

# Fiscal Policy and regional inequality in Brazil

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## Resumo

Este artigo estima o impacto de longo prazo de uma política de austeridade sobre as regiões brasileiras. A principal contribuição é medir esses efeitos a partir de um modelo dinâmico e inter-regional de equilíbrio geral computável, capturando os impactos indiretos em setores e regiões, somado aos efeitos diretos do corte dos gastos. Os principais resultados mostram que o ajuste fiscal atenuaria o crescimento na maioria dos estados brasileiros em 2037. Municípios localizados nas regiões mais pobres seriam relativamente mais afetados. Além disso, o ajuste teria um impacto negativo na desigualdade regional em todos os cenários, tanto a nível estadual quanto municipal.

## Palavras-chave

Política fiscal; Desigualdade regional; Modelo de EGC; Brasil.

## Abstract

This paper aims to estimate the long-term impacts of an austerity policy in the Brazilian regions. Our main contribution is to measure those effects using a dynamic interregional general equilibrium model, capturing the indirect impacts in sectors and regions, in addition to the direct effects of the expenditure cuts. The main results show that the fiscal adjustment would attenuate growth in most of the Brazilian states by 2037. Municipalities located in the poorest regions would be relatively more affected. Furthermore, the adjustment would have a negative impact on regional inequalities in all scenarios, both at the state and municipal levels.

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## **Keywords**

Fiscal policy; Regional inequality; CGE model; Brazil.

## **JEL Classification**

C68; E62; R58.

## **1. Introduction**

At the end of 2016, the Brazilian National Congress approved the Constitutional Amendment (EC) 95/2016, also known as the “expenditure ceiling.”<sup>1</sup> This amendment established stagnation of the Union’s primary expenditures in real terms over a twenty-year horizon, starting in 2017. The adoption of the new fiscal regime was justified because of primary public sector deficit expansion since 2014, accompanied by the deterioration in public debt sustainability indicators and the fall in private investment. This policy is restricted to the Union’s primary expenditure, but some federative units (states) also have started discussions and negotiations with the Central Government to adopt a similar rule. The covid-19 crisis has temporarily paralyzed these discussions<sup>2</sup>.

The attempt to solve fiscal imbalances often occurs through the implementation of fiscal policy rules. The argument of the authors who defend this strategy is based on the idea that in the absence of a sound fiscal policy rule, uncertainties associated with the macroeconomic scenario and structural imbalances may prevent economies from growing to their full potential (Kopits and Symansky 1998). According to Ljungman (2008, p. 3), fiscal rules can foster fiscal discipline by simplifying decision making, promoting interest in economic sustainability issues, and reducing the scope of inconsistent intertemporal decisions.

Brazil has adopted a primary outcome target since 1998. According to Salto and Barros (2018), given the inability of the Government to meet

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<sup>1</sup> “*Teto de gastos*”, in Portuguese.

<sup>2</sup> There was pressure for States to adhere to the ceiling, as in the case of Minas Gerais, in exchange of the postponement of payment of debt maturities with the Union. But, given the difficulty of unanimous decision and the arrival of the Covid-19 pandemic crisis, nothing concrete has been established.

positive primary outcome target<sup>3</sup> in 2014, the limitation in public expenditure growth has become an anchor for the economic agents' expectations. Thus, the implementation of EC 95/2016 would lead to fiscal solvency within a reasonable horizon, benefiting the interest rate dynamics and, at the same time, allow the government to advance the necessary policies to control the public debt trajectory.

On the other hand, authors have drawn attention to the rigidity of the expenditure ceiling compared to other countries' fiscal rules and to the potential dismantling of the welfare state that would be occasioned by the new fiscal regime. Brazil is a country with deep social issues, and the budget cuts in social areas would deepen the socioeconomic problems. Dweck et al. (2018) argue that there is no guarantee that the "expenditure ceiling" rules could be met without public health and education expenditure also being limited by inflation. This means that, even on a path of real economic growth, there would be a reduction in the share of public health and public education in federal expenditure.

The "expenditure ceiling" proposal is based on the theory known in international literature as Expansionary Austerity or Expansionary Fiscal Contraction. This theory argues that fiscal consolidation, by consolidating the agents' confidence in the country's economy, allows for a subsequent reduction in the interest rate, increasing consumption and private investment. Therefore, austerity plans could be accompanied by product growth, even with the contraction in public expenditure (Giavazzi and Pagano 1990; Alesina and Perotti 1995; Ardagna 2004; Alesina *et al.* 2016; Alesina et al. 2018). This theory contrasts with the Keynesian argument that fiscal consolidations exert purely contractionary effects on aggregate demand. Expansionary fiscal contraction can therefore be defined as the positive correlation between fiscal adjustment and private consumption and investment.

Krugman (2010) is critical of the theory of expansionary austerity. In the author's view, empirical evidence of the positive effects of increased confidence in private investment and consumption is absent. Camuri et al.'s (2015) and Anderson et al.'s (2014) results shed some light on the issue. Camuri et al. (2015) have found, through panel econometric estimates, that the relationship between austerity and growth is different between

<sup>3</sup> Since 1999, Brazil has adopted the macroeconomic tripod regime that consists in positive primary surplus, inflation targets and floating exchange rates.

developed and emerging economies. These authors suggest that, depending on the country's developmental level, the results may be the opposite of the policy target. Anderson et al. (2014) also found similar results for central and peripheral countries of the Eurozone.

After 2010, the adoption of fiscal austerity plans was the strategy adopted by the Eurozone peripheral countries that were experiencing fiscal issues. Previous studies have shown that the positive results expected from the austerity plans are not yet being perceived, and they may have contributed to the aggravation of the economic and fiscal crisis (Schneider et al. 2016; Nikiforos et al. 2015).

Another frequent concern is the impact of those policies on poverty, household welfare, and inequality. Bourguignon et al. (1991), Taylor (1991), and Stewart (2005) analyzed the impacts in countries that underwent fiscal adjustments, especially in the late 1980s and early 1990s. The most recent literature focused on the Eurozone, such as Schneider et al. (2016), Rawdanowicz et al. (2013), and Bova et al. (2018). In general, these studies point to a greater exposure of the most vulnerable households to the effects of public-expenditure cuts, given the greater share of public services in their consumption and the vulnerability of their jobs. Therefore, they highlight trends of deepening poverty and inequality.

For Brazil, fiscal austerity impacts are still uncertain, whether at macroeconomic and sectoral levels or in the social spectrum, as well as in the welfare and income distribution of households. The first study to evaluate the potential impacts of an austere scenario in Brazil that considered the sectoral, institutional, and personal distribution of income interdependencies was Cardoso (2019). The author uses a computable general equilibrium model, capable of dealing with personal income distribution issues, to design austere scenarios for the growth of public expenditure in the Brazilian economy, with and without recovery of private investment. The author's conclusion is that even if the recovery of private investment were sufficient to counterbalance the negative impacts on economic growth, it would not be enough to recover household incomes. Moreover, considering the supply of public goods as social or expanded income (as the concept proposed by Atkinson 2015), contraction scenarios of expenditure with (the) public education and health (sectors) would have regressive effects on income distribution.

An issue not yet evaluated in relation to austerity policies in Brazil is their potential impacts in different regions. Given regional heterogeneities, whether in the productive structure, the share of public expenditures, economic activity or even social issues, the impacts of fiscal adjustments may have uneven effects throughout space, with the potential to reinforce previous disparities.

The deep Brazilian regional inequality, already exhaustively evidenced in the literature (i.e., Baer and Geiger 1978; Haddad 1999; Diniz 2006; Baer 2007), had shown a declining trajectory from 1990 to 2014. Since 2015, however, this process has suffered a reversal (Rocha 2019), and the country has once again observed an increase in the indicators of regional inequality. In addition to the rise in unemployment and the greater labor market precariousness of the poorest regions in the context of economic crisis, this reversal would be associated with the public expenditure cuts that have been observed since 2015, when the government started to adopt fiscal adjustments to balance the public accounts. The poorest regions of the country exhibit a greater share of public expenditure in their economic structures and in government transfers to households.

The aim of this paper is to fill the gap in the recent literature on the long-term impacts of fiscal austerity by assessing the interregional impacts, especially on regional disparities. In this paper we consider a policy that establishes no real growth for the general government primary expenditure for 20 years. Although the expenditure ceiling currently applies only to the Union, the discussions established before the covid-19 crisis signaled the adoption of a similar rule in the States as well. So, in the simulations we consider the hypothesis that the austerity policy is extended to all spheres of government and our results represents a scenario of a reduction of the government share in the economy.

The contribution of this paper is to measure the regional impacts of austerity through a general equilibrium analysis which, in addition to the direct effects of the expenditure cuts, captures the indirect impacts between sectors and regions. For this, we use a dynamic computable general equilibrium (CGE) model calibrated for the 27 Brazilian federal units. The CGE model is based on data from 2013 published by the Brazilian System of National Accounts and allows a top-down analysis at the municipal level.

From this model, we project the real stagnation of the Brazilian current general government's expenditures over a 20-year horizon, considering whether or not investments would be recovered. Given the specificities of our CGE model, we present the results at different spatial levels: macro regional, state, and municipal.

## **2. Fiscal Policy and Regional and Social Inequality**

The literature that aims to evaluate the impacts of fiscal policies adopted by central governments is vast. However, the evaluation of heterogeneities in the regional distribution of these impacts is a less frequent concern. Given the geographical aspect of income inequality and the persistence of poverty in certain countries and regions, it is expected that the effects of austere reforms and measures by the government are manifested heterogeneously in different regions. In most studies, however, the impacts of fiscal adjustment policies are measured from a purely macroeconomic perspective, while issues such as development and regional inequalities are relegated to the background in the debate.

Recently, especially since the resumption of a more active role of central governments through fiscal policy in the face of the global financial crisis and fiscal adjustment plans adopted in the Eurozone, some studies have focused on capturing these heterogeneities in Greece (Caraveli and Tsionas 2012; Pearce 2013; Green and Lavery 2015; Murphy, 2017), the United Kingdom (Beatty and Fothergill 2013), Guatemala (Cabrera et al. 2015) and Brazil (Tupy and Toyoshima 2013).

Caraveli and Tsionas (2012), for instance, through data series comparison, assess the influence of the macroeconomic policies adopted during periods of economic recession in Greece on regional inequality in the country between the 1990s and 2000. The results indicate that economic integration from the 1990s which, in the authors' opinion, contributed to the country's de-industrialization, aggravated the inequality of relatively more industrialized but less diversified regions in comparison to the metropolitan region of Attica. In the early 2000s, structural changes – that is, the growth of real estate and financial sectors to the detriment of industry and civil construction—contributed to widening regional disparities, given the

strengthening of urbanization trends and concentration of the population in the metropolitan center.

Also concerned about regional effects of macroeconomic policies, Beatty and Fothergill (2013) measure the impact of the implementation of fiscal reforms adopted by the British Central Government projected for the years of 2014 and 2015 at the regional level.<sup>4</sup> The authors assess the spatial distribution of monetary losses associated with cuts in social benefits. After estimating cuts to each benefit, the authors point to a loss of income of £19 billion per year or an average of £470 per working-age adult across Britain, with more severe effects in places where social-assistance applicants are concentrated, usually in the poorest regions of the Union. The authors conclude that the magnitude of the contractionary impact has a positive correlation with the degree of economic deprivation of the local authorities.

Other studies analyze the regional economic impacts of fiscal policy for their effects on specific characteristics such as rural or urban population, native-born descendants, health status, and gender issues. Cabrera et al. (2015) show that in Guatemala, regions where the descendants of the native-born people—the poorer and less developed populations—are concentrated are more vulnerable to fiscal reforms, especially public expenditure cuts.

Pearce (2013) investigates the effects of austerity measures in Britain on the regional inequalities of health status. According to the author, economic recessions are associated with harmful effects on mental health, increased suicide rates, and unhealthy habits such as alcoholism, smoking, worsening diet, and reduction in physical activities; the most affected are the inhabitants of regions and communities stigmatized by violence and a low developmental level.

Murphy (2017) suggests that British women are the most strongly affected by recent fiscal austerity measures in Great Britain, mainly due to cuts in welfare policies. The cuts in these policies reinforce the need for “juggling caring roles” in a context of precarious employment. Green and Lavery

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<sup>4</sup> Relating to changes in the following measures: Housing Benefit—Local Housing Allowance; Housing Benefit—Under-occupation; Non-dependent deductions; Household benefit cap; Council Tax Benefit; Disability Living Allowance; Incapacity benefits; Child Benefit; Tax Credits and 1 percent reduction in annual up-rating of value of most working-age benefits.

(2015) also mention the precariousness of the British female labor market in periods of austerity.

With regard to the role of government in small regions, Caraveli and Tsionas (2012) find evidence that the austerity policy recently adopted in Greece has more significantly affected the peripheral regions of the country, places where the public sector and pensions account for more than 50% of household incomes, while employment in the private sector is lower and the industrial base weaker. According to the authors, one can observe in these localities a reduction in household incomes of up to 40% more than in the capital and other regions of similar income.

To characterize similar localities in a Brazilian region, Tupy and Toyoshima (2013) appeal to the concept of “Economy without Production.” The authors study the impact of government income transfers on the productive structures of the 51 municipalities of the Jequitinhonha region in the Minas Gerais state between 2004 and 2009. The region is marked by the high incidence of poverty, great rural exodus, economic activity directed to the primary and subsistence sectors, and low dynamism, in addition to serious social problems, such as low schooling and low per capita income. These municipalities have government transfers (Income Transfer Programs such as Bolsa Família and Continuing Care Benefit, Rural Retirement, Public Employment, and Intergovernmental Transfers) as the main sources of income. Tupy and Toyoshima (2013) show that direct income transfers through social programs correspond to approximately 27.3% of the Gross Domestic Product (GDP) of the municipalities of the Jequitinhonha region. The intergovernmental transfers, in turn, correspond to 94.14% of the total budget of municipal governments and are more than 19 times higher than the tax collected.

This is a frequent feature for a significant number of localities in Brazil, mainly concentrated in the Northeast and North regions. The study of Tupy and Toyoshima (2013) suggests that Union budget cuts, such as those projected after the recent adoption of the “expenditure ceiling” in Brazil, tend to have significant contractionary impacts in these localities, deepening household poverty and creating a relative backwardness of these regions in relation to those with a productive structure less dependent on the public sector.



In order to access those effects, our proposed model includes data for 5,570 Brazilian municipalities, accounting for the participation of public expenditure in each location, as well as detailed data on economic interconnections between each of the 27 federal units, as the next section details.

### 3. Model, Database and Simulations Strategy

The model used for simulations is a recursive dynamic CGE model calibrated for Brazil. It follows the theoretical structure of The Enormous Regional Model (TERM), which is a well-documented model<sup>5</sup> developed by the Center of Policy Studies (CoPS) in Australia with several applications for the Brazilian economy (including Ferreira Filho and Horridge 2014; Carvalho et al. 2017; Ribeiro et al. 2018).

#### 3.1. TERM model

TERM is a bottom-up model, meaning the economic decisions are organized at the regional level (in our case, the 27 Federal Units of Brazil) and aggregated at the national level. Additionally, each federal unit result can be disaggregated at the municipality level, resulting in 5,570 subnational regions.

The theoretical structure of TERM follows basic neoclassical assumptions. For each federal unit, a representative household chooses a consumption bundle by maximizing a Stone-Geary utility function. Firms for each sector and each region minimize production costs following a Leontief production function for intermediate goods combined hierarchically with a Constant Elasticity of Substitution (CES) function between labor and capital. All economic agents (households, firms, government, and investors) can choose between domestic (from different regional sources) and imported goods using a CES specification (Armington hypothesis), based on the purchase price differences from each source. All markets clear for each period by adjusting prices and quantities each year.

<sup>5</sup> See, for instance, Horridge et al. (2005); Horridge and Wittwer (2010); Wittwer (2012, 2017).

The dynamics adjustment is based on investment and capital stock accumulation at the regional (federal units) and sectoral level. Following Dixon and Rimmer (2002), in each simulation year, it is assumed that the rates of capital growth are determined by the willingness of investors to provide funds to an industry based on expected rate of return. Basically, if the rate of return expected by investors is higher than the normal rate of return, then capital accumulation is above the normal rate (Dixon and Rimmer 2002).

The application of a CGE model to analyze the regional impacts of a fiscal scenario is very appropriate, since this kind of model captures the regional and sectoral interdependences in the economy, which is important to capture the full effect of fiscal policy and its leaks, considering the heterogeneity of the productive structure between regions. It is important, however, to highlight some limitations of the analysis in regional CGE framework. The need to disaggregate information in an interdependent framework consistent with the National Accounts means that some additional hypotheses need to be taken in relation to the distribution of some flows, the consideration of homogeneous production and consumption functional forms between regions and also imposes some restrictions on analyses. We should highlight some of them:

- i) Differently from that established by EC 95/2016, in the model the public expenditure is taken under the fiscal concept of “General Government”, that is, to the total expenditures of the Federal, State and Municipal spheres. It is, therefore, an illustrative scenario of reduction of the size of the State in the economy, since the Federal units (states) and municipalities are not, at first, subject to the expenditure ceiling.
- ii) In a regional framework, we can only consider current government spending on goods and services, that is, how much the government consumes in goods and services and its supply of health, education and public administration, including what it pays in salaries. Given the lack of regional Integrated Economic Accounts, which show the secondary distribution of income, we do not consider government transfers to households in the simulations. Although transfers are a very representative type of expenditure that shows significant growth over time, their absence in the model does not bias the results that will be discussed in this article, mainly because they are mostly mandatory constitutional transfers (more than 80% of transfers

to families are social security benefits). Thus, the austere scenario tends to be reflected in other Government expenditures, mainly in its consumption expenditures, since with the growth of mandatory pension expenditures, for example, current expenditures for the maintenance of public services that are not in a plaster cast and investments will be compressed. Thus, the results capture well what should happen: a compression of expenses with goods and services. Even in terms of impacts on interregional inequalities, the conclusion is the same. Mandatory expenditures, which are distributed across regions and grow at a natural rate (such as social security, for example) cannot be cut, so current expenditures for the supply of goods and services and investments will be those that will feel the impacts of austerity. Therefore, the results reflect the effects of the compression of these expenditures on regional inequalities, taking into account the different proportions of these expenditures in regional economies.

- iii) The model captures the effect on tax revenue in the face of a change in economic activity as a response to policy scenarios, but this is not reflected in public spending, since taxes are exogenous and the model does not have any type of link between tax revenue and expense. The absence of this link is suitable for the simulation, precisely because in the design of the new Brazilian fiscal framework, increases in government revenue will not convert into spending increases, since spending should only grow at the rate of inflation, no matter the increase in revenue. Thus, the results well represent the impacts of the austere scenario, even with the absence of a fiscal module that links revenue to government spending. Also, it is considered that the tax structure and rates remain the same throughout the entire period, as taxes are exogenous. Thus, the simulations do not consider any type of tax modification that could be made because of the austerity scenario. We believe that this hypothesis is quite adequate and has no implications for the results, precisely because it allows us to capture the isolated impact of austerity via spending cuts, which is the objective of this paper. Furthermore, there is no indication that a tax expenditure rule implies changes in the tax structure.
- iv) In the model, public investment is not separate from private investment. Thus, we do not consider changes in public investment in the policy scenarios. This hypothesis is strong and the results must be analyzed in light of this limitation, as the proportion of public investment in total investment remains constant in the simulation. Even so, it is noteworthy that public investment has a very small share in the economy's total investment (this share went from 2.5%

of the economy's total investment to around 1.5% in the last years of the fiscal crisis), which alleviates the hypothesis since this type of expenditure has much smaller magnitude and proportion than current expenditure. Given this, it can be said that the results to be explored represent a lower level of the regional impacts of austerity, since public investments are not under the restriction of zero real growth.

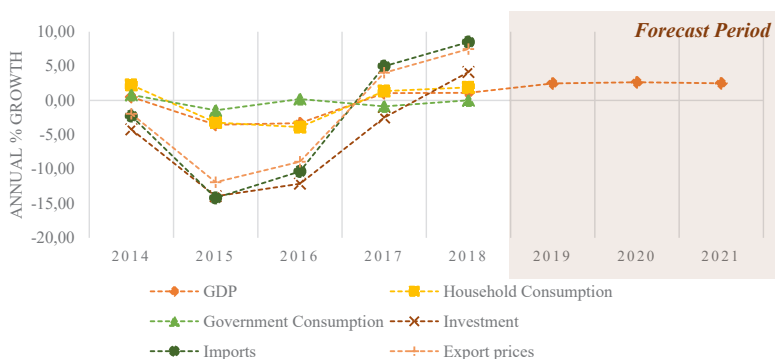
The next section presents the database procedures.

### *3.2. Database*

The model's database was developed through a regionalization procedure created by Horridge (2012), using information from the 2013 Brazilian System of National Accounts (IBGE 2017) and adjusted according to the procedure described in Guilhoto and Sesso Filho (2005). Additional data at the regional level includes information on consumption from the Brazilian Household Budget Survey 2008–2009; employment from the Annual List of Social Information (RAIS, from Portuguese "*Relação Anual de Informações Sociais*"); and international trade from the Secretary of Foreign Trade (SECEX).

### *3.3. Simulations strategy*

In order to evaluate fiscal adjustment impacts, the simulation is divided into baseline and two policy scenarios. The baseline simulation updates the database. For the observed period (2014–2018), we used key official macroeconomic estimates for real GDP, investment, household consumption, government expenditure, exports, imports' prices, and consumer price index (Figure 1). For the period 2019–2021, we used Brazilian GDP estimates projected by the Brazilian Central Bank (2019), 2.48%, 2.65%, and 2.5%, respectively; and from 2022 onwards, we assumed a homogeneous growth scenario of 2.5% per year. Therefore, baseline simulations allow the projections for the economy from 2014 onwards without any further state intervention.



**Figure 1 – Macroeconomic Variables in the baseline Scenario**

Source: Own elaboration based on IBGE (2019) and Brazilian Central Bank (2019) data.

For policy simulation, two alternative scenarios were considered. In the first one, real general government consumption growth was fixed at zero percentage change, accounting exactly for the commitment of fiscal adjustments assumed in 2017. This assumption is held constant from 2017 to 2037 (twenty-year period).

As mentioned before, the policy was implemented based on the argument that the fiscal adjustment would allow the investments to recover after the crises. Assuming the recovery may occur, the next question would be the measure of the exact monetary amount of new investment. We avoided an *ad hoc* definition by calculating endogenously the necessary investment to keep GDP growth as it was in the baseline scenario. Therefore, in short, the first policy simulation accounts for zero real government consumption and, at the same time, allows the minimum investment response needed to achieve the main fiscal policy goal.

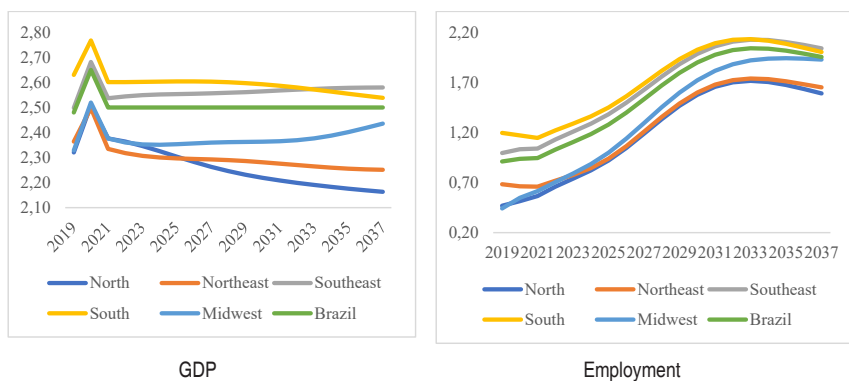
However, in our general equilibrium model, the simple announcement of such a policy has only the effect of changing aggregated demand but not the expected rate of return from investment. Therefore, one can say that our second policy scenario simulates what would happen if the government keeps its commitment, but households and firms nevertheless do not change their expectations about the future. Thus, simulation 2 does not have an additional investment response to keep GDP constant, so the impact on investment is only endogenously determined by changes in sec-

torial rates of return. That is, the exogenous imposition in simulation 2 is just zero growth in government expenditure.

#### 4. Results and Discussion

In order to facilitate our analysis, we present our results from four perspectives: i) at the macro regional level, showing the impact on GDP and employment in the five regions over time (2019–2037); ii) at state and sectoral levels; iii) at the municipal level in terms of GDP and employment; and iv) impacts on regional inequality through Gini indexes.

Figure 2 shows the GDP and employment annual percentage variation over time (2019–2037) in the first policy scenario (i.e., the scenario with investment recovering), considering the five Brazilian regions. The first evidence is that the South and Southeast are the only regions where the trajectory of GDP and employment is above Brazil's trajectory, which could indicate a worsening of regional inequality once the South and Southeast become the richest regions in the country (will be discussed later).



**Figure 2 - Impacts of the Policy Simulation 1 on GDP and employment at regional level: 2019-2037 (%)**

Source: Author's own elaboration based on CGE simulations.

Table 1 shows the macroeconomic results at the state level of scenario one. These results are reported as the cumulative percentage difference between 2019 and 2037 in relation to the model's baseline scenario. The fiscal adjustment would negatively impact most of the states in terms of GDP, except for Pará, Minas Gerais, Espírito Santo, São Paulo, Paraná, Santa Catarina, Mato Grosso, Mato Grosso do Sul, and Goiás. The worst result is in Roraima, i.e., the accumulated result in 2037 of real GDP would be -14.5%. This means that in 2037, Roraima's GDP would be 14.5% lower than expected in the baseline scenario in the absence of fiscal adjustment. In other words, the fiscal adjustment would attenuate the growth of most Brazilian states. On the other hand, Mato Grosso presents the greatest positive result, i.e., an accumulated deviation of 6.8% in terms of real GDP.

Household consumption shows the same pattern in real GDP because this variable, according to our model, follows GDP. Except for Roraima and Distrito Federal, all of the states have an increase in investments. This is an expected result because in our first policy scenario, we allow investment return to adjust in order to increase total investments and keep the GDP trajectory the same as the baseline. The fiscal adjustment would reduce domestic prices due to the decrease in government expenditures. Given the model's substitution effect, this would stimulate exports (positive changes in all Brazilian states) and discourage imports (negative changes in all states). Aggregate employment follows the same trajectory as GDP growth. Compared to the baseline scenario, all of the Brazilian states have a decrease in employment.

**Table 1 - Macroeconomic results at state level - accumulated deviation 2019-2037 compared to baseline (%) for the Policy Simulation 1**

Brazilian states	Real GDP	Households Consumption	Investment	Exports	Imports	Employment
RO - Rondônia	-1.2	-1.9	8.8	30.0	-12.7	-9.5
AC - Acre	-8.2	-9.9	1.8	29.0	-20.1	-16.9
AM - Amazonas	-3.7	-4.3	4.7	29.8	-9.6	-11.7
RR - Roraima	-14.5	-15.6	-3.1	23.5	-30.6	-22.2
PA - Pará	3.6	1.1	18.0	28.0	-7.8	-6.7
AP - Amapá	-7.9	-11.6	4.1	24.7	-18.8	-18.4
TO - Tocantins	-2.9	-4.5	8.1	30.8	-11.1	-11.9
MA - Maranhão	-1.5	-2.3	8.8	27.0	-14.3	-9.8
PI - Piauí	-3.8	-5.7	7.8	30.9	-14.3	-13.0
CE - Ceará	-2.7	-3.2	7.4	30.4	-14.1	-10.7
RN - Rio Grande do Norte	-1.4	-2.7	9.6	29.4	-13.0	-10.2
PB - Paraíba	-6.9	-8.6	2.9	30.6	-18.6	-15.6
PE - Pernambuco	-5.5	-6.7	3.4	26.1	-17.6	-13.9
AL - Alagoas	-1.4	-4.1	10.2	24.0	-10.7	-11.5
SE - Sergipe	-3.4	-5.5	7.7	31.1	-11.8	-12.8
BA - Bahia	-1.3	-2.3	9.8	26.9	-8.6	-9.9
MG - Minas Gerais	3.9	4.1	16.8	30.1	-6.3	-3.9
ES - Espírito Santo	2.8	2.0	14.6	25.6	-7.3	-5.8
RJ - Rio de Janeiro	-0.5	-2.0	11.0	27.2	-11.2	-9.6
SP - São Paulo	0.1	1.3	10.0	28.7	-10.1	-6.5
PR - Paraná	1.7	2.7	12.2	31.0	-10.5	-5.3
SC - Santa Catarina	0.9	1.8	11.6	37.0	-11.9	-6.0
RS - Rio Grande do Sul	-0.5	-0.2	10.5	29.2	-11.2	-7.9
MS - Mato Grosso do Sul	2.3	2.7	13.0	30.2	-9.6	-5.2
MT - Mato Grosso	6.8	7.2	18.5	30.2	-4.3	-1.1
GO - Goiás	2.2	2.8	12.3	30.5	-9.1	-5.2
DF - Distrito Federal	-10.9	-11.6	-1.5	27.4	-23.0	-18.5

Source: Authors' elaboration based on CGE simulations.

Figure 3 shows the sectoral impacts on Brazilian states. For this analysis, we consider an aggregation of seven sectors, which are Agriculture, Mining and Quarrying, Manufacturing, Electricity, Gas and Water Supply (SIUP), Construction, Private Services and Public Services. We can see clearly the heterogeneous impact among sectors and states. The most affected sectors would be Electricity, Gas and Water Supply (SIUP) and Public Services, in which all of the states would have a decrease in these two sectors compared to the baseline scenario. Regarding Public Services, the most affected states are located in the poorest regions in the country, i.e., the North (AC, RO, and TO) and Northeast (PI, RN, AL, and SE).



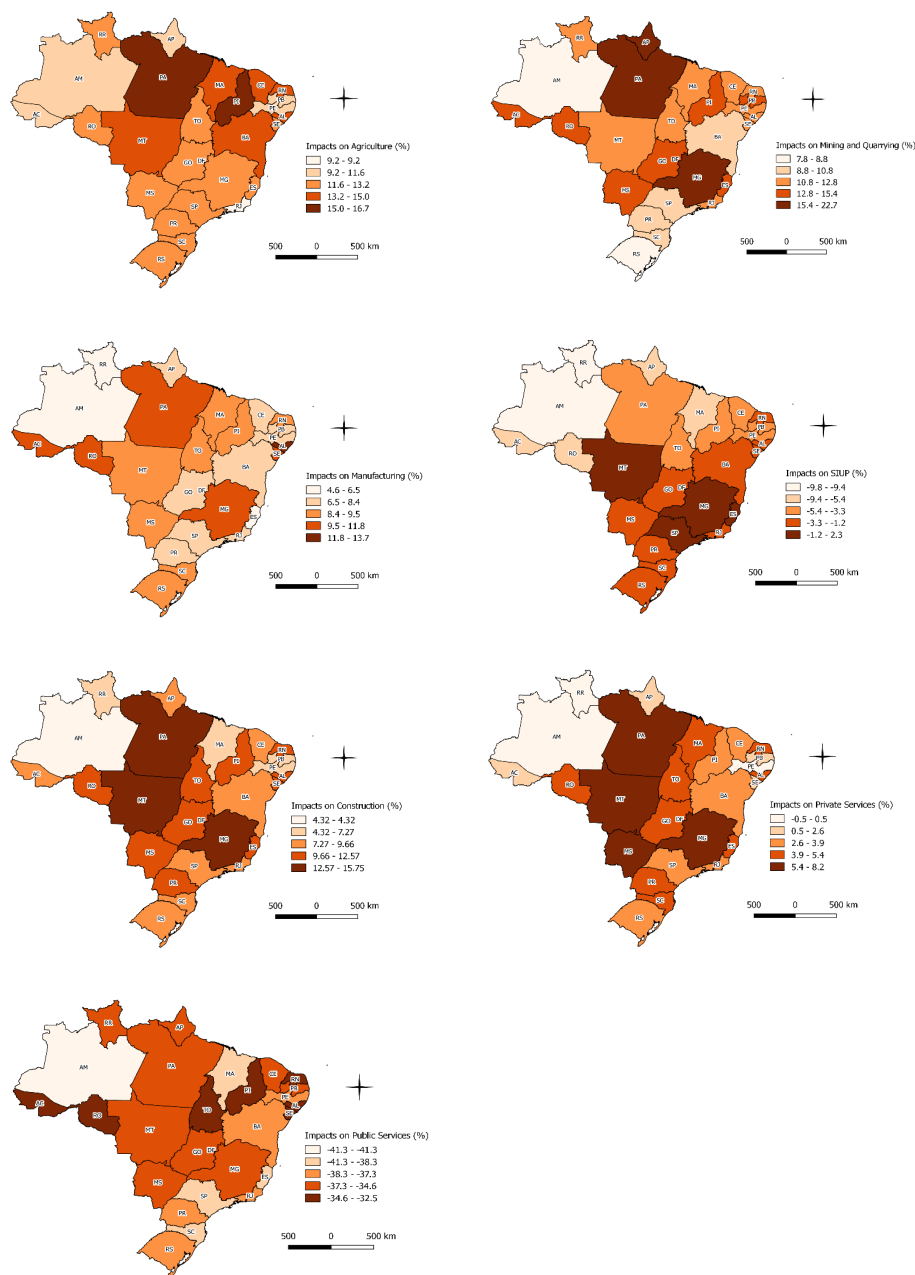
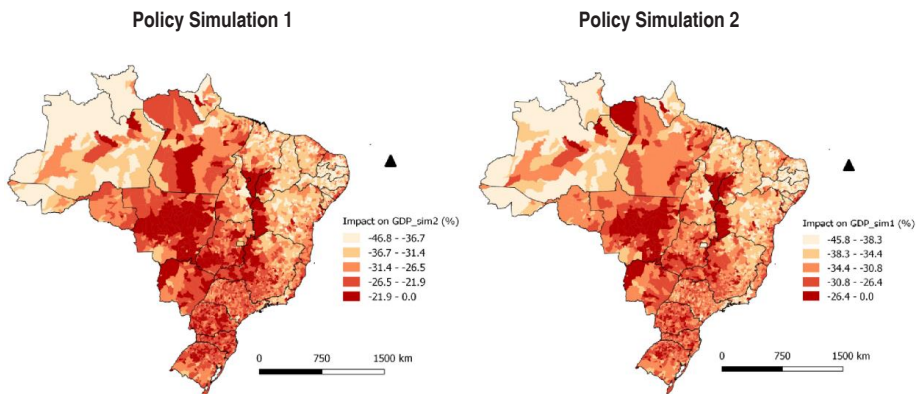


Figure 3 - Sectorial impacts on Brazilian states: accumulated deviation 2019–37 compared with the baseline (%) for the Policy Simulation 1

Source: Authors' elaboration based on CGE simulations.

Unlike previous analyses, Figures 4 and 5 show the impacts on Brazilian municipalities' GDP and employment by considering the two policy scenarios, as commented upon previously. The lighter the color, the greater the negative impact. In general, the results of both simulations are quite similar. Again, it is possible to see that municipalities located in the North and Northeast regions would be the most affected by the fiscal adjustment. This means that in those regions, we have municipalities that depend relatively more on the government. In other words, usually in poor regions and small municipalities, economic activities are very concentrated in the public services. This result is directly related to the structure of municipalities in Brazil, where 68.3% of the 5,570 Brazilian municipalities have up to 20,000 inhabitants, according to (IBGE 2017). Thus, Marinho and Jorge (2015) argue that it is important to improve the planning of small municipalities (less than 20,000 inhabitants) in Brazil in order to achieve better levels of development.

It is important to highlight that, even in the scenario with investment recovering (policy simulation 1), the poorest regions would exhibit the greatest contractionary impacts. This means that the investment response to the fiscal consolidation is not able to alleviate the greatest negative impacts of the policy in the poorest regions of the country. Furthermore, even if the investment recovery is enough to guarantee economic growth in terms of national GDP, it would not be sufficient for most regions in Brazil.



**Figure 4 - Impacts on Brazilian municipalities' GDP: accumulated deviation 2019–37 compared with the baseline (%).**

Source: Authors' elaboration based on CGE simulations.

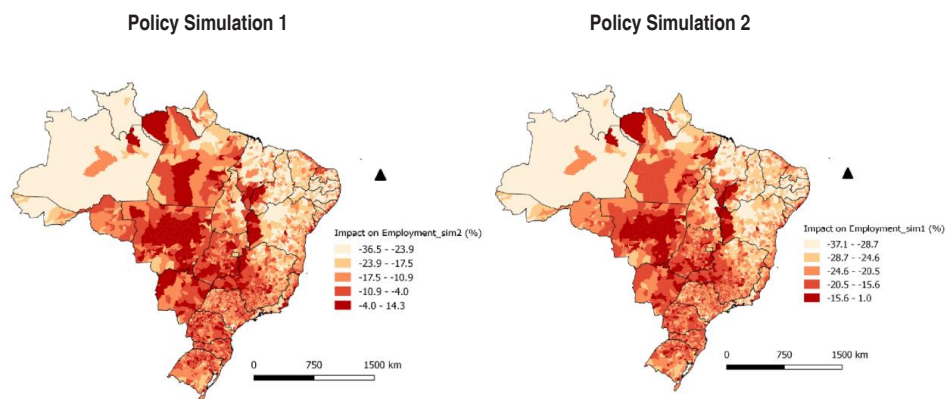


Figure 5 - Impacts on Brazilian municipalities' employment: accumulated deviation 2019–37 compared with the baseline (%).

Source: Authors' elaboration based on CGE simulations.

In order to assess the fiscal policy impact on Brazilian regional inequality, we used the method proposed by Ribeiro et al. (2017, 2018). We consider the GDP distribution of both Brazilian states and municipalities to calculate at current basic prices the Gini index in the baseline and in the two policy scenarios. Table 2 summarizes Gini values in the baseline and policy scenarios, as well as their variations.

Table 2 - Impacts on regional inequality –GINI indexes of regional GDP in 2037 in the baseline and policy scenarios

Spatial unit	Baseline	Policy 1	Variation %	Policy 2	Variation %
State	0.6457	0.6509	0.82	0.6474	0.27
Municipality	0.8727	0.8766	0.45	0.8733	0.07

Source: Authors' elaboration based on CGE simulations.

Our estimates show an increase in regional inequality at both state and municipality levels, which was suggested by our previous results. However, it is important to highlight that we are not taking into account any income variations among households inside the same region but only in regional GDP distribution. At the state level, regional inequality increases 0.82% in policy scenario one and 0.27% in policy scenario two. At the municipal level, the Gini variation is lower, i.e., 0.45% in policy scenario one and

0.07% in policy scenario two. In other words, the current Brazilian fiscal policy could increase regional inequalities among states and municipalities in the long term.

An important result is that the increase in the Gini index is higher for the scenario with investment recovering. This means that compared with scenario two, the scenario with investment response to the austere fiscal policy is even worse for the poorest regions of the country. This occurs due to the regional concentration of investment in the Southeast and South and the greater diversification and sectoral connections of the productive structures of these regions. Accordingly, these regions tend to reap most of the benefits of the investment increase, amplifying regional disparities.

In this regard, the most recent and famous case is Greece. According to Caraveli e Tsionas (2012), the Greek fiscal policies contribute to increased regional inequalities, especially in most industrialized regions. Furthermore, in the United Kingdom, Green and Lavery (2015) have shown that in the period 2007–2008 (post-crisis), the fiscal policy favored increased income disparity among households. Cabrera et al. (2015) argue that poorer people with less human development would be more vulnerable to fiscal reforms in Guatemala, especially because of the cuts in public expenditure. Our results also agree with the literature of “economy without production,” highlighted by Gomes (2001) and Tupy and Toyoshima (2013), for the poorest Brazilians and extreme dependents on the local government expenditure.

## **5. Conclusion and Policy Implications**

This paper aimed to estimate the long-run economic impacts of a fiscal consolidation policy that reduces the government share in the economy on regional inequalities. To do so, we used a dynamic and inter-regional CGE model calibrated for 2013. One of the main contributions of this study is that we discuss our results on different spatial levels.

The main results show that the fiscal adjustment would attenuate the growth of most Brazilian states, which would be reflected in the drop in employment and household consumption until 2037. In terms of GDP, the

worst results are in the North and Northeast regions, with annual growth around 2,1%-2,2% in 2037, below the average for Brazil. Roraima is the state with the worst negative accumulated deviation from the baseline, since the real GDP of the state in the policy scenario would be -14.5% lesser than in the baseline (without the fiscal adjustment), when we analyze the accumulated impact between 2019 and 2037. In terms of employment, also North and Northeast regions tends to be the most negatively impacted, exhibiting deviations from the baseline scenario below the average deviation for the country.

The municipalities located in the poorest regions (North and Northeast) would be relatively more affected. Furthermore, the adjustment would have a negative impact on regional inequalities in all scenarios, both at the state and municipality levels. In the state level, the Gini index would increase in 0.82% when we measure the effect of the Government expenditure cuts with the investment response. In the municipal one, the increase in the Gini index in the same scenario tends to be around 0.45%. When we consider only the fiscal adjustment, without investment response, the Gini index would increase by 0.27% in the state level and 0.07% in the municipal level. In an international comparison perspective, our results are similar to those presented for countries like Greece, Guatemala, and the United Kingdom, in which the poorest regions were also more affected by cuts in public expenditure.

An important conclusion is that even in the scenario with investment recovering, the poorest regions would exhibit the greatest contractionary impacts due to fiscal austerity. This means that the investment response to the fiscal consolidation is not able to alleviate the greatest negative impacts of the policy in the poorest regions of Brazil. If investment were to expand, as expected by the expansionary austerity theory, it would tend to be concentrated in the relatively wealthier regions of the country, increasing regional disparities.

In terms of policy implication, it would be very important to adopt regional policies focused on the North and Northeast regions, which are the poorest regions of the country and, according to our results, would suffer the greatest contractionary impacts of an austerity agenda.

It is worth mentioning some limitations of our work. Our model does not have a fiscal module. Therefore, we do not have transfers between governments and institutions (as households) and local governments. In addition, there is no direct connection between tax revenues and public expenditures, which are exogenously determined. Due to specificities of the System of National Accounts' statistics, the model does not capture the direct effects of fiscal cuts in public services on households' consumption bundles but only the indirect effects. Therefore, we are not considering a concept of amplified income which accounts for the consumption of public goods.<sup>6</sup> This can be a starting point for future works.

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<sup>6</sup> As proposed by Atkinson (2015) and used in Cardoso (2019).

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