

Regional income inequality in Brazil: state-level Distributional National Accounts

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Abstract

Purpose – Brazil's regional inequality is an important topic due to the large and persistent differences in development between states and the high levels of inequality in the country. These variations in development can potentially render survey data inaccurate since the significance of capital income varies across the states. Besides, previous studies incorporating tax and national accounts data globally have mainly focused on measuring the income distribution at the country-level. This approach can limit the understanding of inequality, especially when considering large countries such as Brazil.

Design/methodology/approach – The methodology used to construct these estimates follows the guidelines of the Distributional National Accounts, whose core goal is to provide income distribution measures consistent with macroeconomic aggregates and harmonized across countries and time. The procedure has three main steps: first, it corrects the survey's underrepresentation of top incomes using tax data. Then, it accounts for national income items not included in the survey or tax data, such as imputed rents and undistributed profits. Finally, it ensures that all components match the national income.

Findings – Compared to survey-based estimations, the results reveal a new angle on the state-level inequality. This study indicates that Amazonas, Rio de Janeiro and São Paulo have a more concentrated income distribution. The top 1% of earners in these states receives around 28% of total pre-tax income, while the top 10% receive nearly 60%. On the other end, Amapá (AP), Acre (AC), Rondônia (RO) and Santa Catarina (SC) are the states where the income distribution is less concentrated. There were no significant changes in the income distribution across the states during the period analyzed.

Originality/value – This study combines survey, tax and national accounts data to construct new estimates of Brazil's state-level income distribution from 2006 to 2019. Previous results only considered income captured in surveys, which usually misses a significant part of capital incomes. This limitation may bias comparisons as capital income has different importance across the states. The new estimates represent the income of top groups more accurately, account for the entire national income and enable to compare regional inequality levels consistently with other countries.

Keywords Brazil, Regional inequality, Income distribution, Distributional National Accounts

Paper type Research paper

1. Introduction

The income level and its distribution can considerably vary between country regions. However, most studies incorporating survey, tax and national accounts data have focused on measuring the income distribution at the national-level, and studies focusing on regional inequality mainly rely only on survey data. This approach can limit the understanding of inequality, especially when considering large countries. Brazil is an emblematic case. It has an area almost as extensive as Europe and more than 200 m inhabitants. Internal economic differences are equally huge. For instance, the gap between the Brazilian state with the



highest and the one with the lowest gross domestic product (GDP) per capita, respectively São Paulo and Maranhão, is similar to the one between Chile and Honduras, the two extremes in Latin America [1]. Due to this heterogeneity, a necessary step to understand Brazil's regional inequality is incorporating tax and national accounts information and moving to a finer geographical decomposition of the income distribution.

This study focuses on the state-level income inequality. Its central question is: what is the income distribution within Brazilian states? To answer this question, it combines publicly available survey, national accounts and tax data to construct new state-level measures of income distribution in Brazil. The methodology follows the Distributional National Accounts guidelines, whose core goal is to provide income distribution measures consistent with macroeconomic aggregates and harmonized across countries and time (Alvaredo *et al.*, 2020).

In brief, the methodology employed in this paper rectifies the top of the distribution observed in the survey data using tax tabulations. It subsequently incorporates national accounts data to include income items not present in the tax or survey data, particularly undistributed profits and imputed rents. To the extent that the survey data underestimates the top income shares differently depending on the relative significance of labor and capital income within the state, this correction has an impact on inequality comparisons among states.

Overall, the new estimations show that there is little variation in the top income shares within the five Brazilian regions despite their sharp differences in average income. In 2018, the top 1% received 24% of the total income in the Southeast. In the North and the South, the top 1% received 22% of the total income that year. However, there are material differences at the bottom of the distribution. While in the Northeast, the bottom 50% gained 7% of the total income, it gained close to double in the South, with 12% of the total income going to the bottom 50%. Besides, there was no relevant change in income distribution within regions from 2006 to 2019 even if growth rates were very different across the regions during this period. When compared to the estimates based solely on the survey data, the results in this study indicate that there is a little less dispersion in the top income shares between the regions, especially in their top 10% income shares.

The state-level analysis reveals a higher heterogeneity. Amazonas (AM), Rio de Janeiro (RJ) and São Paulo (RJ) have an exceptionally high share of total income flowing to the top of the distribution. In these states, the top 1% income share surpasses 25% of total income, reaching as high as 30%, and the top 10% income share is close to 60% in most years. On the other end, Amapá (AP), Acre (AC), Rondônia (RO) and Santa Catarina (SC) are the states where the income distribution is less concentrated. The top 1% income share in these states usually stays below 20% and the top 10% stays close to 50% of the total income.

Compared to the survey-based estimations, a clear pattern emerges. The states with a higher share of labor income, such as most of those in the North region and the Federal District (DF), exhibit a smaller change in top income shares when transitioning from estimations based solely on the survey data to estimations that incorporate survey, tax and national accounts data. On the other hand, the states where capital income holds more importance, such as Amazonas (AM) and those in the South and Southeast regions appear to be relatively more unequal when considering new estimates. Due to the differences in economic structure among states, the new estimations unveil a different narrative regarding which states are the most unequal.

Despite the significant differences in average income between states, a decomposition analysis shows that the within-state inequality explains almost all the national inequality. However, one should not interpret this result as an indication that regional inequalities are less critical (Kanbur, 2006). Foremost, it indicates that income is highly concentrated in all states.

Several authors have investigated Brazil's spatial inequalities before. Azzoni and Haddad (2018) provides a short summary of this literature. Reis (2014) and Bucciferro and Ferreira de Souza (2020) offer a long-term perspective on income inequality between the states,

measuring it from the late 19th century to the beginning of the 21st-century; [Zamberlan Pereira \(2020\)](#) takes into account local prices to measure differences in real wages in the early 20th century and [Azzoni \(2001\)](#) constructs a measure to evaluate the long-run income convergence between the states. [Silveira Neto and Azzoni \(2011\)](#) evaluate the role of non-spatial policies in income convergence between 1995 and 2006. [Almeida and Azzoni \(2016\)](#) and [Oliveira and Neto \(2022\)](#) consider cost of living adjusted measures to compare regional inequality in recent decades, finding a significant reduction in the income differences between metropolitan areas once the correction is done.

Previous analysis of within-state inequality includes [Bértola, Castelnovo, Rodríguez, and Willebald \(2009\)](#), which looks at the years 1872 and 1920; [Azzoni \(1999\)](#), which covers the period between 1960 and 1991; [Souza \(2013\)](#) that decomposes Brazil's inequality and compares it to that of the United States of America and Mexico; and [Góes and Karpowicz \(2017\)](#) that analyzes the years between 2004 and 2014 with an approach to adjust for spatial price differences. This study also relates to the strain of the literature that analysis regional production structures, as the sorting of skills and occupations in the country can shape state-level inequalities ([Andrade, Gonçalves, & Freguglia, 2014](#); [Sobrinho & Azzoni, 2016](#); [Gonzaga & Azzoni, 2018](#)).

From a national perspective, this work relates to the pioneer works of [Medeiros, Souza, and de Castro \(2015\)](#) and [Souza and Medeiros \(2015\)](#) that introduced the use of tax income data in the analysis of income distribution in Brazil. More generally, this study dialogues with a larger effort of constructing Distributional National Accounts (DINA) globally ([World Inequality Database, 2021](#)), and in particular, with [Morgan \(2018\)](#) that built Brazil's DINA at the national-level.

The main contribution of this study is to construct new income distribution estimations that cover the income of top groups more accurately due to the combination of surveys with tax data, which provides a detailed picture of high-income earners in each state. Previous results solely considered the income captured in surveys, which usually misses a considerable part of capital incomes ([Blanchet, Flores, & Morgan, 2018](#)). This limitation is relevant because capital incomes are more concentrated than labor incomes, and states have different proportions of the two, possibly distorting the comparisons. In light of this correction, there is a revision of states with the highest income concentration compared to earlier research. Beyond Brazil's case, these results hold implications for the comparison of regional inequality levels relying on surveys.

In addition to the main contribution, these new estimates accounts for the entire national income, while surveys only capture a fraction. In particular, it incorporates money that does not appear in bank accounts but is part of individuals' income. The most prominent example is undistributed profits. This money effectively belongs to the company's shareholders, independently of being distributed as dividends or staying in firms' accounts. So to have an accurate picture of inequality, it must be attributed to shareholders ([Piketty, Saez, & Zucman, 2018](#)). Also, the methodology allows comparing the regional inequality levels between Brazil and other countries consistently. The fact that survey data only captures a fraction of national income limits the international comparability of previous results in the literature, given that surveys may vary in their capacity to capture different components of the national income.

The rest of the paper is organized as follows: [Section 2](#) describes the data. [Section 3](#) presents a brief overview of the income concepts used in the study. [Section 4](#) describes the methodology, including the assumptions behind the estimations. [Section 5](#) presents the results and [section 6](#) concludes.

2. Data

This study uses three primary sources to construct Brazil's state-level Distributional National Accounts (DINA): household surveys, tax tabulations and national accounts data. All databases are publicly available online, and this section overviews each of them.

2.1 Survey data

The first data source is the *Pesquisa Nacional de Amostras de Domicílios* (PNAD). The PNAD was an annual national survey produced by the *Instituto Brasileiro de Estatística e Geografia* (IBGE), Brazil's statistical bureau. It contains questions on income and its sources as well as employment status and household characteristics. This study uses the surveys conducted between 2007 and 2015 [2].

After 2016, the IBGE replaced the PNAD with the *Pesquisa Nacional de Amostras de Domicílios Contínua* (PNADC), a quarterly survey with a rotating panel [3]. Both the PNAD and the PNADC are representatives of the national- and the state-level. Despite the differences between the two surveys, there is no significant discontinuity for purposes of this study. The only point worth noticing is that the PNADC added questions that allow a more nuanced differentiation between unemployment benefits, financial income and social transfers. It also added more detailed information on secondary jobs. Therefore, these items can be estimated more precisely after 2016 [4].

2.2 Tax data

The second source is tax tabulations from the *Receita Federal*, Brazil's tax authority. They cover the period from 2006 to 2019, with one table for each state-year pair, totaling 378 tables. They portray the universe of tax returns, grouping them into centiles [5]. For the top 1% of state tax filers, there is a more granular division into groups of 0.1%. For the top 0.1%, there is a further division into groups of 0.01%. The income variable used to rank taxpayers sums the gross taxable income, including incomes subject to special taxation regimes, with distributed profits and dividends, which are not taxed in Brazil [6]. This income variable does not include unemployment benefits, the non-taxable share of pensions and some forms of non-taxable investment gains. However, on average, they represent no more than 5% of the total reported income and are unlikely to impact the ranking significantly. Finally, the tabulations contain the average and the cutoff income of each fractile.

2.3 National accounts

The third data source is national accounts, which are constructed by IBGE. They are available up to 2018. More specifically, the analysis uses the *Contas Econômicas Integradas* (CEI) complemented by the *Tabela de Recursos e Usos* (TRU) for the data on imputed rents. The databases follow the standards set in the System of National Accounts (United Nations, 2010). Namely, all the aggregates are divided into five sectors: nonfinancial corporations (S11), financial corporations (S12), government (S13), households (S14) and non-profit institutions serving households (S15) [7].

In addition, starting in 2010, IBGE also provides national accounts at the state-level, called *Sistema de Contas Regionais*. However, they are a simplified version. First, they do not disaggregate into the five sectors, containing only the sum for the total economy (S1). Second, it does not break down the aggregates as finely as the complete national accounts. More precisely, there are values for wages and salaries (D11), employers' social contributions (D12), taxes less subsidies on production and imports (D2–D3) and operating surplus plus mixed income (B2 + B3) [8]. Given the limitations of the state-level accounts, the estimations use them jointly with the national ones.

Finally, since the Brazilian national accounts do not contain information on depreciation, the estimations also use the Consumption of Fixed Capital (CFC) measure provided by the *Instituto de Pesquisa Econômica Aplicada* (IPEA), a public institution responsible for economic analysis. Júnior and Cornelio (2020) detail how they constructed the database.

3. Income concepts

This section introduces briefly the income concepts that guide the construction of the Distributional National Accounts. These concepts mostly come from the System of National Accounts. It focuses on the economic intuition behind the study choices and the description of their composition in Brazil.

The first concept is Fiscal Income. It corresponds to the sum of all incomes that an individual should report in the personal tax returns. It includes all taxable income but also non-taxable income that tax filers should disclose. In Brazil, this second group comprises dividends, unemployment benefits and exempted labor and pension incomes. However, Fiscal Income remains an incomplete measure. It does not account for money that individuals do not directly receive but constitute part of their resources. Two notable examples are undistributed profits and imputed rents for owners-occupiers. Not taking them into account would give an incomplete view of the income distribution (Piketty *et al.*, 2018). Besides, it would bias the inequality estimation between countries and over time, given that the advantages of distributing or retaining profits depend on the tax system.

In this study analysis, the central aggregate income concept is the Net National Income (NNI), as defined in the System of National Accounts (SNA). It is equal to the GDP (B1, S1) plus the net foreign income (NFI) minus the CFC. Although GDP appears more in the public debate than the NNI, there are reasons to support that the second is more meaningful when describing the income distribution. In short, the intuition behind adding the NFI is that it affects the actual income available for country residents. The CFC, in its turn, is the amount necessary to replace capital stock depreciation, which means no one can consume or accumulate it. So not subtracting the CFC would artificially inflate the income of capital owners as it would account for the cost of replacing the depreciated stock as part of their incomes [9].

A final clarification relative to the income concepts is that the study focuses on the pre-tax post-replacement income (henceforth pre-tax income) and restricts the analysis to adults [10]. The pre-tax income is the sum of all incomes accruing to individuals before the operation of the tax and transfer system but after the operation of the social insurance system. Naturally, it sums up to the NNI. This study focuses on this concept for two reasons. First, the Brazilian pension system functions on a pay-as-you-go model, which means that current contributors finance current beneficiaries. Not including pensions would artificially increase inequality because pensioners do not have retirement savings in their names despite having contributed in the past. Second, as previously pointed out, the state-level accounts are a simplified version of the national accounts. Concretely, the state-level accounts do not have the items that record the operation of the taxes and transfers system. As such, this study would have to make an increasing number of assumptions to obtain the state-level post-tax income distribution. To keep the inequality estimations as reliable as possible, the pre-tax income definition was prioritized.

To give a sense of the magnitude of each item of the NNI, Table 1 presents the decomposition of the NNI in its main items. The first column shows the code of each item in the state-level national accounts. The second and the third columns show, respectively, the name and the code in the national-level national accounts. The last column gives their average share between 2006 and 2018.

The largest item is wages and salaries, corresponding to 41.3% of the NNI. Employers' social contributions are also significant, accounting for another 10.7%. Among the incomes grouped in the operating surplus plus mixed income item, the most substantial part corresponds to corporations' interest and distributed income, with a share of 14.6% of the NNI. Imputed rents, mixed incomes and households' undistributed profits are also sizable, with shares of 5.1%, 9.4% and 4.7%, respectively. The government capital incomes and the property income paid have negative signs. The first is negative because the government pays

State-level national accounts	National-level national accounts	SNA code	Share (%)
D11	Wages and salaries	D11, S14	41.3
D12	Employers' social contributions	D611 + D612, S14	10.7
B2 + B3	Imputed rents	part of B2n, S14	5.1
	Households' net leasing income	part of B2n, S14	0.7
	Mixed income, net	(B3n, S14)	9.4
	Interest and distributed income of corporations	D41 + D42, S14	14.6
	Investment income disbursements	D44, S14	1.5
	Households' undistributed profits	B5n, S11 + S12	4.7
	Property income paid	D4, S14 received	-5.9
	NPISH sector income	B5n, S15	0.3
	Government capital income	B2n + D4n, S13	-1.4
D2–D3	Taxes less subsidies on production and import	D2–D3, S13	19
Social security system	Social security benefits in cash and other social insurance benefits	D621 + D622, S14	18.1
	Employers' social contributions	D611 + D612, S14	-10.7
	Employees' social contributions	D613/D614, S14	-2.5
	Pension and other social insurance surplus	D61–(D621+D622), S14	-4.9

Source(s): Authors' elaboration based on Brazil's national accounts from IBGE. *Interpretation:* Between 2006 and 2018, the average share of wages and salaries in the NNI was 41.3%.

Table 1.
Net National Income
decomposition

more interest than receives it and the second because it corresponds to a payment, reducing the individuals' income. At the bottom, there are items related to the social security system. As the state-level national accounts are a simplified version, they do not contain this breakdown [11]. Notice that the social security part sums to zero by definition since it is a redistribution of the total income. Social security benefits in cash and other social insurance benefits are a large item, totaling 18.1 % of the NNI. Pensions are the bulk of this value, but the item also includes unemployment benefits and other smaller social security benefits.

4. Methodology

The methodology follows the Distributional National Accounts guidelines (Alvaredo *et al.*, 2020, September). The procedure has three main steps: first, it corrects the survey data using the tax tabulations so that it reflects top incomes accurately. Then it adds National Income items that the corrected survey income does not include. Finally, it guarantees that all the components match the National Income. This section overviews these steps, explaining the assumptions behind them [12].

4.1 Combining survey and tax data

Due to its nature, survey data has limitations in portraying the top of the income distribution. The first reason is that nationally representative surveys rarely sample very affluent households as they are a tiny share of the population. The literature refers to this problem as a sampling error because, in theory, one could solve it by having larger samples. The second reason is that even when surveys sample these households, they generally have higher underreporting and higher non-response rates than the rest of the population. The literature refers to this problem as a non-sampling error, as it persists no matter the sample size [13]. In contrast, tax data portrays the universe of high-income individuals. Despite misreporting being a reality, this problem is arguably less present than in the survey data since evasion

may lead to legal penalties. In Brazil, though, tax data only cover a small share of the population. Hence, one must use both survey data and tax data to picture the income distribution entirely.

To combine both data sources, this study uses the method proposed by Blanchet *et al.* (2018). The process departs from the survey data, which is used to construct an income variable as close as possible to the income definition used in the tax tabulations. This variable includes all job, financial and pension income as contained in the survey [14]. Then the method reweights the survey observations so that its top income shares align with those observed in the tax data, correcting the non-sampling error. It also creates new observations at the top of the distribution to account for groups in the tax data with an income that surpasses the highest one in the survey. This procedure corrects the sampling error. In practice, it means using for each state-year the tax tabulation for the top of the distribution, while preserving the survey for the rest of the distribution.

Finally, to get the Fiscal Income, this study uses the survey data to add tax-exempted pensions and unemployment benefits, which were not in the harmonized income variable. The final outcome of this process is a database with an income variable and sample weight that correctly captures the top income distribution as contained in the tax data and includes all Fiscal Income present in the survey and tax data.

Figure 1 gives a sense of the magnitude of the difference between the aggregated income in the survey and the aggregate income obtained with the combination of the survey and tax data. It shows the NNI's share covered by the uncorrected survey data and the Fiscal Income in 2018. On average, the Fiscal Income captures 15 percentage points more of the NNI than the raw survey data. The percentages for the Fiscal Income vary from 58 for Amazonas (AM) to 80 for Goiás (GO), with a median of 71%. Besides, there is no clear pattern between regions, indicating that the differences are likely due to state-level idiosyncrasies.

4.2 From Fiscal Income to National Income

As discussed in section 3, the Fiscal Income still misses a considerable part of the National Income, as the survey and tax data do not account for some of the National Income components. This section explains how to pass from the Fiscal Income, obtained as explained in the previous subsection, to the National Income, focusing on the assumptions behind each step.

The first element not taken into account in the Fiscal Income is social contributions. The pre-tax income definition used in this study considers the income distribution after the operation of the social security system. As such, it is necessary to subtract social contributions from individuals' incomes. The income variables of the survey and the tax

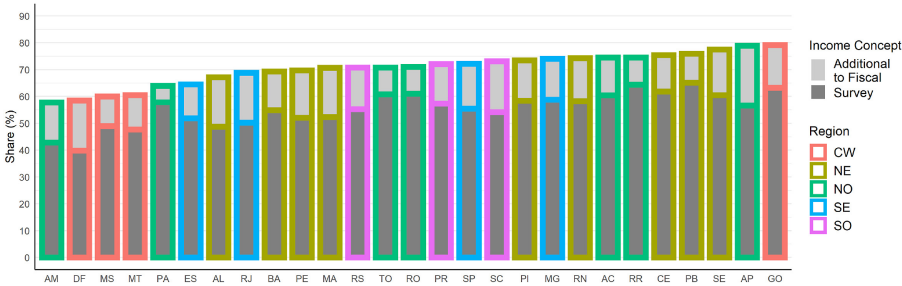


Figure 1.
Fiscal income share of
the Net National
Income, 2018

Source(s): Authors' computations combining surveys, tax data and national accounts.
Interpretation: In 2018, the survey income expressed approximately 50% of Rio de Janeiro's (RJ) NNI and the Fiscal Income almost 70%

tabulations are net of employers' social contributions, so this item is not an issue. However, the survey variable incorporates employees' social contributions. To subtract this item, these contributions are estimated based on the legislation, using workers' income, employment status and sector in the survey [15]. Then wages net of social contribution is obtained by subtracting the estimated values.

The estimations must also account for parts of the National Income that do not directly flow to individuals but ultimately constitute their incomes. The first main item is imputed rents for owner-occupiers. As explained in section 3, although individuals do not receive it in money, it still constitutes a relevant gain. The estimation of imputed rents uses data on observed rents and household characteristics available in the survey to predict the imputed rents [16]. Then, it adds this value to the individual income.

The second main missing component is undistributed profits (B5n, S11 + S12). Undistributed profits should be added because profits belong to firms' shareholders irrespective of being distributed or retained for reinvestment. Households, however, are not the only shareholders, so it would not be accurate to add the entire NNI item to households' income. To divide undistributed profits between the household (S14), the government (S13) and the foreign sectors (S2), the procedure is to use their equity and investment funds share (AF5). The procedure assumes that this variable reflects the macro ownership structure of the economy [17]. Between 2010 and 2018, on average, the share of undistributed profits of each sector was 48%, 36% and 16%, respectively. Then, the household share of undistributed profits is allocated based on financial income. The assumption is that the observed financial income proxies the right to these profits [18].

The household sector property income paid is the sum of interest payments made by individuals. It is important to subtract this item to not overestimate the income of debtors. Ideally, one would like to subtract this item from the interest payers, but this information is not available in the data. So the procedure is to subtract them proportionally to the final income, not affecting the income distribution measure. This assumption underestimates inequality if poorer individuals have relatively larger and more expensive debts than richer ones, resulting in higher interest payments as a share of total income. This possibility seems plausible, which implies that a proportional allocation is a conservative approach.

The government has a part of the national income – namely, the government share of undistributed profits, the government net primary income (D4, S13), the pension and other social insurance surpluses (D61 – (D621 + D622), S14) and the net production taxes received by the government (D2–D3, S1) [19]. The method distributes them to individuals in proportion to their final income, so these items also do not affect the income distribution measure [20].

The last procedure is to rescale the survey incomes that do not precisely match the national accounts due to methodological or measurement differences. In the case of wages (D11, S14), they are matched directly at the state level. Capital incomes are less straightforward than wages because the state-level national accounts group them into a single item. The procedure to overcome this limitation has two steps. First, it matches the items nationally using Brazil's national accounts, which finely subdivides capital income. Then, it rescales to match the state-level operating surplus plus mixed income (B2 + B3, S1) [21].

5. Results

Throughout this section, the analysis starts by presenting results for 2018, given that it is the latest year in this study with complete state-level national accounts data. To analyze time-varying patterns, this section also shows the evolution of estimations throughout the entire period under consideration. Where relevant, it offers comments on the distinctions between 2018 and the other years.

5.1 Regions

This section starts by presenting the region-level income distribution. Regions are an interesting starting point because the federal government defines several development policies at this level. Figure 2a shows the income share of four groups in each region based on the new estimates: the bottom 50%, the middle 40%, the top 10%–1% and the top 1%. The top 1% income share goes from 22% in the North and the South to 24% in the Southeast. The Center-West and the Northeast stay in the middle with 23% of the NNI flowing to the top 1%. The top 10%, which corresponds to the sum of the groups' top 10%–1% and top 1%, follows a similar pattern. It varies from a 51% income share in the South to 56% share in the Center-West and 55% in the Southeast and the Northeast. The middle 40% group income share varies between 34% and 38% across the five regions. Finally, significant differences at the bottom 50% compensate for the differences at the top. The bottom group gains only 7% of the net income in the Northeast, which is a bit more than half the group share in the South, 13%.

Figure 2b shows the income share of the same groups by region using only the survey data. Compared to the estimations based solely on survey data, the results reveal, unsurprisingly, that the income distribution is more concentrated in all regions with the new estimates. Furthermore, they indicate that regions now exhibit more similar top income shares than previously assumed, especially the top 10% income share. The South and the Center-West are the two regions with the lowest top income shares in the survey, with the top 1% concentrating 12% of the income. These regions experience the most significant increase in top income shares when transitioning to the new estimations. On the other hand, the North and Northeast, which initially had the highest top income shares in the survey, display the

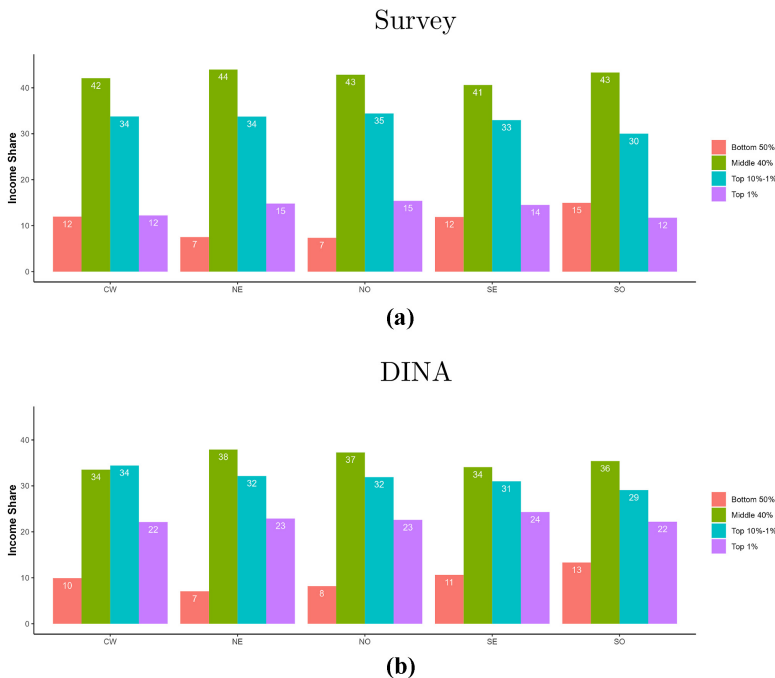
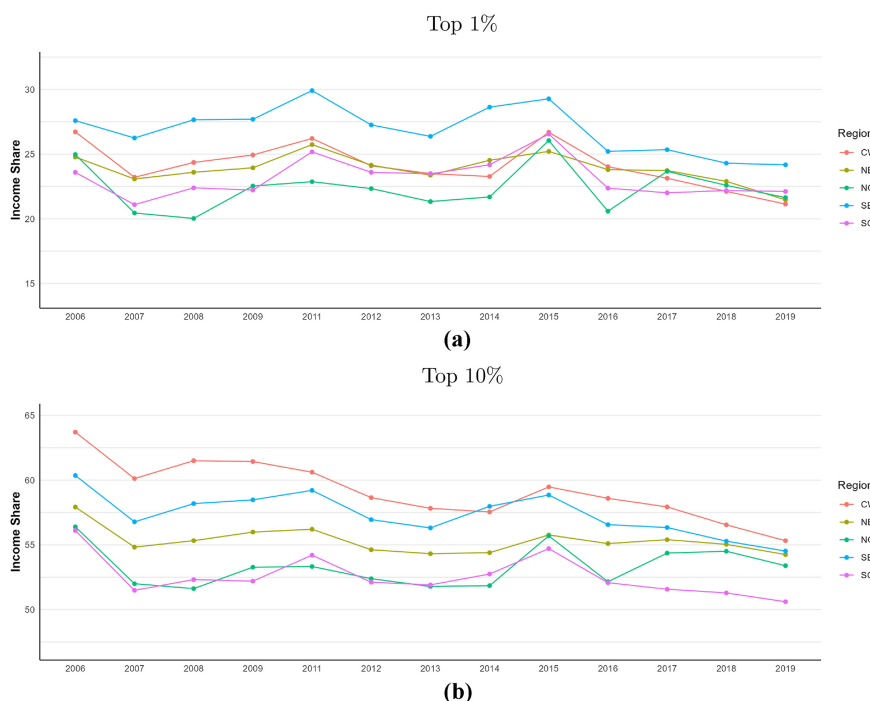


Figure 2.
Income distribution of
Brazilian regions, 2018

Source(s): Authors' computations combining surveys, tax data and national accounts. Interpretation: In 2018, the 50% poorer individuals living in the Southeast received 11% of the region's national income

smallest increase in top income shares when comparing the survey estimates to the new estimations. In addition, the Southeast also witnesses a substantial increase, with the top 1% income share rising by 10 percentage points between the two measures. The reason behind these changes between the survey-based and the new estimated is further discussed when analyzing the state-level estimations. Considering the top 10%, there is a decrease in the difference of this group income share between the South and North regions from eight percentage points to four percentage points. This same difference falls from four to one percentage point comparing the North and the Center-West.

Looking at the time evolution in Figure 3, the previous patterns are similar in the entire period. Additionally, the figures remained roughly stable for all regions during the 2006–2019 period. It is worth noticing, however, that in the earlier years of the sample, there was a larger difference in the top 10% income shares between regions, and their top 10% income shares started to come closer from 2015. For the top 1% group, the Southeast consistently has the highest values. For the top 10% group, the income shares stay between 52% and 58% for all regions. The Center-West has the higher top 10% income share, close to 60% in most years, followed closely by the Southeast. The North and the South alternate at the bottom with values around 52%. The overall stability draws attention because, in the 2006–2019 period, the regions did not have the same story at the macro-level. On the one side, the Center-West and the North experienced continuous growth in aggregate income, with an average close to 3% per year. On the other, the Southeast almost stagnated with an average increase lower than 1% per year.



Source(s): Authors' computations combining surveys, tax data and national accounts. The values used to make this figure are in the appendix. Interpretation: The income share of the 1% richest individuals living in the Northeast fluctuates around 24% of the region's national income

Figure 3.
Top income shares of
Brazilian regions,
2006–2019

5.2 States

There is more variation at the state-level than at the regional-level. Figure 4 shows the top shares at the state-level. The top 1% income share goes from 16% in the Federal District (DF) to 30% in Amazonas (AM), while the top 10% goes from 48% in Santa Catarina to 60% in Amazonas (AM). Besides, there are differences within the regions. The most striking one is in the North. Amazonas (AM) is the state with the highest top 1% share in Brazil in 2018, 30%, while all other states in the region are below the national median. Amazonas (AM) is the Brazilian state where the industrial sector importance is relatively higher due to the Zona Franca de Manaus, a federal tax-free zone. Indeed, in 2018, the industrial sector represented 34% of Amazonas GDP, while only 20% nationally. This difference leads to a relatively higher importance of capital income, which is more concentrated, contributing to a higher top 1% income share. In the South, Santa Catarina (SC) has a lower figure than its neighbors, 20%. The same is true for Goiás (GO) in the Center-West, with 21%. In Goiás's case, the difference may be due to the contiguity with the Federal District (DF), as about a fifth of the state population lives in cities adjacent to the Federal District (DF). The Northeast states, in turn, are more homogenous, with an average top 1% income share of around 23%. In the Southeast, São Paulo stands out as one of the states with the highest top 1% shares in Brazil, 25.5%. High participation of capital income explains this result. While the state represents roughly 32% of the capital income in national accounts, its residents concentrate almost 45% of the capital incomes captured in the corrected survey data. When looking at the top 10%, the overall picture changes little. The South becomes more homogenous. In the North, Amazonas (AM) continues to be an outlier, with the top 10% reaching an income share of 60%. In the Southeast, Rio de Janeiro (RJ) and São Paulo (SP) have high top 10% income shares, while the Northeast states present a homogenous top 10% income share around 56%.

Figure 5 shows the evolution of the top 1% income share in each state. States with smaller populations and economies, notably in the North and the Northeast, exhibit higher fluctuations in their top income shares because their income distribution is more easily influenced by exceptionally high gains recorded in the tax data by a few individuals.

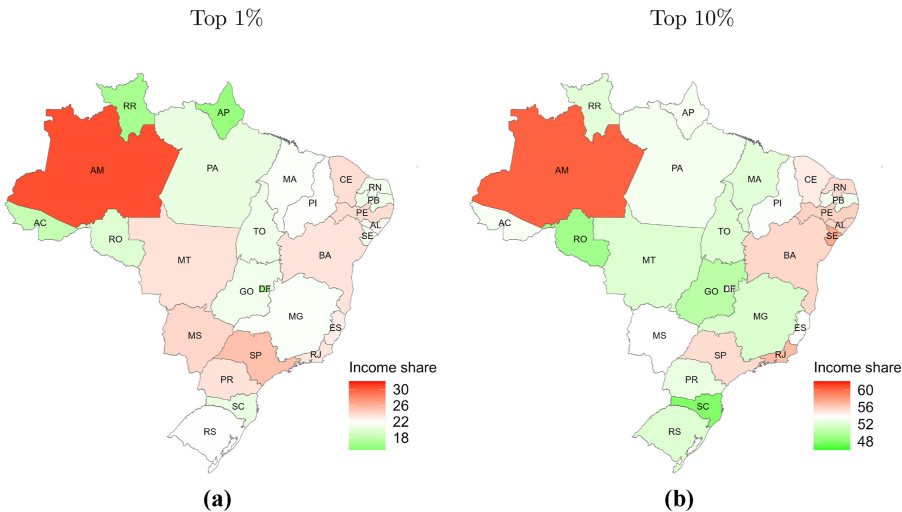


Figure 4.
Top income shares of
Brazilian states, 2018

Source(s): Authors' computations combining surveys, tax data and national accounts. The values used to make this figure are in the appendix

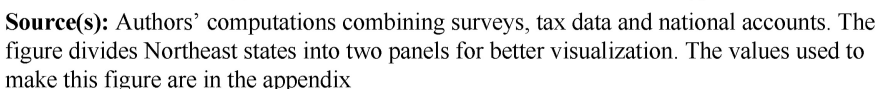


Figure 5.
Top 1% income share
of Brazilian states,
2006–2019

To gain insight into how DINA estimation differs from current estimations using the survey data, [Figure 7](#) compares the top income shares obtained in each case. The x-axis represents the top income share using survey data, while the y-axis represents the new

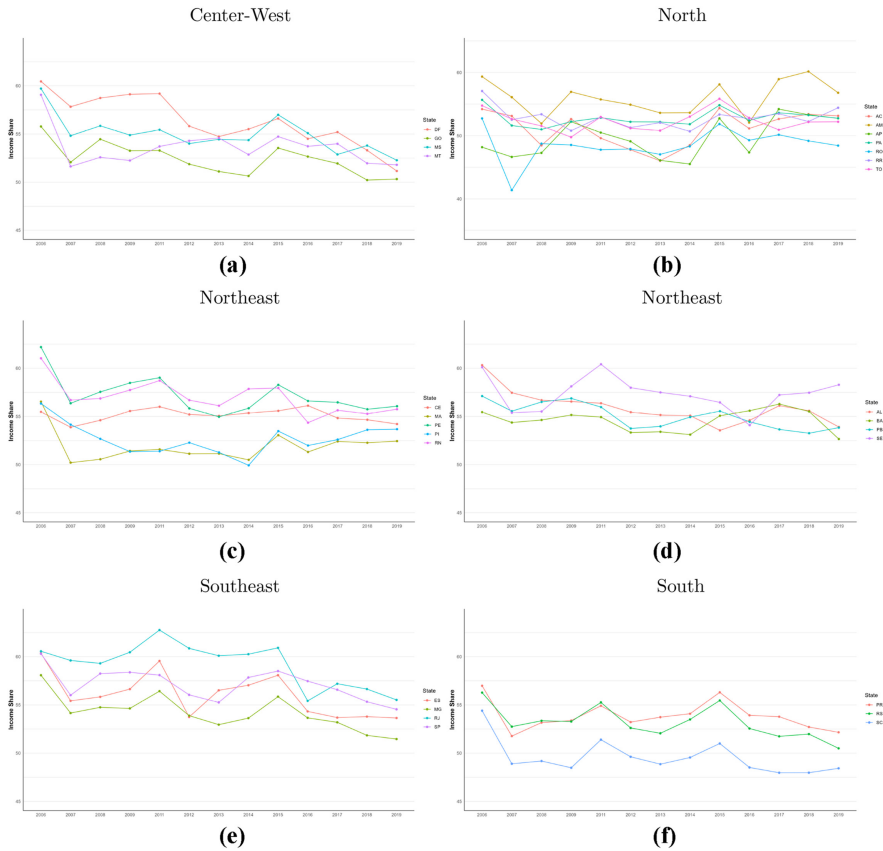


Figure 6.
Top 10% income share
of Brazilian states,
2006–2019

Source(s): Authors’ computations combining surveys, tax data and national accounts. The figure divides Northeast states into two panels for better visualization. The values used to make this figure are in the appendix

estimations for top income shares. The y-axis has been adjusted upward by the average increase in top income shares in the DINA estimations compared to the survey estimations. This way the diagonal line divides states according to their increase in top income shares when passing from the survey-based to the DINA estimations. States above the diagonal line had an increase in the top income share above the average national increase, while the states below the diagonal line had an average increase below the average national increase. It is evident that the states in the North region, except for Amazonas (AM), had a smaller increase in the top income share when transitioning from the survey estimates to the DINA estimates both for the top 1% and top 10% groups. The Federal District (DF) also experienced a smaller change in the top income shares than the average national increase. The Northeastern states are divided, with an overall increase close to the national average. In contrast, all the states in the South, Center-West, and Southeast, except for the Federal District, have increases above the national average between the two estimates. To guarantee the consistence of this result over the period, the [Online Appendix](#) presents the same analysis displayed in [Figure 7](#) for 2006, 2009, 2012 and 2015. The pattern discussed for [Figure 7](#) is similar in all these years.

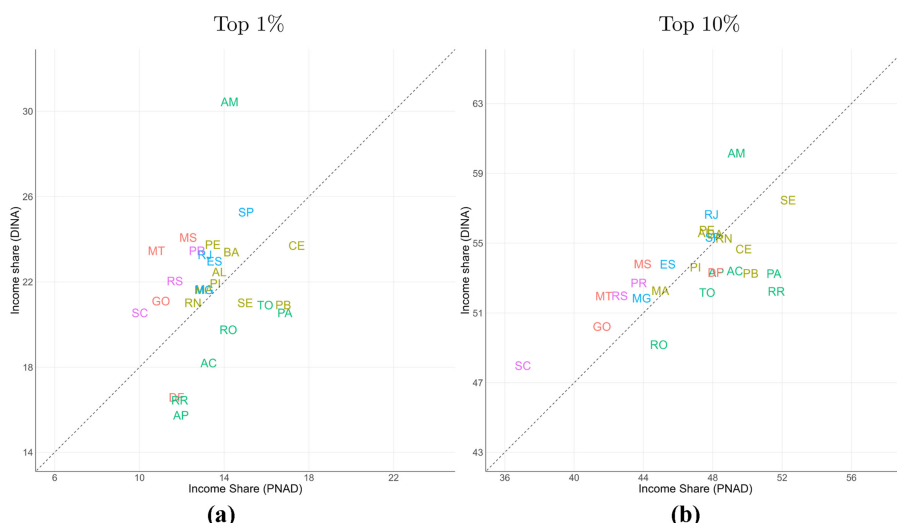


Figure 7.
Comparison of top
income shares between
survey and DINA, 2018

Source(s): Authors' computations combining surveys, tax data and national accounts

Figure 8 provides insights into why some states have stronger increases in the top income shares when transitioning from the survey estimation to the DINA estimation. It illustrates the relative importance of labor, capital and production taxes in the NNI of each state. It is evident that the production structures of states vary significantly. Taking the two extremes, the Federal District has a labor share of 72%, while Amazonas has a labor share of 52%. In general, states with higher labor shares and consequently lower capital shares experience smaller changes between the survey and DINA estimations. This observation underscores the fact that the survey is more adept at capturing labor income than capital income. As the importance of capital income varies considerably across states, comparing states using only the survey data misses a significant portion of income differences among states.

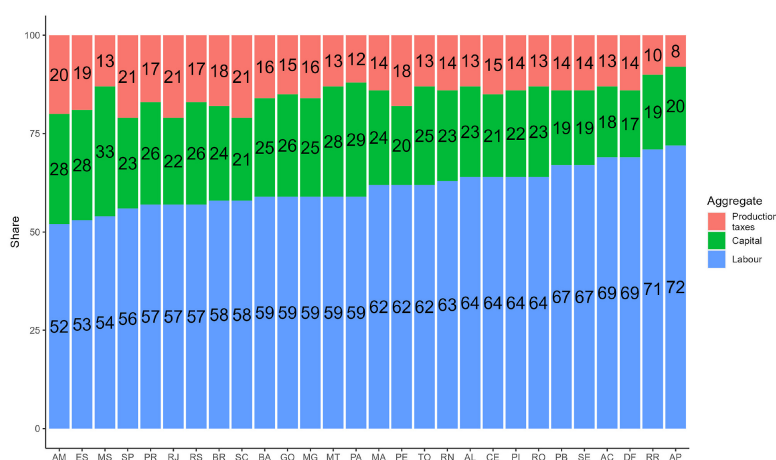


Figure 8.
Decomposition of state
Net National
Income, 2018

Source(s): Authors' computations combining surveys, tax data and national accounts

5.3 Gini coefficients

Table 2 displays Gini coefficients at both the state and regional levels. The first column presents the Gini coefficients calculated by IBGE, the second column presents the Gini coefficients calculated with the survey data only, the third columns presents the Gini coefficients calculated using the estimations from this paper, the DINA estimation. The fourth column exhibits the percentage change between the survey-based and the DINA Gini coefficients. The fifth column provides the state ranking based on the survey, the sixth column provides the ranking using the estimations from this paper and the seventh column shows the difference between these two rankings in positions.

Before analyzing the table, it is important to provide some context: IBGE calculates its Gini index using the average household income, which contrary to the main estimations presented in this paper are at the household level and includes social transfers.

State	IBGE	Survey	Gini		Survey	Ranking	
			DINA	Change (%)		DINA	Change (Position)
Center-West	0.51	0.60	0.67	11.6	4	3	1
DF	0.57	0.65	0.68	5.4	9	5	4
GO	0.47	0.56	0.62	9.9	25	26	-1
MS	0.49	0.59	0.65	10.3	21	18	3
MT	0.46	0.57	0.63	10.4	24	22	2
Northeast	0.55	0.65	0.68	5.9	2	1	1
AL	0.55	0.65	0.69	6.2	7	3	4
BA	0.55	0.64	0.69	6.8	13	4	9
CE	0.55	0.65	0.68	5.2	10	9	1
MA	0.53	0.64	0.67	5.5	15	12	3
PB	0.55	0.65	0.67	3.1	8	13	-5
PE	0.53	0.64	0.68	6.6	14	7	7
PI	0.53	0.64	0.68	6.4	12	6	6
RN	0.54	0.64	0.68	6.2	11	8	3
SE	0.58	0.67	0.70	4.3	2	2	0
North	0.55	0.66	0.67	2.3	1	2	-1
AC	0.56	0.65	0.67	2.5	6	14	-8
AM	0.54	0.66	0.72	8.7	5	1	4
AP	0.55	0.67	0.68	1.9	4	10	-6
PA	0.56	0.68	0.67	-1.4	1	15	-14
RO	0.50	0.60	0.62	3.0	19	24	-5
RR	0.57	0.67	0.66	-1.0	3	16	-13
TO	0.53	0.61	0.64	3.9	17	20	-3
Southeast	0.53	0.61	0.66	8.3	3	4	-1
ES	0.51	0.59	0.64	8.4	20	19	1
MG	0.49	0.58	0.63	9.2	22	23	-1
RJ	0.54	0.62	0.67	8.4	16	11	5
SP	0.54	0.61	0.66	7.9	18	17	1
South	0.47	0.55	0.61	11.6	5	5	0
PR	0.49	0.58	0.63	9.8	23	21	2
RS	0.49	0.56	0.62	11.3	26	25	1
SC	0.42	0.50	0.58	15.5	27	27	0

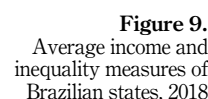
Source(s): Authors' computations combining surveys, tax data and national accounts and IBGE's Gini coefficients. *Interpretation:* The IBGE Gini coefficient for the Southeast region was 0.53 in 2018. The survey-based Gini coefficient for the Southeast region in the same year was 0.61, and the DINA-based Gini coefficient was 0.66. The percentage increase between the survey and the DINA Gini coefficients for this region is 8.3%. The South region has the third highest survey-based Gini coefficient and the fourth highest DINA-based Gini coefficient among all regions. When comparing the survey-based to the DINA-based Gini coefficient, the South region is ranked one position lower, indicating it is relatively less unequal

Table 2.
Gini coefficients of
Brazilian state, 2018

In general, this table reinforces the findings presented in Figure 7. First, the coefficient increases for all states when passing from the survey-based to the DINA estimations. Second, states in the North region and the Federal District (DF) experience the most significant drops in their rankings, indicating that they are relatively less unequal compared to other states when using the DINA estimation. Third, the states in the South and Center-West regions, which are those with the lowest Gini coefficients using the survey-based measures, see the largest increases in their Gini coefficients when comparing survey-based and DINA estimations. For the Center-West, there is an increase of 11.6% in the Gini, while for the South, the increase is 9.2%. The Gini increase for the North and Northeast regions is only 2.9% and 5.3%, respectively. While this shift in GINI coefficients does not necessarily lead to much higher rankings for the South and Center-West states, it does bring them closer to the national average.

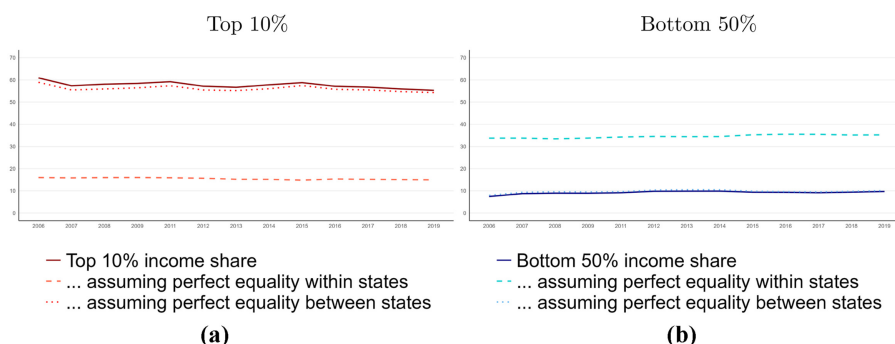
There is no evident relationship between state development and the inequality level when considering the top income shares. [Figure 9a](#) plots the relationship between the state average NNI and the top 1% income shares, while [Figure 9b](#) plots the relationship between the state average NNI and the top 10% income shares. For the top 1%, it is clear that there is no discernible trend. The relationship is slightly negative for the top 10%, yet the states are fairly dispersed. [Figure 9c](#) plots the relationship between the state average NNI and the DINA Gini coefficient. This measure considers all income deciles and not only the top income groups. In this case, the relationship appears to be negative. The states with a lower average NNI tend to have higher Gini coefficients. Differences in the bottom of the distribution drive the distinction between [Figure 9a and b](#). This result aligns with [Figure 2b](#), which shows that poorer regions have lower bottom 50% income shares. Given these two results, it is not possible to conclude about the existence of a regional Kuznets curve in Brazil, linking inequality level to the state development stage.

Figure 10 compares two different counterfactuals for the top 10% and the bottom 50%. The solid line shows the actual share of the group. The dotted line shows the percentage obtained if all states had an average income equal to the national average. In other words, if there were



Source(s): Authors' computations combining surveys, tax data and national accounts

Figure 10.
Between and within-
state inequality
decomposition in
Brazil, 2006–2019



Source(s): Authors' computations combining surveys, tax data and national accounts

no between-states inequality. The dashed line shows the percentage obtained if the income is equally divided within states. In other words, if there were no within-state inequality. The shares barely change when the between-state inequality is eliminated. However, when there is no within-state inequality, the top 10% drops from 56% to 15% and the bottom 50% triples from 10% to 35%.

A Theil Index decomposition of between and within state inequality attributes 95% of the National Income inequality to differences within the states. Formally, the Theil Index is the generalized entropy index with a coefficient of one. The decomposition analysis uses the statistical package developed by [Jenkins \(1999\)](#). However, this kind of measure is limited. The between-inequality component only captures different means across groups. As [Kanbur \(2006\)](#) points out, they do not account for shared public goods or the absence of normative justifications to these inequalities. These two points are, especially, true considering that the analysis focuses on subnational entities. As such, these results should not serve as an argument to disregard the relevance of between-state inequality in Brazil. Instead, they reinforce that the share of income captured by top groups is very high in all the states.

Moreover, states are considerably different in the income necessary to enter their top 1%. The first column of [Table 3](#) shows the ratio between the minimum incomes to enter the top 1% nationally relative to the state-level threshold. There is a clear division between the south and the north of the country, replicating the average income. In São Paulo (SP) and Rio de Janeiro (RJ), an individual needs to gain around 25% more to be part of the state top 1% than the national top 1%. In the Federal District (DF), individuals must gain two times more. In the other extreme, there is Maranhão (MA), in which the threshold is just half the national one. The values are not as low but still below the national for all the North and Northeast states. The second column of [Table 3](#) shows the ratio between the state participation in Brazil's top 1% relative to the state share in the total population. For instance, one can say that the Piauí (PI) have only 38% of the participation expected in the national top 1% if the number was proportional to the state population. The third column of [Table 3](#) shows the ratio between population shares in Brazil's top 1% relative to the state share of the National Income. Some states, such as Rio de Janeiro (RJ), São Paulo (SP) and Espírito Santo (ES), continue to be over-represented. These Southeast states have elevated ratios due to the combination of high average incomes and high within-state concentration.

6. Conclusion

Brazil's regional inequality is an extensively studied topic. Its importance comes from the large and persistent differences in development between the states and the country high inequality levels. This study presents a unique view on the topic using new data and

				Regional income inequality in Brazil
State	Threshold	Ratio Population	GDP	
<i>Center-West</i>				49
DF	2.05	4.84	2.03	
GO	0.74	0.58	0.70	
MS	1.07	1.24	1.03	
MT	1.04	1.03	0.88	
<i>Northeast</i>				
AL	0.65	0.53	0.90	
BA	0.67	0.48	0.78	
CE	0.62	0.46	0.83	
MA	0.47	0.31	0.62	
PB	0.61	0.45	0.80	
PE	0.67	0.64	0.96	
PI	0.55	0.38	0.67	
RN	0.68	0.63	0.97	
SE	0.71	0.47	0.77	
<i>North</i>				
AC	0.60	0.39	0.60	
AM	0.75	0.63	0.77	
AP	0.80	0.60	0.86	
PA	0.63	0.42	0.65	
RO	0.72	0.62	0.79	
RR	0.80	0.71	0.86	
TO	0.66	0.56	0.78	
<i>Southeast</i>				
ES	1.05	1.08	1.06	
MG	0.85	0.75	0.87	
RJ	1.30	1.54	1.20	
SP	1.22	1.41	1.07	
<i>South</i>				
PR	1.05	1.07	0.97	
RS	1.06	1.08	0.91	
SC	0.99	0.98	0.84	

Source(s): Authors' computations combining surveys, tax data and national accounts. *Interpretation:* The threshold ratio captures the relation between the state-level and the national-level threshold to enter the top 1%. For example, in 2018, the threshold to enter the top 1% in Acre (AC) is 61% of the national threshold. The population ratio captures how much the state is represented in the top 1% compared to its population share. For example, Acre (AC) has 39% of the share in Brazil's top 1% compared to what we could expect if its share in this group were proportional to its population share. The GDP ratio captures how much the state is represented in the top 1% compared to its GDP. Acre (AC) has 60% of the share in Brazil's top 1% compared to what we could expect if its share in this group were proportional to its GDP share

Table 3.
Top 1% ratios, 2018

methodology to construct state-level income distribution measures. Overall, this study finds some variation at the regional level, but this variation is not substantial. The Southeast is the region where the income distribution is most concentrated, and the North and the South the least. Besides, there is no significant change during the period analyzed, 2006 to 2019.

At the state level, in contrast, there are more nuances. Amazonas (AM), Rio de Janeiro (RJ) and São Paulo (RJ) have an exceptionally high share of total income flowing to top earners. In these states, the top 1% share reaches as high as 30% and the top 10% share is close to 60% in most years. On the other end, there are Amapá (AP), Acre (AC), Rondônia (RO) and Santa Catarina (SC), where the top 1% share usually stays below 20% and the top 10% close to 50%.

The states in the South and Center-West regions show a relatively higher increase in top income shares when transitioning from survey-based to DINA estimations. In contrast, the Federal District (DF) and the states in the North region, with the exception of Amazonas (AM), exhibit a relatively lower increase in top income shares between the two estimates. These new estimates underscore the importance of accounting for the entire NNI when comparing inequality levels across states, especially when states have different economic structures.

This paper cannot trace a single factor to explain the differences between the states. In particular, there is no clear relation between the average income and the income distribution. Nevertheless, it was possible to partly relate the result to states' idiosyncrasies and economic structure.

This research contributes to a larger picture of inequality in Brazil. However, much remains to be done. There are two promising extensions: enlarging the series to have a longer perspective on the subnational income distribution and constructing a post-tax series to understand the tax and transfer system's role in the state-level income distribution. Moreover, investigating the factors behind state differences in income distribution is a large front as it may help to understand the dynamics of inequality more broadly.

Notes

1. The [World Bank \(2021\)](#) estimates that Chile's GDP per capita in 2018 was \$24,700 in PPP dollars, second only to Panamá in Latin America. In Honduras, it was \$5,800, the lowest in the region. Using World Bank's PPP conversion, the GDP per capita was \$6,250 in Maranhão and \$21,700 in São Paulo. Brazil's national average was \$15,000.
2. There is no survey for 2010 since IBGE did not conduct the PNAD in census years.
3. The estimations use the annual database that groups the first visit in each household as it is the one that contains more detailed data on income.
4. Details of all survey variables are in the [Appendix](#).
5. Couples may declare together. However, in practice, this option usually is not fiscally beneficial when both have positive taxable incomes.
6. The Receita Federal refers to this income concept as RB2.
7. Throughout the text, there are references to the codes of the System of National Accounts (SNA) to support the exposition.
8. In the SNA's terminology, the state-level national accounts present only the generation of income account.
9. The interested reader can find further details of the procedure to pass from the GDP to the NNI in the [Appendix](#).
10. The procedure defines adults as individuals above 20 years old following [Alvaredo et al. \(2020, September\)](#).
11. The items of the social security system are in the secondary distribution of income account, which the state-level national accounts do not contain.
12. The [Appendix](#) presents schematically the steps discussed in this section.
13. In addition, statistical offices may adjust outliers. In Brazil's case, IBGE top-codes PNADC's job income six standard deviations above the average income in the metropolitan area where the respondent resides.
14. Details of all survey variables are in the [Appendix](#).
15. The rates of employees' social contributions vary from 8 to 11% of the gross wage for formal workers.
16. The predicting variables include the residence location, the number of rooms, the quality of the materials used in construction, possession of home appliances and family income.

17. For the years before 2010, equity and investment funds share (AF5) is not available in Brazil's national accounts, so the procedure uses the shares for the closest year, 2010.
18. The estimations also impute investment incomes attributable to insurance policyholders (D441, S14) and investment incomes attributable to collective investment fund shareholders (D443, S14) based on observed financial income. Investment incomes payable to pension entitlements (D442, S14) are added based on wages. Before 2010, Brazil's national accounts grouped these three sub-items, so the procedure assumed the repartition in these years is the same as in 2010.
19. The estimations also include in this group the NNI of the NPISH sector, which corresponds to only 0.3% of the NNI. The implicit assumption is that this sector serves the households in proportion to their incomes.
20. The method attributes the social insurance surpluses ($D61 - (D621 + D622)$) to the states in proportion to their share in the net production taxes received by the government (D2–D3, S13) before diving them between the individuals. The logic is that the government must pay for this deficit with taxes, and some states have higher effective taxes than others. In addition, notice that the relative value of net production taxes received by the government (D2–D3, S1) varies across states. So it can affect the between-states and the national-level income distribution despite not changing the within-state income distribution.
21. The [Appendix](#) has further discussion on the procedure and presents an alternative rescaling approach.

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Appendix

The supplementary material for this article can be found online.

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