REGIONAL FUNDING AND REGIONAL INEQUALITIES IN THE BRAZILIAN NORTHEAST

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RESUMO

Este artigo tem como objetivo avaliar os impactos macroeconômicos, regionais e setoriais de um programa de crédito no Brasil: o Fundo Constitucional de Financiamento do Nordeste (FNE). Para isso, são realizadas simulações utilizando um modelo dinâmico e inter-regional de equilíbrio geral computável, calibrado para o ano de 2013, composto por 27 estados brasileiros e 20 setores econômicos. As simulações foram realizadas com base nos dados de investimento setoriais e regionais do FNE para os anos de 2014 e 2015, permitindo isolar o efeito do financiamento nas regiões. Os principais resultados indicam que os gastos do FNE entre 2014 e 2015 têm o potencial de aumentar o PIB do Nordeste em 3,51% até 2025, e os estados mais beneficiados são o Piauí, o Ceará e o Rio Grande do Norte. Além disso, as estimativas mostram uma diminuição da desigualdade regional entre os estados do Nordeste de 0,46%, medida pelo Gini regional. Em geral, os resultados são compatíveis com os objetivos do fundo, embora os efeitos totais, principalmente na desigualdade regional, sejam modestos.

Palavras-chave: Desenvolvimento regional; FNE; Equilíbrio geral computável; Região Nordeste.

ABSTRACT

This paper aims to evaluate the macroeconomic, regional and sectoral impacts of a credit program in Brazil: Northeast Constitutional Financing Fund (FNE). For this, simulations are performed using a dynamic and inter-regional computable general equilibrium model, calibrated for the year 2013, and composed by 27 Brazilian states and 20 economic sectors. The simulations were carried out based on FNE sectorial and regional investment data for the years 2014 and 2015, allowing to isolate the effect of the funding on macro regions. The main results indicate that FNE expenditures between 2014 and 2015 have the potential to increase Northeast GDP by 3.51% until 2025, and the most benefited states are Piauí, Ceará, and Rio Grande do Norte. Additionally, our estimations show a decrease in regional inequality among Northeastern states of 0.46% measured by regional Gini. In general, the results are compatible with the objectives of the fund, although the total effects, mainly on regional inequality, are quite modest.

Keywords: Regional development; FNE; Computable general equilibrium; Northeast region.

JEL-CODES: C68; D58; R15; R58.

1. INTRODUCTION

Socioeconomic inequalities are a very deep issue in Brazil. The levels of regional inequalities are among the greatest in the world (BAER, 2007; SHANKAR and SHAH, 2001), although it has decreased in recent decades (AZZONI, 2001; DINIZ, 1993; 2006; SILVEIRA NETO and AZZONI, 2011; 2012; RIBEIRO et al., 2018). The industrialization process that occurred between the 1950s and 1970s is associated with the increase of regional inequalities in Brazil, since it concentrated the industrial and urbanization advances in the Southeast region as discussed by Baer and Ginger (1978), Haddad (1999) and Diniz (2006). In this process, other regions, mainly the Northeast, were locked-in a subsistence agriculture production based, situation aggravated by the climatic conditions of the place, since much of the land constitutes the Brazilian semi-arid. From the 1990s, the de-concentration of industrial production process, the inflation control as well as the minimum wage appreciation policy and the income transfer programs in 2000s, have contributed to alleviate the regional inequality and poverty. However, the Northeast remains as the most unequal region in intra-regional terms (RIBEIRO et al., 2018). In addition to the processes and policies cited, microcredit policies were directed to poorer regions in an attempt to alleviate regional inequality in Brazil.

Regional financing funds began to be adopted when the Brazilian Constitution of 1988 addressed regional inequalities. The document has established not only direct transfers from the Federal Government to the states and municipalities (States Participation Fund – FPE, and Municipalities Participation Fund – FPM[1]), but also investment policies called Northern (FNO), Midwest (FCO), and Northeast (FNE) Financing Constitutional Funds. The main goal of this policy is to provide long-term financing for investment projects, focusing mainly on small business and family farmers that work in dynamic sectors. This policy would increase the participation of these poor regions in the national economy.

Some papers have studied the impact of this policy on employment, income, and other variables, such as Rodrigues and Guilhoto (1998), Oliveira and Domingues (2005), Silva *et al.* (2007), Almeida *et al.* (2007), Silva (2007), Resende (2014) and Gonçalves *et al.* (2014). However, there is no consensus about the impacts of the program.

The Northeast is one of the most unequal region when we consider its states or municipalities. So it is important to evaluate how the constitutional funds would help to improve the Northeast regions. This paper addresses macroeconomic, regional and sectoral impacts of FNE. This paper contributes with the literature through the analysis of the FNE program using an inter-regional and dynamic computable general equilibrium (CGE) model, calibrated for 2013[2] for Brazilian 27 federation units. Through this model, we are able to identify the impacts of FNE for a very detailed set of investments, with local specific characteristics.

The paper is divided in five sections after this introduction. Section two presents the literature review on microcredit in developing regions, highlighting the public policies in Brazil that aims to reduce regional inequalities, more specifically, the FNE. The following section describes the main characteristics of the CGE model, whereas section four explains the database. The two final sections present the results and main conclusions.

[1] Most of the acronyms are written as if in Portuguese.

[2] Authors thank the Bank of Northeast (BNB) for providing the database.

2. PUBLIC POLICIES AND REGIONAL DEVELOPMENT

Many policies to support and finance private enterprises have been adopted in Brazil, especially in the end of the 1990s, after macroeconomic stabilization, when concerns about regional inequalities were intensified. The regional (North, Northeast, and Midwest) Financing Constitutional Funds, whose main goal is to integrate less developed regions in Brazil to a national level through credit availability to more productive sectors (CNI, 2011), were created. These funds were established by the Brazilian Federal Constitution in 1988 and, since then, provide long term credit to entrepreneurs, especially family farmers, micro and small farmers, committed to develop dynamic areas, using a lower interest rate, when compared to the market interest, and extra benefits, such as longer terms and a compliance bonus[3].

The origin of the Constitutional funds lays on 3% of the revenue of Income Taxes and Industrialized Product Taxes (IPI[4]), collected in the previous year. 0.6% of the collected money goes to FNO, 0.6% goes to FCO, and the remaining 1.8% goes to FNE. In addition to taxes revenue, interest payments and unused resources from previous years compose the fund. This paper analyzes the economic impacts of FNE, whose area of activity comprehends the whole Northeastern region of the country, besides the north of Minas Gerais and Espírito Santo states. These two states, although are not part of the Northeast region, are under the supervision of the SUDENE[5], the institution responsible for the analysis and for stimulate economic growth in the northeastern region of Brazil.

Half of this fund should be directed to projects located in the semiarid area, which is a subarea of the Brazilian Northeast whose socioeconomic development is still very underdeveloped when compared to the whole region. The policy focus on some specific sectors, such as infrastructure, agroindustry, livestock, irrigation, mining etc. According to Oliveira and Domingues (2004), one of the problems is that ultimately the fund is allocated according to the demand, concentrating applications in more developed regions.

One of the first papers analyzing the efficiency of the FNE was written by Rodrigues and Guilhoto (1998). The authors used an input-output model to analyze the efficiency in terms of the allocation of the funds, and the impact of the policy on income, employment, output, and imports between 1991 and 1993. They found the result pointing in the same direction that Almeida et al. (2006) and Almeida et al. (2007) found almost ten years later: funds were transferred primarily to the sectors with bigger potential effects over production, income and employment. On top of that, the authors argue that there were positive effects of FNE on income, employment and output.

In a partial equilibrium perspective, using econometric models, Almeida et al. (2006) and Almeida et al. (2007) have analyzed how the Brazilian program is allocated among the municipalities, and they have found that the loans are allocated primarily in more dynamic municipalities, instead of in lower income municipalities, as it was supposed to be, based on the goals of the program. According to the authors, the program contributes to a decrease in inter-regional inequalities, which is a primary focus of the policy, but also with the increase of

[3] *Superintendência de Desenvolvimento do Nordeste*. For more details about FNE characteristics, see Almeida, Silva and Resende (2006).
[4] From Portuguese "Imposto Sobre Produtos Industrializados".
[5] The simulation was made using data for investment in the Northeastern states.

intra-regional inequality, given that more dynamic areas are located in wealthier municipalities.

In the last years, the literature on the FNE impacts has intensified [Silva *et al.* (2007), Almeida *et al.* (2007), Silva (2007), Resende (2014), Gonçalves *et al.* (2014), among others]. However, there is still no consensus in the literature about the effects of the program on municipalities growth rates. Gonçalves *et al.* (2014), for example, have found a positive effect on economic growth of most of the Brazilian Northeastern municipalities. On the other hand, Silva et al. (2007), using Propensity Score Matching, have not found any effect of the same policy on employment and wages from 1995 and 2000. For the analysis in the sub-period between 1995 and 1998, the authors found positive impact on employment, which means that, on average, firms that have received funding from the policy have increase the amount of employees more than firms without the treatment.

CGE models allow a distinct perspective, through a integrated analysis about the potential impacts of FNE in different regions (Northeastern states and the rest of Brazil) and economic sectors, taking into account spillover and feedback effects among regions in a general equilibrium setting. The simulations allow the creation of a counterfactual situation where the fund effect can be isolated from other economic shocks and policies. The following section describes the main characteristics of the model we use in this paper to analyze the economic impacts of FNE.

3. METHODOLOGY

We use an interregional CGE model with recursive dynamic mechanism developed for the 27 federative units of Brazil, calibrated for 2013. The model is specified for 20 industries[6], 4 final users (households, investment, government and exports) and imports, three productive factors (land, labor and capital), two margins (trade and transport), a tax aggregate production and indirect taxes for each of the 27 regions. The database represents the productive structure of the Brazilian economy in 2013, including the trade flows among regions.

The model is a Johansen type CGE model, based on the Australian tradition in CGE modelling, in which the mathematical structure is represented by a set of linearized equations and the solutions are obtained in a growth rates form. It is a botton-up model and follows the theoretical structure of the TERM (The Enormous Regional Model) (WITTWER and HORRIDGE, 2010).

One of the major features our model is its computational ability to work with many regions and sectors from a simple database. This feature stems from the more compact structure of the database comparing to others regional CGE models and from simplifying assumptions in the modeling of multi-regional trade (HORRIDGE et al., 2005).

The presence of cost-minimizing sectors and utility-maximizing households compose the structure of our model. Each sector produces only one commodity using intermediate inputs, as well as primary factors (labor, capital and land). The mix of primary factors and intermediate inputs is obtained in fixed proportions, by a Leontief function. Industries produce in constant returns of scale. Households, industries and investors choose between domestic and imported goods or inputs (from another country) using a CES specification

[6] Aggregated from 67 industries in Brazilian input-output database.

(Armington hypothesis), based on the purchase price from each source. Household demand equations are specified as a CES / Klein-Rubin preferences function

There is market equilibrium for all goods, both domestic and imported, as well as in the factor market (capital, land and labor) in each region. The demands for margins (transport and trade) are proportional to the flows of goods to which the margins are connected. Purchase prices for each of the use groups in each region (producers, investors, households, exporters, and government) are the sum of basic values, direct and indirect taxes on sales and margins. The recursive-dynamics is based on a sequence of solutions for each year, among which, investment and capital stocks are adjusted according to regional and sectorial rates of return[7].

The model database was developed through a regionalization procedure of information from the 2013 National Accounts System to Brazil (IBGE, 2017), based on the procedures developed by Horridge (2006) adapted to the Brazilian case. This methodology ensures the consistency of the database with the official information available for the country. Carvalho et al. (2017) and Ribeiro et al. (2018) apply this procedure to regionalize the official database for Brazil in an Amazon micro regions-Rest of Brazil and a Northeast micro regions-Rest of Brazil database, respectively. Our model accounts for the 27 Brazilian federative units, contemplating in a separate way the nine states that compose the Brazilian Northeast as well as the trade flows between these and the other states of Brazil. [8]

The next section presents the simulation strategy adopted to access the macroeconomic, regional and sectorial impacts of the FNE program.

4. SIMULATION STRATEGY

In order to evaluate FNE impacts the simulation is divided in two types: baseline and policy scenarios. The baseline simulation allows updating the model database for the historical period, for which we already have information on key macroeconomics variables and forecast the economy trajectory in a "Business as Usual" perspective.

For the historical period (2014 to 2016), we used observed information on real GDP, investment, household consumption, government expenditure, exports, imports prices, consumer price index and regional population growth as exogenous shocks. From 2017 to 2025, we used only two exogenous data: real GDP and government expenditure. For the period 2017-2018 Brazilian GDP estimates correspond to the values projected by the Brazilian Central Bank (2017), 0.7 and 2.7%, respectively, and from 2019 to 2025 we assumed a homogeneous growth scenario of 3% per year. Government consumption is assumed to grow 1% less than GDP, account for fiscal adjustments commitment assumed in 2017 (Senado Federal, 2016). Therefore, baseline simulations allow the projections for the economy from 2014 to 2025 without any further intervention in regional investments.

[7] For a complete description of equations and solution method see Dixon and Rimmer (2002) and Wittwer (2012).

[8] In the regionalization process, it was assumed that the regional industries have the same technology (input-output coefficient) of the respective national industry, both for intermediate inputs (domestic and imported) and for primary factors. The regionalization of the final demand vectors (consumption, investment, exports and government consumption) was based on specific information to each of these components. See Carvalho *et al.* (2017) and Ribeiro *et al.* (2018) for more information about the regionalization procedure.

Therefore, regional growth, and investment, are generated endogenously by our model in the baseline scenario[9].

Policy scenario, by its turn, includes regional and sectorial detailed investment from FNE for 2014 and 2015 as an exogenous change (shocks) in the economy, allowing a deviation from the baseline scenario. The data provided by the Brazilian Northeast Bank allows to identify not only the region and the sector that receives the funding, but also the purpose of the fund, whether investment or for any other kind of expenditure. Selecting only the resources for which the finality was defined as investment, data reveals the funding is deeply concentrated in agriculture activities, and the largest beneficiary is the state of Bahia, however, looking for the share of FNE over total investment by sector and region, it was possible to see that FNE is also important for education activities and for other states like Piauí, where total investment is very low (Annex 1). All those differences, especially, in relative terms, are the main drivers of our results detailed in the next section.

5. RESULTS AND DISCUSSION

This section presents our results from four perspectives: i) aggregated, from showing the impact of FNE on the Northeast region; ii) regional, through the economic impacts on GDP and employment among the Brazilian states; iii) sectoral, from the identification of "winners" and "losers" in terms of sectors; and iv) regional inequality, comparing Gini variation in 2025 between the baseline and policy scenarios. Figure 2 demonstrates Northeast GDP growth in the baseline scenario and in the policy scenario. These results show how FNE funds would be able to impact positively the regional growth, moving the cumulative deviation in 2025 from 19.35%, to 23.54%, a cumulative difference of 3.51% in eleven years. As the deviation from baseline captures the policy effect, all the following results are presented as cumulated differences from the baseline scenario.

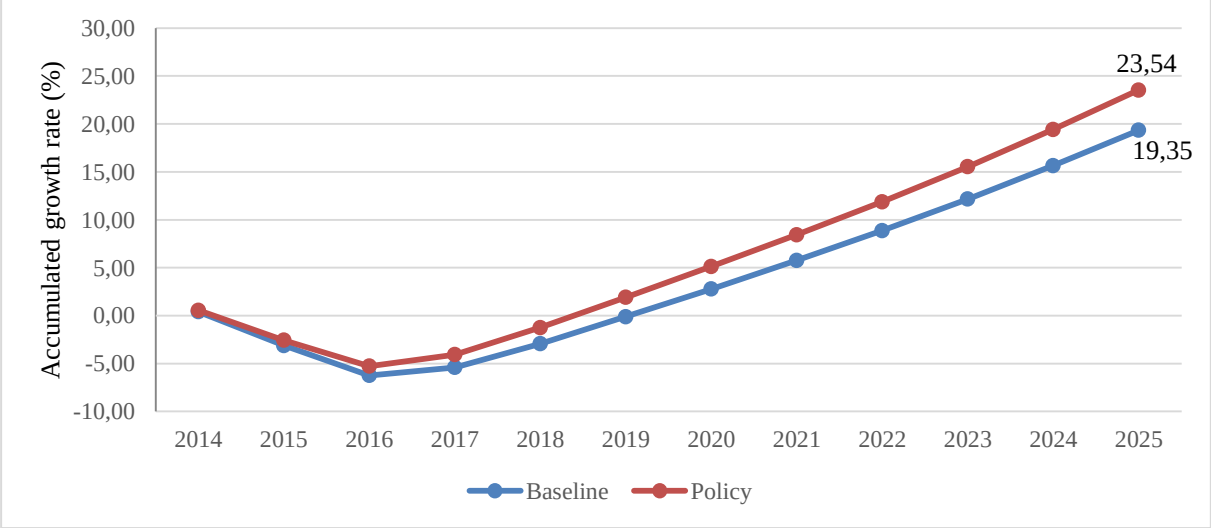


Figure 2: GDP results in the Brazilian Northeast, Baseline and Policy Scenarios – accumulated growth rate (%)
Source: Authors' own elaboration based on CGE simulations.

[9] With the exception of the regional population growth variable, the baseline scenario does not incorporate other regional characteristics, accordingly regions follow national macroeconomic trends.

As well as GDP all the other macroeconomics variables in Brazilian Northeast would be positively impacted by FNE investments as shown in Figure 3. It is important to highlight that the impact on Brazilian economy as a whole would be 0.70%. As expected, the main component of the final demand that would contribute to the positive impacts on GDP would be investment, whose variation peaked at 9.16% in 2016. This is mainly due to the adopted simulation strategy which shock investment in the sectors which have received FNE investments in 2014 and 2015.

In our model, according to the capital adjustment process, when a sector receives exogenous investment, as FNE resources, in period t, the sector uses these resources for capital formation, i.e., buying machinery, equipment, construction services and other goods, in order to improve its production capacity in period $t + 1$. Therefore, in the next period that industry will become more competitive, either attracting more investments or encouraging investments in other related industries. In this way, the investment generates cumulative effects in all regions directly affected and, in their surroundings, provoking positive effects throughout the economy.

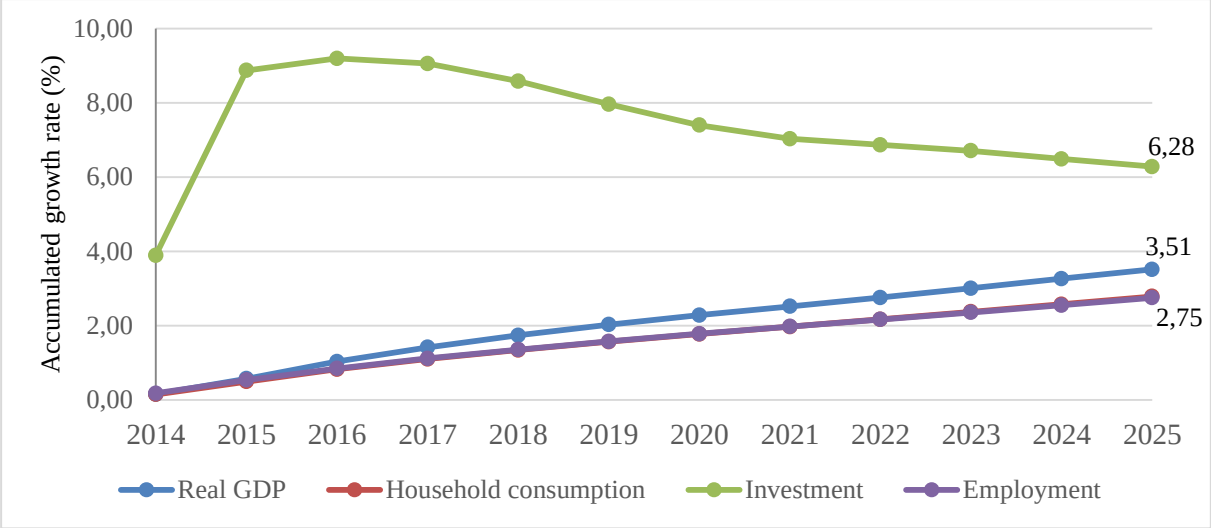


Figure 3: Macroeconomic results in the Brazilian Northeast: accumulated deviation 2014–25 compared with the baseline (%).
Source: Authors' own elaboration based on CGE simulations.

Aggregate employment follows the same trajectory of GDP growth, since the expansion of the economy implies greater use of primary factors in production, however, with the intensification of capital usage (due to investments), employment growth is slightly lower, increasing 2.75% in the end of the simulation period. Household consumption follows employment very closely and increases 2.78%, above the baseline scenario in 2025.

Figure 4 shows the investments' impact on exports and imports of the Brazilian Northeast. It shows a relative growth in imports compared to exports, which can be explained by changes in terms of trade. The demand for investments from the benefited sectors by the FNE would increase their production costs, since the capital usage becomes more expensive. These sectors, in turn, would pass on the increase in its costs to final consumers through price increases, which would imply domestic goods relatively more expensive than imported goods.

Given the model's mechanism of substitution effect, this would stimulate imports (positive changes throughout the period) and discourage exports, which would show negative variations during the investments' period (2014 and 2015). Furthermore, the increase in

production contributes to the increase of imports, whose cumulative deviation in 2025 would be 3.74% against 0.43% of exports.

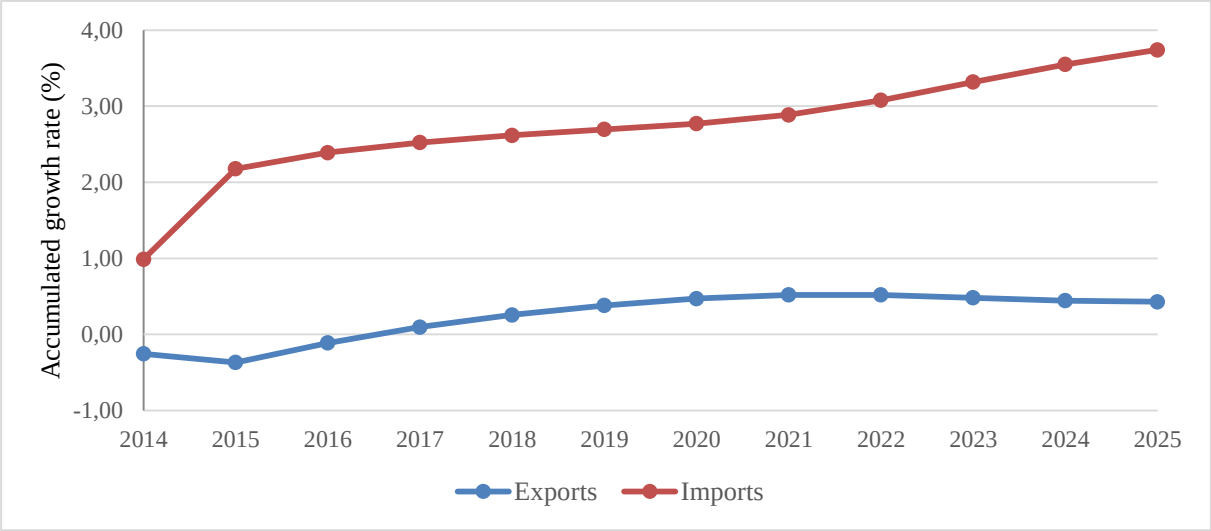


Figure 4: FNE impacts on Northeast's exports and imports: accumulated deviation 2014–25 compared with the baseline (%).
Source: Authors' own elaboration based on CGE simulations.

In order to measure FNE impacts in the Northeast and identify the spatial in the rest of Brazil, Figures 5 and 6 show the impact on GDP and employment among the Brazilian states in 2025. The greatest impacts, as expected, would be in the Northeast states, which are directly benefited by FNE resources. However, there is heterogeneity from the point of view of the impact magnitude within the region itself. Piauí – PI (5.69%), Ceará - CE (5.39%) and Rio Grande do Norte - RN (5.06%) would be the states with the largest accumulated GDP deviation in 2025, while the other states would grow around 3% above the baseline scenario.

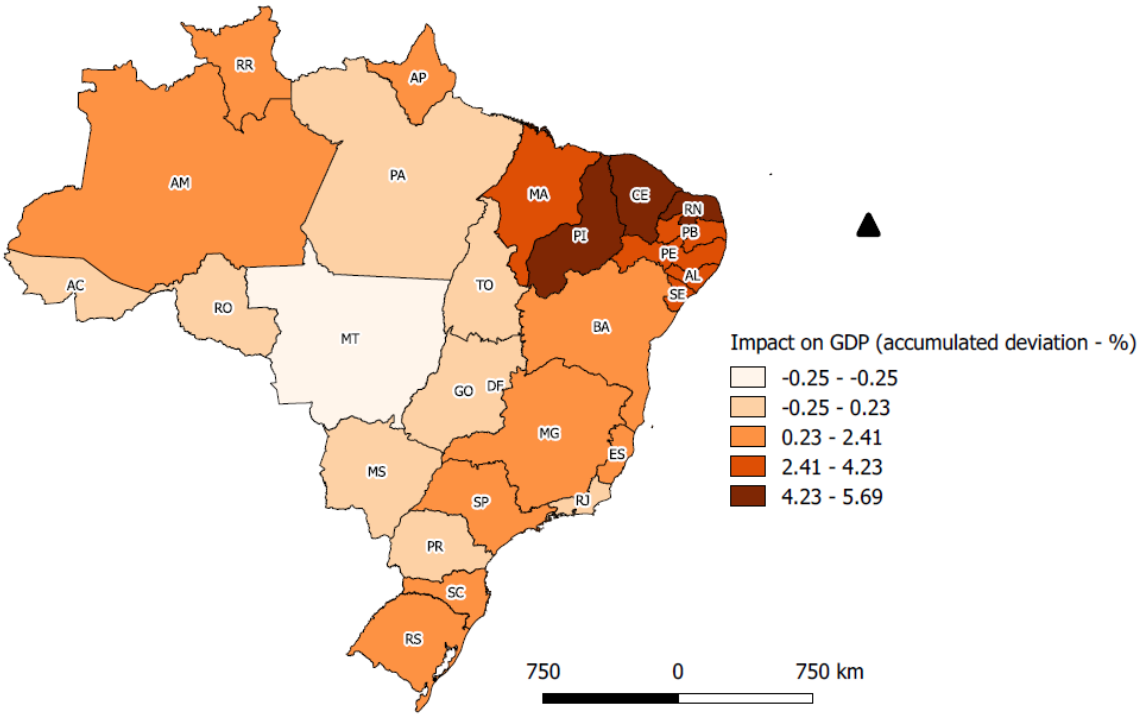


Figure 5: FNE impacts on Brazilian states' GDP: accumulated deviation 2014–25 compared with the baseline (%).
Source: Authors' own elaboration based on CGE simulations.

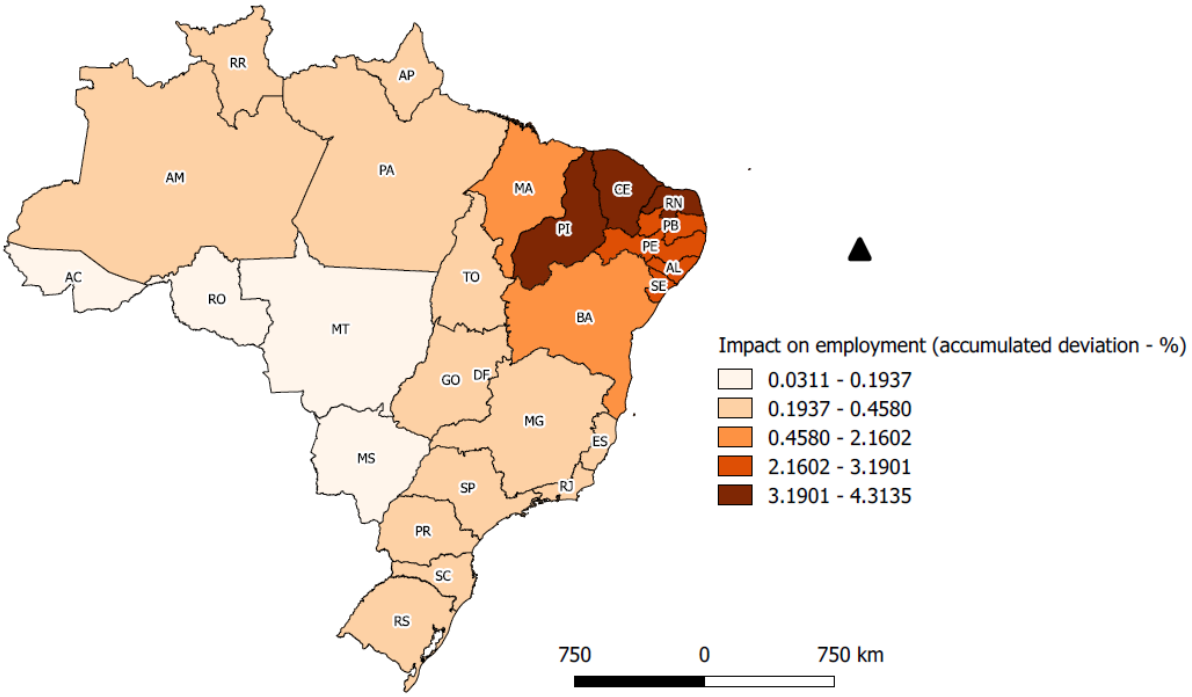


Figure 6: FNE impacts on Brazilian states' employment: accumulated deviation 2014–25 compared with the baseline (%).
Source: Authors' own elaboration based on CGE simulations.

Although Bahia, in absolute terms, received the largest share of FNE resources, its impact (2.41%) would be the lowest among the Northeastern states. This can be explained as a result of Bahia having the largest economy in the region and therefore the contribution of FNE over total investment is less representative compared to other Federal Units.

Excluding Mato Grosso - MT (-0.25%), all other Brazilian states would present positive impacts as a result of the indirect effects of FNE investments. Following the mechanisms of our model, this occurs both because the intermediate demand of inputs from the Northeast sectors benefited by the FNE and the increase of the Northeast's final demand in relation to the other states of Brazil. The FNE was allocated, considering the priority sectors, and the demand for resources, concentrating founds to the agriculture and livestock of the Northeast. Given that Mato Grosso is an important agricultural producer in the country, this state suffers a type of competitive effect due to the relative improvement of agriculture in the Northeast. It is worth mentioning that in terms of employment impact (see Figure 7), there would be no losers, i.e., employment would increase in all of the Brazilian states as a consequence of FNE investments. Furthermore, the impact distribution in the Northeast is similar when compared to the GDP impact (Figure 5).

Figure 7 shows the sectorial impact on output and employment as the accumulated difference between 2014 and 2025 relative to the baseline scenario. There are no losers related to baseline scenario, which means all of Northeast's sectors would have positive impact on output and employment in the region as a whole

The two most benefited sectors by FNE investments, i.e., Agriculture, forestry and livestock and Mining industry, are the same which would have the greatest impact on output and employment. In contrary, public sectors such as Public administration and social security, Public education and Public heath, would present the lowest impacts once these activities are not eligible to receive resources from FNE.

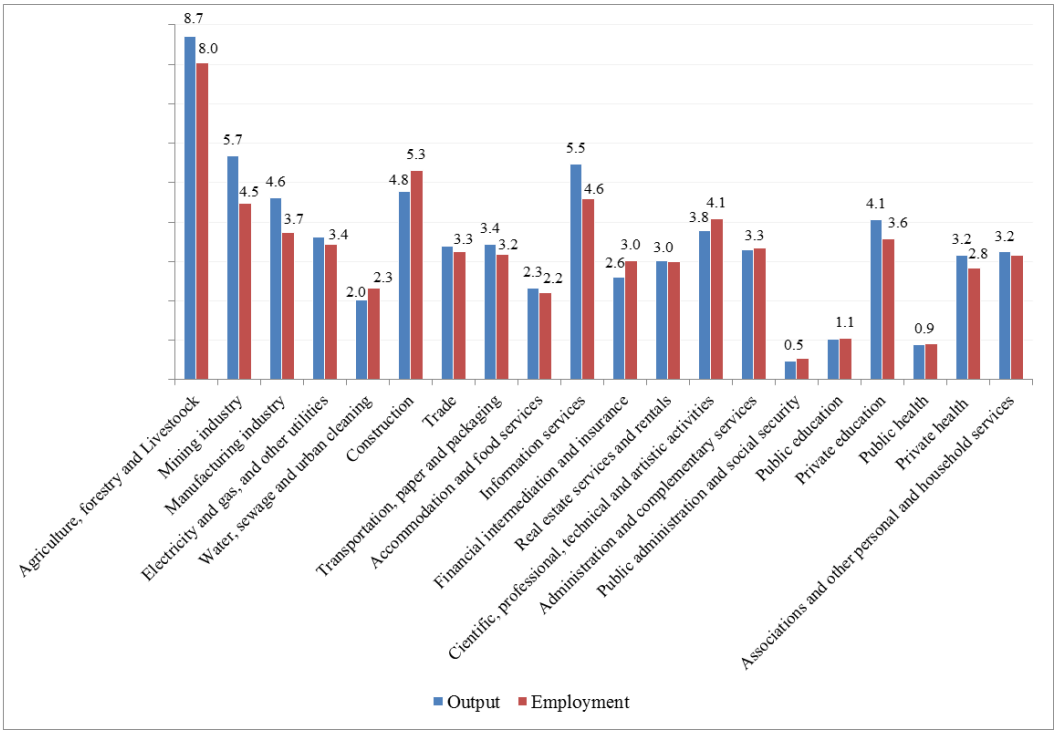


Figure 7: Impacts on sectorial output and employment in the Northeast region - accumulated deviation 2014-2025 compared to baseline (%)
Source: Authors' own elaboration based on CGE simulations.

In order to assess the impact that FNE investments could have on Brazilian regional inequality, the method used by Ribeiro *et al.* (2017; 2018) was adopted. GINI index from Brazilian states' GDP distribution was calculated at current prices in the baseline and policy (considering the FNE investments) scenarios. According to Ribeiro *et al.* (2018: 737) "the idea is to see if there would be a positive (concentration) or negative (deconcentration) variation of the GINI index".

Table 1 shows the GINI index calculated in the baseline scenario and impacted by FNE investments and their relative variation for Brazil (taking into account all of the 27 states) and for Northeast region (only their states). The first one could reflect the impact on inter-regional inequality, once the last on intra-regional inequality.

Table 1: Impacts on regional inequality –GINI indexes of regional GDP in 2025 in the baseline and policy scenarios

	GINI baseline	GINI FNE scenario	Variation %
Brazillian states	0.643	0.641	-0.26%
Northeast states	0.393	0.391	-0.46%

Source: Authors' own elaboration based on CGE simulations.

Our estimations show a modest decrease in regional inequality among Northeast states of 0.46% measured by regional Gini. It is important highlight that we do not assume any income change among households in the same federal unit, but only on regional GDP distribution.

For sectorial specific investments, similar result was found by Ribeiro *et al.* (2017). These authors have shown using input-output simulations and Gini index variation that the domestic tourism expenditure spent in Northeast states also contributes to reduce regional inequalities. On the other hand, Ribeiro *et al.* (2018) have shown that structuring investments in the Brazilian Northeast increase regional inequalities.

6. FINAL REMARKS

Regional policies have been adopted in Brazil since the Brazilian Constitution of 1988, addressing, especially, to promote regional economies and to reduce poverty and inequality. The Northeast Financing Constitutional Funds (FNE) is one of the most important regional policy of the country, since Northeast has some of the poorest regions in the country. Many studies have addressed the impacts of the FNE program on employment, income and other aspects, even though there is no consensus about these impacts. The aim of this paper was to contribute with the literature through the analysis of the FNE program in Brazil using an inter-regional and dynamic computable general equilibrium (CGE) model, calibrated for 2013 for all Brazilian states.

The results show that FNE would increase, mainly, the output of the states and sectors that receive more of FNE resources in the Northeast: Agriculture, forestry and livestock and Mining industry. Sectors such as manufacturing industries, Construction and information services are also among the most positively impacted, both due to the indirect effects caused by the expansion of the regions most benefited and due to the direct effects, given the greater relative participation of the investment generated by the FNE in the total investment of these sectors. The positive impact on all Northeast's sectors output would cause a positive impact on the regional GDP. Thus, the simulation proposed here points the positive impacts of FNE over the years on regional and sectorial economic growth. The result suggests important positive effects for the Northeast, and also for Brazil.

In terms of regional inequality, we found that the FNE program has positive impacts in regional inequality in Brazil given the direct and indirect effects of investment in the Northeastern states and the system of complementarities among the sectors. A more important result, however, it is about its effects in reducing intra-regional inequality. Our results suggest that the investment funding has larger generator effects on small economies, such as Piauí, Ceará and Rio Grande do Norte while Bahia, the largest economy of the Northeast, is the less impacted, where FNE is less representative compared to total investment.

Thus, we can conclude that the FNE funding has been applied for a long time, and it has been an important source for local investment, especially for small producers, and underdeveloped areas.

Finally, we can point out some considerations that could be explored in further developments. Agriculture is a priority sector for the FNE policy, being the main target of resources, since employs the poorest population of the Northeast. In terms of this objective, our results indicate that the FNE has been successful, since the sectorial results reinforce that priority sectors have been clearly benefited, and the spillover effects induce growth even in sectors

that are not directly affected by the policy. An interesting point to be explored, however, would be the profile of agricultural production that has been promoted by the program, if it benefits directly familiar agriculture or by creating jobs in large scale production. The information about the production size to could allow this type of analysis in a model with household divided by income. Other important question is to investigate if the current allocation of the FNE resources is maximizing the impacts on reducing inequality or if there is another composition of investment that would bring more benefit for this target. CGE models can be used not only for policy evaluation, but especially for ex-ante analysis of alternative policy designs. The alternative scenarios can also be connected to more specific policy goals, for instance, exploring the trade-off between allocation efficiency and inequality reduction.

REFERENCES

ALMEIDA, M. F., SILVA, A. M. A. D., RESENDE, G. M. **Uma análise dos fundos constitucionais de financiamento do Nordeste (FNE), Norte (FNO) e Centro-Oeste (FCO)**. IPEA - Texto para Discussão n. 1206, Brasília, 2006.

ALMEIDA, M. F., da SILVA, A. M. A., RESENDE, G. M. Fundos Constitucionais de Financiamento do Nordeste, Norte e Centro-Oeste (FNE, FNO e FCO): uma descrição para o período recente. In: **IPEA - Ensaios sobre economia regional e urbana**. Cap. 11, 2007.

ALMEIDA, M. F., RESENDE, G. M., SILVA, A. M. A. Distribuição espacial dos fundos constitucionais de financiamento do Nordeste, Norte e Centro-Oeste. **Revista de Economia** 33(2): 115-137, 2007.

AZZONI, C. R. Economic growth and regional income inequality in Brazil. **The Annals of Regional Science** 35: 133–152, 2001.

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

BAER, W., GEIGER, P. P. 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, 1978.

BANERJEE, A. V., DUFLO, E., GLENNERSTER, R., KINNAN, C. The miracle of microfinance? evidence from a randomized evaluation. **MIT - Working Paper Series** 13-09. 2013.

BRAZILIAN CENTRAL BANK. **Focus - Relatório de Mercado**. 29 de dezembro de 2017. Available at: https://www.bcb.gov.br/pec/GCI/PORT/readout/R20171229.pdf

BUCKLEY, G. Microfinance in Africa: Is it either the problem or the solution?. **World development** 25(7): 1081-1093, 1997.

BURGESS, R., PANDE, R. Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment. **The American Economic Review** 95(3): 780-795, 2005.

CARVALHO, T. S., DOMINGUES, E. P., HORRIDGE, J. Controlling deforestation in the Brazilian Amazon: Regional economic impacts and land-use change. **Land Use Policy** 64: 327-341, 2017.

CNI, Confederação Nacional da Indústria. **FCO, FNE e FNO Fundos Constitucionais de Financiamento :** como as micro, pequenas e médias empresas podem se beneficiar / Confederação Nacional da Indústria. – Brasília, 2011.

CRÉPON, B., DEVOTO, F., DUFLO, E., PARIENTÉ, W. **Impact of microcredit in rural areas of Morocco:** Evidence from a Randomized Evaluation. MIT Working Paper, 2011.

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

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

DIXON, P. B. *et al.* **Orani, a multisectoral model of the Australian economy**. Amsterdam: North-Holland Pub. Co., 1982.

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

DOMINGUES, E. P. ; OLIVEIRA, H. C. ; VIANA, F. D. F. . Investimentos em Infraestrutura no Nordeste: projeções de impacto e perspectivas de desenvolvimento. Revista Econômica do Nordeste, v. 43, p. 10, 2012.

GONCALVES, M. F., SOARES, R. B., LINHARES, F. C., VIAN, L. F. G. Efeitos diferenciados do Fundo Constitucional de Financiamento do Nordeste (Fne) No Crescimento Econômico Dos Municípios Nordestinos. **In: Anais do XLI Encontro Nacional de Economia**. ANPEC-Associação Nacional dos Centros de Pósgraduação em Economia. 2014.

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

HORRIDGE, J. M. **Preparing a TERM bottom-up regional database.**Preliminary Draft, Centre of Policy Studies, Monash University, 2006.

HORRIDGE, J. M. The TERM model and its database. In: WITTWER, G. (Ed.). **Economic Modeling of Water**. London: Springer, 2012.

HORRIDGE, J. M., MADDEN, J. R., WITTWER, G. The impact of the 2002-03 drought on Australia. **Journal of Policy Modeling**, v. 27, n. 3, p. 285–308, 2005.

JOHANSEN, L. **A multisectoral model of economic growth**. Amsterdan: North Holland Press, 1960.

KHANDKER, S. R. **Fighting poverty with microcredit**: experience in Bangladesh**.** Oxford University Press, 1998.

MACEDO, F. C., MATTOS, E. N. O papel dos fundos constitucionais de financiamento no desenvolvimento regional brasileiro. **Ensaios FEE** 29(2): 355-384, 2008.

MCKERNAN, S. M. The Impact of Microcredit Programs on Self-Employment Profits: do Noncredit Program Aspects Matter? **The Review of Economics and Statistics** 84(1): 93–115, 2002.

NAVAJAS, S., SCHREINER, M., MEYER, R. L., GONZALEZ-VEGA, C., RODRIGUEZ-MEZA, J. Microcredit and the Poorest of the Poor: Theory and Evidence from Bolivia. **World development** 28(2): 333-346, 2000.

OLIVEIRA, H. C.; DOMINGUES, E. P. . Desigualdades regionais e os Fundos Constitucionais de Financiamento do Norte e do Centro-Oeste. In: José Raimundo Carvalho; Klauss Hermanns.. (Org.). **Políticas Públicas e Desenvolvimento Regional**. Coletânea CAEN / Konrad Adenauer. Fortaleza, 2005

RESENDE, G. M. **Avaliação dos impactos econômicos do Fundo Constitucional de Financiamento do Nordeste entre 2004 e 2010**. Texto para Discussão IPEA, n. 1918, 2014.

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

RIBEIRO, L. C. S., SILVA, E. O. V., ANDRADE, J. R. L., SOUZA, K. B. Tourism and regional development in the Brazilian Northeast. **Tourism Economics** 23(3): 717-727, 2017.

RODRIGUES, M. T., GUILHOTO, J. J. M. Eficiência alocativa do Fundo Constitucional de Financiamento do Nordeste (FNE) - uma visão de insumo produto. **Revista Econômica do Nordeste**, Fortaleza 29(3): 319-348, 1998.

SENADO FEDERAL. **Emenda Constitucional nº 95 de 15/12/2016**. Available at: http://legis.senado.leg.br/legislacao/DetalhaSigen.action?id=540698

SILVA, A. M. A., RESENDE, G., SILVEIRA NETO, R. D. M. Uma Avaliação da Eficácia do FNE, no período 1995-2000. **Análise Econômica** 25(48): 213-241, 2007.

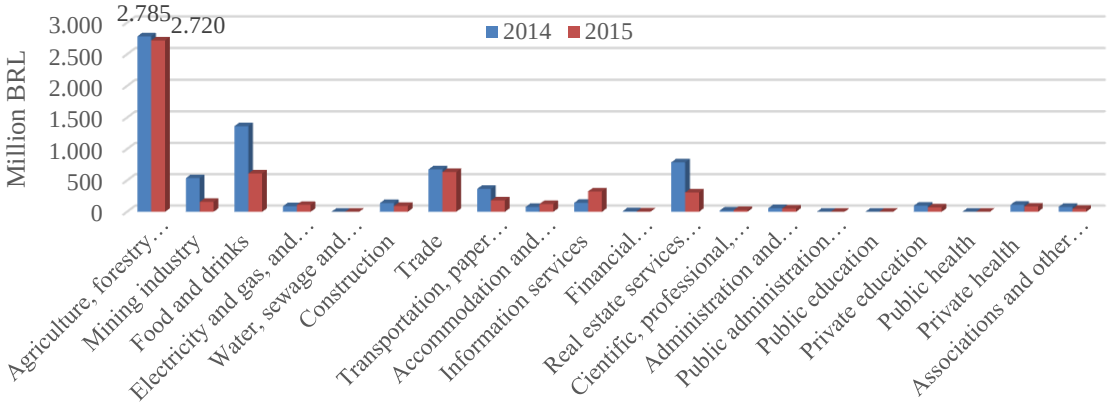
SHANKAR, R., SHAH, A. Bridging the economic divide within nations: a scorecard on the performance of regional development policies in reducing regional income disparities, 2001. Retrieved from http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-2717

SILVEIRA NETO, R. D. M., AZZONI, C. R. Non-spatial government policies and regional income inequality in Brazil. **Regional Studies** 45(4): 453–461, 2011.

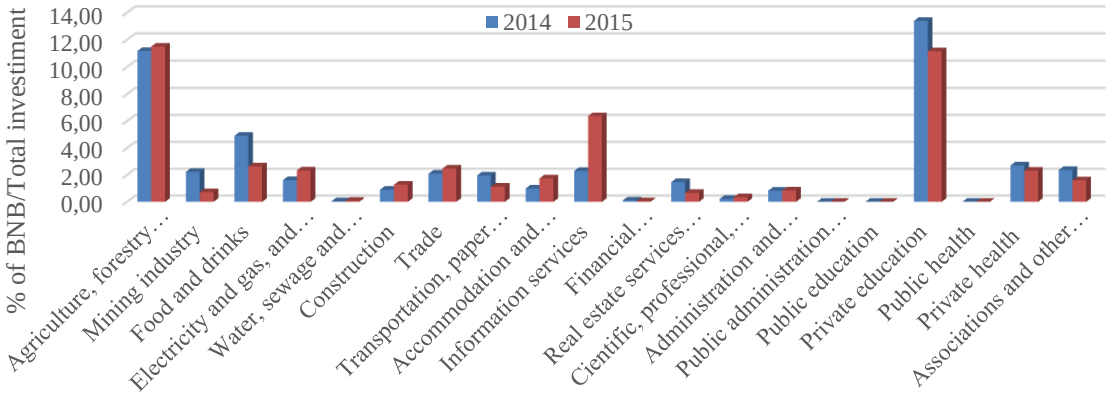
SILVEIRA-NETO, R. M., AZZONI, C. R. Social policy as regional policy: Market and nonmarket factors determining regional inequality. **Journal of Regional Science** 52(3): 433–450, 2012.

WITTWER, G. **Economic Modeling of Water**. The Australian CGE Experience. Springer Netherlands, 2012.

Annex 1 – Sectorial and regional distribution of FNE resources



(a)



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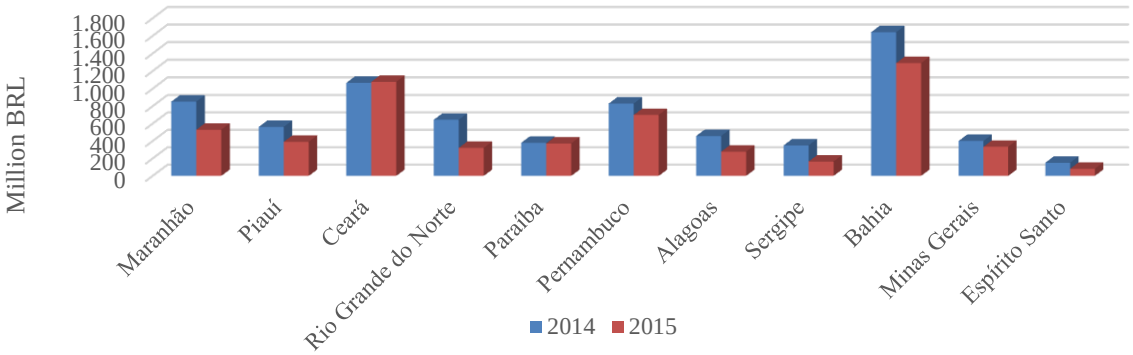

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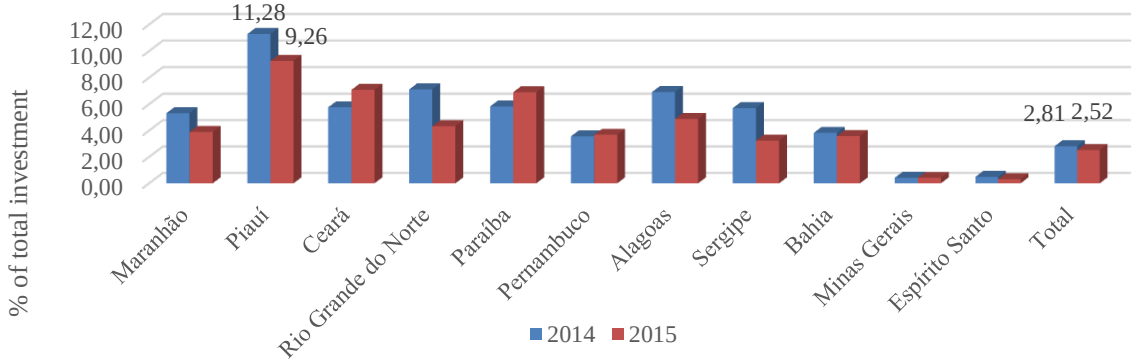

(d)

Source: Authors' own elaboration based on data provided by the Brazilian Northeast Bank and CGE data.