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Spatially blind but regionally progressive? Effects of a Universal Basic Income on regional welfare inequality in Brazil

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ABSTRACT
We employ a microsimulation model to investigate the effects of the current Brazilian tax-benefit system, and of a policy that combines a Universal Basic Income with a flat-rate income tax on the regional inequality of per capita income. Our results indicate that, despite its regionally progressive character for per capita disposable income, the current system of taxes and monetary benefits does not significantly change the level of Brazilian regional income inequality. However, the introduction of a Universal Basic Income combined with a flat-rate income tax, which replaces current individual income taxes and monetary transfers, results in a significant reduction in inequality in the distribution of per capita disposable income among Brazilian states.

KEYWORDS
Universal Basic Income, Regional inequality, Microsimulation

Cegueira espacial, mas progressividade regional? Efeitos de uma Renda Básica Universal sobre a desigualdade de bem-estar regional no Brasil

RESUMO
O trabalho utiliza um modelo de microssimulação para investigar os efeitos da estrutura corrente de tributos e transferências monetárias e de uma política que combina uma Renda Básica Universal com um imposto de renda com alíquota uniforme sobre a desigualdade de renda per capita entre os estados brasileiros. Os resultados obtidos indicam que, a despeito do seu caráter regionalmente progressivo para a renda disponível per capita, o sistema corrente de tributos e benefícios monetários não muda significativamente o nível da desigualdade regional brasileira. Contudo, a introdução de uma Renda Básica Universal combinada com um imposto de renda com alíquota única, que substituem os atuais tributos sobre a renda individual e as transferências monetárias, gera uma significativa redução da desigualdade na distribuição da renda disponível per capita entre os estados brasileiros.

PALAVRAS-CHAVE
Renda Básica Universal, Desigualdade regional, Microssimulação

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1. Introduction

A Universal Basic Income (UBI) broadly refers to a regular amount of money provided by the state to everyone, regardless of their circumstances. Over the past decade, the debate about UBI has become global, intensifying in scope and depth with the outbreak of the COVID-19 pandemic, as the disease revealed the failure of traditional welfare systems to provide financial security to large segments of the population.

Although the primary motivation for implementing a UBI will depend on each country's social, economic, and political contexts, proponents of this policy have highlighted four objectives (Van Lancker, 2017; Gentilini et al., 2020)[1]: i) mitigate the increasing income insecurity faced by individuals and families due to automation and globalization, as well as risks of pandemics and catastrophes associated with climate change; ii) reduce poverty, primarily by raising workers' bargaining power; iii) promote a sense of citizenship and social cohesion; and iv) improve the efficiency of the social welfare system.

All objectives of a UBI mentioned above could motivate its adoption in Brazil. The dysfunctionality of its welfare system is particularly evident, being reflected in the fact that, despite the high level of social spending, Brazil remains one of the most unequal countries in the world where poverty is widespread (Bank, 2022). In this context, a UBI appears particularly appealing. It is possible to design UBI schemes that are equity-improving and fiscally sustainable, as a substantial proportion of the UBI's gross cost can, in principle, be offset by adjusting the levels of existing benefits downwards. Recently, Siqueira e Nogueira (2023) found that the payment of a relatively modest transfer to everyone in Brazil, partially replacing existing social benefits and financed by a single-rate income tax, has the potential to drastically reduce poverty and inequality.

Notice that, in 2004, the Brazilian National Congress Brazil approved the so-called Citizen´s Basic Income Law (Lei de Renda Básica de Cidadania), which establishes a UBI to be progressively implemented in the country. Although no definitive steps towards the practical implementation of this law have been taken so far, the outbreak of the COVID-19 pandemic, which exposed the limitations of the existing social protection system, has renewed the debate about the Citizen's Basic Income Law.

In the present study, we explore an unintended but potentially important effect of the introduction of a UBI in Brazil. Our main objective is to investigate the effects on regional income inequality of a policy that combines a UBI with a flat rate income tax, partially replacing current taxes and transfers, taking the Brazilian federal units (26 states plus the Federal District) as the units of analysis. Subsidiarily, we also examine

[1]Several further potential advantages of a UBI over existing welfare systems have been pointed out in the literature. For instance, the Palgrave International Handbook of Basic Income (2019) highlights health improvements, ecological benefits, and advances in gender equality. A full review of the pros and cons of a UBI, and other key issues concerning this policy, is also provided in Van Lancker (2017) and Gentilini et al. (2020).

the interregional redistributive effect of the current tax and transfer system. As in Sousa (2022) and Siqueira e Nogueira (2023), a static tax-benefit microsimulation model is used to perform the calculations. This approach allows us to estimate each household's per capita disposable income (i.e., income after taxes and transfers) as our measure of welfare.

Brazil's high level of spatial inequality is recognized as one of the hallmarks of the Brazilian economic trajectory in the 20th century (Leff, 1972; Baer, 2007). As demonstrated by Azzoni (1997), between 1939 and 1995, the GDP per capita of the poorest Brazilian state has consistently been below half of the country's value. The regional income inequality in Brazil is also high when compared to other countries (Shankar e Shah, 2003; Gennaioli e La Porta, 2014; Lessmann e Seidel, 2017), is only partially explained by regional differences in the cost of living (Gennaioli e La Porta, 2014; Oliveira e Silveira-Neto, 2022), and shows a persistent and rather slow downward pattern (Azzoni, 1997; Silveira-Neto e Azzoni, 2006; Oliveira e Silveira-Neto, 2022). Not least important, this pattern is directly associated with significant regional disparities in poverty (Silveira-Neto, 2014).[2]

Although not a traditional regional or place-based policy, the introduction of UBI in the context of strong spatial concentration of low-income families can have significant impacts on regional inequality of per capita disposable income (Silveira-Neto e Azzoni, 2012; Silveira-Neto, 2014). Thus, even if one follows Glaeser e Gottlieb (2008) in suggesting helping poor people and not poor regions, in the Brazilian context, the introduction of the UBI may also result in substantial gains for the poorest regions. These potential regionally equalizing effects of the UBI contrast with the country's experience with traditional territorial policies still currently applied, whose effects on the poorest federation units' income and welfare are yet to be demonstrated (Silva et al., 2009; Resende, 2014).

Studies investigating the regional impacts of the introduction of a UBI are rare. The few studies that investigate the regional impacts of a UBI focus on the introduction of the policy in specific (targeted) regions, are small in scale, and only indirectly explore its influence on inequality in well-being between spatial units or regions of a country (Danson, 2019; Connolly et al., 2022). This scarcity of works on the regional effects of the introduction of a national UBI becomes even more prominent when considering, on the one hand, that regional development should not be restricted to the evolution of GDP per capita (Pike et al., 2018; Connolly et al., 2022) and, on the other, the limitations of traditional spatially targeted policies (Glaeser e Gottlieb, 2008; Gaubert, 2018; Austin et al., 2018).

[2]Using microdata from the 2019 Pesquisa Nacional por Amostra de Domicílio Contínua (PNADC), Brazilian official household survey, and computing disposable incomes for all 27 Brazilian federation units, we find that the per capita income of the poorest Brazilian state (the state of Maranhão, MA) corresponded to only 28.5% and 48.3% of the per capita disposable income values of the richest federation unity (Distrito Federal, DF) and the country, respectively. In the same year, using the World Bank PPP poverty line of US$ 5.50 per day, we observe that Maranhão had a share of the total poor of more than double (2.2) its share of the country's population, with the same number for the DF being 0.46.

As for Brazil, there are still few studies analyzing the potential general effects of introducing a UBI.[3] The available set of research includes SIQUEIRA (2001), Monitor (2017), Rigolini et al. (2020), Amaral (2021), Paiva et al. (2021), Sousa (2022), Enami et al. (2023), and Siqueira e Nogueira (2023). Among them, only Sousa (2022) and Siqueira e Nogueira (2023) consider the fiscal and distributional impacts of reforms that combine a UBI with structural changes in the existing tax and transfer systems. The former primarily investigates the distributional impacts of a specific UBI proposal within each of the five large geographic regions of Brazil, whereas the latter examines the effects of alternative UBI proposals. None of these works about the introduction of a UBI in Brazil, however, investigate the spatial effects of the policy considering the Brazilian federation units. In this context, apart from offering a more accurate assessment of the spatial impact resulting from the implementation of a Universal Basic Income (UBI), it is worth noting that such a viewpoint remains pertinent due to the significant disparities in well-being among Brazilian federal units within the country's macro-regions.[4]

Our results indicate that if, on one hand, the current Brazilian tax-benefit system contributes to a relatively small reduction in the per capita disposable income inequality among Brazilian federal unities, on the other, the introduction of a UBI financed by a flat rate income tax results in a significant reduction in this inequality. Measured, for example, by Gini and Theil coefficients, this regional inequality drops by 30% and 49%, respectively. Importantly, these reductions are obtained with important decreases in household per capita income inequality within the federation units, i.e., with effective transfers from local economic elites to poor households. Thus, in the Brazilian case, a UBI may be doubly pro-poor, as it is progressive from an individual and regional point of view.

The paper is structured in five sections. After this introduction, section 2 presents the method used, microsimulation modeling, and the data, and briefly describes the tax-transfer instruments considered, as well as the main simulation procedures. Section three considers the influence of the current structure of government transfers and direct taxes on regional income inequality in Brazil. Section four presents and discusses the estimated effects of introducing a UBI/flat rate tax program on Brazilian regional income inequality. Final remarks are given in section five.

2. Empirical strategy and data

In this study, all calculations are performed using a static tax-benefit microsimulation model specially built to incorporate key features of the Brazilian tax-benefit system, named the Brazilian Household Microsimulation System (BRAHMS). Details

[3] Gentilini et al. (2020) provides a comprehensive review about concepts and evidence associated with the implementation of the UBI around the world.

[4] Considering two federation units in the Northeast region, for example, we observe that the per capita disposable income in the state of Maranhão corresponded to only about 65% of that of Rio Grande do Norte in 2019.

about the model are provided in Immervoll et al. (2006).

A microsimulation model is a computational program that calculates taxes paid and transfers received by individuals/households in a nationally representative sample of the population. These models apply the policies' legal rules on each individual and household in the micro data set, considering personal and household characteristics, as well as the interaction among the different policy instruments built into the tax-benefit system.

The version of BRAHMS used in this study is based on the household survey Pesquisa Nacional por Amostra de Domicílios Contínua (PNADC – Continuous National Household Sample Survey) for the year 2019 (Contínua, 2020). PNADC is carried out by the Brazilian official statistics agency, IBGE (Instituto Brasileiro de Geografia e Estatística), which collects economic and sociodemographic data from more than 430,000 individuals and 147,000 households.

The policy instruments considered in this study include cash transfer programs and direct personal taxes. The former include public pensions, work-related benefits (namely, unemployment security benefits, family wage, and wage bonus), and non-contributory means-tested social assistance benefits (the old age/disability benefit and the family grant known as the Bolsa Família). The latter consists of the employee's social security contributions and the personal income tax. Detailed specifications for each of these instruments are presented in Appendix A of a Supplementary Material available upon request.

In our calculations, the payments of pension benefits, which account for nearly 83% of all cash transfers to households, are taken directly from PNADC. All other policies are simulated by applying the 2019 tax legislation to the dataset, which involves considering both federal legislation and all the specific rules for all 27 Brazilian federation units. This strategy is necessary because the amounts paid/received are either not reported in PNADC or are significantly underreported.

The aggregated results for each tax and transfer simulated are subject to a validation procedure that involves a comparison to available official statistics. In cases of significant discrepancies between the model's simulated results and the official figures, the simulation is adjusted to better reflect the effective incidence of government programs. The results of this validation are presented in Table A3 in Appendix A of the Supplementary Material.

The UBI scheme simulated in this study is the so-called 'basic income/flat tax proposal', which combines a uniform payment of a basic income to every individual in society with a single-rate tax on all other incomes. Such a system is formally equivalent to the Negative Income Tax (NIT) proposed by Friedman (1962).

In the simulation exercise, the UBI is set at the level of the World Bank poverty line for upper-middle-income countries, which is US$ 5.50 a day, corresponding, in 2019

purchasing power parity terms, to R$ 434 per month.[5] Existing pension and poor elderly benefits are reduced by the amount of the basic income and all other cash benefits are totally replaced by the basic income. The current personal income tax and employee social security contributions are abolished. The rate of the new income tax is calculated to ensure that the reform is budget-neutral, that is, total revenue minus total spending is the same as in the 2019 baseline.

In the presentation of our results, we use three concepts of income: initial income, gross income, and disposable income. The household initial income is obtained directly from the individual income from PNADC.[6] In turn, the household gross income is obtained by adding to this initial income the public transfers received by the individuals. Finally, the household disposable income is obtained by subtracting from the gross income the personal income tax and social security contributions.

It should be noted that, as the model is static, it only estimates first-round effects, and no behaviour changes are considered. Nonetheless, we believe that the results are quite informative regarding the cost and immediate regional consequences of the introduction of a UBI in Brazil and may be useful to qualify the regional public policies in the country. Investigating the long-run regional effects of the introduction of a national UBI is beyond the scope of the present study.

3. Regional effects of the Brazilian current tax-benefit system

The effects of the tax-benefit system on the distribution of per capita disposable income among the Brazilian federation units depend on how the transfers change the regional distribution of per capita gross income and on how taxes are distributed regionally. Siqueira e Nogueira (2023) show that the current Brazilian tax-benefit system does not significantly change the level of individual income inequality. Despite some available evidence about the regional impacts of Brazilian social programs provided by Silveira-Neto e Azzoni (2012), regional distributive effects of the tax-benefit system have not yet been investigated and this is our focus in this section. Significantly, apart from not specifically considering the regional effects of introducing a UBI, these authors have concentrated on the impact of social programs on regional inequality in Brazil using the per capita gross income of the country's federal units. In contrast, the current investigation examines the regional effects of the entire Brazilian structure of direct personal taxation and transfers; consequently, it employs a measure of the per capita disposable income of Brazilian federal units, providing a more precise account of the levels of regional well-being inequality in the country.

In 2019, cash benefits (pensions, social assistance benefits, and in-work transfers)

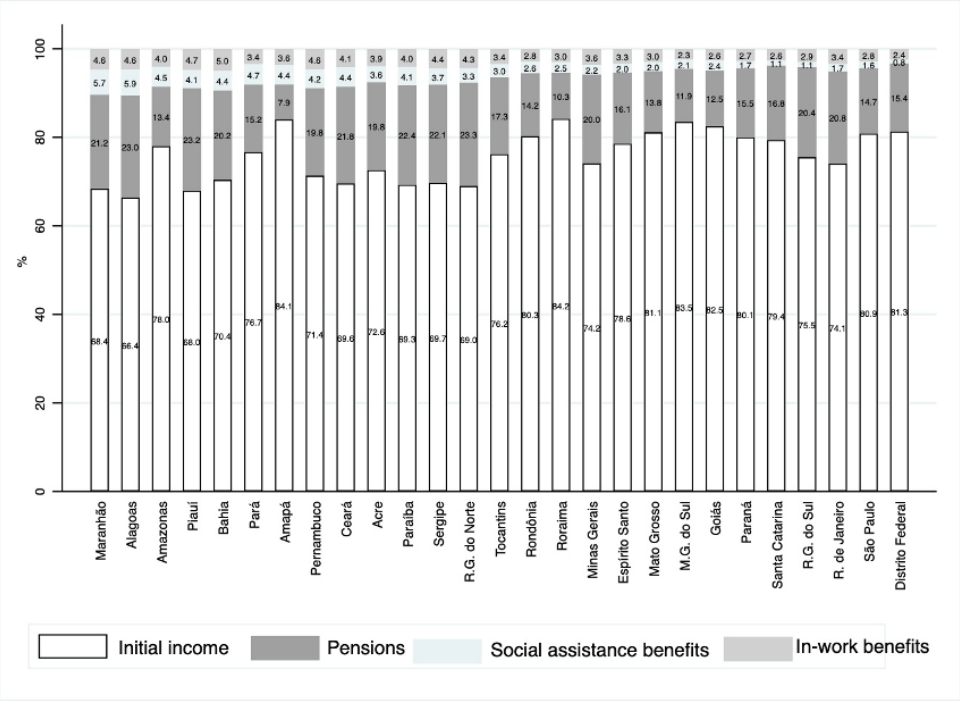
[5] Monetary values in the text, figures, and tables are given in Brazilian reais (R$).

[6] However, we supplement this information simulating the thirteenth wage and the holidays bonus, which are non-regular, mandatory benefits paid by firms to their formal employees and are not captured by the PNADC original data.

in Brazil amounted to 23% of total household income, a percentage comparable to that of the OCDE countries (da Fazenda , Brasil), with pensions accounting for about 83% of the total value of transfers. Figure 1 shows the composition of gross income by Brazilian federation unit, ranking the latter in ascending order according to per capita gross income.

The values presented in Figure 1 make clear that in Brazil public transfers have a greater impact on the composition of the gross income of the poorest federation units than of the richest federation units. Note that, despite the pattern of regional differences being, in general, the same concerning all three kinds of transfers, it was less prominent in the case of pensions and more evident in the case of social assistance benefits. For instance, the share of social assistance benefits in Maranhão's gross income (about 5.7%) is about 2.6 times higher than the Federal District's share.

Figure 1. Composition of per capita gross income of Brazilian federation units by different sources of Income in 2019. Federation units are ranked in ascending order according to the per capita gross income

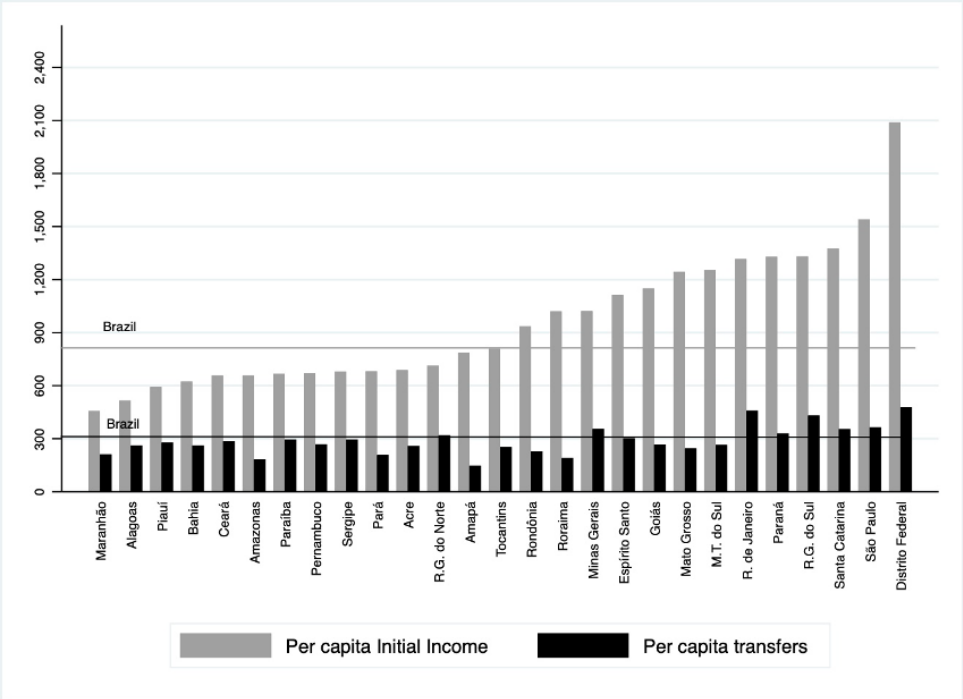


Source: authors' calculus using the 2019 PNADC microdata.

Figure 2 presents per capita values of total transfers and initial income for the Brazilian federation units, ranked in ascending order by their initial income. There are significant regional differences among the federation units. Maranhão's per capita initial income represented only 41.6% and 24.7% of the corresponding values for Brazil and the Federal District, respectively. Notice that regional differences are significantly less pronounced for per capita values of transfers.

However, as we detailly show in Appendix B in the Supplementary Material, there are clear differences both in magnitude and in the regional pattern of the distribution

Figure 2. Per capita initial income and per capita transfers of Brazilian federation units in 2019. Federation units are ranked in ascending according to the per capita initial income



Values in monthly R$. Source: authors' calculus using the 2019 PNADC microdata.

across the components of the transfers. For all federation units, per capita pension values are much greater than social assistance and work-related benefits, and their regional distribution is largely reflected in the regional distribution of transfers (see Figure 2). We also observe that, despite less pronounced trends, pensions and in-work benefits follow, in general, the regional pattern of initial income distribution, favoring the richest federation units.

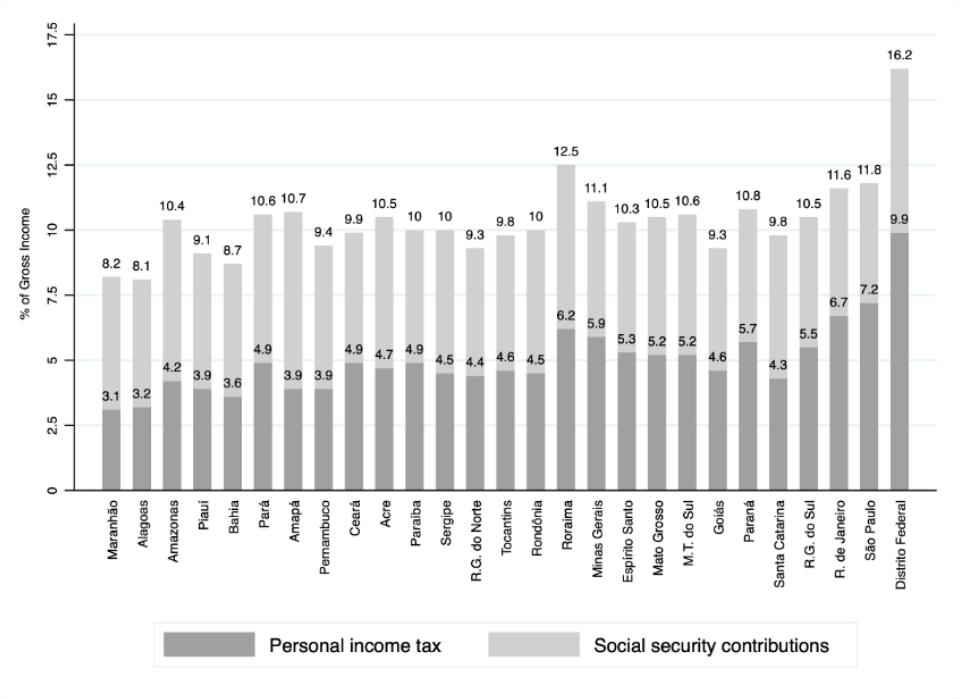
On the other hand, social assistance benefits favor the poorest federation units. For instance, while Maranhão's per capita value of pensions corresponded only to 35.9% and 57.2% of the values of the Federal District and Brazil, respectively, its per capita value of social assistance benefits were about 1.7 and 1.2 times the corresponding values of these two references, respectively. Thus, despite its spatial-blind character, the Brazilian regional distribution of social benefits in 2019 noticeably favored the poorest federation units, in line with results presented in Silveira-Neto e Azzoni (2012).

After accounting for transfers, there is a significant decrease in the inequality of the distribution of per capita gross income among Brazilian federation units, as compared to the distribution of per capita initial income. For example, the Gini and Theil coefficients for this distribution are reduced by 11.4% and 22.2%, respectively (see Table 2).[7]

[7]In Appendix B of the Supplementary Material, we present detailed results of the application of the Gini decomposition of Lerman e Yitzhaki (1985) for the distribution of per capita gross income among the federation units and make clear the contribution of each source of the per capita income gross income.

Figure 3 shows the total direct taxes as a proportion of the federation units' gross income and how this proportion is split between the two components (personal income tax and social security contribution), with the federation units ranked in ascending order of per capita gross income. We notice that, even though richer federation units pay higher proportions of income in direct taxes than poorer ones, the differences do not seem to be so significant. For example, while Maranhão's payment of personal direct taxes corresponded to 8.2% of gross income, the correspondent number for Brazil is 10.8%. Also, notice that the values in Figure 4 indicate that the incidence of the personal income tax is more regionally progressive than that of social contributions.

Figure 3. Personal income tax and total direct taxes as proportions of gross income of Brazilian federation units 2019. The federation units are ranked in ascending order of per capita gross Income



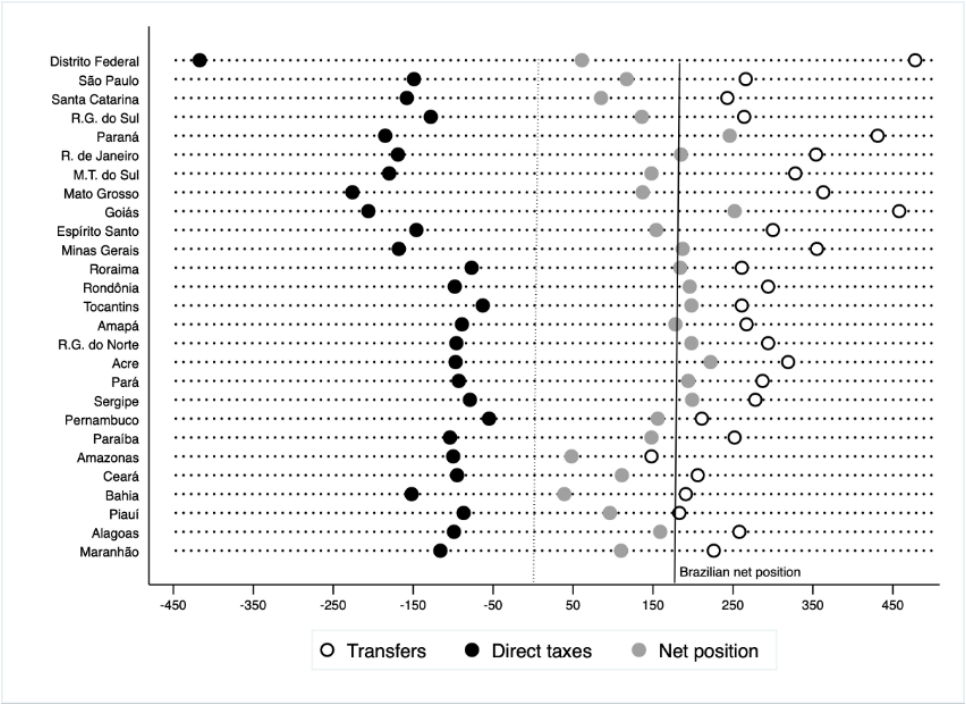
Source: authors' calculus using the 2019 PNADC microdata.

The net regional effects of the Brazilian tax-benefit system are displayed in Figure 4. Note that the values are monthly variations in absolute per capita income, with federation units now ranked in ascending order according to their per capita initial income.

One can observe that, firstly, both taxes and transfers tend to increase with the per capita income of the federation unit. However, the transfers tend to follow more closely the ranking of federation units based on initial incomes. Secondly, the eight federation units with the lowest initial per capita incomes and the four federation units with the highest per capita initial incomes present net positions inferior to that observed for Brazil. For the federation units with the lowest incomes, this happens mainly because they received low values of per capita transfers, which are due to their low per capita pension values, as previously discussed. For the four federation units

with the highest per capita initial incomes, the explanation for the low value of the net position is more mixed (with contributions of both taxes and transfers).

Figure 4. Income effects of taxes and transfers and the net final position of Brazilian federation units in 2019. Federation units are ranked in ascending order according to the per capita initial income



Source: authors' calculus using the 2019 PNADC microdata and official information about taxes. Values in monthly R$.

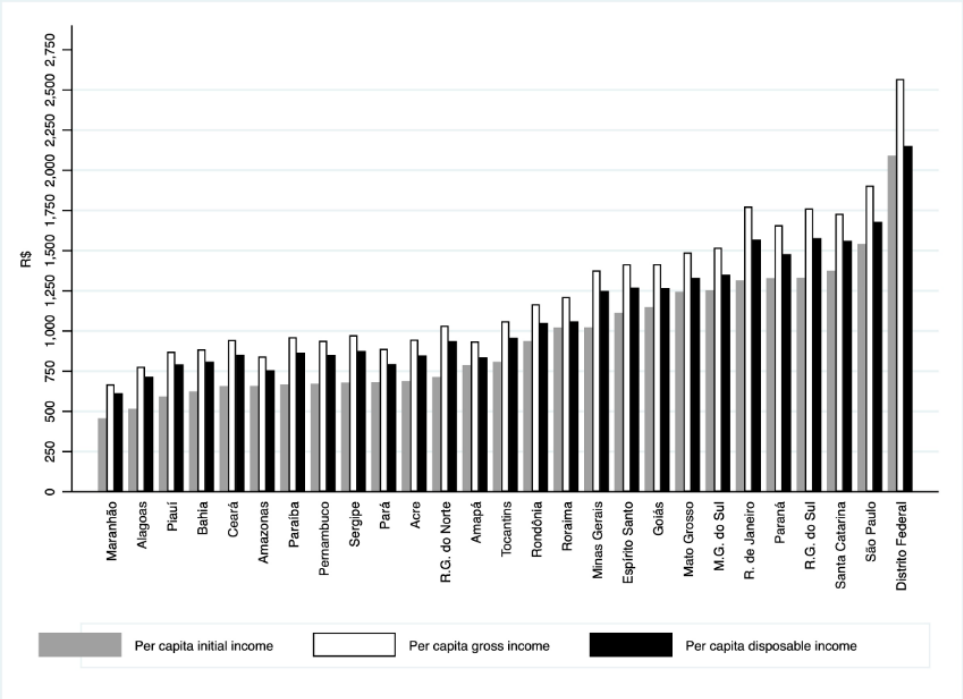
Next, Figure 5 shows values of per capita disposable income of the federation units, together with the corresponding values of per capita initial income and per capita gross income, with the federation units ranked in ascending order according to the per capita initial income. The evidence indicates that under the current Brazilian tax-benefit system, the poorest federation units have greater relative increases in per capita initial income and smaller relative reductions of per capita gross income than the richest ones. For instance, when comparing per capita initial and disposable incomes, Maranhão has an increase of income of 34.4%, while the correspondent values for Brazil and the Federal District are 15.7% and 3%, respectively.

We consolidate the effects of the Brazilian tax-benefit system on regional per capita income inequality by presenting summary indicators of inequality for different measures of per capita income.[8] Table 1 presents the traditional Gini, Theil, and Atkinson indices of inequality among Brazilian federation units for the three definitions of per capita income . It also shows the following inequality indicators: the maximum/minimum relation, the 3+/9- ratio, and the 6+/6- ratio.

In general, the values and variations of the indexes are consistent with each other

[8]In the case of Atkinson's index, we use a parameter of inequality aversion equal to 1.

Figure 5. Per capita values of initial income, gross income, and disposable income of Brazilian federation units in 2019. Federation units are ranked in ascending order according to the per capita initial income



Source: authors' calculus using the 2019 PNADC microdata and official information about taxes. Values in monthly R$.

and point to a reduction of the regional inequality of the distribution of per capita income in Brazil as one moves from initial to disposable income. The Gini, Theil, and Atkinson indices, and the ratio between income averages of the top 6 federation units and of the bottom six, are reduced by about 15%, 29%, 29%, and 14%, respectively. Also, note that most of the reduction in regional income inequality is associated with the move from per capita initial income to per capita gross income, indicating the importance of transfers in reducing regional inequality. For the Gini coefficient, for example, the reduction of regional inequality, from initial income to gross income, is equivalent to 73.5% of the reduction from initial income to disposable income, of 15%.[9]

Thus, transfers play the most significant role in reducing regional inequality in Brazil. Furthermore, this reduction is obtained not from the higher value of transfers to the poorest federation units (see Figure 6), but from the very low per capita initial income levels of those federation units. However, after taking taxes and transfers into account, the level per capita disposable income inequality among Brazilian federation units remains quite high.

We conclude this section by presenting the levels of poverty among Brazilian federation units that result from the current distribution of per capita household disposable

[9]For all other inequality indicators such percentage reduction is above 68%.

Table 1. Regional per capita income inequality across Brazilian federation units by different measures of per capita income – 2019

	Gini	Theil	Atkinson ($\epsilon = 1$)	Max./Min.	3+/9-	6+/6-
Inequality Level						
Initial	0.2111	0.0717	0.0684	4.57	2.70	2.55
Gross	0.1869	0.0559	0.0527	3.84	2.41	2.30
Disposable	0.1784	0.0509	0.0485	3.49	2.30	2.22
Inequality Variation						
Gross/Initial	-11.4	-22.2	-23.0	-16.0	-13.0	-10.8
Disposable/Gross	-4.5	-8.8	-7.9	-8.7	-4.1	-3.4
Disposable/Initial	-15.5	-29.0	-29.1	-23.3	-16.6	-13.8

Source: Authors' estimation using microdata from PNADC- IBGE.

income, using the head-count poverty measure. The World Bank PPP poverty line of US$ 5.50 per day, which corresponded to a monthly per capita household income of R$ 434 in 2019, is used as the poverty threshold. The evidence is presented in Figure 6 and indicates significant differences in poverty levels across Brazilian federation units.

Maranhão has the highest poverty rate of 53.4% (about 3.7 million people) among all federation units, which is almost 5 times that of the Federal District, and 2.2 times that of Brazil (see the black dashed line in Figure 6). Thus, the regional income disparities in Brazil are still clearly associated with significant regional differences in poverty levels. This explains why income transfer programs for the poor, such as the Bolsa Família, tend to direct most of their resources to the poorest federation units. They, thus, assume a doubly pro-poor nature: in Brazil, pro-poor programs tend to be also pro-poor federation units.[10]

4. The effects of a UBI on Brazilian regional income inequality

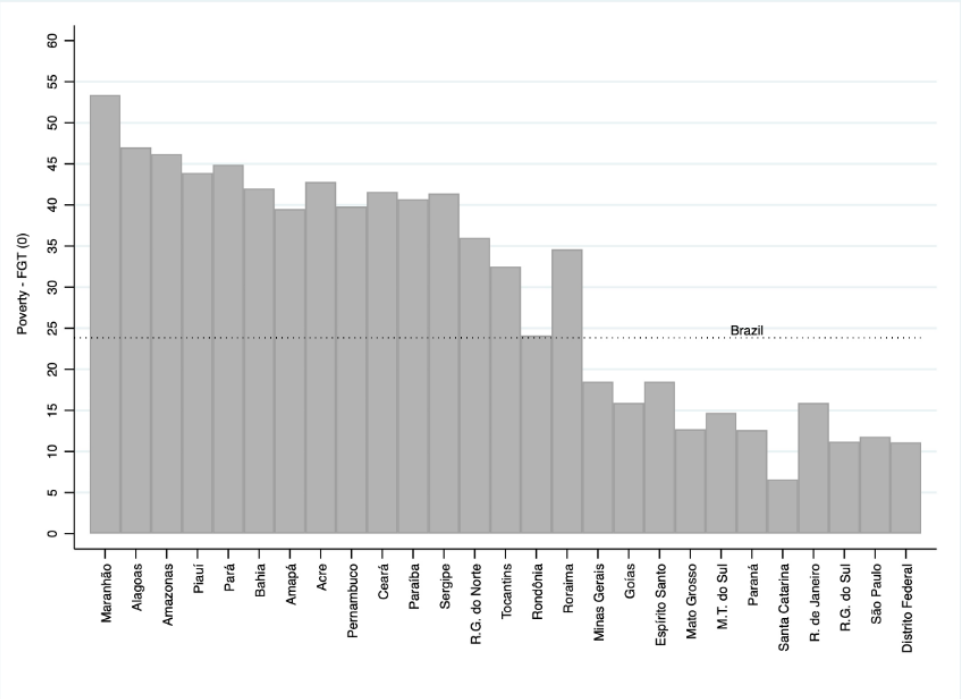
We now present the simulated effects of the introduction of a UBI on the per capita income disposable income of Brazilian federation units, and the associated changes in the pattern of Brazilian regional income inequality.

Notice, first, that the gross cost of the UBI payments simulated in this study is around R$ 1 trillion, about 15% of GDP in 2019. However, the downward adjustment of pensions and poor elderly/disability benefits coupled with the elimination of the other existing benefits offsets 23% of the gross cost. Accordingly, the UBI's net cost is estimated at 11.3% of GDP.[11] By its turn, the flat income tax rate that ensures budget

[10] Silveira-Neto e Azzoni (2011) and Silveira-Neto e Azzoni (2012), for example, analyzing regional inequality effects of spatially blind policies, such as the social programs adopted in Brazil during the 2000s, found that those policies have regionally progressive effects, but given the low value of the transfers, they did not substantially change the prevailing regional income inequality picture.

[11] It is important to note that some authors, such as Widerquist (2017), have argued that when eval-

Figure 6. Poverty (headcount, FGT(0)) across Brazilian federation units – 2019. Federation units are ranked in ascending order according to per capita disposable income. The horizontal black dotted line indicates the mean value for Brazil



Source: authors' calculus using the 2019 PNADC microdata and official information about taxes.

neutrality is 36.7%.

We begin by focusing on the changes in the distribution of per capita disposable income distribution among the federation units. Table 2 presents the per capita disposable income of the federation units before and after the introduction of the UBI, along with the correspondent relative variations (as in Figure 1, values correspond to monthly Brazilian reais in 2019). The numbers in the table underscore the significance of the policy for the configuration of the regional distribution of income among the Brazilian federation units.

Despite its spatially blind characteristic, the introduction of the UBI has a spatially progressive character. In general, the lower the per capita disposable income of the federation unit, the greater the benefit from the introduction of the UBI. More specifically, while the 16 lowest-income federation units experience important income gains (with an average income increase of around 15%), 10 of the other 11 relatively richer federation units show an income loss (including all the federation units of the South and Southeast regions, which experience an average income loss of about 3.2%). This pattern is consistent with the spatial distribution of income and poverty level among the federation units (see Figures 1 and 2) and indicates that the introduction of the

uating the affordability of a UBI program, one must deduct the amount people pay to themselves from the net cost. By doing this, what remains, referred to as the 'true net cost' of the UBI, is the amount that is transferred from the group of 'net contributors' to the program, to the group of 'net beneficiaries. In our analysis, this corresponds to 4.5% of GDP.

UBI generates a strong β-convergence type of income dynamics (Barro e Sala-i Martin, 1992).[12]

Table 2. Per capita disposable income (PCDI) before and after the introduction of the UBI – Brazilian federation units - 2019. Values in monthly R$

	PCDI Before		PCDI After		Variation
	R$	% Brazil	R$	% Brazil	%
Maranhão	614	48.3	797	62.7	29.8
Alagoas	716	56.3	861	67.7	20.3
Amazonas	755	59.4	918	72.2	21.6
Piauí	793	62.3	917	72.1	15.6
Pará	795	62.5	948	74.5	19.2
Bahia	810	63.7	927	72.9	14.4
Amapá	835	65.6	979	77.0	17.2
Acre	848	66.7	979	77.0	15.4
Pernambuco	851	66.9	965	75.9	13.4
Ceará	852	67.0	967	76.0	13.5
Paraíba	866	68.1	977	76.8	12.8
Sergipe	876	68.9	988	77.7	12.8
Rio G. do Norte	937	73.7	1,020	80.2	8.9
Tocantins	957	75.2	1,046	82.2	9.3
Rondônia	1,051	82.6	1,118	87.9	6.4
Roraima	1,060	83.3	1,156	90.9	9.1
Minas Gerais	1,250	98.3	1,237	97.2	-1.0
Goiás	1,268	99.7	1,274	100.2	0.5
Espírito Santo	1,270	99.8	1,268	99.7	-0.2
Mato Grosso	1,331	104.6	1,323	104.0	-0.6
Mato G. do Sul	1,351	106.2	1,341	105.4	-0.7
Paraná	1,479	116.3	1,421	111.7	-3.9
Santa Catarina	1,561	122.7	1,462	114.9	-6.3
Rio de Janeiro	1,569	123.3	1,486	116.8	-5.3
Rio G. do Sul	1,578	124.1	1,476	116.0	-6.5
São Paulo	1,680	132.1	1,574	123.7	-6.3
Federal District	2,152	169.2	2,006	157.7	-6.8
Brazil	1,272	100.0	1,272	100.0	0.0

Note: The federation units ranked in ascending order from the poorest (Maranhão) to the richest (Federal District) based on the per capita disposable income before the introduction of the UBI.

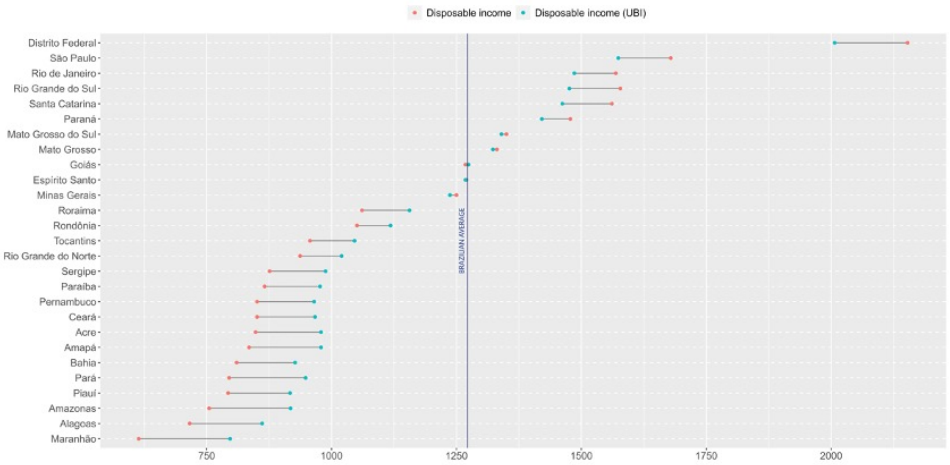
To elucidate the magnitude and implications of the regional income changes associated with the introduction of the UBI, Figure 7 illustrates the shifts in the per capita disposable incomes of the federation units from the situation without UBI (represented by a small red circle) to the situation with UBI (represented by a small blue circle), ranking them in ascending order based on per capita disposable income.

All federation units gravitate towards the national per capita disposable income

[12]More specifically, we would observe a convergence speed of incomes among the Brazilian federation units at 3.5% per year. This rate is significantly higher than the 2% rate regularly reported by Barro and Sala-I-Martin (1992) for cross-country comparisons (the 'iron law' of convergence) and by Genaiolli et al. (2014) for comparisons across countries' regions. When considering specifically the Brazilian UFs, the speed of convergence is greater than that identified by Silveira Neto and Azzoni (2011) for the period 1995-2011 (approximately 2.6%), a time interval these authors regard as a rare period of pronounced regional income inequality reduction in Brazil.

level (the vertical line at R$ 1,272). The most substantial absolute income changes are observed in Maranhão, Amazonas, Pará, and the Federal District, all of which experience income variations of more than 11.4% of the national income.

Figure 7. Per capita disposable income before and after the implementation of the UBI by federation unit - 2019



Source: authors' calculus using the 2019 PNADC microdata and official information about taxes. Values in monthly R$.

With its focus on eradicating poverty, the introduction of the UBI indisputably makes the Brazilian federation more homogeneous in terms of per capita disposable income. This is achieved through regionally progressive income changes across them. Using the income inequality indicators and ratios discussed in the last section, measures of per capita disposable income inequality among Brazilian federation units before and after the introduction of the UBI are displayed in Table 3.

The variations in the indicators are quite consistent and highlight the significant regional inequality reduction associated with the introduction of the UBI. For instance, the Gini and Theil coefficients, show respective reductions 29.6% and 49% with the introduction of the UBI. These reductions are about 1.9 and 1.7 times the reductions observed in these indicators when moving per capita initial income to per capita disposable income (see Table 2). Similar consistent movements are observed for the ratios of incomes. Importantly, as the last line of Table 4 makes clear, even by expanding the numbers of the lowest-income and highest-income federation units in measuring the ratio (to the bottom and top six federation units), we observe a significant reduction in the distance between the groups of federation units. This reduction is about 50% greater than the one observed in Table 2 for the movement from per capita initial income to per capita disposable income.

These shifts are also significant when compared, for example, to those observed by Silveira-Neto e Azzoni (2011) for the Gini and Theil coefficients during the period 1995-2006. Using a measure of per capita gross income of the Brazilian federation units, these authors observed reductions of about 14% and 22%, respectively, in the

Gini and Theil coefficients during this 11-year period. These numbers do not reach 50% of reductions observed in Table 4 for these indicators.

The reduction in regional income inequality associated with the introduction of the UBI is also significant when compared to the reduction of per capita household income inequality during the 2000s in Brazil. For instance, Souza (2018) points out that between 2001 and 2013, inequality, measured by the Gini coefficient, was reduced between 12% and 14%.

Finally, the significance of the variations obtained can also be understood by using the values of the Gini coefficient for the 180 countries analyzed by Lessmann e Seidel (2017), based on regional per capita GDP. In this context, an equivalent 29.6% reduction in the Gini coefficient of the distribution of per capita GDP per capita among the Brazilian federation units would move Brazil from 120th to 73rd place in terms of the level of lowest regional income inequality among the 180 countries (a position currently occupied by Denmark).

Table 3. Regional per capita disposable income inequality across Brazilian federation units before and after the introduction of the UBI – 2019

	Before the UBI	After the UBI	Variatio (%)
Gini Coefficient	0.1784	0.1257	-29.6
Theil Coefficient	0.0509	0.0260	-49.0
Atkinson (ϵ=1)	0.0485	0.0247	-49.1
Max./Min. Ratio	3.49	2.52	-28.2
3+/9-	2.30	1.83	-21.7
6+/6-	2.22	1.75	-22.7

Note: 3+/9- and 6+/6- refer to the ratios between averages of per capita disposable incomes of correspondent groups of federation units; for example, +3 means the average income of the top 3 federation units and 6- indicates the average income of the bottom 6 federation units.

An advantage of using the microsimulation approach to studying regional income inequality is that it also allows us to consider the variations in each individual's per capita household disposable income within the federation units after the introduction of the UBI. This information provides a better understanding of how the UBI, and the associated fiscal arrangement proposed for its implementation, operate by redistributing income among individuals. In Table 4, we present the average change in per capita household disposable income due to the introduction of the UBI by deciles of the initial distribution of this income for each federation unit. The evidence reveals a relevant aspect behind the regional income inequality reduction in Brazil.

First, the numbers in Table 4 show that, for all federation units, as expected given the focus of the UBI on poverty eradication, the lower the decile of the distributions, the more favorable are the income variations. The spatially blind nature of the policy and the focus on the social conditions of the individuals also explain the income losses in the highest income deciles in all federation units. For example, the two highest income deciles of Alagoas (AL), the federation unit with the second lowest per

capita disposable income, have income losses of more than 10%. Thus, the reduction of per capita disposable income inequality across the federal units occurs with significant progressive movements of income within all federation units, involving losses for economic local elites even in the federation units with the lowest levels of per capita disposable income.[13]

Given the significant regional disparities of income and poverty among the federation units (see Figures 5 and 6, respectively), important regional differences in the deciles' income variation across the federation units are also noteworthy. For example, the increase of income in the lowest income decile in Maranhão (MA) is about 8.3 times that seen in the correspondent decile in São Paulo (SP). At the same time, while income gains occur up to the seventh income decile in the case of the fourteen lowest-income federation units, positive income variations occur only up to the fourth income decile in the three highest-income federation units.

Table 4. Variation (%) of per capita Disposable Income with the introduction of the UBI in Brazilian federation units by deciles of the distribution of Disposable Income

	1	2	3	4	5	6	7	8	9	10
Maranhão	1,022.7	522.1	240.9	129.2	81.4	53.4	29.7	14.4	-4.8	-11.5
Alagoas	716.1	286.4	140.9	91.7	62.0	37.4	21.8	6.3	-10.3	-14.6
Amazonas	719.6	383.8	200.6	118.5	73.8	46.6	27.3	13.0	-3.0	-12.8
Piauí	757.6	268.1	123.8	72.6	42.2	23.7	9.1	-6.9	-8.4	-15.7
Pará	642.9	266.5	145.1	89.5	57.2	34.3	20.9	5.4	-5.6	-14.1
Bahia	626.7	252.3	127.6	75.6	48.8	26.5	12.2	-5.6	-6.1	-15.7
Amapá	344.8	148.8	93.7	61.4	37.2	28.3	12.4	1.0	-4.1	-12.0
Acre	737.4	332.0	140.0	78.2	47.3	27.3	11.7	-1.9	-7.9	-14.7
Pernambuco	653.9	242.1	117.9	71.7	46.5	25.3	13.5	-7.5	-5.1	-15.4
Ceará	675.7	253.7	124.9	76.1	47.1	16.5	12.2	-5.2	-5.2	-15.8
Paraíba	599.5	204.6	107.4	63.6	38.0	23.0	9.8	-8.6	-8.3	-16.0
Sergipe	530.2	209.4	115.6	72.3	45.9	26.2	13.4	-3.3	-5.7	-15.3
R.G. Norte	512.4	172.9	88.5	58.4	35.6	17.9	9.8	-7.2	-7.7	-17.9
Tocantins	312.1	119.2	70.2	44.1	28.1	15.8	5.0	-9.9	-8.4	-14.9
Rondônia	198.6	85.2	54.1	33.0	20.4	11.3	-3.0	-3.6	-10.5	-15.2
Roraima	366.4	145.5	88.3	56.2	35.3	22.0	8.3	-2.2	-7.6	-13.1
M. Gerais	219.4	79.8	43.6	24.4	12.4	3.1	-7.0	-8.2	-14.4	-18.8
Goiás	144.1	60.5	33.9	21.9	11.4	-3.9	-1.1	-7.2	-12.5	-16.9
E. Santo	188.8	71.8	40.5	25.5	13.1	-2.3	-2.9	-7.9	-13.7	-17.7
M. Grosso	131.3	50.1	30.1	17.7	7.8	-2.7	-3.1	-8.1	-12.6	-16.0
M.G. Sul	132.8	55.0	32.1	20.5	11.7	-1.7	-3.3	-7.7	-12.7	-16.7
Paraná	142.8	50.1	25.9	14.4	4.5	-6.8	-5.6	-10.6	-15.4	-17.6
S. Catarina	84.1	28.6	13.9	-2.3	-3.1	-5.0	-8.4	-12.1	-16.3	-18.5
R. Janeiro	154.8	58.2	29.2	16.0	7.4	-6.0	-5.3	-12.3	-17.0	-18.4
R.G. Sul	116.0	39.0	19.6	7.7	-8.6	-4.6	-10.2	-14.0	-17.6	-18.7
São Paulo	123.2	44.9	23.3	12.2	-1.5	-2.4	-7.6	-12.5	-17.3	-18.3
D. Federal	111.8	41.9	22.3	11.1	-1.1	-4.7	-9.1	-12.9	-14.2	-14.9
Brazil	435.2	127.7	65.5	36.5	20.6	9.6	-6.3	-5.5	-12.7	-17.3

Note: federation units are ranked in ascending order based on the per capita disposable income before the introduction of the UBI.

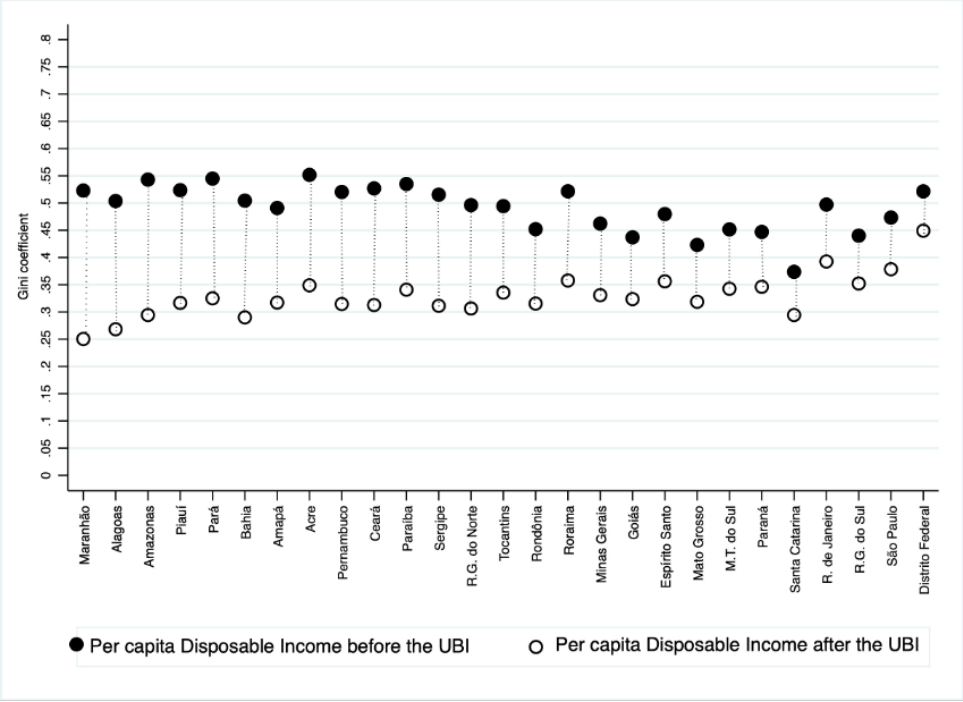
In Figure 8, we use the Gini coefficient to measure levels of inequality within the

[13]Notice that this represents a substantive difference with respect to the traditional territorial policies historically implemented in Brazil, generally based on subsided credits or tax reductions (Silveira-Neto e Azzoni, 2012).

federation units in terms of the distribution of the per capita household disposable income before and after the introduction of the UBI. It is not surprising that, with the introduction of the UBI, all Brazilian federation units show reductions in inequality levels, nor is it surprising that those with lower incomes present greater reductions. These reductions in inequality of per capita household disposable income in the lowest-income federation units are very significant, even relatively, despite their initial higher level of inequality. For example, for the sixteen lowest-income federation units, the average percentage reduction of the Gini coefficient is 38%, a value well above those observed for the country (about 27%) and for the other eleven lowest-income federation units (22.5%).

Thus, in terms of per capita disposable income, the introduction of the UBI makes the country unequivocally more balanced regionally and individually (within federation units).[14]

Figure 8. Income inequality (Gini coefficient) in per capita disposable income by Brazilian federation units, ranked in ascending order according to per capita disposable income before the UBI



Source: authors' calculus using the 2019 PNADC microdata and official rules and information on taxes.

[14] Analyzing the distributive impacts of the introduction of a UBI in Brazil under different tax schemes, Siqueira e Nogueira (2023), using 2017 PNADC micro data, also found significant reductions in the Gini coefficient for the individual distribution of per capita disposable income. In a tax scheme like ours, they observed a reduction of 25.5% in the Gini coefficient.

5. Concluding remarks

The dysfunctionality of the Brazilian social protection system and the regional inequality of welfare in the country render income transfer policies potentially doubly beneficial for the poor: they may simultaneously reduce poverty and regional welfare inequality. In the present study, we used the Brazilian 27 federation units as the unit of analysis to investigate the effects of introducing a policy that combines a UBI with a flat-rate income tax on the historical and persistent regional inequality of per capita disposable income in the country.

Our body of evidence is derived from a microsimulation model that considers the heterogeneity of Brazilian households and the rules of the current Brazilian tax-benefit system, including those specific to each federation unit of the country. By considering both benefits and direct personal taxes, the strategy, thus, expands and qualifies the previous analysis by Silveira-Neto e Azzoni (2011, 2012) about the regional effects of social policies in Brazil. We emphasize two results.

Firstly, despite contributing to a reduction in regional per capita disposable income inequality, the current tax-benefit system does not substantially alter the high level of regional welfare inequality among Brazilian federation units. This is attributed to the regressive nature of Brazilian pensions, coupled with the weak redistributive effect of direct taxes and the low value of social assistance transfers.

However, our main results indicate that a policy that combines a UBI with a flat-rate income tax, in addition to eliminating poverty, results in a significant reduction in the inequality of per capita disposable income distribution across Brazilian federation units. Measured by the Gini and Theil indicators, this inequality decreases by 30% and 49%, respectively. The reason for this significant regional effect is linked to the spatial distribution of poor and economically vulnerable individuals in Brazil: the poorest federation units also have an overrepresentation of individuals in poverty. Remarkably, the reduction of Brazilian regional income inequality with the introduction of the UBI is achieved with significant reductions in per capita disposable income inequality within federation units, implying an effective contribution from the local economic elites.

Accordingly, our results indicate significant equalizing spatial impacts of spatially blind social policies in Brazil, in contrast with the country's experience with traditional territorial policies that are still in effect, the impacts of which on both per capita regional inequality and poverty have yet to be demonstrated. Thus, although our set evidence does not indicate that territorial-targeted regional development policies are ineffective, it suggests that their opportunity costs (in terms of alternatives) are significant.

It should be remarked that the feasibility, or even the desirability, of a universal basic income is often questioned on two major grounds: firstly, it is too expensive,

requiring unreasonable tax increases; and, secondly, it may have a negative impact on the supply of labour. Although the discussion of these issues is out of the scope of this paper, the same framework used in this research can be extended in both directions: (i) to consider more carefully the problem of financing the UBI, and (ii) to provide some idea of incentive effects on labour supply. In the first case, the model can be modified to incorporate additional ways of financing, including consumption taxation, the elimination of some inefficient ill-targeted programs, and the abolition of numerous regressive fiscal subsidies.

Concerning the investigation of potential effects on labour supply, a first step – still using a static microssimulation model – is to calculate the effective marginal tax and participation rates faced by individuals when deciding how many hours to work or whether to enter the labour market. This would allow us to compare the structure of incentives to work under the current tax and benefit system with that resulting from the implementation of a UBI program. It is worth mentioning that, according to Santana et al. (2013), 83% of workers in Brazil face participation rates above 60%, and for 25% of them – those with the lowest incomes – this rate is above 90%. On the other hand, a UBI program has the potential to drastically reduce marginal tax and participation rates for lower income individuals. These further steps are left for future work.

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