Área 1 – Economia Regional

FISCAL POLICY AND REGIONAL INEQUALITY IN BRAZIL

Débora Freire, Doutora, Professora do Departamento de Ciências Econômicas da UFMG e do Cedeplar/UFMG, Avenida Presidente Antônio Carlos, 6627 - Pampulha - Belo Horizonte – MG. CEP: 31270-901. Tel: +55(31) 3406-7181. E-mail: dfreire@cedeplar.ufmg.br

Kênia Barreiro de Souza, Doutora, Professora do Departamento de Ciências Econômicas da Universidade Federal do Paraná, Av. Prefeito Lothário Meissner, 632 – térreo – Jardim Botânico – 80210-170 – Curitiba/PR. E-mail: keniadesouza@gmail.com

Luiz Carlos Santana Ribeiro, Doutor, Professor do Departamento de Ciências Econômicas Universidade Federal do Sergipe, Cidade Universitária José Aloísio de Campos, Avenida Marechal Rondon, s/n Jd. Rosa Elze, São Cristovão/SE, 49100-000. E-mail: ribeiro.luiz84@gmail.com

Guilherme Silva Cardoso, Mestre, Doutorando do Cedeplar/UFMG, Avenida Presidente Antônio Carlos, 6627 - Pampulha - Belo Horizonte – MG. CEP: 31270-901. E-mail: scardoso.guilherme@gmail.com

Área 1 – Economia Regional

ABSTRACT

This paper aims to estimate the long-term impacts of the Brazilian fiscal austerity, assessing the interregional impacts, especially on regional inequality. The contribution of this paper is to measure these impacts from a regional general equilibrium analysis, which, in addition to the direct effects of the spending cuts, captures the indirect impacts between sectors and regions. To do so, a dynamic computable general equilibrium (CGE) model calibrated for the 27 Brazilian federal units will be used. The CGE model is based on data from 2013 published by the Brazilian National System Accounts and allows a top-down analysis for municipal level. The main results show that the fiscal adjustment would attenuate the growth of the most Brazilian states, which would be reflected in the fall of employment and household consumption in 2037. The municipalities located in the poorest regions (North and Northeast) would be relatively more affected. Furthermore, the Brazilian fiscal adjustment would have a negative impact on regional inequalities in all the scenarios both in the state and municipality levels.

Keywords: Fiscal policy; regional inequality; CGE model; Brazil.

RESUMO

Este artigo objetiva estimar os impactos de longo prazo do ajuste fiscal brasileiro, avaliando os impactos inter-regionais, especialmente sobre a desigualdade regional. A principal contribuição deste artigo é mensurar esses impactos a partir de uma análise de equilíbrio geral regional, em que, além dos efeitos diretos do corte dos gastos, captura também os efeitos indiretos entre setores e regiões. Para tanto, será utilizado um modelo dinâmico de equilíbrio geral computável (EGC) calibrado para as 27 Unidades da Federação brasileiras. O modelo de EGC é baseado em dados de 2013 publicados pelo Sistema de Contas Nacionais do Brasil e permite uma análise *top-down* a nível municipal. Os principais resultados mostram que o ajuste fiscal atenuaria o crescimento da maioria dos estados brasileiros, o que refletiria na queda do emprego e do consumo das famílias em 2037. Os municípios localizados nas regiões mais pobres (Norte e Nordeste) seriam relativamente mais afetados. Além disso, o ajuste fiscal brasileiro teria um impacto negativo sobre as desigualdades regionais em todos os cenários tanto a nível estadual quanto a nível municipal.

Palavras-chave: Política fiscal; desigualdade regional; modelo de EGC; Brasil.

Jel-codes: C68; E62; R58

Introduction

At the end of 2016, the Brazilian National Congress approved the Constitutional Amendment (EC) 95/2016, also known as the spending ceiling. This amendment established the real stagnation of the Union's primary expenditures over a twenty-year horizon, starting in 2017. The adoption of the new fiscal regime was justified by the context of permanence and expansion of the primary public sector deficits since 2014, accompanied by the deterioration of public debt sustainability indicators and the fall of private investment in the country.

According to Salto and Barros (2018), given the deterioration of the primary outcome target, the limitation of public spending growth has become an anchor for the economic agents' expectations. Thus, the implement of EC 95/2016 would act in favor of fiscal solvency within a reasonable horizon, benefiting the interest rate dynamics and providing time to the government to advance in the necessary policies to control the public debt trajectory (SALTO and BARROS, 2018).

On the other hand, authors have drawn attention 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 serious socioeconomic problems of the country. Dweck, Oliveira and Rossi (2018) argue that there is no guarantee that the spending ceiling rules will be met without public health and education spending also being limited to inflation. This means that, in a path of real economic growth, there would be a reduction in the share of public health and education in the federal spending.

The spending ceiling is based on the theory known in the 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 of the interest rate, increasing consumption and private investment. Thus, austerity plans can be accompanied by product growth, even with the contraction of public spending (GIAVAZZI and PAGANO, 1990, ALESINA and PEROTTI, 1995, ARDAGNA, 2004, ALESINA *et al.*, 2016, ALESINA, FAVERO and GIAVAZZI, 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 to the theory of expansionary austerity, especially due, in the author's view, to the absence of empirical evidence of the positive effects of increased confidence in private investment and consumption. Camuri, Gonzaga, and Hermeto (2015) have found, through panel econometric estimates, that the relationship between austerity and growth is different between developed and emerging economies. These authors suggest that, depending on the development level of the country, the results may be opposite to the policy target. Anderson, Hunt and Snudden (2014) also found similar results to those of Camuri, Gonzaga and Hermeto (2015) for central and peripheral countries of the Euro Zone.

The adoption of fiscal austerity plans is not, in the current context, a Brazilian specificity. At the beginning of the decade of 2010, the scenario of deterioration of the public accounts and growth of sovereign debt promote the attempts of fiscal austerity in the peripheral countries of the Euro Zone. Some studies have shown, however, that the expected positive results with the austerity plans are not yet being perceived and, in the view of some authors, have contributed

to the aggravation of the economic and fiscal crisis (SCHNEIDER et. al., 2016; NIKIFOROS, PAPADIMITRIOU and ZEZZA, 2015). This literature is quite recent, so empirical studies are needed to measure the impact of fiscal consolidation policies, considering the recent experiences of different countries.

Another frequent concern in the empirical literature on the impacts of austerity is the impact of these policies on poverty, household welfare, and inequality. Bourguignon, Melo and Morrisson (1991), Taylor (1991) and Stewart (2005) analyzed these impacts in countries that underwent fiscal adjustments, especially in the late 1980s and early 1990s. In the most current literature, there are some studies for the Euro Zone, such as Schneider et al. (2016), Rawdanowicz, Wurzel and Christensen (2013) and Bova, Kinda and Woo (2018). In general, these studies point to a greater exposure of the most vulnerable households to the effects of public spending cuts, given the greater share of public services in their consumption and the vulnerability of their jobs. They point out, therefore, to trends of deepening poverty and inequality.

For Brazil, fiscal austerity impacts are still uncertain, whether at macroeconomic and sectoral level or in the social spectrum, as well as in the households welfare and income distribution. The first study to evaluate in an empirical way the potential impacts of an austere scenario in Brazil, considering the sectoral, institutional and personal distribution of income interdependencies is that of 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 spending 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 in a same magnitude. Moreover, considering the supply of public goods as social or expanded income (ATIKINSON, 2016), contraction scenarios of spending with public education and health, whether or not with private investment response, would have regressive effects on income distribution.

An issue not yet evaluated in relation to austerity policies in Brazil, and even very little analyzed in the international literature, is the potential distribution of its impacts in space. Given regional heterogeneities, whether in the economic sphere, in the productive structure, in the share of public expenditures in economic activity or even in social problems, it is to be expected that the impacts of fiscal adjustments will be distributed heterogeneously in space, aggravating regional disparities .

The deep Brazilian regional inequality, already exhaustively evidenced in works such as those of Baer and Geiger (1978), Haddad (1999), Diniz (2006) and Baer (2007), has showed a decline trajectory from 1990 to 2000. Since 2015, however, this process has suffered an inflection and the country has once again observed an increase in the indicators of regional inequality. Besides 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 spending cuts that have been observed since 2015, when the government started to adopt fiscal adjustment to balance the public accounts. The poorest regions of the country exhibit a greater share of public spending in their economic structures and household income. It would be natural, therefore, to expect them to be more vulnerable to budget cuts, showing greater contractionary impacts and increasing the backwardness in relation to the more developed regions of the country.

The aim of this paper is to fill this gap in the recent literature on the long-term impacts of fiscal austerity, assessing the interregional impacts, especially on regional disparities. The contribution of this paper is to measure these impacts from a regional computable general equilibrium analysis, which, in addition to the direct effects of the spending cuts, captures the indirect impacts between sectors and regions. For this, a dynamic computable general equilibrium (CGE) model calibrated for the 27 Brazilian federal units will be used. The CGE model is based on data from 2013 published by the Brazilian National System Accounts and allows a top-down analysis for municipal scales.

From this model, we project the real stagnation of the Brazilian government's expenditures over a 20-year horizon, considering the hypothesis of recovery or not of the investment. Given the specificities of the CGE model used, we present the results at different spatial scales: macro regional, state and municipal.

2. Fiscal Policy and Regional 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 distribution of these impacts in the territory 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 manifests itself heterogeneously in space. 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.

More 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 the recent fiscal adjustment plans adopted in the Euro Zone, some studies have focused on capturing these heterogeneities.

Caraveli and Tsionas (2012) assess the influence of the macroeconomic policies adopted during periods of economic recession in Greece on regional inequality over the country between the 1990s and 2000. The results indicate that due to economic integration from the 1990s, which, in the opinion of the authors, contributed to the country's de-industrialization, aggravated the inequality of relatively more industrialized but less diversified regions in relation 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 in the metropolitan center.

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 in the regions of the country[1]. The authors assess the spatial distribution of monetary losses associated with cuts in social benefits. The results point to a loss of income of £19 billion per year or an

[1] Relating to changes in the following measures: Housing Benefit – Local Housing Allowance; Housing Benefit – Under-occupation; Non-dependant deductions; Household benefit cap; Council Tax Benefit; Disability Living Allowance; Incapacity benefits; Child Benefit; Tax Credits and 1 per cent reduction in annual up-rating of value of most working-age benefits.

average of £470 per working-age adult across Britain, with more severe effects in places where social assistance applicants are concentrated, usually in the poorer regions of the Union. The authors conclude that the magnitude of the contractionary impact of the reforms has a positive correlation with the degree of economic deprivation of the local authorities.[2]

Some studies further analyze the regional economic impacts of fiscal policy for their effects on rural, urban, native-born descendants, health status, and gender issues. Cabrera, Lustig and Moran (2015) show that, in Guatemala, the regions where the descendant of the native-born peoples – the poorer and less developed populations – are concentrated, are more vulnerable to fiscal reforms, especially those of cut of public expenditures.

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

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 reinforces the need for 'juggling caring roles' in a context of precarious employment. Green and Lavery (2015) also mention the precariousness of the British female labor market in periods of austerity.

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 the 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 in up to 40% more than in the capital and other regions of similar income.

Tupy and Toyoshima (2013) appeal to the concept of 'Economy without Production' to characterize similar localities in a Brazilian region. The authors study the impact of government income transfers on the productive structures of the 51 municipalities of the Jequitinhonha Meso-region in the state of Minas Gerais 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 with low dynamism, besides serious social problems, such as low schooling and per capita income. The municipalities in the region have government transfers (Income Transfer Programs such as Bolsa Família and Continuing Care Benefit, Rural Retirement, Public Employment and Intergovernmental Transfers) as the main source of income.[3]

[2] 379 local authorities are contacted in Great Britain, divided between unitary authorities and district councils throughout the territory of England (8 regions), Wales and Scotland.

[3] Since these resources do not require a productive counterpart, it is sometimes verified that the region has income, but does not validate the macroeconomic identity of which income is equal to the product. There would be regions where the product is much smaller than income, as described by Gomes (2001) when analyzing the occurrence of the "economy without production" in the northeastern semi-arid region of Brazil. If these transferred values are

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 that municipal governments and are more than 19 times higher than the tax collection.

This is a frequent feature for a significant number of localities in Brazil, mainly concentrated in the Northeast and North regions. The Tupy and Toyoshima (2013) study 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 of the public sector.

3. Model, database and simulations strategy

The model used for simulations is a recursive dynamic computable general equilibrium model calibrated for Brazil. The model follows the theoretical structure of The Enormous Regional Model (TERM) which is a well-documented model[4] developed by the Center of Policy Studies (CoPS) in Australia with several applications for 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 the country) 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.

The dynamics adjustment is based on investment and capital stock accumulation ate the regional (Federal Units) and sectorial 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 that industry based on expected rate of return. Basically, if the

not efficient in order to generate new productive activities in the region, in order to increase the per capita income of the households, the generation of jobs and the collection of taxes, there is a risk that this situation will be perpetuated (TUPY and TOYOSHIMA, 2013).

[4] See for instance Horridge et al. (2005); Horridge and Wittwer (2010); and Wittwer (2012, 2017).

rate of return expected by investors is higher than the normal rate of return then capital accumulation is above a normal rate (Dixon and Rimmer, 2002).

3.2 Database

The model database was developed through a regionalization procedure developed by Horridge (2012) using information from the 2013 Brazilian System of National Accounts (IBGE, 2017), adjusted according to the procedure described in Guilhoto and Sesso Filho (2005). Additional data at the regional level includes information of consumption from Brazilian Household Budget Survey 2008-2009; employment from Annual list of social information (RAIS, from Portuguese "*Relação Annual 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 in 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 homogeneous growth scenario of 2.50% per year. Therefore, baseline simulations allow the projections for the economy from 2014 onwards without any further state intervention.

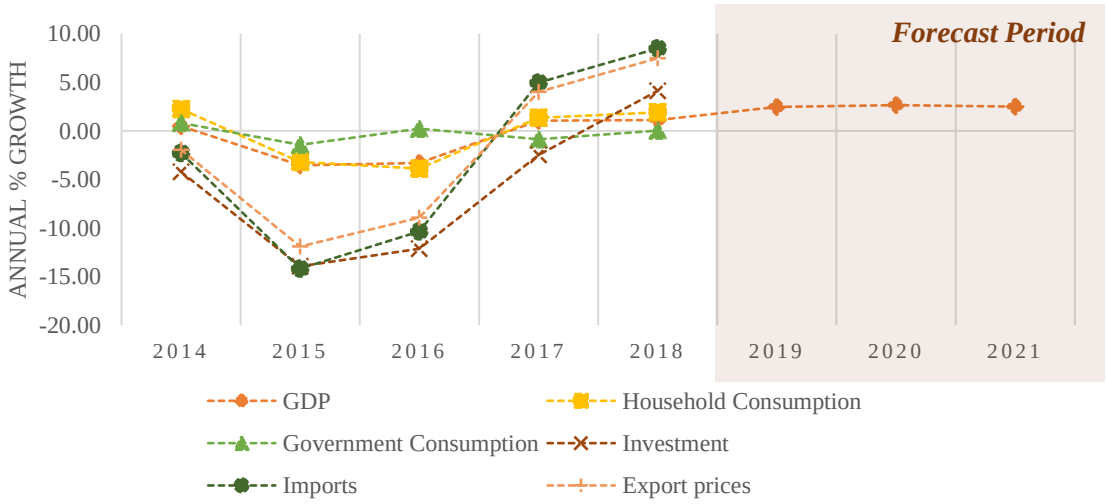


Figure 1 – Macroeconomic Variable in the baseline Scenario

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 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 which corresponds to the twenty years length period proposed by law. As mentioned before, the policy was implemented focusing on the argument that the fiscal adjustment would allow the investments to recovery after the crises. However, in our general

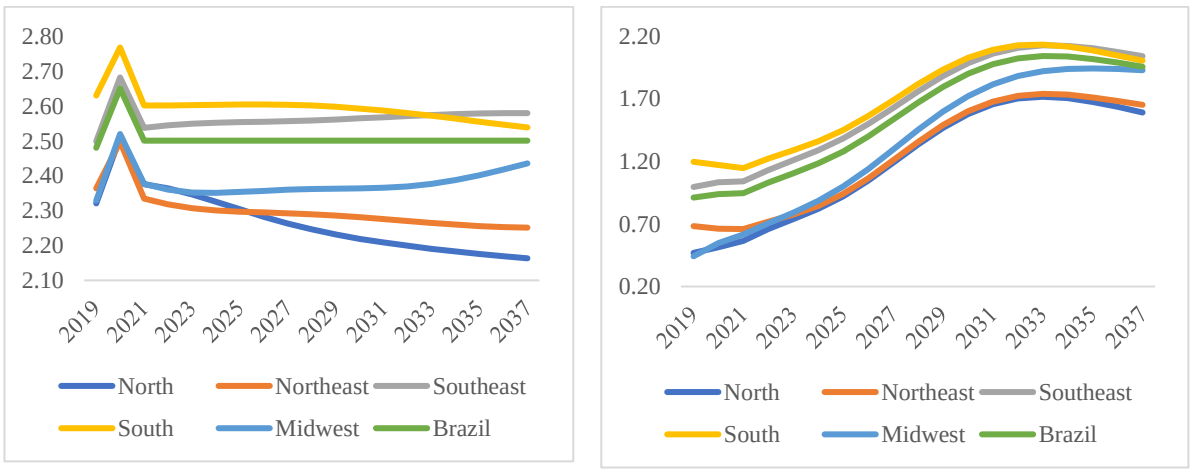
equilibrium model, the simple announcement of such a policy has de only effect of changing aggregated demand but not the expected rate of return from investment. Therefore, one can say that our first policy scenario simulates what would happen if the government keeps its commitment, nevertheless household and firms do not change their expectations about the future.

The second policy scenario augment the first by allowing an investment response. Even if we assume that 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 second policy simulation measures the minimum investment response needed to achieve the main fiscal policy goal.

4. Results and Discussion

In order to facilitate our analysis, we present our results from four perspectives: i) at macro regional level, showing the impact on GDP and employment of the five regions over time (2019-2037); ii) at state and sectorial level; iii) at municipality 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 (2019-37) in the scenario 2 (i.e., the scenario with investment recovering) taking into account the five Brazilian regions. South and Southeast are the only regions that the trajectory of GDP and employment is above Brazil's trajectory, which could indicate a worsening on regional inequality once South and Southeast are the richest regions in the country (will be discussed later).



GDP Employment

Figure 2: Impacts 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 state level of the scenario 2. These results are reported as the percentage cumulative 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 from 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 the most Brazilian states. On the other hand, Mato Grosso presents the greater result, i.e., an accumulated deviation of 6.8% in terms of real GDP.

Household consumption shows the same pattern of real GDP, because this variable, according to our model, follows the GDP. Except for Roraima and Distrito Federal, all of the states have an increase in investments. This is an expected result because in our simulation we have positive shocks in this variable in order to keep GDP's trajectory. The fiscal adjustment would reduce domestic prices due to the decrease in government expenditures. Given the model's mechanism of 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 baseline scenario, all of the Brazilian states have a decrease in employment.

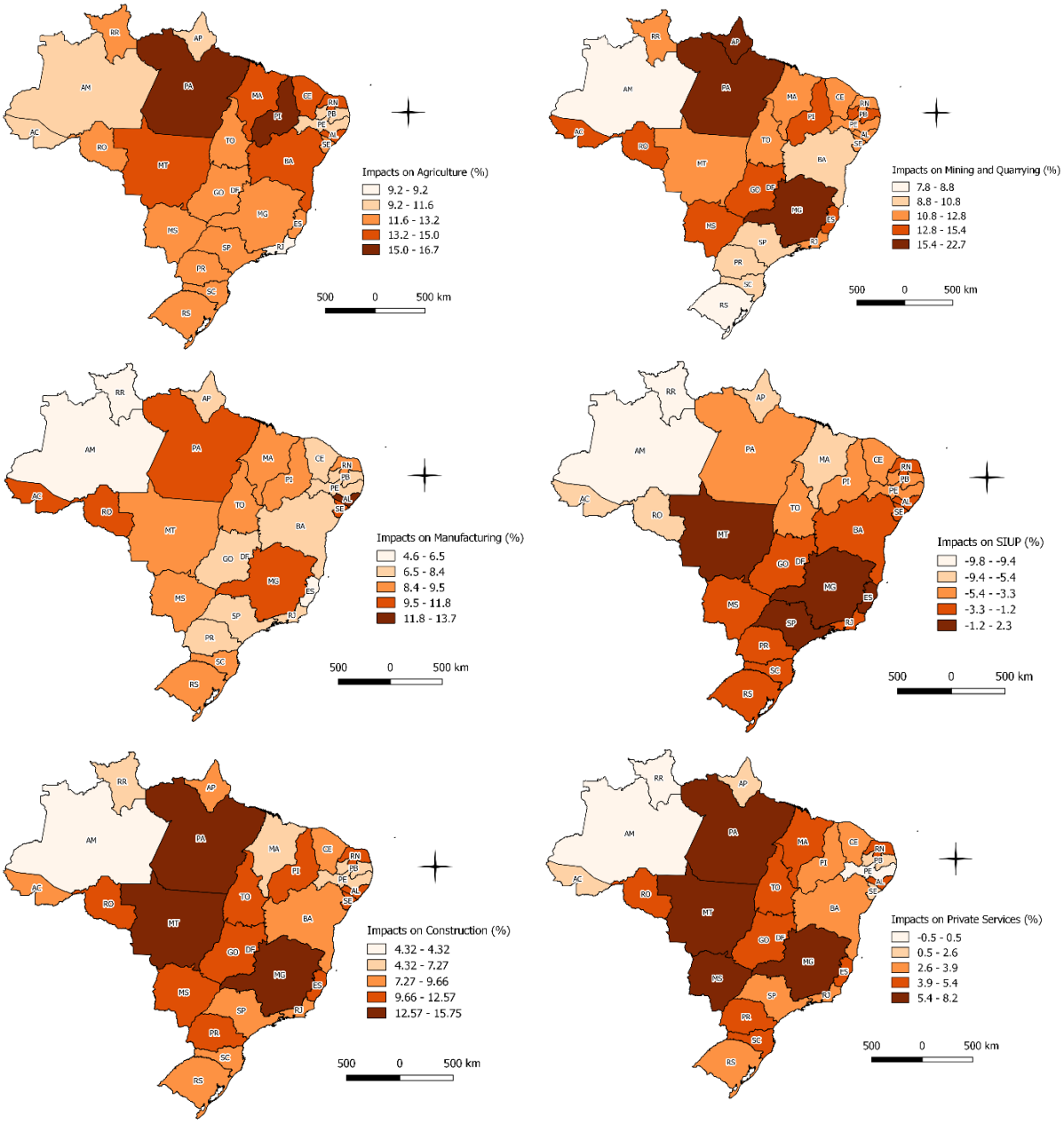
Table 1: Macroeconomic results at state level - accumulated deviation 2019-2037 compared to baseline (%)

Brazilian states	Real GDP	Households Consumption	Investment	Exports	Imports	Employment
RO - Rondonia	-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 sectorial impacts on Brazilian states. For this analysis, we take into account 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 a 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 baseline scenario. Regarding to the Public Services, the most affected states are located in the poorest regions in the country, i.e., North (AC, RO and TO) and Northeast (PI, RN, AL and SE).



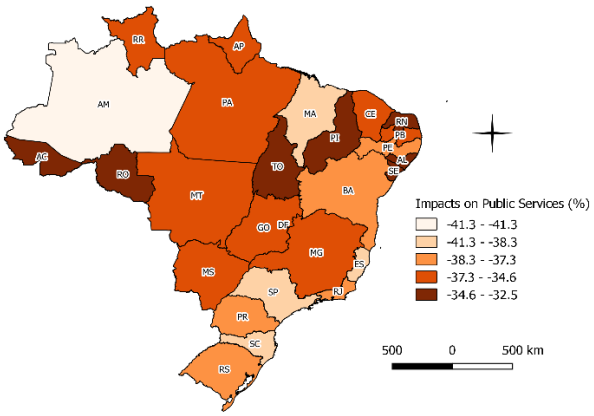


Figure 3: Sectorial impacts on Brazilian states: accumulated deviation 2019–37 compared with the baseline (%).
Source: Authors' elaboration based on CGE simulations.

Unlike previous analyzes Figure 4 and 5 show the impacts on Brazilian municipalities' GDP and employment considering the two policy scenarios, as commented 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 North and Northeast regions would be the most affected by the fiscal adjustment. This means that in those regions we have municipalities that depends relatively more on the government. In other words, usually in poor regions and small municipalities their economic activities are very concentrated in the public services. Marinho and Jorge (2015) argue that it is important to improve the planning of small municipalities[5] (less than 20 thousand inhabitants) in Brazil in order to achieve better levels of development.

It is important to highlight that, even in the scenario with investment recovering, 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.

[5] Dos 5.570 municípios brasileiros, 68.3% têm até 20 mil habitantes (IBGE, 2017).

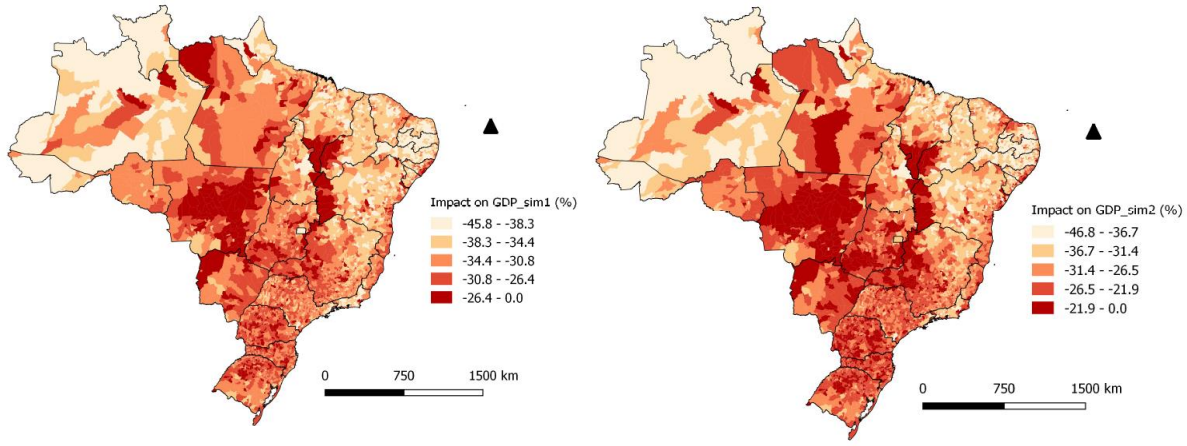


Figure 4: Impacts on Brazilian municipalities' GDP: accumulated deviation 2019–37 compared with the baseline (%).

Simulation 1 **Simulation 2**

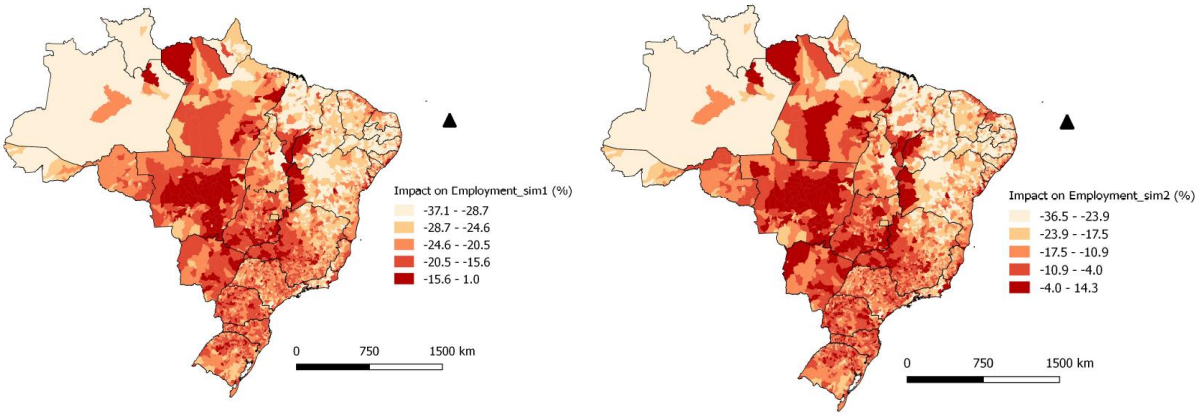


Figure 5: Impacts on Brazilian municipalities' employment: accumulated deviation 2019–37 compared with the baseline (%).
Source: Authors' elaboration based on CGE simulations.

In order to assess the fiscal policy impact on Brazilian regional inequality, we use the method proposed by Ribeiro et al. (2017, 2018). Thus, we take into account 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 at 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	GINI baseline	Policy 1	Variation %	Policy 2	Variation %
State	0.6457	0.6474	0.27	0.6509	0.82
Municipality	0.8727	0.8733	0.07	0.8766	0.45

Source: Authors' elaboration based on CGE simulations.

Our estimates show an increase in regional inequality considering both state and municipality level, which was suggested by the previous results. However, it is important to highlight that we do not taking into account any income variation among households, but only on regional GDP distribution. At state level, the regional inequality increases 0.27% in policy scenario 1 and 0.82% in policy scenario 2. At municipality level, the GINI variation is lower, i.e., 0.07%

in policy scenario 1 and 0.45% in policy scenario 2. 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 Gini index increase is higher for the scenario with investment recovering. This means that, comparing with the scenario 1, the scenario with investment response to the austere fiscal scenario is even worst 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. So these regions tend to concentrate 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 contributes to increase regional inequalities, especially in most industrialized regions. Furthermore, in United Kingdom, Green and Lavery (2015) have shown that in the period 2007-08 (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 as regards the cut of public expenditure. The results also dialogue with the literature of the "economy without production", highlighted by Tupy and Toyoshima (2013) and Gomes (2001) for the Brazilian poorest and extremely dependents of the State actions municipalities.

5. Conclusion and Policy Implication

This paper aimed to estimate the long-run economic impacts of the fiscal consolidation policy adopted in Brazil since 2017 on the regional inequalities of the country. 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 from different spatial scales.

The main results have shown that the fiscal adjustment would attenuate the growth of the most Brazilian states, which would be reflected in the fall in employment and household consumption in 2037. The municipalities located in the poorest regions (North and Northeast) would be relatively more affected. Furthermore, the Brazilian fiscal adjustment would have a negative impact on regional inequalities in all of the scenarios both in the state and municipality levels.

An important conclusion is that, even in the scenario with investment recovering, the poorest regions would exhibit the greatest contractionary impacts of the 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 the country. More, the very unequal pattern of regional production and investment in the country, would concentrate the positive impacts of the investment. So, if investment were to expand, as expected by the expansionary austerity theory, it would tend to concentrate on the relatively wealthier regions of the country, increasing regional disparities.

In terms of policy implication and taking into account the current fiscal policy regime until 2037, our results highlight the importance to implement public policies in order to avoid the increase in regional inequalities in Brazil. In this line, the Brazilian tax burden must be more progressive. Larger tax rates could be created for higher income levels, taxing profits and dividends, and reducing consumption tax, for instance. These kinds of measures could have a positive impact on regional inequalities. In addition, 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 the new fiscal scenario.

It is worth mentioning some limitations of our work. The CGE model used does has a fiscal module. Therefore, we do not have transfers between governments and institutions (as households) and local governments. Also, there is no direct connection between tax revenues and public expenditures, which are exogenously determined. In addition, due to specificities of the national accounts system statistics, the model does not capture the direct effects of fiscal cuts in public services on household's consumption basket, only the indirect effects. So, we are not considering a concept of amplified income, in which accounts for the consumption of public goods[6]. This can be a starting point for future works.

References

Alesina, A.; Perotti, R. Fiscal expansions and adjustments in OECD countries. **Economic policy**, Oxford University Press Oxford, UK, v. 10, n. 21, p. 205–248, 1995.

Alesina, A.; Azzalini, G.; Favero, C.; Giavazzi, F.; Miano, A. **Is it the "How" or the "When" that matters in fiscal adjustments?** NBER working paper series n. 22863, November 2016. Disponível em: <http://www.nber.org/papers/w22863>.

Alesina, A.; Favero, C.; Giavazzi, F. **What do we know about the effects of Austerity?** NBER working paper series n. 24246, 2018. Disponível em: <http: //www.nber.org/papers/w24246>.

Anderson, D.; Hunt, B.; Snudden, S. Fiscal consolidation in the euro area: How much pain can structural reforms ease? **Journal of Policy Modeling**, Elsevier, v. 36, n. 5, p. 785–799, 2014.

Ardagna, S. Fiscal stabilizations: When do they work and why. **European Economic Review**, v. 48, n. 5, p. 1047 – 1074, 2004.

Atkinson, Anthony B. (2016). "**Inequality: What can be done**." *PRACTICE* 40.2.

Baer, W. (2007). **Brazilian economy: growth and development** (6th Revd E). Boulder, CO: Lynne Rienner.

Baer, W., & Geiger, P. P. (1978). Industrialização, urbanização e a persistência das desigualdades regionais no Brasil. In W. Baer, P. P. Geiger, & P. R. Haddad (Eds.), **Dimensões do desenvolvimento brasileiro**. Rio de Janeiro: Editora Campus.

Beatty, C., Fothergill, S. (2013). **Hitting the poorest places hardest**: The local and regional impact of welfare reform. Centre for Regional Economic and Social Research Sheffield Hallam University.

Bird, R. M., Zolt, E. M. (2015). Fiscal Contracting in Latin America. **World Development** 67: 323-335.

Bourguignon, F.; Melo, J. D.; Morrisson, C. Poverty and income distribution during adjustment: issues and evidence from the OECD project. ***World Development***, *Elsevier*, v. 19, n. 11, p. 1485–1508, 1991.

[6] As proposed by Atkinson (2016).

Bova, E.; Kinda, T.; Woo, J. **Austerity and inequality: The size and composition of fiscal adjustment matter**. Vox CEPR Policy Portal, 2018.

Cabrera, M., Lustig, N., Morán, H. E. (2015). Fiscal policy, inequality, and the ethnic divide in Guatemala. **World Development** 76: 263-279.

Camuri, P. A.; Gonzaga, F.; Hermeto, A. M. Fiscal consolidation in developed and emerging economies. **Nova Economia**, v. 25, p. 835–861, 2015.

Caraveli, H., Tsionas, E. G. (2012). **Economic restructuring, crises and the regions**: the political economy of regional inequalities in Greece. GreeSE papers (61). London School of Economics and Political Science, Hellenic Observatory, London, UK.

Cardoso, G. S. **Política fiscal e gasto público no brasil: impactos na renda das famílias e na atividade econômica**. Universidade Federal de Minas Gerais. Centro de Desenvolvimento e Planejamento Regional, 2019. (Dissertação de mestrado).

Carvalho, T. S., Domingues, E. P., & Horridge, J. (2017). Controlling deforestation in the Brazilian Amazon: Regional economic impacts and land-use change. **Land Use Policy** 64: 327-341.

Diniz, C. C. (1993). Desenvolvimento poligonal no Brasil: Nem desconcentração nem contínua polarização. **Nova Economia,** 31(1): 35–64.

Diniz, C. C. (2006). A busca de um projeto de nação: o papel do território e das políticas regional e urbana. ***Revista Economia***, 7(4): 1–18.

Dixon, P., Rimmer, M. **Dynamic general equilibrium modelling for forecasting and policy.** A practical guide and documentation of MONASH. Cayton: Emerald, 2002.

Dweck, E.; Oliveira, A. L. M. D.; Rossi, P. **Austeridade e retrocesso: impactos sociais da política fiscal no Brasil**. São Paulo: Brasil Debate e Fundação Friedrich Ebert. 2018.

Ferreira Filho, J. B. S., Horridge, J. M. (2014). Ethanol expansion and indirect land use change in Brazil. **Land Use Policy** 36 (2014): 595-604.

Giavazzi, F.; Pagano, M. Can severe fiscal contractions be expansionary? tales of two small european countries. **NBER macroeconomics annual**, MIT Press, v. 5, p. 75–111, 1990.

Gomes, G. M. (2001). **Velhas secas em novos sertões**. Brasília, DF: Ipea.

Green, J., Lavery, S. (2015) The regressive recovery: distribution, inequality and state power in Britain's post-crisis political economy, **New Political Economy** 20(6): 894-923.

Greer, M. A. (2017). Austerity in the United Kingdom: the intersections of spatial and gendered inequalities. **Area** 49.1 122-124.

Guilhoto, J. J. M., Sesso Filho, U. Estimação da matriz insumo-produto a partir de dados preliminares das contas nacionais. **Economia Aplicada** 9(2): 277-299, 2005.

Haddad, E. A. (1999). *Regional inequality and structural changes: lessons from the brazilian experience*. Aldershot: Ashangate.

Horridge, J. M., Madden, J. R., Wittwer, G. (2005). The impact of the 2002-03 drought on Australia. **Journal of Policy Modeling** 27(3): 285-308.

Horridge, J. M., Wittwer, G. (2010). Bringing regional detail to a CGE model using Census data. **Spatial Economic Analysis** 5(2): 229-255.

IBGE, Instituto Brasileiro de Geografia e Estatística. **Estimativas da população residente para os municípios e para as Unidades da Federação brasileiros com data de referência em 1º de julho de 2017**. (2017). Available at: <http://biblioteca.ibge.gov.br/visualizacao/livros/liv100923.pdf >

Green, J., Lavery, S. (2015) The Regressive Recovery: Distribution, Inequality and State Power in Britain's Post-Crisis Political Economy, **New Political Economy** 20(6): 894-923.

Krugman, P. **Myths of austerity**. The New York Times, v. 1, n. 7, p. 10, 2010. Disponível em: https://www.economics.utoronto.ca/gindart/2010-07-02%20-%20Myths%20of%20austerity.pdf Acesso em: jan/2019.

Marinho, A. P. S., Jorge, M. A. O planejamento local é mais eficiente? Uma análise de 14 municípios sergipanos de pequeno porte. (2015). **Nova Economia** 25(1): 123-142.

Nikiforos, M.; Papadimitriou, D. B.; Zezza, G. The Greek public debt problem. **Nova Economia**, v. 25, p. 777 – 802, 12 2015.

Pearce, J. (2013). Commentary: financial crisis, austerity policies, and geographical inequalities in health. **Environment and Planning A** 45(9): 2030-2045.

Ramos, C. A. (2000). **Impacto distributivo do gasto público**: uma análise a partir da PCV/1998. Texto para Discussão n. 732, Ipea.

Rawdanowicz, Ł., E. Wurzel and A. Christensen (2013), "The Equity Implications of Fiscal Consolidation", **OECD Economics Department Working Papers**, No. 1013, OECD Publishing, Paris. https://doi.org/10.1787/5k4dlvx2wjq0-en.

Ribeiro, L. C. S., Domingues, E. P., Perobelli, F. S., Hewings, G. J. D. (2018). Structuring investment and regional inequalities in the Brazilian Northeast. **Regional Studies** 52(5): 727-739.

Ribeiro, L. C. S., Silva, E. O. V., Andrade, J. R. L., Souza, K. B. (2017). Tourism and regional development in the Brazilian Northeast. **Tourism Economics** 23(3): 717-727.

Salto, F. S.; Barros, G. L. **A importância da Emenda Constitucional nº 95/2016**. Instituição Fiscal Independente, Nota técnica nº 21. Agosto/2018. Disponível em: <http://www2.senado.leg.br/bdsf/bitstream/handle/id/546293/NT21_2018.pdf> Acesso em: janeiro/2019.

Schneider, M. P. A; Kinsella, S.; Godin, A. Changes in the profile of inequality across Europe since 2005: austerity and redistribution. **European Journal of Economics and Economic Policies: Intervention**, v. 13, n. 3, p. 354-374, 2016.

Stewart, F. **Adjustment and poverty: options and choices**. Routledge, vol. 2, 2005.

Taylor, L. **Varieties of stabilization experience: Towards sensible macroeconomics in the third world**. Oxford (UK) Clarendon Press, 1991.

Tupy, I. S., Toyoshima, S. H. (2013). Impactos dos programas governamentais de transferência de renda sobre a economia do Vale do Jequitinhonha. **Revista Econômica do Nordeste** 44(3): 671-692.

Wittwer, G. (Ed). (2017). **Multi-regional dynamic general equilibrium modeling of the U.S. Economy:** USAGE-TERM development and applications. Springer International Publishing.

Wittwer, G. (Ed.). (2012). **Economic modeling of water:** the Australian CGE experience (Vol. 3). Springer Science & Business Media.

Wei, Y. D. (2002) Multiscale and multimechanisms of regional inequality in China: implications for regional policy. **Journal of Contemporary China** 11(30): 109-124