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Intergovernmental Transfers and Economic Development: Spatial Panel Data Analysis in Brazilian States

João Paulo de Oliveira Louzano[1]
jplouzano@gmail.com | 0000-0002-2920-8003

Luiz Antônio Abrantes[2]
abrantes@ufv.br | 0000-0002-4460-125X

Antônio Carlos Brunozi Júnior[2]
acbrunozi@yahoo.com.br | 0000-0001-9372-6246

ABSTRACT

Brazilian Fiscal Federalism makes intensive use of mechanisms of inter-jurisdictional transfers as strategies to combat poverty and regional differences, even while recognizing that, if poorly conceived, they can generate or aggravate existing regional demands and create externalities that affect the behavior of economic development of the recipients´ governments. In this sense, this paper aims to assess the effect of intergovernmental transfers from the State Participation Fund (FPE) on the economic development of Brazilian states. To this end, we employed spatial panel data models for the 27 Brazilian federative units from 1997 to 2016. The results show that when spatial dependence is controlled, the spatially lagged FPE has a negative effect on the GDP per capita of the states. This indicates that the criteria for determining the fund transfers must be expanded, considering other factors besides the sole equalization of horizontal imbalances between states.

KEYWORDS

Intergovernmental transfers; State Participation Fund; economic development; spatial panel.

[1]Universidade Federal de Juiz de Fora, Governador Valadares, MG, Brazil

[2]Universidade Federal de Viçosa, Viçosa, MG, Brazil

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TRANSFERÊNCIAS INTERGOVERNAMENTAIS E DESENVOLVIMENTO ECONÔMICO: UMA APLICAÇÃO DE DADOS EM PAINEL ESPACIAL PARA OS ESTADOS BRASILEIROS

RESUMO

O Federalismo Fiscal brasileiro faz uso intensivo de mecanismos de transferências intergovernamentais como estratégias de combate à pobreza e às diferenças regionais, mesmo reconhecendo que, se mal concebidos, podem gerar ou agravar as demandas regionais existentes e criar externalidades que afetam o comportamento do desenvolvimento econômico dos governos destinatários. Neste sentido, o objetivo deste estudo é avaliar o efeito das transferências intergovernamentais do Fundo de Participação dos Estados (FPE) sobre o desenvolvimento econômico dos estados brasileiros. Para esse fim, utilizou-se o Modelo Espacial de regressão em Dados em Painel para as 27 unidades federativas brasileiras no período de 1997 a 2016. Os resultados encontrados apontaram que ao controlar a dependência espacial, o FPE defasado espacialmente apresenta efeito negativo no PIB *per capta* dos estados, indicando que os critérios para a determinação do repasse do fundo devem ser ampliados considerando outros fatores além da equalização dos desequilíbrios horizontais entre os estados.

PALAVRAS-CHAVE

Transferências Intergovernamentais; Fundo de Participação Estadual; Desenvolvimento Econômico; Painel Espacial.

1. INTRODUCTION

It is clear that intergovernmental transfers are based on reducing disparities between states, by primarily seeking a fiscal balance for entities with low levels of economic activity and, consequently, a low level of tax collection (Brenton, 2020; Shah, 2006; Spahn, 2007; Weingast, 2009). Such transfers are relevant to promoting fiscal cohesion in developed countries (Muinelo-Gallo et al., 2019), and most countries in the Organization for Economic Co-operation and Development (OCDE) have relied on transfer programs as a means of reducing fiscal disparities at the regional level (Martínez-Vázquez, 2015).

In this sense, in Brazil—the country that is the focus of this study—the State Participation Fund (FPE), established after Constitutional Amendment No. 18 of December 1, 1965, focuses on harmonizing and maximizing the well-being of the population. FPE's resources derive from the Income Tax (*Imposto sobre a Renda e Proventos de Qualquer Natureza*, IR) and the Tax on Industrialized Products (*Imposto sobre Produtos Industrializados*, IPI), with a portion of the collected taxes being allocated in the fund. According to data from the National Treasury, in 2019, more than 77 billion Brazilian reais were transferred to the State Participation Fund, showing that this mandatory transfer accounted for the largest portion of the total resources transferred to the Brazilian states.

According to the Brazilian constitutional text, the FPE aims to promote socioeconomic balance between Brazilian states. Therefore, by privileging the less developed regions in the distribution of resources, such transfers would promote economic and social development, so as to help such regions to reach the same levels of development of the other ones (Santos et al., 2018). However,

this does not seem to be the most appropriate argument for the Brazilian case, as, despite several years of distribution favoring less developed regions, such a significant amount of resources has not reflected in their economic development (Salto, 2013).

The initial expectation of the constitutional instrument was that the FPE would reduce income inequality between regions. However, in the view of Castro (2018), this goal has not been achieved, because the convergence of income has not occurred between the different regions of Brazil. Therefore, the FPE operates more as an instrument of fiscal equalization, capable of reducing the horizontal imbalances between the states' capacities (revenues) and needs (expenditures) than properly reducing social and economic inequalities.

The literature on the use of transfers as a means to promoting economic development shows that these mechanisms have remained the object of debate on both theoretical and empirical grounds (Breidenbach et al., 2016; Easterly, 2003; Rajan & Subramanian, 2008). However, most of that debate addresses entire nations (Koetter & Wedow, 2013), and few studies have focused on regional economic interactions. Among them, we can mention Baskaran et al. (2017); Kurniawan and Budiono (2019); Muinelo-Gallo et al. (2019) and Nantharath et al. (2020).

In the specific literature applied to Brazil, several studies analyzed the effects of intergovernmental transfers, among which Baião et al. (2017); Cardoso et al. (2012); Costa and Castelar (2015); Deda and Kauchakje (2017); Louzano et al. (2020); Suzart et al. (2018) and Vieira et al. (2019) stand out. However, a significant share of these studies focused on the effect of transfers at the municipal level, and the theme has become quite consolidated in this sphere. In turn, studies and academic and scientific discussions at the state level are scarce.

Furthermore, previous works on the effects of transfers on the recipient units in the Brazilian context have reached no consensus. Some studies pointed to the positive implications of transfers, such as Cardoso et al. (2012) and Vieira et al. (2019), while others found negative results regarding transfers, such as those by Varejão (2009), Salto (2013), Santos et al. (2018), and Louzano et al. (2020).

Therefore, it has yet to be determined how transfers affect federated states. To this end, we must verify how and how much intergovernmental transfers contribute to reducing regional differences or aggravate existing demands, as well as if all the effects resulting from such transfers occur homogeneously among the Brazilian states. Additionally, as a distinctive element, as for previous works, this study considers the spatial logic of interdependence between states (spatial dependence).

In this sense, considering the importance of this type of transfer to the finances of the states, the following question emerges: how do the transfers made by the State Participation Fund interfere with the economic development of the Brazilian states? To answer the guiding question, we employed the spatial panel data model, to identify the possible effects of the distribution of participation funds throughout the analysis period, while controlling the spatial dependence of the dependent variable. In other words, if the spatial logic of interdependence operates between the states, the location where a given state is inserted would somewhat interfere with the overall transfer effects.

When the spatial effects were considered, the FPE did not play a significant role in reducing economic inequalities between states, while it may have aggravated their disparity. Hence, this paper contributes to the dynamics of fiscal transfers as an explanatory factor of the changes occurring (or not) in the degree of economic development of Brazilian states. It aims to verify

whether the FPE has had any effect on regional differences over the past 20 years; that is, whether or not it has fulfilled the initial expectations upon its creation in 1966, and its reaffirmation, which resulted from the promulgation of the 1988 Constitution.

2. THEORETICAL FRAMEWORK

2.1. Intergovernmental Transfers and Economic Development

The classic approach to fiscal federalism, presented in seminal works by Tiebout (1956) and Oates (1972), does not explicitly consider the relationship between fiscal decentralization/transfer mechanisms and economic development. However, as Yushkov points out (2015), studies in this field of knowledge have become particularly relevant and increasingly frequent, especially after the decentralization reforms of the late 1980s and early 1990s, implemented in countries such as China, Russia, and the former Soviet republics.

One of the main mechanisms of resource decentralization in federations, intergovernmental transfers are the instrument adopted by most federated states to achieve the redistribution of public resources between regions (Baskaran et al., 2017). However, these transfers tend to be controversial if the granting regions must subsidize the recipients for prolonged periods. Indeed, discontent on their part can lead to growing support for separatist movements and facilitate political disintegration (Baskaran et al., 2017).

Many are the reasons why countries may want to subsidize selected regions through intergovernmental transfers (Schroeder & Smoke, 2003), even if these can exacerbate political tensions and create conflicts between the paying and recipient states (Baskaran et al., 2017). The main reason is that transfers can promote regional economic growth (Shah, 2006). Subnational jurisdictions can invest transferred resources to expand regional infrastructure, promote structural change, and attract innovative companies (Baskaran et al., 2017).

Nonetheless, the literature on the subject diverges as for the use of transfers to promote economic development. In general, convergence theories argue that the policy of allocating resources to poorer regions is sensible, provided that they have growth potential (Barro et al., 1991). In this case, as Santos et al. (2018) point out, transfers would contribute to reducing the socioeconomic gap between regions, as additional investments in weaker economies would potentially result in stronger economic growth compared to the more developed regions.

Given such arguments, most federations provide considerable resources to less developed regions through intergovernmental transfer systems (Bird & Smart, 2002; Bird & Tarasov, 2004). However, as Baskaran et al. (2017) argue, the question of whether the recipient units actually use those transfers to foster their growth has yet to be answered.

As stated earlier, transfers can bring negative externalities to the fiscal management of recipient units (Bird & Smart, 2002; Lewis & Smoke, 2017), such as reducing fiscal effort (Oates, 1999; Peterson, 2007) through the increase of public spending (Bahl & Linn, 1994; Wyckoff, 1991; Fisher, 1982). Therefore, in the face of higher levels of development and the consequent increase in revenues from the recipients' own sources, the receipt of transfers is expected to decrease in the future. According to Kessler et al. (2011), this implicit tax on the increase in revenues from their own sources reduces incentives to invest transfers in projects that generate growth. Therefore, the recipient units may prefer to invest the transferred funds to achieve consumption purposes or subsidize other expenses that do not promote development.

Specific evidence in the literature (Breidenbach et al., 2016; Koetter & Wedow, 2013) indicates that transfers slow rather than speed the development of transfer-dependent regions. A classic example is southern Italy, referred to as *Mezzogiorno*, which has remained less developed despite having received large transfers from the North for decades (Putnam, 2015). The Italian case is so famous that *Mezzogiorno* is often used to describe a perpetually dependent region, despite receiving considerable transfers (Baskaran et al., 2017).

When analyzing the European Structural and Investment Funds (ESIF), Breidenbach et al. (2016) found that the incorporation of spatial dynamics (which are decomposed into a direct and a spatially indirect component) is negatively correlated with regional development. Regarding the factors that led to these results, the negative spatial effect obtained may reflect the role played by policy-induced spatial competition between neighboring regions. We can highlight the delay in technological endowments and economic structures in highly financed regions.

According to Breidenbach et al. (2016), controlling spatial dependence is crucial to analyze the effect of transfers on economic development. For the authors, the specification and interpretation of regression models with panel data with the mutual space-time dynamics become quite complex, if the focus is on the effect of a specific policy variable.

In this sense, Mohl and Hagen (2010) and Alecke et al. (2013), among others, show that it is necessary to control the global spatial spillover effects, as the levels of regional growth depend strongly on the performance of neighboring regions.

Baskaran et al. (2017) analyzed the effect of intergovernmental transfers on the economic development of West German states from 1975 to 2005. The results suggest that transfers do not promote economic development, probably because beneficiaries tend to use the funds received to subsidize declining industries.

In line with the previous work, Koetter and Wedow (2013) controlled the spatial effects to analyze transfers to subnational units in Germany, in the period between 1992 and 2005. The findings showed a negative effect on economic development, suggesting that regional redistribution was ineffective, potentially due to the lack of spatial concentration to create growth poles and the institutional factors pertinent to the recipient units.

However, other studies have found positive results. Kurniawan and Budiono (2019) analyzed the impact of fiscal decentralization on regional economic development and its influence on regional income disparity between regions and municipalities in the province of West Sumatra, Indonesia, between 2011 and 2017. The authors found that the combination of local own income and intergovernmental transfer positively affects regional economic growth and reduces regional income disparity.

Muinelo-Gallo et al. (2019) investigated the equalizing role of intergovernmental transfers in Uruguay from 2006 to 2014 and simulated the effects of a new transfer system. The proposed system would reduce the horizontal fiscal disparities: transfers from the central government would have a more significant role in terms of reducing regional inequalities than the current system.

Nantharath et al. (2020) verified whether fiscal decentralization contributed positively to economic growth Thailand, in the period from 2004 to 2017, and found that five regions of the country showed a positive tilt.

However, it is difficult to causally link transfers to low levels of growth based on anecdotal evidence, as it is not clear if economic development in regions dependent on transfers would have been worse without receiving the transfers (Baskaran et al., 2017; Dawid et al., 2018).

As the analysis of the empirical literature reveals, and as Carniti et al. (2019) point out, the relationship between fiscal decentralization, transfers, and economic development is still inconclusive in studies between countries and regions. Furthermore, it is highly dependent on several factors, such as the transversal and temporal structure of the data (number of countries or regions analyzed, time frame, the inclusion of structural shocks and crises in the period considered) (Ligthart & Van Oudheusden, 2017); econometric methods of analysis; the choice of fiscal decentralization measures (decentralization of revenues and expenses, transfers); the control variables included in the econometric model; and the presence of spatial dependence; that is, if there is a spatial logic of interdependence between states, of spillover between neighboring regions, the effect of the location in which a given state is inserted would somewhat interfere with the transfers effect.

In this context, two hypotheses are proposed:

- **H_1:** FPE transfers have immediate positive implications for the local economic development of Brazilian states.
- **H_2:** FPE transfers have negative implications for the local economic development of Brazilian states when spatial dependence between neighboring states is considered.

Therefore, in principle, the increase in fiscal resources available to states through received transfers allows states to invest in policies that promote economic development (Baskaran et al., 2017). However, when spatial dependence is considered, it is possible to control the effects of the location wherein the state is inserted (Breidenbach et al., 2016). Furthermore, this allows us to verify how the similar characteristics of different regions of Brazil can influence the use of transfers by the recipient states, as these are influenced by the mimetic behavior of states in their relationship with their neighboring states.

3. METHODOLOGICAL PROCEDURES

To assess the impact of FPE transfers on the economic development of Brazilian states, we created a sample with all 27 Brazilian Federative Units, comprising the period from 1997 to 2016, organized into a balanced panel with a total of 540 observations. The time frame was chosen due to the availability of data for the dependent, explanatory variables, and other controls to be used in the panel.

Brazil was chosen as a unit of analysis because it has consistent data and a reasonable number of federative units (27 states), in addition to presenting great economic development, and institutional variability among its federative units. Even more importantly, the country annually distributes a vast amount of resources among its states through the FPE. Along these lines, states with below-average tax revenues receive transfers from states with above-average tax revenues, as well as from the federal government.

3.1. Analytical Operations

To achieve the objective of this study, we employed the Exploratory Spatial Data Analysis (ESDA) and the spatial panel data model. This choice is justified by our intention to identify possible effects of the FPE distribution over the analyzed period and control the spatial dependence of the dependent variable; that is, to find out if the spatial logic of interdependence between states, or the location in which they are inserted would somewhat interfere with the transfers.

According to Anselin (1992), spatial models are instruments capable of quantifying the behavior of individuals, according to their interaction with other individuals present in the same space. Unlike traditional econometrics, this method considers spatial effects, such as spatial dependence and heterogeneity between individuals (Anselin, 2003).

To conduct the ESDA, we must adopt a spatial weights matrix (W). According to Almeida (2012), this is an *n* by n square matrix, whose elements denote the degree of spatial connection between the micro-regions under analysis, while following proximity criteria. In this study, the proximity criterion will be based on contiguity, as both the statistical analyses and the estimates of the spatial models will be performed considering a first-order Queen contiguity neighborhood matrix, normalized on the line.

3.2. The spatial regression model with panel data

Considering that the estimation of the econometric model using panel data leads to more robust results than those using the cross-section methodology, we employed it in combination with spatial operationalization. Generally, this model is more informative, contains more variation and less collinearity between variables, and increases the degrees of freedom and estimation efficiency (Elhorst, 2003; Hsiao, 1986). Therefore, as Almeida (2012) points out, spatial heterogeneity must be controlled through the use of fixed or random-effects models. In this paper, the choice between the models will be based on the Hausman test.

The fixed-effects model with spatial dependence assumes that the differences between the regions are captured in the different intercepts. According to Almeida (2012), this model aims to capture the unobservable heterogeneity in the socio-economic, institutional, and political structures of the regions. The general specification of the spatial fixed effects model can be represented by equations (1) and (2):

$$y_t = \alpha + \rho W_1 y_t + X_t \beta + W_1 X_t \tau + \xi_t \quad (1)$$

$$\xi_t = \lambda W_2 \xi_t + \varepsilon_t \quad (2)$$

Where α corresponds to the unobserved heterogeneity; $W_1 y_t$ it is the spatial lag of the dependent variable; $W_1 X_t$ represents the lagged explanatory exogenous variables; $W_2 y \xi_t$ are the spatially lagged error terms; ρ and λ are the scalar spatial parameters; τ is a vector of spatial coefficients and W is the spatial weights matrix.

An alternative model to the fixed effects model would be the random-effects model with spatial dependence, which considers the unobserved and time-invariant effects, which are specific to each region as random variables. The random-effects model treats unobserved effects as components of the random error term, but not as parameters to be estimated. The general specification of the spatial random effects model can be represented by equations (3) and (4):

$$y_t = \rho W y_t + X_t \beta + W X_t \tau + \xi_t \quad (3)$$

$$\xi_t = \alpha + \lambda W \xi_t + \varepsilon_t \quad (4)$$

By starting from the general models of spatial dependence and imposing some restrictions on the behavior of the parametersρ, λ and τ, we can specify different forms of fixed and random spatial effects models. Three models for the control of spatial dependence were employed, namely the *Spatial Autoregressive* (SAR) model (inclusion of the spatially outdated dependent variable), the *Spatial Error Model* (SEM) (presence of spatial autocorrelation in terms of model error), and the *Spatial Durbin Model* (SDM) (inclusion of both the spatially lagged dependent variable and the spatially lagged explanatory variables on the right side of the regression).

As the type of spatial dependence that the estimated model will present is unknown a priori, we conducted the procedures for estimating models with spatial dependence, as suggested by Almeida (2012) and Belotti et al. (2017).

First, the Breusch-Pagan (BP) test was performed to verify if the unobserved effects are relevant to be incorporated into the constructed model. As the BP test indicated that the variance of unobservable effects was statistically different from zero, the Hausman test was performed to find out which is the most appropriate model of unobserved effects: the fixed-effects or the random-effects model. Finally, the model indicated by the Hausman test was estimated.

Residues were checked to verify the presence of spatial dependence, and the unobserved effects models with spatial dependence SAR, SEM, and SDM were estimated. The best model was selected using the LeSage and Pace (2009) and Elhorst et al. (2010) selection strategy, considering the goodness of fit of the model, according to the Akaike and Schwarz Information Criteria; that is, the smaller a model is, the more appropriate. The analysis was performed having as reference the spatial econometric model, in stacked form, represented by equations 5 and 6:

$$PIB_t = \alpha + \rho W_1 TxPIB_t + Z_t\delta + \xi_t \quad (5)$$

$$\xi_t = \alpha + \lambda W_2 \xi_t + \varepsilon_t \quad (6)$$

Where the term $PIB_t = (PIB_{1t},\ldots, PIB_{nt})$ is the vector of GDP per capita, representing the economic development of Brazilian states i in period t; $\alpha = (\alpha 1,\ldots,\alpha N)$ represents a constant; W_1 is a spatial weights matrix, so that $W_1PIB_t = (W_1PIB_{1t},\ldots, W_1PIB_{nt})$ is the spatial lag vector of the dependent variable and ρ is the spatial lag coefficient $Z_t = (Z_{1t},\ldots, Z_{nt})$ is the matrix that represents the other explanatory variables (FPE, EDU, CapEx, CurEx, DTO, CND) and $\delta = (\delta 1,\ldots,\delta k)$ is the vector of coefficients; $\xi_t = (\xi_{1t},\ldots, \xi_{nt})$ represents the autocorrelated error term; $\varepsilon_t = (\varepsilon_{1t},\ldots, \varepsilon_{nt})$ denotes the vector of independent and identically distributed errors (i.i.d) with variance σ^2; λ means the spatial autocorrelation coefficient of the error term; W_2 reveals a spatial weights matrix, so that $W_2\xi_t = (W_2\xi_{1t},\ldots, W_2\xi_{nt})$ represents the lag vector of the error term.

Table 1 presents the variables used and their main characteristics. The period from 1997 to 2016 was considered for the panel. Furthermore, all monetary variables were deflated according to the General Price Index – Internal Availability (IGP-DI) based on 2017 and subsequently transformed into a natural logarithm, except for the variables presented by indexes, such as capital expenditure to GDP ratio (CapEx), current expenses to GDP ratio (CurEx), Consolidated Net Debt (CND) to Current Net Revenue (CNR) ratio, and human capital proxy used in its normal form.

Table 1
Description of the variables used in the model

Variable	Description	Expected sign	Unit of measurement/Natural logarithm
PIB_t	GDP per capita		R$ (in thousands of Brazilian reais)/population
FPE	State Participation Fund per capita	-	R$ (in thousands of Brazilian reais)/population
EDU	Human proxy capital	+	Average years of schooling among people aged 25 and over
CapEx	Capital expenditure to GDP ratio	+	R$ (in thousands of Brazilian reais)
CurEx	Current expenditure to GDP ratio	-	R$ (in thousands of Brazilian reais)
DTO	Degree of trade openness	+	Sum of exports and imports
CND	Consolidated Net Debt (CND) to Current Net Revenue (CNR) ratio	+	Cash amount

Source: Prepared by the authors.

FPE transfers are expected to have an immediate positive effect on the local economic development of Brazilian states (Hypothesis H1) (Baskaran et al., 2017). However, when spatial dependence is considered, the effect becomes negative (Hypothesis H2) (Breidenbach et al., 2016). In addition to the variable of interest (FPE), we adopted macroeconomic and educational indicators such as control variables and potential determinants of economic development in the regression model.

In the set of conditional information, the EDU variable was included as a human capital proxy, represented by the average years of schooling of the population above 25 years at the beginning of each subperiod. The objective was to capture the human capital stock, expecting that states with the highest stock will also have higher income levels over the analyzed period (Lucas, 1988; Mankiw et al., 1992).

As a representation of the macroeconomic variables of each state, we employed capital expenditure, current expenditure, degree of trade openness, and Consolidated Net Debt to Current Net Revenue ratio. As for the other variables that make up the model, the capital expenditure of the states is expected to have a positive effect on economic development. Indeed, investment in productive areas is one of the main factors used to explain growth models (Cullison, 1993).

Investments in revenue models are subdivided into public and private, and non-interventionist models attribute greater weight to private investments. However, Aschauer (1989) found a positive correlation between public investment and productivity, showing that low productivity growth is not associated with the adoption of a lower public investment strategy. On the other hand, as for current expenditure, they are expected to have a negative relationship with development, as these funds are seldom allocated in the productive sectors.

As for the degree of trade openness, measured by the sum of exports and imports in the current rate of US dollars, a positive effect on economic development is also expected. Smith (1776), in his classic work *An inquiry into the nature and causes of the wealth of nations*, argued that free

trade is an extremely important factor for economic growth. This statement, in turn, stimulated the literature in the area to conclude that there is a positive correlation between international trade and economic development, as presented in the studies of Lee (2011), Lee et al. (2004), Krueger (1997), and Ventura (2005).

Finally, we expect to find a negative association between indebtedness, measured from the Consolidated Net Debt to the Current Net Revenue ratio, and economic development, as indicated by the endogenous growth model with public capital and public debt by Greiner (2008), as well as the empirical evidence presented in the works of Kumar and Woo (2010) and Reinhart and Rogoff (2010).

4. RESULTS AND DISCUSSION

4.1. Descriptive Analysis and Spatial Correlation

Considering that the behavior of a variable of a given state can be affected by the behavior of the surrounding states (thus confirming a spatial dependence), we employed Exploratory Spatial Data Analysis (ESDA) to find associative patterns of data in space; that is, to identify the presence of spatial components. To verify the spatial association of the variable of interest (FPE per capita) with the dependent variable (GDP per capita), the bivariate Local Moran's I test was performed, as shown in Figure 1.

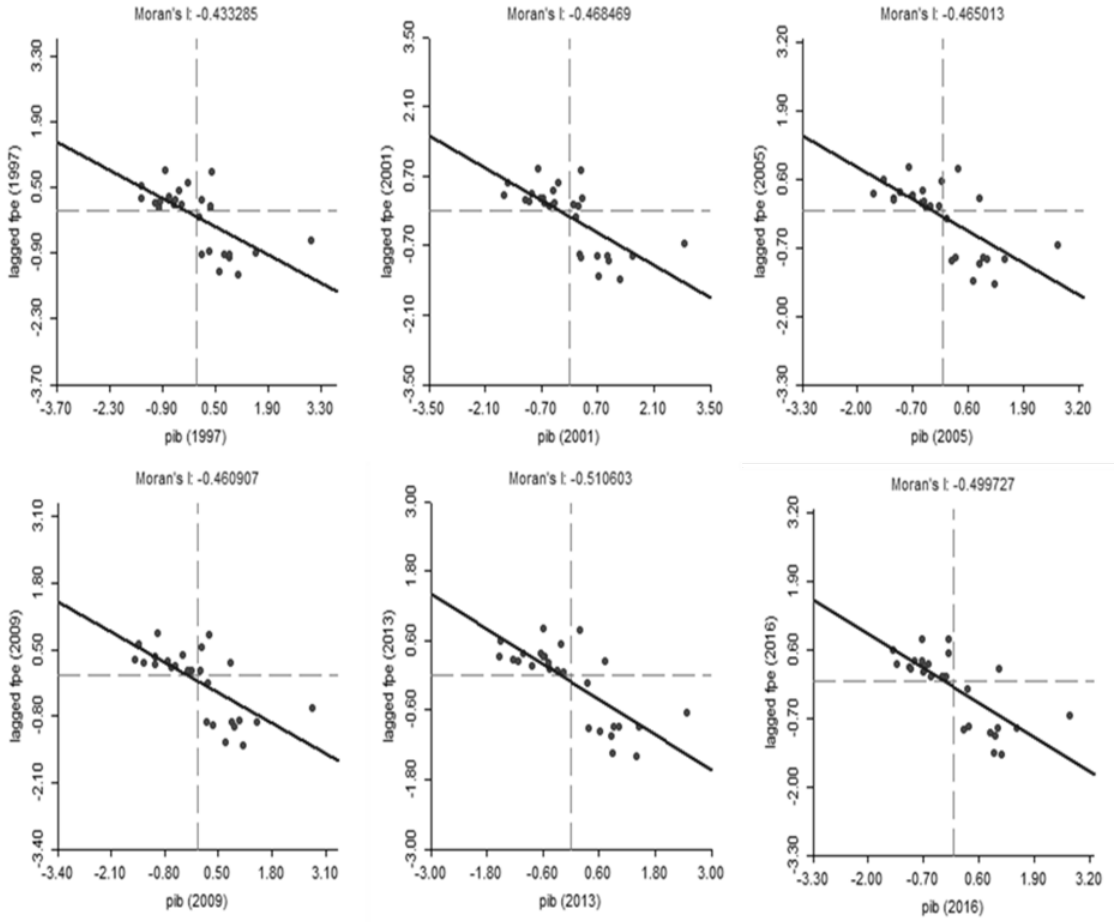

Figure 1 – Bivariate Moran's I Dispersion Diagram / GDP and FPE.
Source: Prepared by the authors.

There is a negative spatial autocorrelation between GDP per capita and FPE per capita for all periods. This implies that states with high (low) GDP values are associated with states with low (high) values of the considered variable. This relationship points to the possible ineffectiveness of FPE transfers in reducing regional inequalities. It is possible to visualize a concentration of states in the high-low quadrant; that is, those receiving high transfer amounts from the FPE and having low GDP per capita. For better visualization of the clusters found, Figure 2 shows the results of the bivariate Local Moran's I test, combined with the LISA clustering maps.

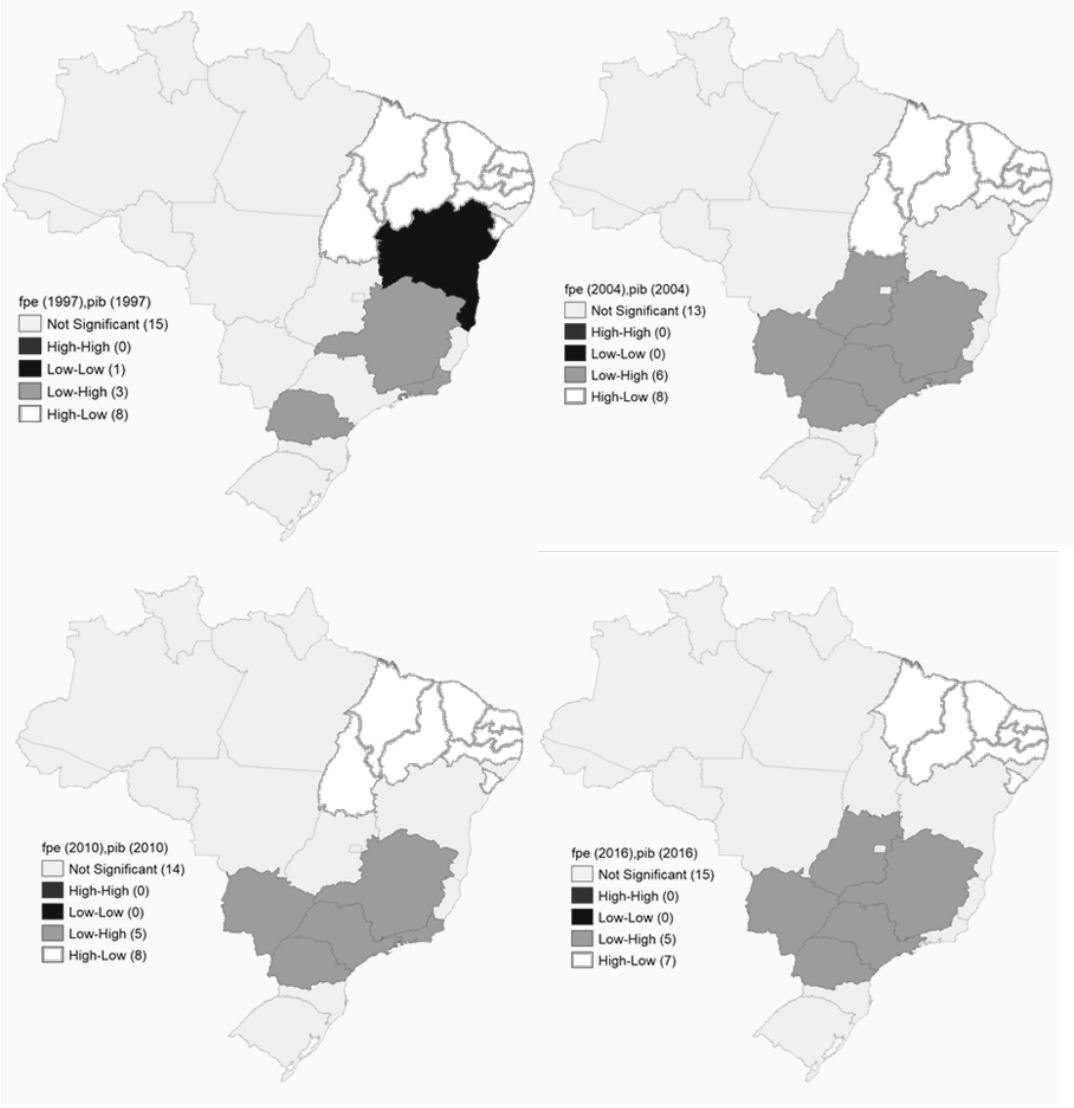

Figure 2 – BiLISA cluster map / FPE per capita and GDP per capita.
Source: Prepared by the authors.

Figure 2 shows the two large clusters we discovered: the first is a high-low cluster, with high FPE per capita values and low GDP, formed by states in the Northeast region and the state of Tocantins; and a low-high cluster, formed predominantly by the states of the Southeast region, in addition to some states in the South and Center-West regions. The clusters point to the presence of spatial dependence on the variables used and the possible absence of explanatory power of the FPE to reduce inequality between states. However, this does not mean that the fund was not or has not remained significant for the states; on the contrary, this may indicate that it is

not enough to distribute or equalize revenues to generate development, prosperity, and income, consumption, and production growth.

4.2. Results of the spatial regression model with panel data

The first issue to be considered is the presence or absence of spatial dependence. There is no single answer to this question since there is no universal test that can assist in the decision. Therefore, we employed the testing proposed by Pesaran (2004), which is a variation of the classic Breusch-Pagan test, to ascertain the presence of spatial dependence in the model. In the Pesaran test, the null hypothesis of non-transversal dependence was rejected. Therefore, there is sufficient evidence to suggest the presence of spatial dependence. Hence, the unobserved effects models with spatial dependence were estimated: SAR, SEM, and SDM, as shown in Table 2.

After estimating these models, the best one was selected using the Hausman test – the random-effects model was compared to the model estimated by fixed effects. The null hypothesis of the test for the absence of systematic difference in the coefficients estimated by the two methods was rejected with 1% significance for the SAR and SEM models. The SDM model was significant at 10%. Therefore, the test indicated that the fixed-effects model is the best choice, over the random-effects model.

To choose which spatial model is more appropriate, we employed the selection strategy by LeSage and Pace (2009) and Elhorst et al. (2010), as well as the Akaike and Schwarz information criteria. The SDM model was the one that presented the best fit and, therefore, will be used as a reference for the analysis of the results.

The coefficient associated with the FPE interest variable per capita was significant both in the main equation (FPE) and in the spatial lag (), but with opposite signs. In the positive coefficient considering the main equation (FPE), the hypothesis H_1 was not rejected. Hence, in principle, the increase in fiscal resources allows states to invest in policies that promote economic development (Baskaran et al., 2017). On the other hand, the negative coefficient, when considering the spatially outdated explanatory variables, does not reject the hypothesis H_2. When considering spatial dependence, that is, the effect of neighbors, the FPE (has a negative effect on GDP per capita. This result is similar to that found in Baskaran et al. (2017), Breidenbach et al. (2016), and Koetter and Wedow (2013).

The model's variable of interest () was significant and showed a negative sign. This indicates a negative association between FPE per capita and GDP per capita, as already indicated in the ESDA. This implies that states with low GDP values are associated with states with high values of the considered variable. This relationship points to the possible ineffectiveness of FPE transfers in reducing regional inequalities.

However, even if the FPE's explanatory power is rejected in terms of reducing inequality between states, this does not mean that the fund was not or has not remained important for the states. On the contrary, the data may indicate that it is not enough to distribute or equalize revenues to generate development, prosperity, and income, consumption, and production growth; it is also necessary to consider other factors that render the policy ineffective, such as the current design of the transfer system and other institutional and cultural factors.

Table 2
Results of the model with spatial effects estimation

Variables	Fixed Effect – SEM	Fixed Effect – SAR	Fixed Effect – SDM
Main Equation			
FPE	0.7646***	0.3121**	**0.7566***
	(0.1381)	(0.0899)	**(0.2184)**
EDU	0.0313	0.0125***	**0.0424****
	(0.0223)	(0.0156)	**(0.0203)**
CapEx	-0.1809	0.0583	0.1446
	(0.3256)	(0.3811)	(0.2706)
CurEx	-0.8440**	-1.1427***	**-0.9678****
	(0.4090)	(0.4390)	**(0.4293)**
DTO	0.0520***	0.0226	**0.0528****
	(0.0172)	(0.0120)	**(0.0204)**
CND	-0.0407*	-0.0483	**-0.0561*****
	(0.0223)	(0.0271)	**(0.0216)**
Lagged values equation: Weighted (Spatially Lagged)			
λ	0.6639***		
	(0.0343)		
ρ		0.5408***	**0.5978*****
		(0.0558)	**(0.04230)**
W_{FPE}			**-0.5848*****
			(0.1959)
W_{EDU}			0.0027
			(0.0234)
W_{CapEx}			**1.3207*****
			(0.3967)
W_{CurEx}			-0.3134
			(0.6445)
W_{DTO}			**-0.0524***
			(0.0276)
W_{CND}			-0.0106
			(0.0406)
Hausman Test	0.0000	0.0000	0.0632
Akaike Inf Criterion	-1295.057	-1233.464	**-1318.667**
Schwarz Criterion	-1260.724	-1199.131	**-1258.585**
SAR/SDM test	108.92	0.000	Choice: **SDM**
SEM/SDM test	36.21	0.000	Choice: **SDM**

Notes: (i) the values in parentheses refer to standard errors and (ii) significance levels *** p < 0,01; ** p < 0,05; * p < 0,1, (iii) λ is the spatially lagged error term and ρ is the spatially lagged dependent variable, and (iv) the variables with the prefix W in the SDM model are the spatially lagged explanatory variables.
Source: Prepared by the authors.

In this regard, although the revenues from FPE transfers are important to equalize the offer of minimum public services, in principle, an increase in fiscal resources allows states to invest in development policies which can nonetheless lead the recipient unit to experience undesired indirect effects. This can be identified from the expansive effect that the FPE has on state expenditure, which, in turn, has a negative effect on overall economic development.

Another negative externality is that, as the FPE has an expansive effect on spending and a reducing effect on the fiscal effort, the recipient units tend to increase their indebtedness, especially in periods of low economic growth and, consequently, of lower transfers of funds from the Federal Government to the states. The high dependence of states on transfers from the Federal Government means that in such periods the states resort to indebtedness to defray their expenditure, which, in turn, had often inflated in previous periods due to the wide availability of resources granted by the fund. As a consequence of this dynamic, indebtedness negatively affects the region's economic development, as expressed by the significant and negative coefficient of the CND variable.

As for the other control variables in the main model, without lagging, only the capital expenditure variable was not significant, although it showed the sign pointed out by the literature. The education variable used as a human capital proxy and the degree of trade openness were significant and showed a positive sign, as expected. As is already consolidated in the literature, states with a higher stock of this type of capital showed a higher level of income over the period. As for trade openness, the assumption is that by entering the international market, the state enhances its productive efficiency, which results from the superior use of economies of scale and allocation of resources in the economy.

In the spatiality model, regarding the parameter ρ, which is the spatially lagged dependent variable, it showed a positive and significant effect, demonstrating the positive spillover of GDP in the economic dynamics of the surrounding states. This demonstrates that, when a given state grows, part of that growth also ends up benefiting the neighboring states, creating a favorable growth cycle.

In turn, as for the other variables in the model, the human capital proxy variables and spatially lagged current expenditure were not significant. The variable capital expenditure, which had not been significant in the main model, was significant and showed a positive effect. A possible explanation for this may be that capital expenditure in neighboring regions, mainly related to health, education, transport, and flow infrastructure, can benefit the neighboring states.

Regarding the negative effect of the neighbors' trade openness on economic development, this result can be explained by the fact that a state with an increased degree of trade openness in its surroundings tends to attract human capital, due to the higher wages opportunities, as well as investments in physical capital. This, in turn, weakens its surroundings.

Finally, additional regressions to establish the robustness of the previous results explores whether the estimates are similar if dummy region variables are employed and if the effects are homogeneous in the different quantiles of the sample. Therefore, we report our estimations using the OLS and Quantile Regression Panel Data in Table 3.

Table 3
Quantile and OLS regression results – robustness tests

Variables	OLS	q.25	q.50	q.75
FPE	-0.0988***	-0.0911***	-0.0911***	-0.0913***
	(0.0167)	(0.0192)	(0.0216)	(0.0218)
EDU	0.2340***	0.2497***	0.2298***	0.2229***
	(0.0099)	(0.0114)	(0.0128)	(0.0129)
CapEx	1.5657***	2.411***	1.4116***	1.4116***
	(0.4043)	(0.4663)	(0.5234)	(0.5285)
CurEx	-1.4630***	-0.8211**	-1.1776***	-2.0099***
	(0.2779)	(0.3205)	(0.3598)	(0.3633)
DTO	-0.0370***	-0.0199***	-0.0187**	-0.0402**
	(0.0061)	(0.0071)	(0.0079)	(0.0080)
CND	-0.1008***	-0.0697***	-0.0643***	-0.0935***
	(-0.0935)	(0.0171)	(0.0643)	(0.0194)
NORTH	-0.3210***	-0.3402***	-0.3108***	-0.2531***
	(0.0435)	(0.0501)	(0.0563)	(0.0568)
NORTHEAST	-0.4053***	-0.3834***	-0.4089***	-0.3793***
	(0.0395)	(0.0455)	(0.0511)	(0.0516)
MIDWEST	0.0534	0.0395	0.0422	0.0715
	(0.0356)	(0.0411)	(0.0461)	(0.0466)
SOUTH	0.0278	0.0529	-0.0068	0.0502
	(0.0316)	(0.0364)	(0.0409)	(0.0413)

Notes: (i) the values in parentheses refers to standard errors and (ii) significance levels *** p < 0,01; ** p < 0,05; * p < 0,1
Source: Prepared by the authors.

Is important to explain that the robustness tests were not estimated considering the spatial dependence for these reasons: i) first, the fixed effects model is the best choice for this research, instead of the random effects model. The SDM model uses the within estimator, making it impossible to include dummy variables, since all variables that are constant over time are excluded of estimation; ii) second, methods for quantile regressions in spatial models are brand new, involve Bayesian estimation (Sánchez et al., 2020), and still do not have friendly estimation packages. Also, the estimation involves a complicated neighborhood criterion, a state of the 75th quantile may have neighbors of the 50th and 25th quantiles, which would make the estimation not operable.

In this regard, the robustness tests showed that the results are qualitatively similar, with no distortions of the coefficients found considering the spatial dependence. Additionally, our results remain the same regardless of the region dummy included or the quantiles analyzed.

5. FINAL REMARKS

The results show that when spatial dependence is controlled, the spatially lagged FPE has a negative effect on the states' GDP per capita. This demonstrates that the criteria for the distribution of funds, such as the design of the transfer system, must be elaborated considering other factors besides the equalization of horizontal imbalances between states. As for the indirect

effects of FPE, two negative externalities of the transfer to the states have been identified: the first is the expansive effect that FPE has on state expenditure, which, in turn, leads to negative consequences in the scope of economic development. The second negative externality is that as the FPE has an expansive effect on expenditure and a reduction effect on the fiscal effort, states tend to increase indebtedness as a result of this dynamic. This, in turn, negatively affects the region's economic development.

The results also confirmed the positive effect of the spatially lagged dependent variable, due to the spillover effect of GDP on the economic dynamics of the surrounding states. This shows that, when a given state grows, a portion of that growth also ends up benefiting the states around it, thus creating a virtuous cycle of growth.

Furthermore, as already pointed out in the literature, the positive effect of education (human capital proxy) and the degree of trade openness must be highlighted as drivers of economic development. This calls attention to the importance of policies aimed at other factors of production that may influence product development, such as education and other determining factors affecting economic development.

The evidence observed in this study indicates that the FPE has not played a significant role in the process of reducing inequalities between states. Furthermore, according to the model's results, it may have aggravated the disparity scenario. Although the FPE presents an apparently positive effect when its exclusively direct effect on economic development is observed, the results point to the opposite direction, when the potential indirect effects are verified, and the spatial dependence is controlled.

It is clear that the results expected on the regional economic dynamics upon the creation of the FPE have not been achieved, especially when considering the effects of time, and the location and neighborhood in which a given federate entity is inserted. However, the explanation does not lie in the failure of the Brazilian federative state or the use of the transfer mechanism itself. Instead, it is probably associated with the absence of institutional mechanisms that encourage the allocation of the resources received by states via the FPE in initiatives that can promote economic growth, expansion of local infrastructure, and boosting private investment decisions.

Therefore, the path to revitalizing the FPE or any other policy that may replace it involves acknowledging that other structural and institutional factors are more significant and relevant to the development process than the mere fiscal equalization through the use of governmental transfers, even though these are paramount to safeguard a minimum offer of public services to the states.

In this sense, policies that simply aim to increase or change the FPE distribution percentages are likely to continue generating unsatisfactory results as for their primary objective, that is, to reduce economic disparities between states. The evidence presented herein indicates that other structural and institutional factors should be included in the debate on the FPE. By not considering other development constraints, the policy of allocating resources through the FPE has not been effective and may be reinforcing the scenario of inequalities between Brazilian states with disparate levels of development. Therefore, new policies and changes in the FPE must be associated with mechanisms that stimulate investment, health and education expenditure, and the other productive factors pointed out by the literature that may promote economic development among the states. This, in turn, will make the distribution of resources through the FPE into an accessory mechanism to the broader policy to reduce regional inequalities, but not its exclusive or primary instrument.

REFERENCES

Alecke, B., Mitze, T., & Untiedt, G. (2013). Growth effects of regional policy in Germany: results from a spatially augmented multiplicative interaction model. *The Annals of Regional Science*, *50*(2), 535-554. https://doi.org/10.1007/s00168-012-0503-7

Almeida, E. (2012). *Econometria Espacial Aplicada*. Editora Alínea.

Anselin, L. (1992). Space and applied econometrics: Introduction. *Regional Science and Urban Economics*, *22*(3), 307-316. https://doi.org/10.1016/0166-0462(92)90031-U

Anselin, L. (2003). Spatial Externalities, Spatial Multipliers, And Spatial Econometrics. *International Regional Science Review*, *26*(2), 153-166. https://doi.org/10.1177/0160017602250972

Aschauer, D. A. (1989). Is public expenditure productive? *Journal of Monetary Economics*, *23*(2), 177-200. https://doi.org/10.1016/0304-3932(89)90047-0

Bahl, R. W., & Linn, J. F. (1994). Fiscal decentralization and intergovernmental transfers in less developed countries. *Publius The Journal of Federalism*, *24*(1), 1-20. https://doi.org/10.1093/oxfordjournals.pubjof.a038105

Baião, A. L., Cunha, A. S. M. d., & Souza, F. S. R. N. d. (2017). Papel das transferências intergovernamentais na equalização fiscal dos municípios brasileiros. *Revista do Serviço* Público, *68*(3), 583-610. https://doi.org/10.21874/rsp.v68i3.1406

Barro, R. J., Xavier Sala, I. M., Blanchard, O. J., & Hall, R. E. (1991). Convergence Across States and Regions. *Brookings Papers on Economic Activity*, *1991*(1), 107-182. https://doi.org/10.2307/2534639

Baskaran, T., Feld, L. P., & Necker, S. (2017). Depressing dependence? Transfers and economic growth in the German states, 1975–2005. *Regional Studies*, *51*(12), 1815-1825. https://doi.org/10.1080/00343404.2016.1255318

Belotti, F., Hughes, G., & Mortari, A. P. (2017). Spatial panel-data models using Stata. *The Stata Journal*, *17*(1), 139-180. https://doi.org/10.1177/1536867X1701700109

Bird, R. M., & Smart, M. (2002). Intergovernmental fiscal transfers: International lessons for developing countries. *World development*, *30*(6), 899-912. https://doi.org/10.1016/S0305-750X(02)00016-5

Bird, R., & Tarasov, A. (2004). Closing the Gap: Fiscal Imbalances and Intergovernamental Transfers in Developed Federations. *Environment and Planning C*: *Politics and Space*, 22(1), 77-102. https://doi.org/10.1068/c0328

Breidenbach, P., Mitze, T., & Schmidt, C. M. (2016). Eu structural funds and regional income convergence-a sobering experience. *Ruhr Economic Papers*. (Discussion Paper no. DP11210). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2766538

Brenton, S. (2020). The price of federation: Comparing fiscal equalization in Australia, Canada, Germany and Switzerland. *Regional & Federal Studies*, *30*(1), 93-111. https://doi.org/10.1080/13597566.2019.1658082

Cardoso, B. F. C., Nascimento, J. d. S., & Paixão, A. N. d. (2012). Efeitos das transferências fiscais sobre as despesas dos estados brasileiros. *Revista de Economia*, *38*(2), 149-167. https://doi.org/10.5380/re.v38i2.24813

Carniti, E., Cerniglia, F., Longaretti, R., & Michelangeli, A. (2019). Decentralization and economic growth in Europe: for whom the bell tolls. *Regional Studies*, *53*(6), 775-789. https://doi.org/10.1080/00343404.2018.1494382

Castro, K. P. d. (2018). Novo critério de rateio do fundo de participação dos estados: efetivo ou inócuo? *Cadernos Gestão Pública e Cidadania*, *23*(76). https://doi.org/10.12660/cgpc.v23n76.74989

Costa, R. F. R., & Castelar, L. I. D. M. (2015). O impacto das transferências constitucionais sobre os gastos dos municípios brasileiros. *Análise Econômica*, *33*(64), 171-189. https://doi.org/10.22456/2176-5456.51004

Cullison, W. E. (1993). Public investment and economic growth. *FRB Richmond Economic Quarterly*, *79*(4), 19-33.

Dawid, H., Harting, P., & Neugart, M. (2018). Fiscal transfers and regional economic growth. *Review of International Economics*, *26*(3), 651-671. https://doi.org/10.1111/roie.12317

Deda, C. C., & Kauchakje, S. (2017). Sistema político multinível no Brasil: uma análise da relação entre transferências intergovernamentais e redução das desigualdades territoriais no Estado do Paraná. *Revista Brasileira de Estudos Urbanos e Regionais (RBEUR)*, *19*(3), 530-553. https://doi.org/10.22296/2317-1529.2017v19n3p530

Easterly, W. (2003). Can foreign aid buy growth? *Journal of economic perspectives*, *17*(3), 23-48. https://doi.org/10.1257/089533003769204344

Elhorst, P. (2003). Specification and estimation of spatial panel data models. *International Regional Science Review*, *26*(3), 244-268. https://doi.org/10.1177/0160017603253791

Elhorst, P., Piras, G., & Arbia, G. (2010). Growth and Convergence in a Multiregional Model with Space–Time Dynamics. *Geographical analysis*, *42*(3), 338-355. https://doi.org/10.1111/j.1538-4632.2010.00796.x

Fisher, R. C. (1982). Income and grant effects on local expenditure: The flypaper effect and other difficulties. *Journal of urban Economics*, *12*(3), 324-345. https://doi.org/10.1016/0094-1190(82)90021-3

Greiner, A. (2008). Does it pay to have a balanced government budget? *Journal of Institutional and Theoretical Economics JITE*, *164*(3), 460-476. https://doi.org/10.1628/093245608785363399

Hsiao, C. (1986). *Analysis of panel data*. Cambridge University Press.

Kessler, A. S., Hansen, N. A., & Lessmann, C. (2011). Interregional Redistribution and Mobility in Federations: A Positive Approach. *The Review of Economic Studies*, *78*(4), 1345-1378. https://doi.org/10.1093/restud/rdr003

Koetter, M., & Wedow, M. (2013). Transfer Payments without Growth: Evidence for G erman Regions, 1992–2005. *International Journal of Urban and Regional Research*, *37*(4), 1438-1455. https://doi.org/10.1111/j.1468-2427.2012.01193.x

Krueger, A. O. (1997). Trade policy and economic development: How we learn. *NBER Working Paper Series*. (Working Paper 5896). https://doi.org/10.3386/w5896

Kumar, M., & Woo, J. (2010). Public debt and growth. *IMF Working Papers*, 1-47. (Working Paper no. 2010/174).

Kurniawan, D., & Budiono, B. (2019). The Impact of Fiscal Decentralization on Regional Economic Growth and Regional Income Disparity in Indonesia (Case Study: West Sumatra Province during the period 2011-2017). *Working Papers in Economics and Development Studies*. (Working Paper no. 201905).

Lee, H. Y., Ricci, L. A., & Rigobon, R. (2004). Once again, is openness good for growth? *Journal of development Economics*, *75*(2), 451-472. https://doi.org/10.3386/w10749

Lee, J. (2011). Export specialization and economic growth around the world. *Economic systems*, *35*(1), 45-63. https://doi.org/10.1016/j.ecosys.2010.11.002

LeSage, J., & Pace, R. K. (2009). *Introduction to spatial econometrics*. Chapman and Hall/CRC. https://doi.org/10.1201/9781420064254

Lewis, B. D., & Smoke, P. (2017). Intergovernmental fiscal transfers and local incentives and responses: The case of Indonesia. *Fiscal Studies*, *38*(1), 111-139. https://doi.org/10.1111/1475-5890.12080

Ligthart, J. E., & Van Oudheusden, P. (2017). The fiscal decentralisation and economic growth nexus revisited. *Fiscal Studies*, *38*(1), 141-171. https://doi.org/10.1111/1475-5890.12099

Louzano, J. P. d. O., Abrantes, L. A., Almeida, F. M. d., Oliveira, G. d. A., & Rocha, T. C. d. (2020). Fundos de participação dos estados e sua implicação sobre as receitas e despesas dos Estados. *Estudios Gerenciales*, *36*(154), 15-26. https://doi.org/10.18046/j.estger.2020.154.3445

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of monetary economics*, *22*(1), 3-42. https://doi.org/10.1016/0304-3932(88)90168-7

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, *107*(2), 407-437. https://doi.org/10.2307/2118477

Martínez-Vázquez, J. (2015). Nota metodológica para el estudio de las "Transferencias Intergubernamentales y las Disparidades Fiscales en LAC". *Banco Interamericano de Desarrollo*.

Mohl, P., & Hagen, T. Do EU structural funds promote regional growth? New evidence from various panel data approaches. *Regional Science and Urban Economics*, *40*(5), 353-365. https://doi.org/10.1016/j.regsciurbeco.2010.03.005

Muinelo-Gallo, L., Urraburu Bordon, J., & Castro Scavone, P. (2019). Fiscal disparities in Uruguay's regions: the role of a new system of intergovernmental equalization transfers. *CEPAL Review*, *129*, 217-242.

Nantharath, P., Laochankham, S., Kamnuasilpa, P., & Kang, E. (2020). Fiscal Decentralization and Economic Growth in Thailand: A Cross-Region Analysis. *International Journal of Financial Research*, *11*(1), 147-156. https://doi.org/10.5430/ijfr.v11n1p147

Oates, W. E. (1972). *Fiscal Federalism*. Harcourt Brace Jovanovich.

Oates, W. E. (1999). An essay on fiscal federalism. *Journal of Economic Literature*, *37*(3), 1120-1149. http://www.jstor.org/stable/2564874

Pesaran, M. H. (2004). *General diagnostic tests for cross section dependence in panels*. University of Cambridge.

Peterson, G. E. (2007). *Decentralization in Latin America: learning through experience*. The World Bank. https://elibrary.worldbank.org/doi/abs/10.1596/0-8213-3865-X

Putnam, R. (2015). Como hacer funcionar la democracia. Capital Social y Tradiciones civicas en la Italia moderna. *Cadernos EBAPE.BR*, *13*(1), 206-216. http://doi.org/10.1590/1679-395117991

Rajan, R. G., & Subramanian, A. (2008). Aid and growth: What does the cross-country evidence really show? *The Review of economics and Statistics*, *90*(4), 643-665. https://doi.org/10.1162/rest.90.4.643

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt (digest summary). *American Economic Review*, *100*(2), 573-578. https://doi.org/10.3386/w15639

Salto, F. S. (2013). *A economia política das transferências fiscais no Brasil: o Fundo de Participação dos Estados (FPE) contribuiu no processo de redução das disparidades regionais entre 1985 e 2009?* [Dissertação de Mestrado, Fundação Getúlio Vargas]. São Paulo.

Sánchez, L., Leiva, V., Galea, M., & Saulo, H. (2020). Birnbaum-Saunders quantile regression models with application to spatial data. *Mathematics*, *8*(6), 1000-1017. https://doi.org/10.3390/math8061000

Santos, M. B. d., Monte-mor, D. S., & Tardin, N. (2018). Eficácia do fundo de participação dos estados e distrito federal para promoção do equilíbrio socioeconômico no Brasil: Uma Análise Empírica para o Período de 1993 a 2013. *Economia & Região*, *6*(2), 69-89. https://doi.org/10.5433/2317-627X.2018v6n2p69

Schroeder, L., & Smoke, P. (2003). Intergovernmental fiscal transfers: concepts, international practice, and policy issues. In P. Smoke & Y.-H. Kim (Eds.), *Intergovernmental fiscal transfers in Asia: Current practice and challenges for the future* (pp. 50–59). Asian Development Bank.

Shah, A. (2006). A Practitioner's Guide to Intergovernmental Fiscal Transfers. *Revista de Economía y Estadística*, *44*(2), 127-186. https://doi.org/10.55444/2451.7321.2006.v44.n2.4088

Smith, A. (1776). *An inquiry into the nature and causes ofthe wealth of nations*. George Routledge and Sons.

Spahn, P. B. (2007). Intergovernmental transfers: the funding rule and mechanisms. In J. Martinez-Vazquez, & B. Searle (Eds.), *Fiscal Equalization* (pp. 163-204). Springer.

Suzart, J. A. d. S., Zuccolotto, R., & Rocha, D. G. d. (2018). Federalismo Fiscal e as Transferências Intergovernamentais: Um Estudo Exploratório Com os Municípios Brasileiros. *Advances in Scientific and Applied Accounting*, *11*(1), 127-145. https://doi.org/10.14392/asaa.2018110107

Tiebout, C. M. (1956). A pure theory of local expenditures. *The journal of political economy*, *64*(5), 416-424. https://doi.org/10.1086/257839

Varejão, S. B. D. S. (2009). *O impacto do fundo de participação dos estados nas finanças estaduais no período de 1986 a 2007* [Dissertação de Mestrado, Universidade Federal do Espírito Santo], Vitória.

Ventura, J. (2005). A global view of economic growth. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of Economic Growth* (pp. 1419-1497, Vol. 1). Elsevier. https://doi.org/10.1016/S1574-0684(05)01022-1

Vieira, M. A., Abrantes, L. A., De Almeida, F. M., & Dos Anjos, D. A. (2019). Implicações do Fundo de Participação dos Estados (FPE) na Redução das Desigualdades Regionais [Federalismo. FPE. Desigualdades Regionais]. *Contabilidade, Gestão e Governança*, *22*(1), 136-152.

Weingast, B. R. (2009). Second generation fiscal federalism: The implications of fiscal incentives. *Journal of Urban Economics*, *65*(3), 279-293. https://doi.org/10.1016/j.jue.2008.12.005

Wyckoff, P. G. (1991). The elusive flypaper effect. *Journal of Urban Economics*, *30*(3), 310-328. https://doi.org/10.1016/0094-1190(91)90052-9

Yushkov, A. (2015). Fiscal decentralization and regional economic growth: Theory, empirics, and the Russian experience. *Russian Journal of Economics*, *1*(4), 404-418. https://doi.org/10.1016/j.ruje.2016.02.004

AUTHOR'S CONTRIBUTION

Each author has participated sufficiently in this work. **JL:** collected the data, performed the analysis, and wrote the paper; **LA:** conceived of the presented idea and designed the analysis; **AJ:** contributed data and analysis tools.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

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