

Spillover effect: a spatial analysis of the quality of accounting information in Brazilian municipalities

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Abstract

Objective: To investigate the spillover effect and the determinants of the quality of accounting information in Brazilian municipalities.

Method: The Global and Local Moran Index was used to identify the presence of spatial clustering with a regression model using the Spatial Autoregressive Model with Autoregressive Disturbances to estimate the determinants. Robustness analysis was performed using the ordinary least squares regression methods, Spatial Autoregressive Regression, and Spatial Error Model with comparison by the Akaike Criterion. The sample consisted of 5,504 municipalities with data from 2019. Data were collected from the Brazilian National Treasury Secretariat and the Brazilian Institute of Geography and Statistics (IBGE).

Results: The results showed spatial clustering and spillover effect on the municipalities' quality of accounting information. Furthermore, population size and *per capita* administrative expenses are negatively correlated, while fiscal autonomy is positively correlated with the quality of accounting information.

Contributions: In academic terms, this study showed that a municipality's quality of accounting information is influenced by its neighbors, and in terms of practice, it showed that promising strategies are those that consider sets of municipalities or encourage key municipalities to improve the quality of accounting information.

Keywords: Spillover effect, Accounting information, Fiscal autonomy, Municipalities.

1. Introduction

This study presents an analysis concerning the spatial correlation of accounting information quality in Brazilian cities. Studies have addressed the management of local governments by focusing on the improvement of public governance and efficiency (Jinsong, Guojian & Song (2009), Wardhani, Rossieta, & Martani, 2017), increased fiscal decentralization (Guedes & Gasparini, 2007; Sousa, Pinhanez, Monte, & Diniz, 2020), and the expansion of public accountability and transparency (Dewi, Azam, & Yusoff, 2019), and a spillover effect has been found. When citizens have benchmarks (neighboring cities), they can control and pressure public managers more effectively (Wang, & Tao, 2019; Li, Ge, Fan, & Zheng, 2021), and cities may start competing with each other (Wu, 2020). Thus, even though municipalities have political, fiscal, and administrative autonomy, the fact that citizens make comparisons and exercise pressure decreases their differences.

In summary, the cities' management is influenced by their neighbors' behaviors. In this context, the quality of accounting information can also be influenced by neighbors because it is an instrument to strengthen institutional and social controls and enable citizens to make comparisons (Coelho, Cruz, & Platt-Neto, 2011; Augustinho & Oliveira, 2014). This study is based on institutional theory. It focuses on the New Institutional Sociology perspective, considering that organizations belong to a larger network and interact with the cultural system (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). Given accounting uncertainties and technical restrictions of local governments' institutional environment (Lopes et al., 2018), the municipalities' accounting practices converge (isomorphism), i.e., there is a spillover effect. In this study, the spillover effect refers to a (positive or negative) influence of a municipal entity's action on its neighbors, mainly through the adoption of new practices resulting from municipal administrations' isomorphic behavior and the competitiveness between local governments.

Previous studies addressing the municipalities' quality of accounting information did not find a spillover effect. Hence, this study seeks to identify this effect and the determinants of accounting information quality among Brazilian municipalities.

Fiscal decentralization is an element that increases local governments' autonomy and enables comparison between municipalities, which encourages competitiveness. The fiscal decentralization mechanism expands the ability of cities to raise funds by exploiting their local tax capacity. As resources are collected and spent locally, closer to needs, citizens are encouraged to participate and exercise control over the public administration. Regarding accounting information, fiscal decentralization can encourage a better qualification of the local governments' accounting numbers, considering that greater citizen involvement in the participation and control of public management demands more from accounting systems (Hayek, 1945; Tiebout, 1956; Oates, 1972).

Accounting information is an instrument that can improve public management by supporting (political or nonpolitical) public managers' decision-making and facilitating the transparency of public accounts. In Brazil, improving the quality of accounting information within the public sector has been pursued since 2008 through efforts to improve and implement new accounting regulations for convergence/harmonization with international accounting standards applied to the public sector (International Public Sector Accounting Standards Board – IPSASB®). In addition, improvement has focused on different points of the public sector accounting systems, such as: standardizing the chart of accounts, improving accounting and tax statements, and establishing the basic requirements of accounting software. However, improved regulations and accounting systems do not necessarily ensure improved accounting information quality (Macêdo & Klann, 2014; Morás & Klann, 2018; Silva & Sanches, 2021).

Quality accounting information is achieved when information is relevant, reliable, representative, comprehensible, well-timed, comparable, and verifiable, as established by the NBC TSP Estrutura Conceitual Aplicada à Contabilidade do Setor Público [NBC TSP Conceptual Framework applied to public sector accounting] (CFC, 2016). The National Treasury Secretariat (STN), aiming to monitor and improve the quality of accounting information, implemented a scoring system to verify accounting and fiscal information sent by the municipalities for accounting consolidation of the National Balance through Siconfi [Information System Accounting and Tax Accounting for the Brazilian Public Sector]. Based on the verifications and scores, the STN created a ranking to classify the Quality of Accounting and Fiscal Information among Brazilian municipalities.

The STN ranking assesses the quality of accounting information provided by the cities. According to Lopes et al. (2018) and Azevedo et al. (2020), Brazilian cities have very distinctive characteristics concerning their administrative structure, information management capacity, and technology access. Knowing how to improve accounting information is relevant, mainly because governments worldwide are already more advanced and compete for investments (Li, Guo, & Di, 2021). In addition, governments are in a new phase, increasingly seeking the integration of government databases (regardless of the field), including federated entities, from the perspective of e-Government modernization (Ritchi, Fetty, & Susanto, 2016). Thus, identifying the spillover effect of the quality of accounting information and its relationship with the municipalities' populations and fiscal profiles is essential for improving accounting applied to the public sector and modernizing public administration in Brazilian local governments.

In addition to this introduction, this paper has section 2, which contains the theoretical framework; section 3, which describes the methodological procedures; section 4, which presents the results; section 5, where the results are discussed; and section 6, which summarizes the findings.

2 Theoretical Framework

2.1 Institutional Theory and accounting applied to the public sector

Accounting practices are commonly investigated in the light of institutional theory. Examples include Dekel-Dachs et al. (2021), Bell (2017) and, specifically, accounting applied to the public sector, Baskerville and Grossi (2019), Argento, Peda, and Grossi (2018) and Gomes, Fernandes, and Carvalho (2015).

The main assumptions of the institutional theory, which emerged from criticisms of the neoclassical economic theory of the firm, are the decision-makers' rational and maximizing behavior and market equilibrium. Thus, institutionalism is born from a disagreement with the orthodox principles of economic thought, which distorts reality through highly abstract and mathematical models without considering the institutional environment that restricts and conditions economic policy and organizations (Matias-Pereira, 2018).

Therefore, the institutional theory shows how an organization and its behaviors meet not only market pressures but also institutional pressure, general social expectations, and the actions of the leading organizations (Greenwood & Hinings, 1996). Therefore, institutionalization stems from pressure exerted by social values that are assumed as rules in the thinking and actions of organizations and individuals in society (Hopwood & Miller, 1994).

This study focuses on one of the three strands of institutional theory, the New Sociological Institutionalism (NSI) (Burns & Scapens, 2000). NIS visualizes a network of relationships formed by organizations and cultural systems. That is, the institutional environment influences the relationship between organizations and the market through their beliefs, norms, and traditions (Meyer, & Rowan, 1977; Dimaggio & Powell, 1983). In other words, one of the basic principles of the NIS is that the organizational structure results from pressures from the organizations' environment. Additionally, to receive support and legitimacy, individuals and organizational entities comply with rules, practices, symbols, beliefs, and normative requirements created in the institutional environment (Soeiro & Wanderley, 2019).

According to Dimaggio and Powell (1983), the institutional theory argues that organizations' compliance with the institutional environment and the incorporation of external rules and norms are beneficial, given the need for survival. This process can occur through reproduction or isomorphism, categorized into three types: coercive, mimetic, and normative.

Coercive isomorphism occurs due to formal and informal pressures exerted by other institutions on which an organization depends and by society's cultural expectations, commonly arising from legal measures. On the other hand, mimetic isomorphism results from symbolic uncertainty or involves a poorly understood technology. Finally, the normative type is based on professionalization, leading the members of a professional class to act similarly (Dimaggio & Powell, 1983).

Accounting research applied to the public sector explains the adoption of the International Public Sector Accounting Standards (IPSASB[®]) and changes in accounting practices in the light of institutional theory. Mnif Sellamia and Gafsib (2017) investigated the environmental factors associated with the decision of 110 countries to adopt IPSASB[®] based on institutional theory. The results reveal a positive influence of external public funding (coercive isomorphic pressure), the degree of external openness (mimetic isomorphic pressure), and the importance of public sector organizations in the adoption of IPSASB[®].

More recently, Jorge, Nogueira, and Ribeiro (2020) investigated pilot entities in the implementation of public sector accounting reform and identified that for pilot entities to be relevant actors in the reform process, they need to be included in the decision-making process to take better advantage of the new IPSASB[®]-based system and receive technical, human and financial support.

Based on institutional theory, Lima and Lima (2019) researched the process of adopting IPSASB[®] in the Brazilian government. They noted that, despite the beginning of the reform in 2008, the process is still incipient, and there is a need for more significant interaction among stakeholders. This indication is in line with Albu, Albu, and Alexander (2014), who suggest that intra-organizational interests and actions are essential for the adoption of IPSASB[®]. In other words, these studies indicate the need to understand the relationship between entities better. Thus, this study partially fills the gap in the literature by analyzing the spillover effect of the quality of accounting information, i.e., when the quality of the accounting information of a municipality is correlated with neighboring municipalities by isomorphic behavior due to the institutional context.

2.2 The quality of accounting information and local governments' public management

In recent decades, the Brazilian public administration has made an effort to improve its management process, with an emphasis on the Managerial Reform of the State, which sought to make state management more flexible and dynamic, even adopting techniques from the private sector, such as results-based management, and creating and using indicators, and expanding accountability and transparency. Furthermore, in the context of local governments, the improvement of public management is also sought to strengthen it through fiscal decentralization (Bresser-Pereira, 1998; Bresser-Pereira & Spink, 2015). Fiscal decentralization concerns the transfer of fiscal responsibilities from the central government to subnational governments, especially municipalities (Oates, 1972; Akin, Bulut-Cevik, & Neyapti, 2016). Hence, different strategies have been implemented to improve public management.

These strategies to improve public management are based on expanding participation and social control, considering the greater proximity to the collection and expenditure of public resources provided by fiscal decentralization. Additionally, administrative acts' greater disclosure and transparency enable citizens to be better informed and make even greater demands on local managers (Hayek, 1945; Tiebout, 1956; Oates, 1972). In this context, accounting information plays a relevant role since improving its quality allows internal and external control and supports the managers' decision-making processes, enhanced by fiscal decentralization (Which, Zhang, & Liu, 2018). Although tax collection within Brazilian local governments (decentralization) is low in proportion to total revenues, research shows that greater local autonomy is associated with better fiscal responsibility (Cruz, Macedo, & Sauerbronn, 2013; Dantas Junior, Diniz, & Lima, 2019), due to the flypaper effect (Diniz, Lima, & Martins, 2017; Pansani, Serrano, & Ferreira, 2020), among other reasons.

Despite studies conducted in the public and private sectors, there are no clear, precise, and reliable criteria to measure the quality of accounting information. However, the NBC TSP Conceptual Framework defined that the quality of accounting information considers its relevance, reliable representation, understandability, timeliness, comparability, and verifiability (CFC, 2016).

In Brazil, accounting information has been improved in the public sector. Since 2008, regulatory and professional bodies have tried to establish and implement standards that converge and harmonize with the international accounting standards applied to the public sector (International Public Sector Accounting Standards – IPSASB®). The normative changes modernize accounting practice in the public sector, modifying different aspects of the accounting systems, such as the standardization of the chart of accounts, improvement of the accounting and tax statements, and adoption of the accrual basis for equity purposes, without compromising the budget records established by Law No. 4,320/1964 (Macêdo & Klann, 2014; Morás & Klann, 2018; Silva & Sanches, 2021).

At the same time, public management has strengthened its instruments of public transparency, driven by the enactment of Law no. 12.527/2011 (LAI – Law on Access to Information) and Complementary Law No. 131/2009 (Transparency Law), which requires the disclosure of public accounts in a virtual environment with public access via the Internet. However, there is still a need for improvement (Sell, Sampaio, Zonatto, & Lavarda, 2018). In addition, this expanded availability of accounting information increases the number of individuals using accounting information, making it relevant to assess the quality of accounting information; thus, accounting information is important for public management.

Given the need to assess the quality of accounting information, the STN recently created the Accounting and Fiscal Information Quality Ranking, obtained by verifying the items for accounting and fiscal information of public accounts sent by municipal governments for accounting consolidation via Siconfi. After assigning scores, the municipalities are ranked, and their scores are published on the STN institutional website. The Ranking 2020 edition analyzes and assigns scores to accounts corresponding to 2019.

However, it is necessary to advance the knowledge concerning the factors that promote the quality of accounting information. According to Thoa and Van Nhi (2021), financial autonomy has a direct positive effect on the quality of financial accounting information. Setiyawati and Doktoralina (2019) consider that using information technology and applying sound governance principles affect the quality of accounting information. Garcia and García-García (2010) showed that Spanish local governments' size, capital investment, and political competition were positively associated with the degree of online disclosure of financial information.

In addition to better control, the quality of accounting information is associated with better government financial performance. As Dewi, Azam, and Yusoff (2019) point out, the quality of the information in financial statements directly and positively influences the financial responsibility of local governments. In this sense, Bukenya (2014) identified that the reporting of entities where accounting information is perceived as of high quality reflects the highest levels of financial performance.

3. Methodological Procedures

This study adopted quantitative methods. The spillover effect and determinants of the quality of accounting information were estimated using the SARAR model, which has a spatial autoregressive lag and error (SARAR – Spatial Autoregressive Model with Autoregressive Disturbances) (Anselin & Florax, 1995; Kelejian & Prucha, 2010). The SARAR model is defined in equations 1 and 2:

$$y_i = \alpha + \rho W_1 y_i + \beta X_i + v_i, \quad i = 1, \dots, i \quad (1)$$

$$v_i = \lambda W_2 v_i + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma^2 I) \quad (2)$$

Where y is the dependent variable of municipality i , X is a matrix of the independent variables of municipality i , α is the model intercept, β is a matrix with the slope of the explanatory variables. ρ (*rho*) is the spatial lag coefficient of the dependent variable y , while λ (*lambda*) is the spatial autoregressive error coefficient. ε_i is a random error of approximately normal distribution, that is, it is considered a Quasi-Maximum Likelihood (QMV) estimator. Nevertheless, the Maximum Likelihood coefficients are asymptotically consistent (Fahrmeir, Tutz, Hennevogl, & Salem, 1994). W_1 and W_2 are spatial weight matrices (W_{ij}) formed by neighboring municipalities of up to second order and normalized by the spatial weight k of neighboring municipalities j (Almeida, 2012), according to equation 3 below:

$$W_{ij}(k) = \frac{W_{ij}(k)}{\sum_1^j W_{ij}(k)} \quad (3)$$

Where $W_{ij}(k)$ is the spatial weight k of municipality i over the influence of neighboring municipalities j of up to second order, so that $\sum_1^j W_{ij}(k)$. The second-order spatial weighting contiguity matrix assumes that the closest neighboring municipalities are more influenced than the more distant ones and that the influence occurs up to the second order of neighborhood (Anselin & Rey, 2014). The georeferencing of the municipalities was obtained from the geometric grid of Brazilian municipalities in 2010 from the Brazilian Institute of Geography and Statistics (IBGE). The QMV uses the concentrated log-likelihood function (Drukker, Prucha, & Raciborski, 2013) defined in equation 4:

$$L_c(y|\lambda, \rho) = -\frac{n}{2}\{\ln(2\pi) + 1\} - \frac{n}{2}\ln(\hat{\sigma}^2(\lambda, \rho)) + \ln\|I - \rho W_1\| + \ln\|I - \lambda W_2\| \quad (4)$$

The concentrated log-likelihood (L_c) function used in the QMV estimates the values $\hat{\rho}$ and $\hat{\lambda}$ and then estimates the values of β and $\hat{\sigma}^2$ of equation 1 such as $\hat{\beta} = \hat{\beta}(\hat{\rho}, \hat{\lambda})$ and $\hat{\sigma}^2 = \hat{\sigma}^2(\hat{\rho}, \hat{\lambda})$. Robustness analysis was performed by estimating the Ordinary Least Squares (OLS), SAR (Spatial Autoregressive Regression), and SEM (Spatial Error Model) models. The Akaike criterion (AIC) indicated the preference for the SARAR model. The empirical model estimated by SARAR was defined in equations 5 and 6:

$$\ln(\text{QualCont}_i) = \alpha + \rho W_1 \text{QualCont}_i + \beta_1 \ln(\text{Popula\c{c}\~{a}o}_i) + \beta_2 \text{Autonomia}_i + \beta_3 \text{DespAdmPerCapita}_i + v_i, \quad i = 1, \dots, i \quad (5)$$

$$v_i = \lambda W_2 v_i + \varepsilon_i \quad (6)$$

Where QualAcci is the quality of accounting information for municipality i . $\text{Popula\c{c}\~{a}o}_i$ is the number of inhabitants residing in municipality i . Autonomia_i is the variable that measures fiscal autonomy in relation to revenue from municipality i , measured by tax revenue divided by the total budget revenue. AdmExpPerCapita_i is the expense paid in the budget function 04 - Administration divided by the population of the municipality i . α , ρ and λ are parameters estimated by the QMV method, already described in equation 1. ε_i is a random error [$\varepsilon \sim N(0, \sigma^2 I)$]

The population size of a municipality is a variable that can enhance the quality of accounting information, considering that these municipalities have a greater supply of qualified workforce, access to technological and financial resources to maintain their administrative structure, and the best tax conditions. Furthermore, fiscal decentralization is a strategy that can also influence the quality of accounting information because strengthening local tax collection encourages citizens to demand results and better accounting information from public managers. Finally, the spillover effect is also expected in the quality of accounting information because when a municipality improves its accounting numbers, the citizens of neighboring cities can also demand better results from their managers, which may improve the quality of accounting information (Cruz, Macedo, & Sauerbronn, 2013; Marengo, Strohschoen, & Joner, 2017; Grin, Nascimento, Abrucio, & Fernandes, 2018; Dewi, Azam, & Yusoff, 2019). The quality accounting information variable (*QualAcc*) was measured by the STN and obtained from Ranking 2020 - Quality of Accounting Information (data from 2019), available at <https://ranking-municipios.tesouro.gov.br/>. The methodology used by the STN to determine the quality of accounting information consists of assigning scores to four dimensions: i) Dimension I - Information management; ii) Dimension II - Accounting information; iii) Dimension III - Tax information; iv) Dimension IV - Accounting information x Tax information, through 60 (sixty) verifications. The scores assigned to each correct verification are summed by dimension (*d*), and the score of each dimension is obtained by its normalization, as described in equation 7:

$$ND_{id} = \left\{ \left[\frac{AE_{id} - M_d}{D_d} \right] * 10 \right\} + 50 \quad (7)$$

Where *ND_{id}* is the Score of the dimension of municipality *i* in dimension *d*. *AE_{id}* is the number of correct answers obtained by municipality *i* in dimension *d*. *M_d* is the municipalities' average of correct answers in dimension *d*. *D_d* is the standard deviation of the municipalities' correct answers in dimension *d*. The final step for obtaining the final *QualAcc* score for each municipality is performed by adding the scores for each of the four dimensions, according to equation 8:

$$NF_i = \sum_1^4 ND_{id} \quad (8)$$

Where *NF_i* is the Final score of the quality of accounting information for municipality *i*. *ND_{id}* is the score obtained in each dimension *d* of municipality *i*. The univariate spatial dependence analysis was performed using the global and local indexes (LISA) by Moran (1948) and with the help of thematic maps.

Table 1 provides a summarized description of the variables adopted in this study:

Table 1

Description of the variables adopted in this study.

Description of the acronyms	Definition	Expected result	Grounding	Source
Quality of accounting information (QualAcc)	Quality of Accounting and Fiscal information measured by the STN.		Ritchi, Fettry, and Susanto (2016); Dewi, Azam, and Yusoff (2019); Thoa and Van Nhi (2021).	STN ¹
Population (Population)	Number of inhabitants in the municipality.	(+)	Garcia and García-García (2010); Cruz, Macedo, and Sauerbronn, (2013); Marengo, Strohschoen, and Joner (2017); Grin, Nascimento, Abrucio, Fernandes (2018);	IBGE ²
Fiscal autonomy (Autonomy)	The municipality's autonomy in producing revenue, measured by tax revenue divided by the total budget revenue.	(+)	Tiebout (1956); Oates (1972); Sari, Tjahjono, and Turino (2018); Thoa and Van Nhi (2021).	Siconfi ³
Administrative Expense <i>per capita</i> (AdmExpPerCapita)	Budget expense settled in Function 04 – Municipal Administration.	(+)	Marengo, Strohschoen and Joner (2017); Grin, Nascimento, Abrucio, Fernandes (2018); Dewi, Azam, and Yusoff (2019)	Siconfi

Source: developed by the authors.

Note 1 – STN: National Treasury Secretariat; 2 – IBGE: Brazilian Institute of Geography and Statistics; 3 – Siconfi: Information System Accounting and Tax Accounting for the Brazilian Public Sector.

The study sample included 5,504 municipalities, 98.81% of the Brazilian cities. Data are from 2019 and were collected from the IBGE, STN, and Siconfi databases maintained by the STN. Siconfi data were collected through the Application Programming Interface (API)¹ using an algorithm developed in R and the respective statistical package. In addition, data manipulation, statistical tests, and the estimation of econometric models were also performed using R.

Municipalities that did not present a settled budget expenditure in the administration function and with tax collection below zero were excluded, as evidence of inconsistency is clear. Furthermore, Ilhabela (SP) was excluded from the sample because it does not maintain a territorial neighborhood with other municipalities and, as a result, it hinders the estimation of spatial econometric models.

4. Results

4.1 Descriptive statistics

Brazilian municipalities have different characteristics in relation to the quality of accounting information and population and financial aspects. Table 2 presents the descriptive statistics of the variables used in this study. The quality of accounting information has an average of 200.9 points, a standard deviation of 32.9, and a total range of 154.10, i.e., the quality of accounting information varies considerably among Brazilian municipalities. In terms of population, the differences are even greater, which was expected, given the heterogeneity of Brazilian municipalities (Baião, Cunha, & Souza, 2017).

¹ Disponível em <http://apidatalake.tesouro.gov.br/docs/siconfi>

Regarding the share of tax revenue collected in the total budget revenue, note that the municipalities are highly dependent on intergovernmental transfers from federal and state entities; on average, the total budget revenue comprises 7.96% of tax revenue. It is also worth mentioning that *per capita* administrative expenses vary between municipalities and, therefore, suggests that the structure and administrative capacity of the municipalities are also different.

Table 2

Descriptive statistics of the variables used in Brazilian municipalities. 2019

Variables	Mean	Standard-deviation	Minimum	Maximum
Accounting information quality (points)	200.9	32.8	93.6	247.7
Population (unit)	37,443	219,111	781	12,252,053
<i>Per capita</i> tax revenue (R\$)	312.52	367.19	0.00	6,327.73
<i>Per capita</i> budget revenue (R\$)	3,836.80	1,855.66	269.50	36,155.00
Fiscal autonomy (%)	7.96	7.06	0.00	59.73
<i>Per capita</i> administration expenses (R\$)	569.78	525.94	1.10	11,611.56

Source: STN, IBGE and Siconfi.

4.2 Analysis of spatial dependence

After analyzing the descriptive statistics, the investigation proceeded with the analysis of the spatial dependence of the quality of accounting information in Brazilian municipalities. Figure 1 presents the thematic map with the scores obtained by Brazilian municipalities in 2019 on the quality of accounting information. The qualitative analysis in Figure 1 suggests the existence of clusters of municipalities with higher scores (municipalities in green) in the states of Rio Grande do Sul and Santa Catarina, in the states of Pernambuco, Paraíba, and Rio Grande do Norte, and in the municipalities in the interior of São Paulo. The municipalities with lower quality of information (municipalities in red) are grouped in the interior of Brazil, mainly in the macro-region of the Center-West.

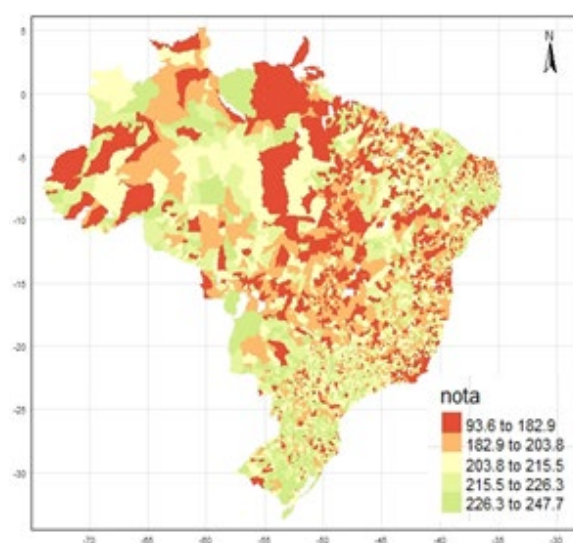


Figure 1. Thematic map concerning scores obtained by Brazilian municipalities in accounting information quality. 2019.

Source: Siconfi.

The quantitative analysis of spatial dependence was performed with the Global Moran Index and resulted in 0.253, statistically significant at 1%. Thus, the municipalities present a characteristic of spatial clustering with a positive sign; that is, the quality of accounting information between groups of municipalities is in the same direction. In other words, the neighbors of a municipality that belongs to a given group and obtained a high score for the quality of accounting information also tend to obtain a high score. Conversely, the municipalities belonging to a group in which low scores are obtained for the quality of accounting information tend to obtain low scores, similar to each other.

Based on these indications, the Local Moran Index was calculated for each municipality in the sample. Figure 2 presents the thematic map of the Local Moran Index of Brazilian municipalities. The municipalities' different shades present potential groups formed with higher (blue and dark blue) and lower (red and light blue) quality of accounting information. Moran's Index Z test was measured for each municipality. Figure 3 presents the thematic map with the p-value of the Z test of Moran's Index per municipality. The municipalities in dark blue and blue present statistical significance at 1% and 5%, respectively. The gray-colored municipalities did not show statistical significance. Thus, the spatial analysis of the quality of accounting information showed spatial clusters of municipalities in different parts of Brazil.

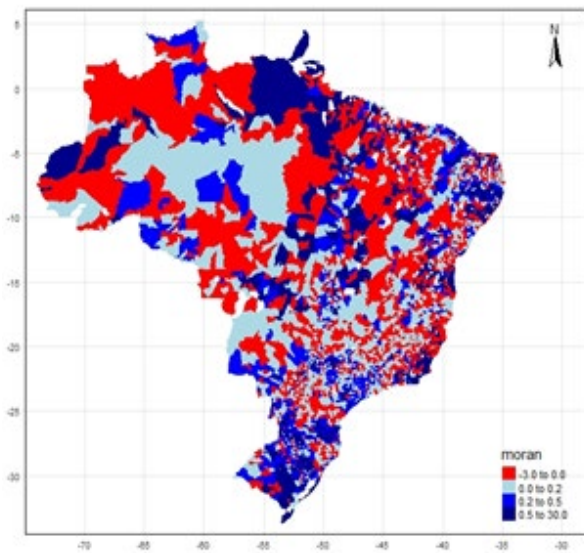


Figure 2. Thematic map of Moran's Index of the quality of accounting information among Brazilian municipalities. 2019.

Source: Siconfi.

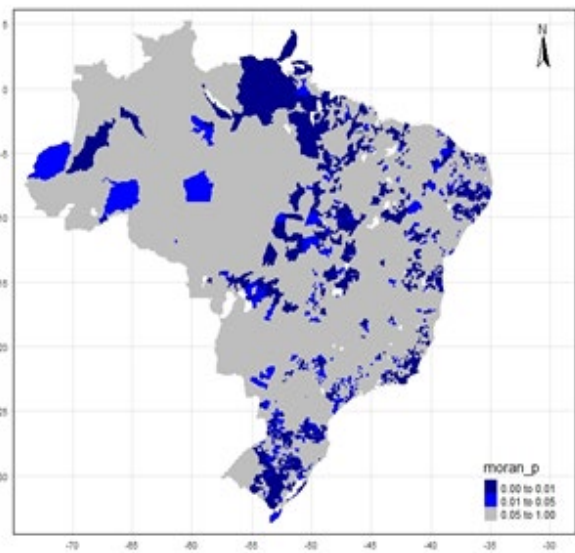


Figure 3. Thematic map of the p-value of the Z Test of Moran's index regarding the quality of accounting information among Brazilian municipalities. 2019.

Source: Siconfi.

4.3 Spatial modeling: the spillover effect of the quality of accounting information

The analysis of the quality of accounting information variable showed the presence of municipalities' spatial clusters. However, it remains to be seen whether the quality of accounting information is spatially dependent when its potential determinants are considered. Table 3 presents the results obtained with the estimation of the OLS, SAR, SEM, and SARAR models to identify the spillover effect and the determinants of accounting information in Brazilian municipalities. The results of the Akaike Information Criterion indicated that the SARAR model is the one that best fits the data. Note that both in the SARAR model and in the SAR model, the spatial dependence of the dependent variable is confirmed (*rho*); that is, there is a spillover effect. Therefore, the quality of a municipality's accounting information is positively influenced by the level of information of its neighbors up to the second order.

Furthermore, the SARAR model confirms that the effects not explained by the variables included in the model are spatially correlated (*lambda*); that is, the results confirm the importance of considering spatial effects in studies addressing municipalities, both due to the potential presence of the spillover effect (confirmed here) and the existence of unknown factors that are spatially correlated and may influence estimations and inferences.

Table 3

Results of the regression model estimated by the OLS, SAR, SEM, and SARAR to identify the determinants of the quality of accounting information among Brazilian municipalities. 2019

Variables	OLS ¹	SAR ²	SEM ³	SARAR ⁴
Population (ln)	-0.031***	-0.010***	-0.005	-0,007***
Fiscal autonomy (%)	0.651***	0.293***	0.286***	0,170***
Per capita administration expenses (ln)	-0.029***	-0.015***	-0.009*	-0,014***
Constant	5.706***	1.872***	5.368***	0,716***
Rho (ρ)		0.677***		0,891***
Lambda (λ)			0.6929***	-0,824***
R ² /Pseudo R ² (Nagelkerke)	0.034	0.181	0.179	0,196
Log-likelihood		1,823.17	1,816.64	1,872.38
Akaike criterion	-2,728.41	-3,634.30	-3,621.30	-3,730.80

Source: STN, IBGE and Siconfi.

Note: 1 – OLS: Ordinary Least Squares; 2 – SAR: Spatial Autoregressive Regression; 3 – SEM: Spatial Error Model; 4 – SARAR: Spatial Autoregressive Model with Autoregressive Disturbances. *p<0.10; **p<0.05; ***p<0.01.

Regarding the determinants, the results of the SARAR model presented in Table 3 showed that cities with larger populations negatively correlate with the quality of accounting information, *ceteris paribus*. On the other hand, fiscal autonomy was positively correlated with the quality of accounting information, confirming the theoretical indications of studies addressing fiscal decentralization that higher local tax collection strengthens local public management. In turn, per capita administrative expenses were negatively correlated with the quality of accounting information; that is, administrative expenses are not associated with the municipalities' improved quality of accounting information.

5. Discussion

This study analyzed the spillover effect and the determinants of the quality of accounting information in Brazilian municipalities. The results showed the spillover effect of accounting information quality, considering that the quality of the municipalities' accounting information is spatially correlated. This finding suggests mimetic isomorphism (Dimaggio & Powell, 1983), considering that the municipality's institutional environment is characterized by workforce shortages and uncertainty (Lopes et al., 2018). Thus, improving the quality of accounting information is a regionalized process in which actions can be directed to groups of neighboring municipalities, such as training and information sharing. Furthermore, the institutional theory helps understand this context of the implementation of new accounting standards and practices since organizational change based only on the technical development of legal instruments, without taking into account the cities' institutional environment, results in mere formality that lacks legitimacy, which naturally does not support the achievement of the desired results. Therefore, the improvement of key municipalities needs to be encouraged in regions with low accounting information quality because it may reflect on their neighbors. Hence, it highlights the need for class councils, accounting bodies (STN), and state courts of accounts to take action considering the municipalities' regional criteria. Such actions can prevent incomplete modernization of accounting in the public sector, as has already happened with other organizational changes, as highlighted by Lino, Carvalho, Aquino, and Azevedo (2019).

Regarding the determinants of the quality of accounting information, population was negatively correlated with the quality of accounting information. This result contradicts the initial expectation that larger municipalities would have better technological, human, and financial conditions to improve accounting information. A potential explanation is that the management of larger municipalities is more complex. In other words, larger municipalities deal with more complex management structures and face greater difficulties in changing and modernizing administrative procedures, since the accounting system is affected by the municipality's capacity and level of governance. Unfavorable managerial practices harm the quality of accounting information (Marengo, Strohschoen, & Joner, 2017; Grin et al., 2018).

Regarding fiscal autonomy, the results confirmed the theoretical expectation. The positive correlation between fiscal autonomy, measured by a larger share of tax revenue of total revenue, and the quality of accounting information shows that municipalities need to increase tax collection, not only to explore their tax bases and improve financial results but also to encourage greater citizen involvement in participation, control and social demand for improved public management (Hayek, 1945; Tiebout, 1956; Oates, 1972).

On the other hand, the *per capita* administrative expense was negatively correlated with the quality of accounting information; that is, higher administrative expenses are not necessarily associated with improved accounting information. On the contrary, it negatively affects it. Hence, it is important to establish planned requirements and procedures directed to the aspects harming the accounting information quality. The variable per capita administrative expenditure comprises expenditures as a whole, which can be positively correlated with other management aspects, such as transparency and efficiency. However, the results indicate the need to investigate and improve administrative expenses to direct and improve the quality of accounting information (Medeiros, Albuquerque, Diniz, Alencar, & Tavares, 2014; Marengo, Strohschoen, & Joner, 2017).

Additionally, it is worth noting that the measurement of the quality of accounting information established by the STN adopted in this study presents methodological limitations, mainly due to its scope predominantly related to the conformity of information between the financial and tax statements and sending/resubmitting deadlines. Therefore, further studies are needed to improve the measurement of the quality of accounting information and fully understand the characteristics established by the NBC TSP Conceptual Structure, such as relevance, reliable representation, understandability, timeliness, comparability, and verifiability, focusing on making accounting information more helpful to users.

Finally, it is important to note this study's exploratory nature. The variables included in the models were those that initially presented the best theoretical-empirical explanation. Thus, further research is needed for regulatory bodies, control institutions, and professional accounting professionals to support the continuous improvement of the public sector accounting systems.

6. Conclusion

This study investigated the spillover effect and the determinants of the quality of accounting information in Brazilian municipalities. The results indicate that the quality of accounting information has a spillover effect in Brazilian municipalities. Furthermore, the population size and *per capita* administrative expenses are negatively correlated with the quality of accounting information, while fiscal decentralization is positively correlated. This study's contribution includes identifying that the quality of accounting information should be treated by grouping municipalities and that any actions regulatory, control, and professional bodies design need to consider this characteristic. From a theoretical point of view, this study observed that the accounting practice of municipalities assumes mimetic, isomorphic behavior when implementing accounting rules aimed at improving the quality of accounting information.

This study's main limitations were that aspects of compliance with accounting standards and manuals, the cross-tabulation of accounting and tax data, and deadlines strongly guide the quality of accounting information measured by the STN and adopted here. Additionally, administration expenditure does not only contain expenses directly related to municipal accounting systems.

The results indicate that future studies can identify the situations that cause spatial dependence between municipalities; investigate the quality of accounting information and the spillover effect over time; improve the metrics of accounting information quality considering the peculiarities of Brazilian local governments; and consider variables such as competition between accountants and accounting companies in the municipalities, the use of different software and the interest of managers in improving the provision of accounting information publicly.

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