. The most significant component of this in-kind benefit are medical appointments expenses, which correspond to an average of 65.6% of the total health expenses, and hospitalization, with 28.7%.[12]

12. Medical appointments encompass expenditure on outpatient curative care, vaccinations, and other tests; hospitalization includes general admissions, rehabilitation, and surgeries; and medications and others include expenses for medicines, patient transportation, and the related emergency allowances used for such transportation.

Therefore, we note the importance of the public and universal health system in Brazil, especially for the poorest population, who cannot afford private health insurance.[13]

There is a large reduction between the post-tax and the final income, with the Gini index decreasing by 19.3% for monetary income and by 16.6% for total income, as shown in table 1. Public education and health have a high impact in poverty and income concentration. While the poverty headcount falls by 23.9 p.p. and the extreme poverty headcount by 9.7 p.p.; the top 10% share drops by 6.4 p.p., both for monetary income.

To better capture the progressivity of the in-kind benefits, we look again at table 2. Regarding public education, spending on preschool, elementary school, and high school are progressive pro-poor, since their concentration coefficients are negative. In particular, spending on elementary education is the most progressive, with a Lerman-Yitzhaki index of 0.686, followed by preschool, with 0.678. However, the low income share of this last component reduces its final impact, resulting in a marginal effect smaller than high school. On the other hand, the 3.9% income share of elementary school spending combined with its low concentration coefficient generates the greatest marginal decrease in inequality.

However, spending on higher education exhibits a regressive effect on inequality, with a coefficient of 0.632, significantly higher than the final income's Gini. This regressiveness is linked to the factors described above, especially the greater concentration of the richest population in Brazil's public higher education. Therefore, despite recent advances arising from the adoption of affirmative action policies for admission to public universities, the richest population still benefits most from higher education spending in the country.

Finally, public health expenses are also progressive pro-poor, highlighting the marginal effects of medical appointments and hospitalization. Both components exhibit a high share in income, respectively 3.9% and 1.7%, which, combined with its negative concentration coefficients, explain its high impact on reducing inequality.

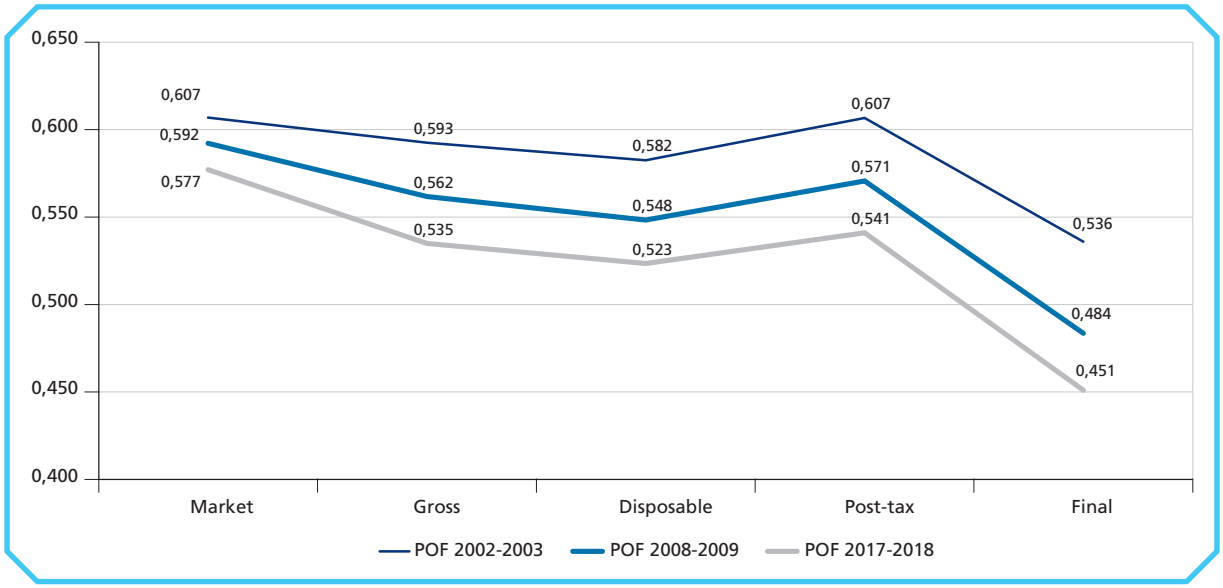
13. In POF 2017-2018 it is possible to observe that 79.9% of the families in the top 10% have private health insurance, while this proportion is only 6.8% for the bottom 10%.

4 CHANGES AND PERSISTENCE AT THE BEGINNING OF THE 21ST CENTURY

This section analyzes the changes in transfers and taxes in the last three surveys, POFs 2002-2003, 2008-2009, and 2017-2018. In order to do this, we build a historical outline of how the redistributive role of the Brazilian State has changed in the first decades of the 21st century.

Figure 3[14] shows the Gini index for each stage of total income in each survey year. First, the inequality of total market income – constituted by imputed rent and income from the labor market, rents and sales, donations and alimony, and gains in savings and the financial market – has decreased from 0,607 to 5,077 between 2002-2003 and 2017-2018. Notably, this is a much smaller reduction in inequality than what is found using other household surveys, such as the PNAD.

FIGURE 3
Evolution of the Gini index by income stages – Brazil



Sources: For cash transfers and direct taxes, POFs 2002-2003, 2008-2009, and 2017-2018 microdata/IBGE; for indirect taxes, Silveira (2012) and Silveira et al. (2022); for public education expenses, Inep; and, for public health expenditures, PNS, SHA, Siops and other administrative records of the Ministry of Health.
Authors' elaboration.

We observe one of the greatest differences over time in the gross income stage. The impact of the cash transfers, measured as the gap between gross and market income, have increased

14. In appendix B, we present the same figure but with pensions classified as market income.

significantly in the period: they were associated with a 2.4% reduction of inequality in 2002-2003, 5.1% in 2008-2009, and 7.3% in 2017-2018.

Direct taxation maintained its low impact on inequality, with an average Gini index reduction between gross and disposable income of around 2.1% across the surveys. On the other hand, indirect taxation also continued to be highly regressive, raising the Gini index between disposable and post-tax income by an average of 3.9%. These results reflect the fact that Brazilian taxation, in contrast to transfers, did not undergo major changes in the period.

Whereas in 2002-2003 the effects of indirect taxes increased the Gini for the market income, the same result is not observed in other years. Thus, the reduction in inequality caused by cash transfers in 2008-2009 and 2017-2018 was larger than the concentrating effect of indirect taxes, resulting in a lower Gini index in the post-tax income compared to that of market income.

In addition to government cash transfers, government spending on education and public health also changed significantly in the period. Through observing the difference between post-tax and final income, we can see that its effect on inequality more than compensated for the regressiveness of the Brazilian tax system in all of the survey years. At a second-order level, its impact also significantly increased, from a Gini reduction of 11.7% in 2002-2003, 15.3% in 2008-2009, and 16.6% in 2017-2018. As a result, Brazilian inequality measured by final income decreased by 15.9% in the first decades of the 21st century.

In international comparison, the reduction in Brazil's inequality between market income and disposable income – after the incidence of cash transfers and direct taxes – is 2.9 p.p. larger than the average obtained from a sample of Latin American countries.[15] At the same time, Goñi, López and Servés (2011) show that direct taxation has a much more significant role in reducing inequality in western European countries than in Latin America. Also, indirect taxes are regressive for a considerable portion of the latter countries; however, the weight of these taxes in Brazil is considerably higher.[16]

15. This sample consists of Argentina (Del Valle et al., 2021), Bolivia (Yánes, Jimenez and Arauco, 2021), Chile (Martinez-Aguilar and Ortiz-Juarez, 2016), Colombia (Meléndez, Pabón and Peña-Tenjo, 2021), Ecuador (Llerena et al., 2014), Mexico (Scott, de la Rosa and Aranda, 2017) and Peru (Jaramillo, 2014).

16. While the Brazilian tax burden was 32.6% of GDP for 2019, very close to the 33.4% observed for OECD countries, the average burden for Latin America is 22.9%. In addition, of the Brazilian burden, 46.6% refer to indirect taxes (Brasil, 2021).

As for public education and health expenditure, these systems reduce inequality by a greater extent in Brazil than in other Latin American countries, with a reduction of 1.4 p.p. in the final income Gini index. Yet, even after transfers and taxes, Brazil remains more unequal than the other countries: 14.4% higher than the market income average of the sample of Latin American countries and 13.9% higher than the final income average.

To better understand this period in Brazil, table 4 shows the Gini decomposition of final income for the three surveys. First, concerning market income, we see a reduction in its final income share as a result of relatively greater growth in cash transfers and in-kind benefits. In addition, despite market income being a regressive component of final income throughout the period, its concentration coefficients have fallen. However, as the inequality of final income fell relatively more the inequality of the market income, the regressive marginal effect of market income increased in the period.

TABLE 4

Decomposition of final income Gini index, concentration coefficients, and marginal effects by income components – Brazil

Income, cash transfers, taxes, public education and health	Final income (%)			Concentration coefficients			Marginal effects		
	2002-2003	2008-2009	2017-2018	2002-2003	2008-2009	2017-2018	2002-2003	2008-2009	2017-2018
Total market income	100.0	91.8	86.9	0.578	0.550	0.527	0.042	0.061	0.066
Cash transfers	13.2	17.8	20.2	0.555	0.526	0.494	0.003	0.008	0.009
Direct taxes	-9.1	-9.4	-8.8	0.649	0.662	0.614	-0.010	-0.017	-0.014
Indirect taxes	-16.6	-14.8	-12.0	0.402	0.374	0.359	0.022	0.016	0.011
Education	7.5	8.3	7.9	0.136	0.055	-0.033	-0.030	-0.036	-0.038
Health	4.9	6.2	5.8	0.001	-0.032	-0.114	-0.026	-0.032	-0.033
Total final income	**100.0**	**100.0**	**100.0**	**0.536**	**0.484**	**0.451**			

Sources: For cash transfers and direct taxes, POFs 2002-2003, 2008-2009 and 2017-2018 microdata/IBGE; for indirect taxes, Silveira (2012) and Silveira et al. (2022); for public education expenses, Inep; and, for public health expenditures, PNS, SHA, Siops and other administrative records of the Ministry of Health.

Authors' elaboration.

Regarding cash transfers, their growing share in final income is remarkable, going from 13.2% to 20.2% between 2002-2003 and 2017-2018. This behavior can be explained in light of the faster increase in transfers than in income: while transfers increased by 188.8% in the period, market income only grew by 64.9%. However, despite the reduction in concentration coefficients over time, this drop was smaller than that observed for the Gini index of final income. Thus, transfers can be classified as neutral components concerning final income for 2002-2003 and slightly regressive for 2008-2009 and 2017-2018.

As described in the previous section, the component responsible for this source of regressiveness is RPPS, which represent 26.5% of total cash transfers. In the present century, these benefits have already undergone several reforms which have reduced their regressive effects: the unification of regimes, more restrictive rules for granting, and the institution of minimum age for retirement. Nevertheless, the effects of these reforms are still small at present, as the changes apply only for new entrants to the system.

Another important component is RGPS, representing 57.0% of total cash transfers and these are characterized as slightly progressive or neutral. It is important to emphasize that pensions, while mostly contributory, are directly linked to inequality on the Brazilian labor market. As a result, the poorest are left out of this social protection system as they are more likely to suffer from unemployment or undertake informal jobs.

The regressiveness of cash transfers is partly explained by the role played by the public pensions. As seen, the pensions are composed by two different regimes, one regressive and other slightly progressive, and the reforms carried out in the last decades have not yet led to large effects. Another possible reason behind this counterintuitive behavior of transfers is precisely the other major changes that took place in the period: the large gains in progressivity observed in in-kind benefits, which significantly reduced the Gini.

Despite this, it is necessary to emphasize the importance of increasing the highly progressive transfer programs, such as in the recently extinct *Bolsa Família*. An increase in the income share of these components and, consequently, in their marginal effects, can significantly impact inequality. Additionally, considering poverty and hunger in Brazil, where 36.7% of the households in the POF 2017-2018 reported some degree of food insecurity, these policies are even more important.

Meanwhile, taxation has changed little over the years. We see that the income share and marginal effects of direct taxes remained relatively constant, and these have a progressive effect on final income. In the case of indirect taxes, their regressivity is high in the period, with concentration

coefficients smaller than the Gini index. However, we observe a reduction in their final income share over the surveys, resulting in a reduction of their regressive marginal effects on inequality.

We can understand this drop in income share given the nature of these taxes, which are largely levied on household consumption. Thus, as income increases are partially followed by consumption increases – between 2002-2003 and 2017-2018, income grew by 64.9% and consumption grew by 47.5% –, the indirect taxes increased in a smaller proportion than income. In this sense, the Brazilian tax system did not undergo major changes in the period, with its potential to reduce inequality little explored.

Finally, the marginal effects of public education and health increased in absolute terms over the period, resulting in a larger contribution to the reduction of inequality. The growth of education expenditures was slightly higher than the growth of income, resulting in a share of final income greater by 0.4 p.p. when comparing the first survey to the last. However, its concentration coefficient was significantly reduced, classified as progressive for 2002-2003 and 2008-2009, and progressive pro-poor in 2017-2018.

Public health expenditures grew proportionately faster in the period, resulting in an increase of 0.9 p.p. between 2002-2003 and 2017-2018. In addition, since 2008-2009 their concentration coefficient became negative, again going from progressive to progressive pro-poor. As a result, the potential for reducing inequality from a marginal increase in public health expenditures is also high, as observed by the absolute increase in marginal effects.

In summary, we observe changes and persistence in the redistributive role of the Brazilian State in the early 21st century. The country was neither able to unshackle itself from the institutional ties of a regressive tax system nor to exploit the potential of direct taxes for greater taxation on the richest. Despite this persistence, Brazil greatly reduced final income inequality, a drop of 15.9% between 2002-2003 and 2017-2018, which can be considered a reference case among Latin American countries.

5 CONCLUSIONS AND FINAL CONSIDERATIONS

The present paper contributes to the literature by analyzing how the Brazilian State's redistributive role affects the country's level of inequality and how this role has evolved in the first decades of the 21st century. For this purpose, we applied the before and after analysis that measures the impact of transfers and taxes on the Gini index. However, this analysis suffers from known methodological limitations, as it ignores behavior effects and depends on the order chosen for the

income stages. To overcome these problems, we estimate the marginal effects, which measure the consequences of proportional changes in the income sources on inequality and eliminate problems of reranking. Another innovation of our paper is in applying the Lerman-Yitzhaki progressivity index, which has several advantages compared to the Kakwani index (Hoffmann, 2013), which is used more frequently in the literature.

The paper is composed of two main parts. In the first, we explore the role of cash transfers, taxes, and in-kind benefits in detail, using the most recent data from the POF 2017-2018. Regarding government cash transfers, RPPS appear as the only regressive component of this group. On the other hand, we find that the BPC and the *Bolsa Família* programs represent the highest progressivity, classified as progressive pro-poor, with their potential for reducing inequality throttled only by their low final income share of these benefits.

Regarding direct taxes, we highlight the IRPF, due to its high progressivity and incidence, especially amongst the top 10% of earners, and the property taxes, with their low progressivity, for IPTU, or even regressivity, for the IPVA. For both taxes, there is plenty of room for improving their progressiveness. In the case of IRPF, it is possible to increase the maximum marginal tax rate (today at 27.5% compared to 35% in neighboring countries), to abolish the exemptions for profits and dividends, and remove the deductions for private health and education expenses. For the wealth taxes and especially for IPTU, we recommend progressive rates and adoption of exemption rules only for low-value properties in locations with poor infrastructure.

In contrast, indirect taxes are highly regressive, with a low concentration coefficient and a high share in final income, at 12.0%. This implies that proportional increases in these taxes considerably increase inequality, with marginal effects of 0.011. In the aggregate, the slight progressiveness of direct taxation is not enough to offset the regressiveness of indirect taxation, resulting in tax system that is regressive in the aggregate.

Regarding in-kind benefits, spending on preschool, elementary school, high school, and all the health items are progressive pro-poor. In particular, the low concentration coefficients and high-income shares of elementary school and medical appointments result in the greatest marginal effects among all final income components, -0.027 and -0.022 respectively. The exception here are higher education expenditures: despite the recent progressive advances arising from adopting affirmative action policies for admission to public universities, they are still regressive, as the richest are relatively better represented at this educational level.

In terms of their impact on poverty, the most notable gains come from cash transfers and in-kind benefits. They reduce the extreme poverty headcount for monetary income by 13.8 p.p.

and 23.9 p.p., respectively, and the poverty headcount by 15.7 p.p. and 9.7 p.p. Indirect taxes, on the other hand, contribute significantly to the rise in poverty in the country, increasing theses indices by 4.6 p.p. and 7.6 p.p.

The second part of this article analyzed how the Brazilian State's redistributive role evolved in the early 21st century. The primary source of persistence is the Brazilian regressive tax system. While direct taxation remained moderately progressive, represented by a drop in the Gini index between the gross and disposable income of around 2.1% in the period, indirect taxation remained highly regressive, represented by an increase in the Gini index between disposable and post-taxation income by an average of 3.9%. In other words, Brazil did not get rid of the institutional burden of regressive taxation.

However, major changes were also observed in the first decades of the 21st century. First, cash transfers became more progressive, with a reduction in their concentration coefficients and an increase in their income share. These effects resulted in a Gini index reduction between market income and gross income by 7.3% for 2017-2018, compared to only 2.4% for 2002-2003. Furthermore, the reduction in inequality caused by this component more than compensated for the regressiveness of indirect taxes, causing the post-tax income Gini to be lower than that of market income for the years 2008-2009 and 2017-2018.

Despite these improvements, cash transfers exhibited a slight regresiveness in terms of their impact on final income. The reason behind this apparently counter-intuitive behavior is related to the regresiveness of RPPS and low progresiveness of RGPS, as well as to the delay effect of the reforms made in these regimes since most of them are only applicable to new entrants. This behavior of transfers is also linked to another major change observed in the period: the large gains in progressivity observed in public education and health expenditures, which reduced the Gini index proportionally more than the reduction in the monetary transfers concentration coefficients.

Both in-kind benefits had their concentration coefficients significantly reduced, especially from 2008-2009 onwards when health expenditures became progressive pro-poor. In addition, the share of these components in final income also increased in the period, by 0.4 p.p. for educational spending and by 0.9 p.p. for health spending, thus increasing its marginal effects on inequality. In other words, the Gini reduction observed between after-tax and final income increased significantly, from 11.7% in 2002-2003 to 15.3% in 2008-2009 and 16.6% in 2017-2018.

In the aggregate, the changes observed with the expansion and progressivity gains from social spending via cash transfers and in-kind benefits more than compensated for the persistence of the tax system's regressiveness. These finding stress the Brazilian State's redistributive role in reducing

inequality in the period, which makes it a reference case among Latin American countries in the early 21st century. However, to continue along the trajectory towards becoming a fairer and more equal country, Brazil will have to unshackle itself from the burden of a regressive tax system by reducing the weight of indirect taxes and increasing taxation on the richest, who currently pay proportionately less taxes than the bottom 10%.

REFERENCES

ACEMOGLU, D.; TICCHI, D.; VINDIGNI, A. Emergence and persistence of inefficient states. **Journal of the European economic association**, v. 9, n. 2, p. 177-208, Apr. 2011.

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

ALVAREDO, F.; GASPARINI, L. Recent trends in inequality and poverty in developing countries. In: ATKINSON, A. B.; BOURGUIGNON, F. (Ed.). **Handbook of income distribution**. Oxford: Elsevier, 2015. v. 2, p. 697-805.

BARROS, R. P. de et al. **Uma análise das principais causas da queda recente na desigualdade de renda brasileira**. Rio de Janeiro: Ipea, ago. 2006. (Texto para Discussão, n. 1203).

BARROS, R. P. de; FRANCO, S.; MENDONÇA, R. S. P. D. A recente queda da desigualdade de renda e o acelerado progresso educacional brasileiro da última década. In: BARROS, R. P. de; FOGUEL, M. N.; ULYSSEA, G. (Ed.). **Desigualdade de renda no Brasil**: uma análise da queda recente. Brasília: Ipea, 2007. v. 2, p. 305-342.

BERG, A. et al. Redistribution, inequality, and growth: new evidence. **Journal of Economic Growth**, v. 23, n. 3, p. 259-305, 2018.

BRASIL. Ministério da Economia. **Boletim estimativa da carga tributária bruta do governo geral**. Brasília: STN, 2021.

CABRERA, M.; LUSTIG, N.; MORÁN, H. E. Fiscal policy, inequality, and the ethnic divide in Guatemala. **World Development**, v. 76, p. 263-279, Dec. 2015.

CINGANO, F. **Trends in income inequality and its impact on economic growth**. Paris: OECD Publishing, 2014. (OECD Social, Employment and Migration Working Papers, n. 163).

DE BRAUW, A. et al. The impact of Bolsa Família on schooling. **World Development**, v. 70, p. 303-316, June 2015.

DEL VALLE, L. et al. **Fiscal policy, income redistribution and poverty reduction in Argentina**. New Orleans: Tulane University, Aug. 2021. (Working Paper, n. 111).

FIRPO, S.; REIS, M. C. O salário mínimo e a queda recente da desigualdade no Brasil. In: BARROS, R.; FOGUEL, M.; ULYSSEA, G. (Ed.). **Desigualdade de renda no Brasil**: uma análise da queda recente. Brasília: Ipea, 2007. v. 2, p. 499-506.

FOGUEL, M. N.; AZEVEDO, J. P. Uma decomposição da desigualdade de rendimentos do trabalho no Brasil: 1984-2005. In: BARROS, R.; FOGUEL, M.; ULYSSEA, G. (Ed.). **Desigualdade de renda no Brasil**: uma análise da queda recente. Brasília: Ipea, 2007. v. 2, p. 343-364.

GALOR, O.; MOAV, O. From physical to human capital accumulation: inequality and the process of development. **The Review of Economic Studies**, v. 71, n. 4, p. 1001-1026, Oct. 2004.

GALOR, O.; ZEIRA, J. Income distribution and macroeconomics. **The Review of Economic Studies**, v. 60, n. 1, p. 35-52, Jan. 1993.

GASPARINI, L. et al. Recent trends in income inequality in Latin America [with comments]. **Economia**, v. 11, n. 2, p. 147-201, 2011.

GLEWWE, P.; KASSOUF, A. L. The impact of the Bolsa Escola/Familia conditional cash transfer program on enrollment, dropout rates and grade promotion in Brazil. **Journal of Development Economics**, v. 97, n. 2, p. 505-517, Mar. 2012.

GOBETTI, S. W.; ORAIR, R. O. Progressividade tributária: a agenda negligenciada. Rio de Janeiro: Ipea, abr. 2016. (Texto para Discussão, n. 2190).

GOÑI, E.; LÓPEZ, J. H.; SERVÉN, L. Fiscal redistribution and income inequality in Latin America. **World Development**, v. 39, n. 9, p. 1558-1569, Sept. 2011.

HALTER, D.; OECHSLIN, M.; ZWEIMÜLLER, J. Inequality and growth: the neglected time dimension. **Journal of Economic Growth**, v. 19, n. 1, p. 81-104, Mar. 2014.

HANNI, M.; MARTNER, R.; PODESTÁ, A. El potencial redistributivo de la fiscalidad en América Latina. **Revista Cepal**, n. 116, p. 8-26, ago. 2015.

HIGGINS, S. et al. Comparing the incidence of taxes and social spending in Brazil and the United States. **Review of Income and Wealth**, v. 62, n. S1, p. 22-46, Aug. 2016.

HIGGINS, S.; PEREIRA, C. The effects of Brazil's taxation and social spending on the distribution of household income. **Public Finance Review**, v. 42, n. 3, p. 346-367, 2014.

HOFFMANN, R. Queda da desigualdade da distribuição de renda no Brasil, de 1995 a 2005, e delimitação dos relativamente ricos em 2005. In: BARROS, R.; FOGUEL, M.; ULYSSEA, G. (Ed.). **Desigualdade de renda no Brasil**: uma análise da queda recente. Brasília: Ipea, 2006a. v. 1, p. 93-106.

_____. Transferências de renda e a redução da desigualdade no Brasil e cinco regiões entre 1997 e 2004. **Econômica**, Rio de Janeiro, v. 8, n. 1, p. 55-81, jun. 2006b.

_____. How to measure the progressivity of an income component. **Applied Economics Letters**, v. 20, n. 4, p. 328-331, 2013.

IBARRA, G. L.; RUBIÃO, R. M.; FLEURY, E. **Indirect tax incidence in Brazil**: assessing the distributional effects of potential tax reforms. Washington: World Bank, 2021. (Policy Research Working Paper, n. 9891).

JARAMILLO, M. The incidence of social spending and taxes in Peru. **Public Finance Review**, v. 42, n. 3, p. 391-412, 2014.

KEEFER, P.; KNACK, S. Polarization, politics and property rights: links between inequality and growth. **Public Choice**, v. 111, n. 1, p. 127-154, Mar. 2002.

LERMAN, R. I.; YITZHAKI, S. Income inequality effects by income source: a new approach and applications to the United States. **The Review of Economics and Statistics**, v. 67, n. 1, p. 151-156, Feb. 1985.

_____. S. Changing ranks and the inequality impacts of taxes and transfers. **National Tax Journal**, v. 48, n. 1, p. 45-59, Mar. 1995.

LLERENA, P. et al. **Social spending, taxes and income redistribution in Ecuador**. New Orleans: Tulane University, Feb. 2015. (Working Paper, n. 28).

LUSTIG, N. Inequality and fiscal redistribution in middle income countries: Brazil, Chile, Colombia, Indonesia, Mexico, Peru and South Africa. J**ournal of Globalization and Development**, v. 7, n. 1, p. 17-60, 2016.

LUSTIG, N.; PESSINO, C.; SCOTT, J. The impact of taxes and social spending on inequality and poverty in Argentina, Bolivia, Brazil, Mexico, Peru, and Uruguay: introduction to the special issue. **Public Finance Review**, v. 42, n. 3, p. 287-303, 2014.

MARTÍNEZ-AGUILAR, S.; ORTIZ-JUAREZ, E. **CEQ master workbook**: Chile. New Orleans: CEQ Data Center, Oct. 2016.

MEDEIROS, M.; SOUZA, P. H. G. F. de; CASTRO, F. Á. de. A estabilidade da desigualdade de renda no Brasil, 2006 a 2012: estimativa com dados do imposto de renda e pesquisas domiciliares. **Ciência & Saúde Coletiva**, v. 20, n. 4, p. 971-986, 2015.

MELÉNDEZ, M.; PABÓN, V. M.; PEÑA-TENJO, N. **El papel de la política fiscal en la reducción de la desigualdad y la pobreza en Colombia**: un análisis de incidencia del gasto social y los impuestos. New Orleans: Tulane University, feb. 2021. (Documento de Trabajo, n. 107).

MENEZES-FILHO, N.; FERNANDES, R.; PICCHETTI, P. Educação e queda recente da desigualdade no Brasil. In: BARROS, R.; FOGUEL, M.; ULYSSEA, G. (Ed.). **Desigualdade de renda no Brasil**: uma análise da queda recente. Brasília: Ipea, 2007. v. 1, p. 285-304.

MORGAN, M. **Falling inequality beneath extreme and persistent inequality**: new evidence for Brazil combining national accounts, surveys and fiscal data, 2001-2015. [s.l.]: WID, Aug. 2017. (Working Paper Series, n. 2017/12).

OCAMPO, J. A.; MALAGÓN, J. Los efectos redistributivos de la política fiscal. **Pensamiento Iberoamericano**, n. 10, p. 71-104, 2012.

ORAIR, R. O.; PALOMO, T. R.; CARVALHO, L. O resgate da progressividade tributária: uma agenda para a justiça social e ambiental. In: SALTO, F.; VILLAVERDE, J.; KARPUSKA, L. (Org.). **Reconstrução**: o Brasil nos anos 20. São Paulo: Saraiva Jur, 2022. v. 1, p. 267-287. (Série IDP).

PAIVA, L. H. et al. **Reformulation of income transfers in Brazil**: simulations and challenges. Brasília: IPC-IG, July 2021. (Working Paper, n. 192).

SCOTT, J.; de la ROSA, E.; ARANDA, R. **Inequality and fiscal redistribution in Mexico**: 1992-2015. New Orleans: Tulane University, Nov. 2017. (Working Paper, n. 65).

SILVEIRA, F. G. Equidade fiscal: impactos distributivos da tributação e do gasto social. In: STN – SECRETARIA DO TESOURO NACIONAL (Org.). **Finanças públicas**: XVII Prêmio Tesouro Nacional, 2012 – coletânea de monografias. 1. ed. Brasília: STN, 2012.

SILVEIRA, F. G. et al. **Tributação indireta**: alíquotas efetivas e incidência sobre as famílias. Brasília: Ipea, 2022. (Texto para Discussão, n. 2823).

SIQUEIRA, R. B. de et al. O sistema tributário brasileiro é regressivo? In: Lukic, M. R. et al. (Org.). **Tributação e desigualdade**. Rio de Janeiro: FGV Direito, 2017. p. 501-528.

SIQUEIRA, R. B. de; NOGUEIRA, J. R.; SOUZA, E. S. Alíquotas efetivas e a distribuição da carga tributária indireta sobre as famílias no Brasil. In: STN – SECRETARIA DO TESOURO NACIONAL (Org.). **XV Prêmio do Tesouro Nacional**. Brasília: STN, 2010.

SOUZA, P. H. G. F. de. **A desigualdade vista do topo**: a concentração de renda entre os ricos no Brasil, 1926-2013. 2016. 377 f. Tese (Doutorado) – Instituto de Ciências Sociais, Universidade de Brasília, Brasília, 2016.

SOUZA, P. H. G. F. de; MEDEIROS, M. **The decline in inequality in Brazil, 2003-2009**: role of the state. Berkeley: University of California, Nov. 2013. (IRLE Working Paper, n. 154-13).

UNDP – UNITED NATIONS DEVELOPMENT PROGRAMME. **Human development report 2020**: the next frontier – human development and the anthropocene. New York: UNDP, 2020.

YÁNEZ, E.; JIMENEZ, W.; ARAUCO, V. P. **Política fiscal e impactos redistributivos en Bolivia**. New Orleans: Tulane University, dic. 2021. (Documento de Trabajo, n. 115).

APPENDIX A

1 THE DECOMPOSITION OF THE GINI INDEX

The Gini index can be decomposed by income sources (Rao, 1969; Pyatt, Chen and Fei, 1980; Lerman and Yitzhaki, 1985). Considerer income x_i – after the benefit or tax, or more broadly *ex post* income – to be ordered in such a way that:

$$x_1 \leq x_2 \leq \ \ldots \ \leq x_n.$$

So, the Gini index of this distribution can be calculated using the following expression:

$$G_x = \frac{2}{n^2\mu}\sum_{i=1}^{n} i\, x_i - \left(1+\frac{1}{n}\right) \tag{2}$$

or

$$G_x = \frac{2}{n\mu}\mathrm{cov}(i, x_i) \tag{3}$$

with

$$\mu = \frac{1}{n}\sum_{I=1}^{n} x_i.$$

It is assumed that income x_i is made up of k sources, considering taxes as negative sources:

$$x_i = \sum_{h=1}^{k} x_{hi}. \tag{4}$$

The average of the *h-th* component is

$$\mu_h = \frac{1}{n}\sum_{i=1}^{n} x_{hi}, \tag{5}$$

and the respective share in total income is

$$\varphi_h = \frac{\mu_h}{\mu} = \frac{\sum_{i=1}^{n} x_{hi}}{\sum_{i=1}^{n} x_i}, \tag{6}$$

being, for the taxes, negative income shares.

By replacing (4) in (3), it is possible to obtain

$$G_x = \frac{2}{n\mu}\sum_{i=1}^{k}\operatorname{cov}(i, x_{hi})$$

or

$$G_x = \frac{2}{n}\sum_{h=1}^{k}\varphi_h \frac{1}{\mu_h}\operatorname{cov}(i, x_{hi}). \tag{7}$$

Similar to (3), the concentration coefficients of the *h-th* component can be defined as

$$C_h = \frac{2}{n\mu_h}\operatorname{cov}(i, x_{hi}) = \frac{2}{n}\operatorname{cov}\left(i, \frac{x_{hi}}{\mu_h}\right). \tag{8}$$

It should be kept in mind, as stated, that the concentration coefficients are defined based on the final income rank.

As a result of (7) and (8),

$$G_x = \sum_{h=1}^{k}\varphi_h C_h. \tag{9}$$

As can be seen, the concentration coefficient is proportional to the covariance between the positions of order *i* and the relative rents μ_{hi}/μ_h. Thus, the concentration coefficient is not affected by the exchange of sign of the source since the relative rents will remain the same. It can be verified that

$$-1 + \frac{1}{n} \leq C_h \leq 1 - \frac{1}{n}. \tag{10}$$

2 THE MARGINAL EFFECTS OF CASH TRANSFERS, TAXES, AND IN-KIND BENEFITS ON INCOME INEQUALITY

Following Hoffmann (2013), let *b* be the benefit and *t* the tax and considering that *x* is the *ex post* income, the gross being for transfers and disposable for taxes. Therefore, the ratio between the value of the benefits and the value of the previous income – in this case, the market income – is

$$\beta = \frac{\sum b}{\sum (x - b)}. \tag{11}$$

And the ratio between the value of taxes and the previous income – in this case, the gross income – is

$$\gamma = \frac{\sum t}{\sum (x+t)}. \tag{12}$$

Remembering (9) $G_x = \sum_{h=1}^{k} \varphi_h C_h$, the Gini index of *ex post* rents (x) after granting benefits and taxation are, respectively,

$$G_x = \frac{1}{1+\beta} C_{x-b} + \frac{\beta}{1+\beta} C_b \text{ and} \tag{13}$$

$$G_x = \frac{1}{1-\gamma} C_{x+t} - \frac{\gamma}{1-\gamma} C_t. \tag{14}$$

The following presentation uses the example of benefits, being similar in the case of taxes. Assuming a proportional change in the value of the benefits, the new value can be described as

$$b_d = \theta b. \tag{15}$$

with $\theta = 1 + \delta$, where δ is positive and arbitrarily small, to the point that it does not cause the *ex post* rents to be reordered, which implies the concentration ratios C_{x-b} and C_b remain the same.

The new value of β is

$$\beta_D = \theta\beta. \tag{16}$$

Thus, the new *ex post* income Gini index is

$$\frac{1}{1+\theta\beta} C_{x-b} + \frac{\theta\beta}{1+\theta\beta} C_b,$$

and the G_x variation is

$$\Delta G_x = \left(\frac{1}{1+\theta\beta} - \frac{1}{1+\beta}\right) C_{x-b} + \left(\frac{\theta\beta}{1+\theta\beta} - \frac{1}{1+\beta}\right) C_b. \tag{17}$$

After some algebraic manipulation, using (12), we obtain

$$\frac{\Delta G_x}{\theta - 1} = \frac{\Delta G_x}{\delta} = \frac{\beta}{1+\theta\beta}(C_b - G_x). \tag{18}$$

Following Lerman and Yitzhaki (1985), it is possible to define the level of variation of the Gini index arising from the marginal increment as

$$\lim_{\delta \to 0} \frac{\Delta G_x}{\delta} = \frac{\beta}{1+\beta}(C_b - G_x). \tag{19}$$

Based on (11),

$$\frac{\beta}{1+\beta} = \frac{\sum b}{\sum x}. \tag{20}$$

Returning to the initial presentation of the section, regarding the decomposition of the Gini index, where it was seen that, when the final income x_i is formed by k components – expression (4) –, the Gini index can be decomposed into k components – expression (9) –, which can be expressed as follows.

$$\sum_{h=1}^{h} \varphi_h (C_b - G_x) = 0. \tag{21}$$

As in (18), the intensity of the G_x variation resulting from a small proportional increase in the x_{hi} portion is given by $\varphi_h(C_h - G_x)$, summarizing the potential of each component to collaborate in changing inequality.

REFERENCES

HOFFMANN, R. How to measure the progressivity of an income component. **Applied Economics Letters**, v. 20, n. 4, p. 328-331, 2013.

LERMAN, R. I.; YITZHAKI, S. Income inequality effects by income source: a new approach and applications to the United States. **The Review of Economics and Statistics**, v. 67, n. 1, p. 151-156, Feb. 1985.

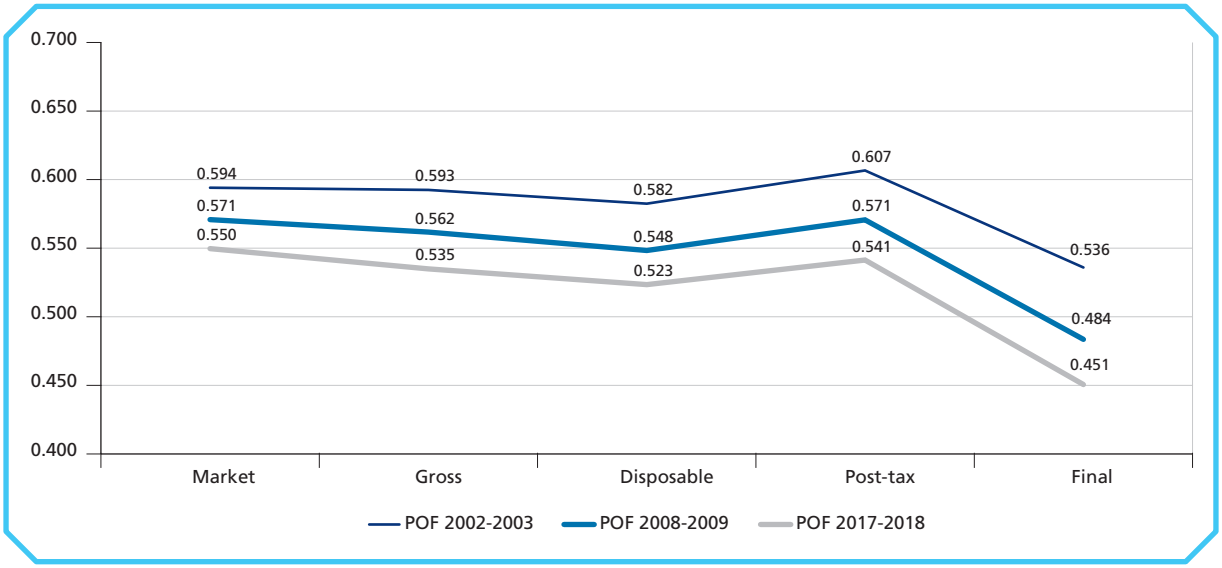
_____. Changing ranks and the inequality impacts of taxes and transfers. **National Tax Journal**, v. 48, n. 1, p. 45-59, Mar. 1995.

PYATT, G.; CHEN, C.; FEI, J. The distribution of income by factor components. **The Quarterly Journal of Economics**, v. 95, n. 3, p. 451-473, Nov. 1980.

RAO, V. M. Two decompositions of concentration ratio. **Journal of the Royal Statistical Society**, v. 132, n. 3, p. 418-425, 1969.

APPENDIX B

FIGURE B.1
Evolution of the Gini index by income stages, with pensions included in market income – Brazil



Sources: For cash transfers and direct taxes, Consumer Expenditure Surveys (*Pesquisas de Orçamentos Familiares* – POFs) 2002-2003, 2008-2009, and 2017-2018 microdata/Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE); for indirect taxes, Silveira (2012) and Silveira et al. (2022); for public education expenses, *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* (Inep); and, for public health expenditures, National Survey on Health (*Pesquisa Nacional de Saúde* – PNS), Brazil's System of Health Accounts (SHA), System on Public Health Budgets (*Sistema de Informações sobre Orçamentos Públicos em Saúde* – Siops), and other administrative records of the Ministry of Health.

Authors' elaborations.

REFERENCES

SILVEIRA, F. G. Equidade fiscal: impactos distributivos da tributação e do gasto social. In: STN – SECRETARIA DO TESOURO NACIONAL (Org.). **Finanças públicas**: XVII Prêmio Tesouro Nacional, 2012 – coletânea de monografias. 1. ed. Brasília: STN, 2012.

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