

Fiscal decentralization and economic growth: evidence from brazilian states

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ABSTRACT

Given the recent discussions that address the theme of fiscal federalism and its importance in the socio-economic development, this article has the main objective of analyzing the relationship between fiscal decentralization and growth rate of the Brazilian states GDP. To this end, in addition to the control variables used, 4 variables of fiscal decentralization were constructed. The estimation was made from a dynamic panel template for the 27 Brazilian states, comprising the period from 1995 to 2014. As a result, evidence shown that fiscal decentralization has a positive relationship with the economic growth rate of the country. Thus, it is possible to infer that public policies aimed at greater fiscal independence of sub-governments might be of great importance to the socio-economic development of Brazil.

Keywords: Fiscal decentralization; growth rate; Brazilian states. **JEL:** Fiscal decentralization; growth rate; Brazilian states.

RESUMO

Dadas as recentes discussões que abordam o tema do federalismo fiscal e a sua importância no desenvolvimento socioeconômico, este artigo tem como objetivo principal analisar a relação entre a descentralização fiscal e a taxa de crescimento do PIB dos estados brasileiros. Para tanto, além das variáveis de controle utilizadas, foram construídas 4 variáveis de descentralização fiscal. A estimação foi feita a partir de um modelo de painel dinâmico para os 27 estados brasileiros, compreendendo o período de 1995 a 2014. Como resultado, foram encontradas evidências de que a descentralização fiscal possui relação positiva com a taxa de crescimento econômica do país. Assim, é possível inferir que políticas públicas que visem maior independência fiscal dos sub-governos podem ser de grande importância para o desenvolvimento socioeconômico brasileiro.

Palavras-chaves: descentralização fiscal; taxa de crescimento; estados brasileiros.

Área 6 - Crescimento, Desenvolvimento Econômico e Instituições.

Código JEL - E02, O11, O23

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1 Introduction

Over the past few decades, numerous countries have changed their institutional settings, as a form of allocating more political power and fiscal autonomy to subnational governments. According to Oates (1972), the basic argument in favor of such decentralization is that it improves the efficiency of the public sector and promotes long-term economic development.

The seminal works of Samuelson (1954) and Samuelson (1955) on the economic theory of decentralization and the works of Tiebout (1956) and Oates (1972) served as the basis for the creation of the economic theory related to the federal tax. Tiebout (1956), in his model of “voting with the feet” put forward the idea of decentralization, arguing that the existence of a decentralized government would facilitate the mobility of families between regions, and thus, given their preferences and the utility, these families could choose the regions where the public supply of goods and services would fit in their baskets of goods.

The initial idea of Oates (1972), known as the “first generation”, argues that fiscal decentralization increases the public sector efficiency because subnational governments are best acquainted with the local conditions and preferences and, thus, achieve a better provision of public goods, due to their physical and institutional proximity. In addition, Oates (1999) argues that higher levels of fiscal decentralization can achieve higher levels of social well-being. For if the demands for public goods are different, equal levels of public goods and services offered by a national government will be inefficient. Thus, the greater the demand for public goods, the greater the benefits of fiscal decentralization. This diversification also allows the citizens to move to communities that better match their demands for public goods and services, and rates of local taxes. Thus, the “screening of individuals of Tiebout” increases the efficiency of subnational governments in the allocation of its resources.

But how does the fiscal decentralization affects economic growth? According to the theory of fiscal federalism, subnational autonomy ensures efficient allocative results, which can result in higher rates of economic growth ((TIEBOUT, 1956), (OATES, 1972)). Or as Brueckner (2006), in a similar way, more fiscal autonomy may be associated with higher levels of product per unit of labor, and higher rates of growth.

The relationship between fiscal decentralization and economic growth, however, is quite complex. In recent years, many studies have tried to test the effect of decentralization on the growth of the economies and, despite the widespread theoretical recognition of this effect, few have succeeded in proving this relationship.

Davoodi e Zou (1998) using panel data for 46 countries for the period 1970-1989, measured the sub-national fiscal decentralization as a sub-local part of the total expenditure of the government. The authors found a negative relationship between fiscal decentralization and economic growth for developed countries and no relation for Developing Countries. Ezcurra e Rodríguez-Pose (2011), using data from 21 countries in the Organization for economic cooperation and development (OECD) for the period 1990-2005 and controlling not only the fiscal decentralization but also the political and administrative decentralization, found evidence for a significant negative association between fiscal decentralization and economic growth. In this same downside, Baskaran e Feld (2013) tested this relationship using the regular indicators of State Finance Statistics (GFS) and a new indicator, based on Stegarescu (2005), for 23 OECD countries. For the usual indicators, the work found negative, but insignificant, effects of fiscal decentralization on economic growth. For the new indicators, the results found were also negative, but, this time, statistically significant.

Among the studies that find positive evidence for the relation in question is the study of Akai e Sakata (2002). Using data from 50 U.S. states for the period 1992 to 1996, the

authors tested the effect of fiscal decentralization on economic growth through 4 decentralization measures: the indicator of revenue, production, autonomy, and production-recipes. The study provided evidence that decentralization contributes to economic growth, suggesting that recent movements by developed countries toward fiscal decentralization can stimulate their economic growth. Gemmell, Kneller e Sanz (2013) found out, using data of 23 OECD countries in the period 1972-2005, that the decentralization of spending tends to be associated with less economic growth, while the decentralization of revenue has been linked to greater economic growth. Filippetti e Sacchi (2016), at last, examined the relationship between fiscal decentralization and economic growth in different institutional contexts, for 21 OECD countries for the period 1970-2010. The authors found evidence that the decentralization of the property tax leads to greater economic growth when it is associated with high administrative and political decentralization. Numerous reasons may explain the controversial results found in the empirical literature. For example, according to Voigt e Blume (2012), the institution can be very complex, and not be fully observed. Or, still, such as Salmon (2013) points out, the heterogeneity of the jurisdiction can be difficult to be captured or, simply, as Filippetti e Sacchi (2016) point out, the political and administrative dimension is not properly considered. It is important to emphasize also that another reason may be related to the configuration of how some forms of decentralization affect economic efficiency by distorting the efficient allocation of resources ((MARTINEZ-VAZQUEZ; LAGO-PENAS; SACCHI, 2017)). Finally, and perhaps the best explanation for the fact is that the studies use different data, technique, and specifications of decentralization, which produces divergent results.

In addition to the academic context, the fiscal decentralization is a topic that has been much discussed in political and economic debates on the worlds scenario. In recent decades, fiscal decentralization has been used as a means for economies to achieve higher economic efficiency. In fact, such speech of efficiency was used by countries such as the United States, China, Great Britain and Spain as justification for their movement of decentralization.

With the 1988 Federal Constitution, Brazil has experienced a movement of decentralization, in the sense of delegate to the federated entities the responsibility to formulate and implement public policies, focusing on the particularities of its local demands. Thus, there was a distribution of administrative functions among the three levels of government. With this, states and municipalities began to be able to deploy and make use of your taxes, aimed at the regional and local development. However, given the heterogeneity of the country and the great inequalities in its different regions, decentralization hasn't presented the effectiveness expected, causing tax wars and increases on the regional inequalities.

In this manner, which justifies the present analysis for the Brazilian economy, in the sense of investigating whether state governments with the highest levels of fiscal decentralization have higher rates of growth, or, still, if there is a positive and significant relationship between these two variables. Thus, in order to investigate what are the effects of the recent fiscal decentralization on the economic growth of Brazil, we use data for the 27 states of Brazil, in the period from 1995 to 2014.

Nevertheless, the work is divided into 6 parts, including this Introduction. In the second section, there will be a brief overview of the process of fiscal decentralization in Brazil is made, as well as are presented some recent data related to the subject. In the third section are presented the methodological aspects, the article-basis, and calculation of the indicators. In the fourth part will be presented the results of decentralization, along with the econometric estimation in the fifth part. At last, will be presented in the final considerations, and the bibliographical references.

2 Brazilian situation of federalism and economic growth

The phenomenon of fiscal decentralization is characterized by budgetary autonomy and collection of the federated entities, beyond the partition of taxes, government transfers and public spending between federal, State and Municipalities.

Since its colonial period, Brazil was managed in a central way. Even after the proclamation of the republic, the central government still had power over the administration of resources for the implementation of state activities. From the decade of 1930, however, after a significant expansion of the public function, the federal government began to share some of the financial resources and administrative capacity with the other government levels (state and municipal). During the military regime (1964-1985), and especially after the Constitution of 1967, the concentration of fiscal resources, the generation of financial resources and the formulation of public policies was expanded by the federal government, significantly reducing the autonomy of subnational governments.

From the 1980s, as a result of this concentration of resources in the Union, enforced by the dictatorship, a series of conflicts between the federal government, states, and municipalities began. Based on that, during the process of redemocratization of the country, the movement of Brazilian decentralization aimed at strengthening the political and financial aspects of the states and municipalities. With the 1988 Federal Constitution, all Brazilian federation was recreated, as well as its structure, purpose, and fundamentals. However, as indicate [Giambiagi e Além \(2008\)](#), since the Brazilian decentralization process was not conducted by the central Government, but by States and mostly by municipalities, there was not a national plan for decentralization, which resulted in an uncoordinated process.

Decentralization in Brazil is a complex process since the country is characterized by severe socioeconomic and geographic inequalities, which are reflected in different capacities. The conciliation between decentralization and the reduction of social inequalities, therefore, is the main challenge to decentralization. Knowing that, in Brazil, this process is more related to participation in the national transfers than the increase of its tax and revenue capacity. Table 1, below, shows the distribution of average earnings for county and state according to the major regions of Brazil, for the period of 1985 to 2014:

Table 1 – Distribution of municipal and state average revenues according to the great regions of Brazil - 1985-2014 -%.

| MUNICIPALITIES | Tax Revenue | | | | | Current Transfers | | | | |
|----------------|-------------|-------|-------|-------|-------|-------------------|-------|-------|-------|-------|
| | 85 | 95-99 | 00-04 | 05-09 | 10-14 | 85 | 95-99 | 00-04 | 05-09 | 10-14 |
| Brazil | 11.40 | 23.50 | 18.70 | 18.70 | 20.20 | 60.30 | 66.10 | 68.00 | 69.20 | 66.70 |
| Midwest | 12.60 | 23.50 | 18.70 | 18.70 | 20.20 | 66.80 | 77.70 | 78.10 | 75.90 | 72.90 |
| Northeast | 6.90 | 16.90 | 12.70 | 13.60 | 16.90 | 60.60 | 81.10 | 82.60 | 83.40 | 81.80 |
| North | 5.80 | 12.60 | 9.90 | 10.00 | 11.80 | 56.70 | 81.10 | 83.30 | 83.10 | 80.30 |
| Southeast | 22.00 | 13.70 | 10.00 | 10.90 | 12.60 | 50.60 | 59.00 | 60.10 | 61.30 | 53.40 |
| South | 12.60 | 29.40 | 24.50 | 24.60 | 26.80 | 66.60 | 69.20 | 67.50 | 68.30 | 66.80 |
| STATES | 85 | 95-99 | 00-04 | 05-09 | 10-14 | 85 | 95-99 | 00-04 | 05-09 | 10-14 |
| Brazil | 45.30 | 65.60 | 63.40 | 62.30 | 63.60 | 23.40 | 24.20 | 22.30 | 24.50 | 23.00 |
| Midwest | 39.70 | 50.10 | 58.70 | 62.60 | 59.90 | 21.40 | 41.00 | 27.70 | 22.80 | 20.30 |
| Northeast | 35.90 | 50.30 | 47.30 | 45.80 | 49.10 | 31.00 | 43.70 | 39.50 | 43.20 | 41.60 |
| North | 17.00 | 42.70 | 41.80 | 41.20 | 41.80 | 47.00 | 49.90 | 48.50 | 48.90 | 45.30 |
| Southeast | 62.00 | 77.20 | 72.10 | 71.00 | 72.70 | 9.30 | 13.10 | 12.00 | 14.00 | 12.40 |
| South | 72.00 | 62.60 | 67.30 | 67.20 | 69.70 | 8.40 | 18.30 | 19.60 | 22.30 | 20.60 |

Source: Own elaboration based on data from the National Treasury Secretariat.

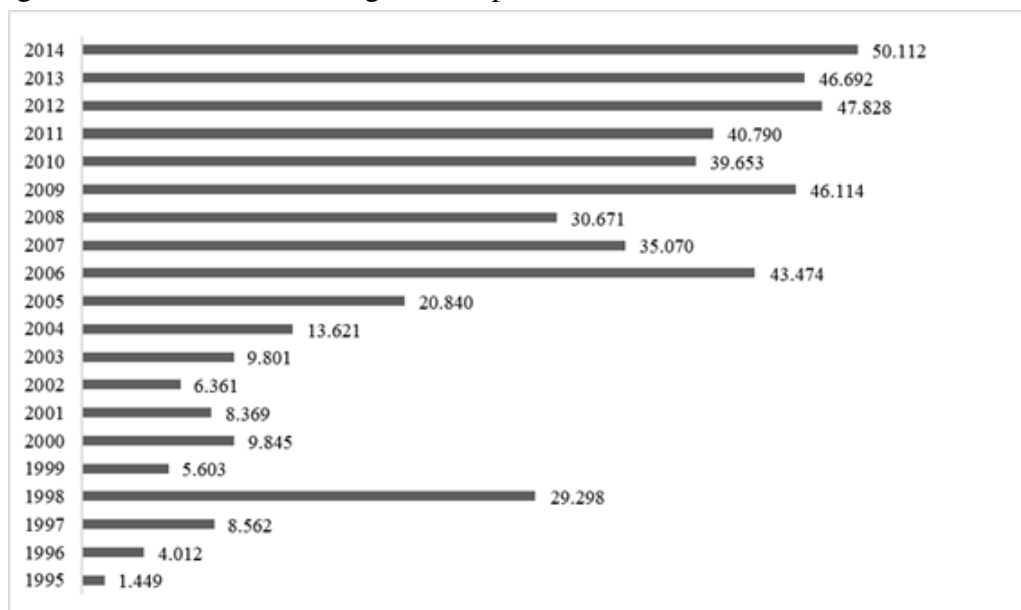
Analyzing the tax revenues, based on the information contained in Table 1, it is possible to notice that the municipalities and Brazilian states showed a significant change in their collected values. When compared to the values before the Federal Constitution of 1988, the municipal tax revenues showed growth in four of the five Brazilian regions, particularly the north and northeast regions, with variations of 112% and 61%, respectively. As for the state tax revenues, is highlighted the performance of the northern regions (145%) and the center-west (50%). However, in the period from 1995 to 2014, despite these variations, the total of shares of tax revenues in state and municipal revenues remained at similar levels – and sometimes even lower than the beginning of the period. Although the existing tax revenue tends to grow, this is connected to the increasing financial dependency of subnational governments.

With regard to transfer revenue, the observed scenario is different. We can see that in 1985, the current transfers of the Brazilian municipalities accounted for about 60% of the total municipal revenue, while in the final period of the analysis (2011-2014), these accounted for 68%. However, by observing in detail the major regions, it is possible to notice much more significant variations. Furthermore, it is possible to notice also that in the regions northeast and north, the less developed, there is a greater weight of current transfers. In these regions, the weight of transfers passes the 80% level, while in the southeast region, the participation is about 60%. As for the states, the portion related to the tax revenue remained constant from 1985 to the period of 2010-2014, in spite of small variations.

When comparing such results with the tax revenues, it is possible to notice an inverse relationship: the concentration of tax revenues in the more developed regions is counterbalanced by a system of transfers of taxes, which favors mainly the less developed regions.

It is known that the majority of municipalities do not possess an own revenue able to sustain their demands. Nevertheless, the Brazilian municipal own collection has experienced significant growth during the period in question, as shown in Figure 1 below:

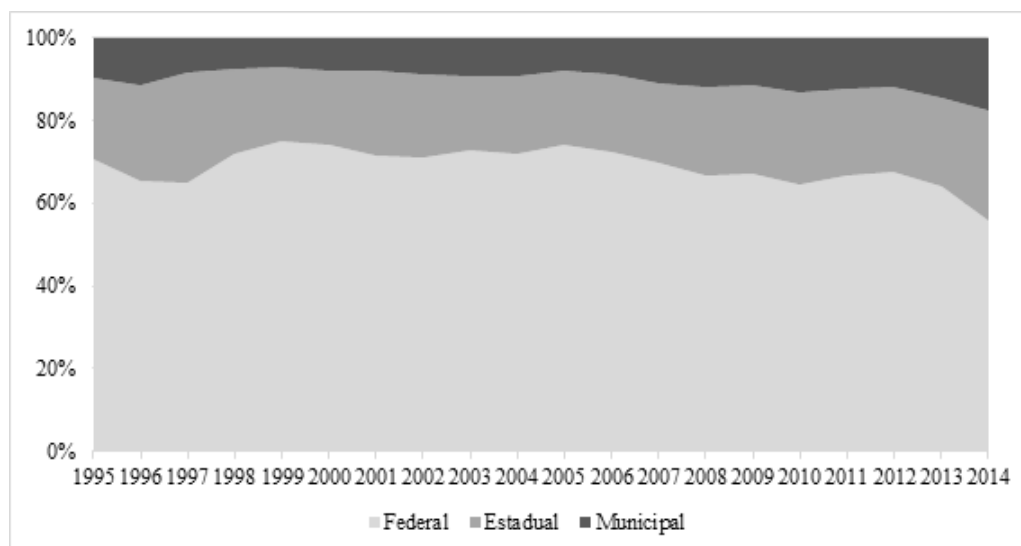
Figure 1 – Evolution of average municipal own collection - 1995-2014 - R\$ million.



Source: Own elaboration based on data from the National Treasury Secretariat, data deflated and worked by the research.

In the period between 1995 and 2014, the growth of municipal own revenue was rather fast. It is possible to notice, however, that from the second half of the last decade, the average level of the municipal collection began to show less significant variations, suggesting a possible stabilization. By analyzing the expenditure side, Figure 2 shows the expenditure by level of Government to Brazil, in the period of 1995 to 2014:

Figure 2 – Expenditures by level of government in Brazil - 1995-2014 - %.



Source: Own elaboration based on data from the National Treasury Secretariat.

Through the Figure 2 is possible to notice that in the initial period, 1995, the federal government controlled approximately 71% of aggregate expenditure, while state and municipal governments controlled about 20% and 9%, respectively. In 2014, the share of federal government expenditure was 56%. While the share of state governments was approximately 27%

and, finally, the expenses of the municipal governments accounted for about 14% of the total. Therefore, we can notice a change in the sizes of state and local governments, reflecting a trend of decentralization in the sense that the sub-national expenditure increased its relevance in the total. However, it is important to be careful, once the concept of decentralization is quite complex and includes numerous other dimensions.

Regarding economic growth, the scenario observed for Brazilian regions is quite similar. Table 2 presents the variations of the nominal averages of GDP for Brazil and its five geographical regions, for the period of 1995 to 2014:

Table 2 – Average nominal variations of Brazilian and state GDP according to the major regions of Brazil - 1995-2014 -%.

| Year | 95-99 | 00-04 | 05-09 | 10-14 |
|-----------|-------|-------|-------|-------|
| Brazil | 10.93 | 12.49 | 11.25 | 11.67 |
| Midwest | 12.27 | 15.24 | 13.17 | 12.4 |
| Northeast | 11.89 | 13.84 | 12.94 | 13.17 |
| North | 12.16 | 14.59 | 13.83 | 11.62 |
| Southeast | 10.93 | 13.24 | 11.78 | 11.61 |
| South | 11.52 | 13.24 | 11.93 | 11.56 |

Source: Own elaboration based on data from the National Treasury Secretariat, data deflated and worked by the research.

In the period in question, the nominal rates of growth of the Brazilian regions were elevated, reaching levels higher than a dozen. It is clear, however, that the most significant variation occurred in the period of 1999-2002, where the northern region recorded the highest rate of nominal growth – around 17%. At the end of the period, the Northeast region presented the greatest variation.

3 Methodology

3.1 Measuring decentralization

Although the fiscal decentralization is a subject quite discussed in political and scientific spheres, there is still no consensus among which quantitative measures are really suitable for the measurement of the process. In order to make this empirical work interpretable and consistent with previous studies, our analysis will be based on the study of the Akai e Sakata (2002).

It is common for fiscal decentralization to be interpreted as the delivery (or return) of authority to a subnational government. Thus, to measure the decentralization, one should know the degree of decentralization or, in other words, the level of authority of subnational governments. However, it is difficult to quantitatively measure such authority.

The most used approach measures the autonomy of these entities from its revenues or expenses. However, some exceptions should be made. The expenditure of subnational governments may be financed by transfers from higher governments and, thus, the share of the lower government expenditures in total expenses do not reflect necessarily the level of authority of the smaller government. In addition, even if the portions of revenue or expenses are small, the subnational government may be considered fiscally decentralized provided that the sufficient resources for the expenses of this government are originally allocated to it. Therefore, it is important that the level of autonomy be used as a proxy for fiscal decentralization.

However, as mentioned, several previous studies have used portions of the subnational revenue and expenditure as indicators of fiscal decentralization. Since it is difficult to develop a

single completely satisfactory measure, we considered four measures of fiscal decentralization, such as Akai e Sakata (2002), that deal with the reservations above and include different points of view. Our four indicators are detailed below:

- i. Revenue Indicator (RI): defined for each subnational government as the participation of each local revenue in the total revenue (the sum of all local revenues);
- ii. Production Indicator (PI): defined for each subnational government as the participation of local expenditure in the total expenditure (the sum of all local expenses);
- iii. Autonomy Indicator 1 (A1): set for each subnational government as the portion of its own revenue in the total revenue, excluding transfers. This indicator gets closer to the true fiscal independence of subnational government;
- iv. Autonomy Indicator 2 (A2): defined for each subnational government as the portion of its own revenue in its total revenue. This indicator gets closer to the real independence of subnational government.

3.2 Empirical strategy

With the purpose of addressing the endogeneity in the models, the estimation used was the one proposed by Arellano e Bond (1991), using instrumental variables from lags of the endogenous variable in differences. The estimator Arellano-Bond is constructed by the application of the first difference to remove the effects of the level of the panel and use instruments to provide conditions of momentum. In this way, it becomes possible to accommodate large self-regressive parameters and large proportions of the variance in the effect of level of panel to the variance of the error idiosyncratic.

The model used has adjusted the dynamic data estimators panel from the estimator Arellano-Bover/Blundell-Bond which was designed for data with many panels and few periods, assuming that there is no autocorrelation in the idiosyncratic errors and does not require the initial condition that the independent variables do not have a correlation with the first difference of the first observation of the dependent variable.

In this way, the estimator of Arellano-Bover/Blundell-Bond displays the estimated model in the following way:

$$y_{it} = \sum_{j=1}^p \alpha_j y_{it-j} + X_{it} \beta_1 + w_{it} \beta_2 + v_i + \epsilon_{it}, \quad i = 1, 2, \dots, N \quad t = 1, 2, \dots, T_i \quad (1)$$

Where,

α_j are the p parameters to be estimated,

x_{it} is a 1 k1 vector of strictly exogenous covariates,

β_1 is a k1 1 vector of parameters to be estimated,

w_{it} is a 1 k2 vector of predetermined or endogenous covariates,

β_2 is a 1 1 vector of parameters to be estimated,

v_i are the effects on the level of the panel (which may be correlated with the covariates),

and

ϵ_{it} is independent, identically-distributed over the whole sample with variance σ

From Akai e Sakata (2002) and with some adaptations, the regression model of this work can be written as:

$$LnGDP_{i,t} - LnGDP_{i,t-1} = \sum_{j=1}^p \alpha_j y_{it-j} + X_{it}\beta_1 + w_{it}\beta_2 + v_i + \epsilon_{it}, \quad i = \text{states} \quad t = \text{years} \quad (2)$$

$$\Delta RealGDP = \sum_{j=1}^p \alpha_j y_{it-j} + X_{it}\beta_1 + w_{it}\beta_2 + v_i + \epsilon_{it}, \quad i = 1, \dots, 27 \quad t = 1995, \dots, 2015 \quad (3)$$

Where i refers to state i to the quantities of year t ; $LnGDP_{it}$ represents the natural logarithm of the real GDP of each state i in year t , so that the left side of the equation represents the rate of growth of the GDP of each state i in year t ; the inside of the model w_{it} represents the endogenous indicators of fiscal decentralization and X_{it} the exogenous variables, both represented for each state i in year t ; finally, v_i are the effects at the level of the panel and ϵ_{it} is the error term.

3.3 Variables

The characteristics of the variables used are summarized in Table 3 below. The data¹ are of annual frequency, covering the period between 1995 and 2014, where the rate of growth of GDP is the dependent variable of the model. All variables, including the indicators of decentralization, have been transformed in natural logarithms.

Firstly, in relation to the four indicators of fiscal decentralization used, it is expected that they contribute to the economic growth, as stated by Oates (1972), showing a positive effect on the dependent variable. The data used for the construction of indicators were obtained through the Secretariat of the National Treasury.

The education variables, degree of trade openness, Gini index, population, life expectancy and occupied population were inserted in the model as control variables. According to the existing literature, it is possible to make some predictions about some of these variables. For education, we expect a positive effect, since the proxy variable used is the average years of study, and higher levels of this rate lead to higher levels of qualification and, thus, of economic activity.

It is expected that a higher rate of life expectancy of newborns will affect positively on the growth rate, since a better quality of life implies a greater general life expectancy and, consequently, an increase on the contribution in the labor market.

To the degree of trade openness, it is expected that this will contribute positively to the dependent variable. As for the Gini index, given that higher values of the coefficient indicate higher levels of income concentration, it is expected that the effect of this variable on the dependent variable is negative. Finally, for the population and the employed population, the expected effect is also positive, given that models often point out that the population that contributes to economic growth.

The data used in the construction of indicators of fiscal decentralization have been collected through the National Treasury Secretariat (STN), while the Gini Index, years of study, the population and the employed population were obtained from the Brazilian Institute

¹ When necessary, the collected data have been deflated as the literature recommends.

Table 3 – Averages, standard deviations and definitions of the variables used.

| Variables | Average | Standard deviation | Definition |
|------------------------------|-----------|--------------------|---|
| Δ Real GDP | 0.08 | 0.13 | Natural logarithm of the real GDP of each state. |
| Revenue indicator (RI) | 0.03704 | 0.054 | The ratio between the state revenue i and the sum of all revenues in the state. |
| Production indicator (PI) | 0.03704 | 0.0571 | The ratio between the expenditure of state i and the sum of all expenditure by the state. |
| Autonomy indicator (A1) | 0.8189 | 0.0906 | The ratio between the states own revenue and its total revenue, excluding transfers. |
| Autonomy indicator (A2) | 0.5016 | 0.1777 | The ratio between the states own revenue and the total of its revenue. |
| Control Variables | | | |
| Education | 6.42 | 1.53 | Average years of study |
| Degree of commercial opening | 0.04 | 0.04 | Natural logarithm of the ratio between the trade balance and the real GDP of each state. |
| Gini Index | 0557 | 0.048 | Natural logarithm of the coefficient of the Gini Index for each state. |
| Population | 6,764,977 | 8,029,711 | Natural Logarithm of the population of each State |
| Life expectancy | 70.75 | 3.13 | <i>Natural logarithm of the expectation of the population of each state.</i> |
| Occupied population | 2,900,361 | 3,707,348 | <i>Natural logarithm of the number of population occupied by state.</i> |

Source: Own elaboration

of Geography and Statistics (IBGE)², the life expectation were obtained from the data of the DATASUS and finally, the degree of trade openness was taken from IPEADATA through the data of the statistics of foreign trade (AliceWeb – MDIC).

3.4 Preliminary Analyzes

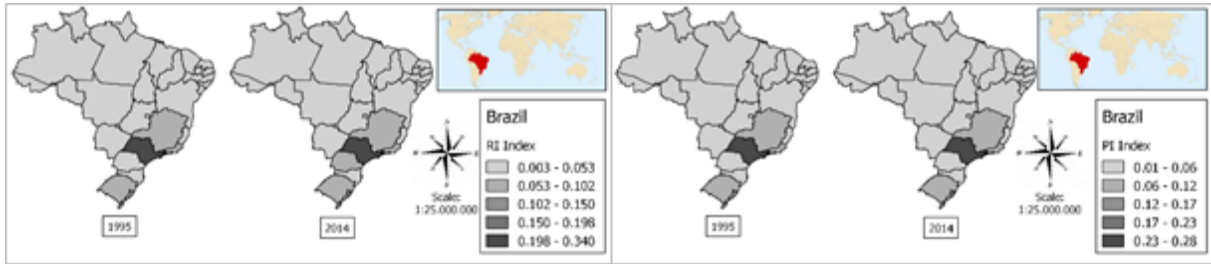
Prior to the estimation, there will be a description of the data. In this regard, the maps contained in Figures 3 and 4 below show the data relating to indexes of autonomy used in the study. The maps present the initial and final year of study, 1995 and 2014, respectively.

In Figure 3 we have the scenarios relating to the revenue and production indicators. Firstly, on analyzing the revenue indicator, RI, it's clear that the situation of the states has hardly changed over the years, with Paraná being the only state who has changed its index, increasing it. However, when analyzing the production indicator, PI, it's evident that the scenario during the period remained the same.³

² For the census years, the data were collected through the Demographic Census.

³ This analysis ignores the small changes in the indicator's values, considering only its leveled distribution.

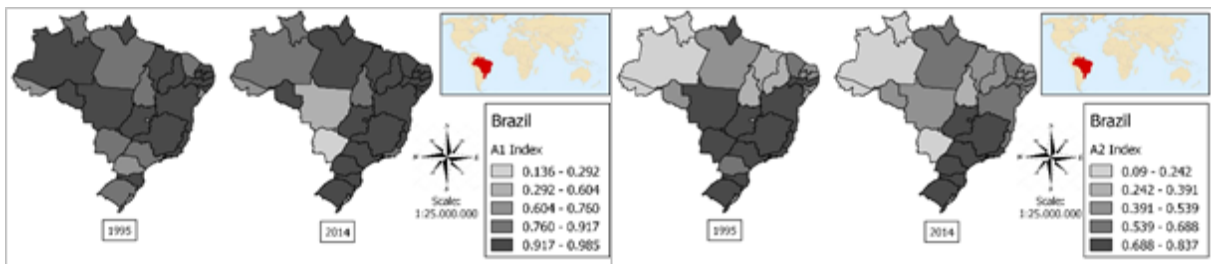
Figure 3 – Maps of revenue indicators (left) and production (right), 1995 and 2014.



Source: Own elaboration of the authors, based on data worked in the research.

Nevertheless, for the autonomy indicators 1 and 2, the scenarios are different, as Figure 4 shows. The left side of the figure, regarding A1, shows that many states have become more fiscally decentralized, seeing that in the year 2014 many had darker colors – demonstrating the highest level of the index. Despite this, there was a reduction of decentralization of other states, such as perceived for the region north and center-west. Finally, the scenario A2, shown by the right side of the figure and the index closer to real independence, shows that, in general, there was a reduction of the indexes for the Brazilian states, since the highest levels are found in the regions southeast and south.

Figure 4 – Maps of the indicators of autonomy 1 (left) and autonomy 2 (right), 1995 and 2014



Source: Own elaboration of the authors, based on data worked in the research.

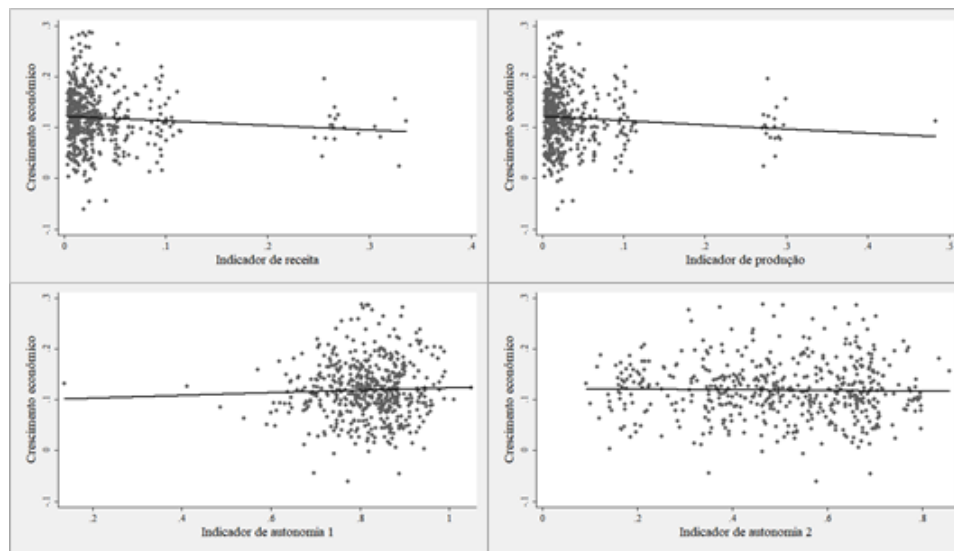
That being said, the next important step is to analyze the correlation between the indicators of decentralization, the explanatory variables, proxies of fiscal decentralization, and economic growth, the dependent variable. Figure 5 below presents, for the study period, the average rate of GDP growth associated with the four indexes of decentralization used in this work:

With the exception of the indicator A1, the simple linear association between economic growth and the autonomy indexes seems to show the existence of a negative relationship between the degree of fiscal decentralization and the economic growth of Brazilian states in the period from 1995 to 2014. In fact, the levels of correlation found for the indicators IR, IP and A2 were -0.0902, -0.0855 and -0.0192, respectively, confirming this impression. To the only positive relationship found, the correlation coefficient was equal 0.0408.

However, the intuition provided by Figure 5 should be treated with caution, since it is well known that economic growth does not depend exclusively on the degree of decentralization of the economy and the possible variables omitted may be influencing the negative relationship observed.

Having that in mind, in order to test the real importance of fiscal decentralization on economic growth of Brazilian states, we estimate the model presented in Equation 3 and we present their main results in the following section.

Figure 5 – Economic growth and indicators of autonomy of the Brazilian states, from 1995 to 2014.



Source: Own elaboration of the authors, based on data worked in the research.

4 Results and discussion

Recently, the effect of the taxation enforcement on economic growth has been the subject of empirical studies, so that the issue became the focus of debates about possible government reforms. In order to contribute to the discussion, the present work uses four types of indicators that measure fiscal decentralization, in addition to control variables, to try to understand the relationship between decentralization and economic growth of Brazilian states.

In table 4 was presented the relationship between the variables studied in the article. The results represent the results obtained from the Stata software for the estimation of the data model in a dynamic panel (GMM). Within the estimates, the variables for education, population, employed population, Gini index, degree of trade openness and life expectancy were considered exogenous to the model. While the variable of fiscal decentralization was considered to be endogenous. All independent variables are in natural logarithm, so the coefficients are interpreted in elasticity.

Using instrumental models with a lag in the dependent variable, we have as a result that the specification test indicated that there was no residual correlation of second order and that the instruments are valid for all the estimated models.

According to the results presented in the table above, the main finding of this study is due to the fact that the indicator of fiscal decentralization A2 is positive and statistically significant to the economic growth of the states in the period analyzed, knowing that the Equation 1.4 is significant for measuring the effect proposed. The A2 positive sign shows evidence that a greater fiscal autonomy represents a higher growth rate. This result is consistent with the findings of Akai e Sakata (2002), which show that fiscal decentralization contributes to economic growth.

Table 4 – Main results of the estimation - 1995-2014.

| Estimator: GMM | Equations | | | |
|-------------------------------|--------------------|--------------------|-------------------|--------------------|
| Variables | (1.1) | (1.2) | (1.3) | (1.4) |
| Δ Real GDP L1. | 10.8 (0.00)* | 5.42 (0.00)* | 7.14 (0.00)* | 13.72 (0.00)* |
| RI | 0.21 (0.83) | - - | - - | - - |
| PI | - - | -0.74 (0.46) | - - | - - |
| A1 | - - | - - | 0.39 (0.69) | - - |
| A2 | - - | - - | - - | 2.96 (0.00)* |
| POP | -0.62 (0.53) | 0.61 (0.54) | -1.40 (0.16) | -0.04 (0.96) |
| EDUC (years of study) | 2.88 (0.00)* | 1.32 (0.18) | 3.13 (0.00)* | 3.68 (0.00)* |
| Occupied population | 0.37 (0.71) | -0.12 (0.90) | -0.08 (0.93) | -0.25 (0.8) |
| GINI | 1.75 (0.08)*** | 1.67 (0.09)*** | 2.18 (0.02)** | 1.78 (0.07)*** |
| Openess | 2.38 (0.01)* | 2.09 (0.03)* | 2.46 (0.01)* | 1.97 (0.04)** |
| Life expectancy | 0.72 (0.46) | -0.17 (0.86) | 0.85 (0.39) | 0.17 (0.86) |
| Constant | 0.1 (0.92) | -0.86 (0.39) | -0.73 (0.46) | 0.19 (0.85) |
| Observations | 513 | 513 | 513 | 513 |
| Sargan Test chi2 Prob>chi2 | 25.93423 (1.00) | 24.6953 (1.00) | 25.3734 (1.00) | 25.744 (1.00) |
| Arellano-Bond Test | | | | |
| Order 1 | -3.9792 (0.00) | -4.1331 (0.00) | -4.1341 (0.00) | -3.9356 (0.00) |
| Order 2 | -0.99346 0.3205 | -0.91856 0.3583 | -0.97816 0.328 | -0.81793 0.4134 |

*** Significant at 10% ** Significant at 5% and *Significant at 1%.

Own elaboration of the authors, based on data worked in the research

With regard to the control variables, the variables related to openness and trade and years of study presented themselves as significant and exerting a positive effect on the growth rate of GDP of the states. Such finding agrees with the results found by [Rodríguez-Pose e Ezcurra \(2010\)](#), in which the authors found the same effects for the variables of human capital and trade openness. [Filippetti e Sacchi \(2016\)](#) found the same result for the trade openness, highlighting the positive effect of this variable on the growth of the economies. In relation to years of study, [Cantarero e Congalez \(2009\)](#) also presented evidence of the contribution of this variable on the economic growth.

Then the Sargan test was conducted to identify super identifying restrictions. The result, presented in the same table, shows that the model tested does not reject the hypothesis that the restrictions are valid. Thus, it was concluded that the instruments used are valid, that is, not correlated with the error term and are, therefore, correctly excluded from the equation estimated, allowing the existence of the model.

And finally, the Test of Arellano-Bond seeks to show the autocorrelation for p differences

in the error term. The results found show that, for the first difference in the error term, the probability of not rejecting the null hypothesis of no autocorrelation is approximately zero. That is, the model does not have evidence of specification error.

5 Final Considerations

Fiscal decentralization is a relevant issue and much debated in the economic literature. For the Brazilian case, this topic became more relevant after the 1988 Constitution, where the states and municipalities gained more freedom related to the provision of public goods and services. Thus, the present work proposed to identify the relationship, if any, between fiscal decentralization and economic growth for the Brazilian states.

Through four measures of decentralization proposed by Akai e Sakata (2002), the estimation performed found positive and significant effect for the variable of decentralization A2, which measures the decentralization as the ratio between the revenue of the states and the total of their revenues. The positive result is in agreement with the expected theoretical support.

This result shows that fiscal decentralization is an important instrument to achieve higher growth rates. In addition, the positive relationship between the rate of growth and the human capital and the degree of trade openness show the types of policies that can be taken to achieve better results in the long term.

These results are important, as they can contribute to the debate on public policies to higher rates of economic growth. For this, policymakers should improve the mechanisms for decentralization, so that to find ways to strengthen the tax structure and to solve the problems of expenditure and revenue redistribution of the government.

Thus, future efforts that aim to contribute to a greater decentralization of the federative entities of the country can also contribute to its economic growth. It is important to note, however, that such evidence should be treated with caution, since the reasons that have resulted in such positive effect of decentralization on growth are not known.

Therefore, a direction that the present study can make, and be enlarged is to seek reasons and evidence of the causes of fiscal decentralization that affect positively the GDP of the Brazilian states. Thus, it is possible to confirm with more accuracy, more efficient public policies.

Finally, some questions deserve to be investigated to improve the understanding of the relationship between the growth rate and fiscal decentralization in the Brazilian states. First, the incorporation of new, more accurate, indicators in relation to growth rate. Second, there can be made simulations of the impacts of the rate of growth through the expansion of the transfers or the tax base itself. Thirdly, it is possible to analyze the case of fiscal decentralization to Brazil at the municipal level.

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