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Artículos

The Relationship Between Socioeconomic Indicators and the Budgetary Efficiency Level in Cities of the State of São Paulo [*]

La relación entre los indicadores socioeconómicos y el nivel de eficiencia presupuestaria en municipios del estado de São Paulo

A relação entre indicadores socioeconômicos e o nível de eficiência orçamentária em municípios do estado de São Paulo

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Abstract:

This study analyzes the influence of socioeconomic indicators on the budgetary efficiency of municipalities in the Vale do Paraíba and Northern Coast regions of the state of São Paulo. Our sample consists of 39 municipalities. We apply the Generalized Method of Moments (GMM) as it is well suited to capturing dynamic effects and controlling for endogeneity in panel data. Descriptive analyses, correlation tests, unit root tests, autocorrelation tests, and the Wald test are also conducted for robustness.
The results reveal a pattern of mean reversion in budgetary efficiency, identified through the negative and significant coefficient on the lagged degree of budgetary efficiency when used as an independent variable. This suggests the existence of budgetary cycles and institutional pressures. Indicators related to education and employment have negative and statistically significant coefficients, indicating that socioeconomic advances in these areas do not necessarily translate into greater budgetary efficiency. These relations may be associated with the political and institutional incentives central to Public Choice Theory (PCT), according to which public managers tend to prioritize decisions that generate greater short-term political returns. In conclusion, socioeconomic factors influence municipal budgetary efficiency, although their effects may be conditioned by institutional, political, and behavioral constraints. The study contributes to the empirical application of PCT in municipal public management and provides insights for improving budgetary management practices.
Keywords: Budget Efficiency, Governance, Public Choice Theory.

JEL Classification: C23, D72, E62.

Resumen:

Este estudio analiza la influencia de los indicadores socioeconómicos sobre la eficiencia presupuestaria de los municipios de las regiones del Vale do Paraíba y Litoral Norte del estado de São Paulo. La muestra está compuesta por 39 municipios. Se aplica el Método Generalizado de Momentos (GMM), dado que es adecuado para captar efectos dinámicos y controlar la endogeneidad en datos de panel. Además, se realizan análisis descriptivos, pruebas de correlación, pruebas de raíz unitaria, pruebas de autocorrelación y la prueba de Wald como análisis de robustez.
Los resultados revelan un patrón de reversión a la media en la eficiencia presupuestaria, identificado mediante el coeficiente negativo y significativo del grado rezagado de eficiencia presupuestaria cuando se utiliza como variable independiente. Esto sugiere la existencia de ciclos presupuestarios y presiones institucionales. Los indicadores relacionados con educación y empleo

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presentan coeficientes negativos y estadísticamente significativos, lo que indica que los avances socioeconómicos en estas áreas no necesariamente se traducen en una mayor eficiencia presupuestaria. Estas relaciones pueden estar asociadas con los incentivos políticos e institucionales centrales en la Teoría de la Elección Pública (TEP), según la cual los gestores públicos tienden a priorizar decisiones que generan mayores retornos políticos de corto plazo. En conclusión, los factores socioeconómicos influyen en la eficiencia presupuestaria municipal, aunque sus efectos pueden estar condicionados por limitaciones institucionales, políticas y conductuales. El estudio contribuye a la aplicación empírica de la TEP en la gestión pública municipal y ofrece elementos para mejorar las prácticas de gestión presupuestaria.

Palabras clave: eficiencia presupuestaria, gobernanza, Teoría de la Elección Pública.

Resumo:

Este estudo analisa a influência de indicadores socioeconômicos sobre a eficiência orçamentária dos municípios das regiões do Vale do Paraíba e Litoral Norte do estado de São Paulo. A amostra é composta por 39 municípios. Aplica-se o Método Generalizado dos Momentos (GMM), por ser adequado para captar efeitos dinâmicos e controlar a endogeneidade em dados em painel. Além disso, são realizadas análises descritivas, testes de correlação, testes de raiz unitária, testes de autocorrelação e o teste de Wald como análises de robustez.

Os resultados revelam um padrão de reversão à média na eficiência orçamentária, identificado por meio do coeficiente negativo e significativo do grau defasado de eficiência orçamentária quando utilizado como variável independente. Isso sugere a existência de ciclos orçamentários e pressões institucionais. Os indicadores relacionados à educação e ao emprego apresentam coeficientes negativos e estatisticamente significativos, indicando que avanços socioeconômicos nessas áreas não necessariamente se traduzem em maior eficiência orçamentária. Essas relações podem estar associadas aos incentivos políticos e institucionais centrais à Teoria da Escolha Pública (TEP), segundo a qual gestores públicos tendem a priorizar decisões que gerem maiores retornos políticos de curto prazo. Em conclusão, fatores socioeconômicos influenciam a eficiência orçamentária municipal, embora seus efeitos possam ser condicionados por limitações institucionais, políticas e comportamentais. O estudo contribui para a aplicação empírica da TEP na gestão pública municipal e oferece subsídios para aprimorar práticas de gestão orçamentária.

Palavras-chave: eficiência orçamentária, governança, Teoria da Escolha Pública.

Introduction

Budgetary efficiency in the public sector has attracted increasing attention within public administration, given its relevance to achieving fiscal targets and promoting transparency and accountability. It is a basic measure of public administration performance, reflecting a government's ability to achieve planned objectives with allocated resources (Nobre et al., 2017).

In a scenario where resources are scarce, it becomes imperative that budgetary decisions align with societal interests and are based on technical and rational criteria (Baldissera et al., 2020). This demand becomes even more relevant when considering the effects of socioeconomic indicators on federative entities' ability to manage their resources and promote development.

Socioeconomic indicators play a crucial role in shaping budgetary outcomes, as they reveal the needs and priorities of a population (Nobre et al., 2017; Vecchia, 2017). The relationship between these indicators and budgetary efficiency is often analyzed from the perspective of Public Choice Theory (PCT), which examines how political and economic incentives influence decision-making in the public sector (Tullock et al., 2005). According to this theory, public agents may prioritize short-term electoral gains over long-term fiscal sustainability, resulting in inefficiencies in resource allocation (Klein & Sakurai, 2015).

However, although several studies exist, few empirically and comprehensively investigate the relationship between budgetary efficiency and socioeconomic indicators. The role of PCT in explaining deviations from ideal budgetary efficiency, particularly in developing contexts like Brazil, warrants further investigation. This theoretical gap highlights the need for research examining how both institutional incentives and local socioeconomic conditions influence public managers' decisions.

Thus, this research aims to address the following question: What is the impact of socioeconomic indicators on budgetary efficiency level (BEL), considering PCT? The primary objective of this study is to examine

the determinants of budgetary efficiency in selected municipalities in São Paulo, focusing on the interplay between socioeconomic and environmental indicators, informed by the assumptions of PCT.

The relevance of this study lies in its potential to inform public policy, governance, and control practices by identifying factors that enhance or impede budgetary efficiency, thereby optimizing resource allocation and improving service delivery. In a country marked by corruption scandals and administrative inefficiency, strengthening governance and accountability mechanisms is crucial (Pina et al., 2007). Furthermore, the theoretical perspective adopted in these studies is PCT, which posits that public officials act guided by personal interests in a process of utility maximization (Buchanan & Tullock, 1962). This reinforces the importance of understanding the determinants of government decisions and applying them in a scenario of instability.

Theoretically, this work contributes to the debate on the rationality of public officials' decision-making, as predicted by PCT, by considering concrete socioeconomic contextual variables and proposing a comprehensive analytical model for evaluating management efficiency. In practice, the findings offer insights for municipal administrators seeking to align budget planning with socioeconomic priorities. It also provides citizens and oversight bodies with tools to evaluate government performance, promoting greater accountability, transparency, and governance (Revorêdo et al., 2021).

Theoretical Framework

Budgetary Efficiency in Public Administration and Public Governance

Budgetary efficiency is one of the central pillars of good public governance, reflecting the government's ability to use available financial resources effectively to achieve tangible results for society. Budgetary efficiency in public administration refers to the state's ability to use available resources effectively to achieve its planned objectives. For the purposes of this study, the BEL is operationalized as the proportion of committed expenditures that are effectively settled during the fiscal year. Therefore, the construct should be interpreted as a measure of budget execution efficiency rather than as a comprehensive measure of public-sector effectiveness or allocative efficiency.

According to Furtado Mota et al. (2017), the budgetary structure plays a crucial role in fiscal transparency, a critical dimension of good public governance. Proper budget preparation and execution, combined with the dissemination of clear and accessible information, are essential components for ensuring efficient and accountable management.

Bezerra et al. (2022) hold that social indicators tend to improve as public management becomes more efficient, suggesting that higher levels of governmental efficiency are associated with better social outcomes. Following the enactment of the Fiscal Responsibility Act (LRF) in Brazil, public managers began to be held accountable for greater fiscal discipline, which imposed new challenges regarding budget planning and execution (Gerigk et al., 2010; Santana et al., 2007). Contemporary public governance, as highlighted by Matias-Pereira (2010) and Miranda and Amaral (2011), must be guided by principles such as transparency, accountability, and effectiveness, requiring more robust institutional structures, social participation, and effective control mechanisms.

Public governance seeks to articulate corporate governance principles, such as transparency, equity, accountability, and responsibility, with the particularities of the public sector. De Benedicto et al. (2013) argue that adopting these principles enables greater control over public management, leading to increased efficiency in resource allocation. However, the authors warn that the full applicability of corporate governance in the public sector requires adaptations to the specificities of state bureaucracy, legal frameworks, and public purposes.

In this context, budgetary governance entails not only the adoption of sound financial management practices but also the alignment of strategic planning with budget execution (Lanis & Bueno, 2020). Crispm et al. (2024) propose performance evaluation models designed to measure the effectiveness of state public spending, emphasizing that meeting budgetary targets must be accompanied by indicators of quality spending. The lack of alignment between the planned and actual budget is highlighted by Da Silva et al. (2023), who identify a series of institutional, operational, and political factors that compromise the accuracy of municipal budgets.

The relationship between governance and budgetary efficiency is also reflected in the development of institutional monitoring, evaluation, and control mechanisms. In this sense, strengthening internal oversight bodies, public policy councils, and the legislative branch is identified as a fundamental instrument to ensure that public spending aligns with collective interests.

It is essential to understand budgetary efficiency as an expression of a broader institutional environment, in which good governance acts as a mediator between social objectives and financial instruments. Contemporary literature on public management emphasizes that consolidating governance in the Brazilian public sector necessarily entails integrating fiscal responsibility, budgetary performance, and accountability to society.

Budgetary Efficiency Based on Socioeconomic Indicators

Budget effectiveness is strongly related to the socioeconomic and environmental contexts in which municipalities operate. In other words, municipalities with better indicators of income, education, and institutional structure tend to have higher levels of BEL. Studies such as those by Costa et al. (2020) and Neves et al. (2015) suggest that variables including the Human Development Index (HDI), population education level, per capita income, and demographic structure have a direct impact on the level of transparency and quality of budget execution.

Furtado Mota et al. (2017) empirically demonstrate a positive correlation between municipal budgetary structure and the degree of fiscal transparency, which, in turn, reflects more effective resource allocation. The work of Divino et al. (2019) expands this discussion by addressing the motivations for adopting budgetary transparency practices. According to the authors, in addition to legal requirements, factors such as social pressure, institutional maturity, and the local socioeconomic context directly influence the level of financial information disclosure. This demonstrates that budgetary effectiveness cannot be dissociated from the social and economic conditions that affect the performance of public entities. This is corroborated by an article by Da Silva et al. (2023), which analyzes the causes of variations between municipal budget planning and execution, revealing that adverse socioeconomic contexts tend to generate greater deviations between what was planned and what was achieved.

In Revorêdo et al. (2021), the factors explaining the effectiveness of budgetary spending are associated with the technical and institutional capacity of municipalities, as well as with the social, economic, and environmental context in which they operate. More developed municipalities tend to be more efficient at managing resources, whether through higher revenue collection or better public management practices. For Cruz et al. (2012) and De Queiroz et al. (2013), fiscal transparency is positively correlated with levels of development and population size, suggesting that federative entities with greater resources and institutional capacity tend to have greater budgetary effectiveness.

In this context, the analysis of budgetary effectiveness must consider not only variables internal to public administration but also the social and economic dynamics that affect governments' ability to plan and execute their policies. As Guillamón and Cuadrado-Ballesteros (2021) point out, the degree of transparency is a significant determinant of efficiency, as it enhances social control and reduces information asymmetries between the government and society. Transparency thus becomes a bridge between citizens and public

authorities, functioning as a mechanism for social control and a promoter of administrative effectiveness. Thus, monitoring budget execution through electronic portals and accessible reports helps increase public trust and reduce inefficiencies or misuse of funds.

Public Choice Theory as a Path to Budget Effectiveness

PCT provides a critical lens for analyzing public officials' behavior in budget management. Based on Buchanan and Tullock (1962), this approach posits that public-sector actors, like those in the private sector, act rationally to maximize their interests. Andrews (2004) argues that this model helps explain the gaps between social objectives and the actual outcomes of public policies, especially in contexts where institutional incentives favor opacity and clientelism.

Caamaño-Alegre et al. (2013) and Sedmihradska (2015) highlight that, even in institutional contexts with high levels of standardization, the strategic actions of politicians and managers can distort the allocation of public resources. In this regard, budgetary efficiency can be compromised by short-term strategies aimed at achieving political gains, such as the electoral use of public resources or the prioritization of visible projects over structural investments.

In this context, transparency mitigates information asymmetry, allowing greater oversight by citizens and oversight bodies. Caamaño-Alegre et al. (2013) reinforce that the greater the visibility of budgetary decisions, the lower the incentives for opportunistic practices. Sedmihradska (2015), in analyzing local governments in the Czech Republic, found that increased transparency significantly reduced waste and inefficiency. Therefore, Ott et al. (2018) emphasize that budget transparency is an essential tool for mitigating the perverse effects of information asymmetry and the opportunistic behavior of public officials. The greater the availability of information and society's access to public accounts, the less room there is for inefficient decisions or misuse of funds.

Furthermore, public choice helps explain why certain municipalities, despite having similar financial capacities, exhibit different BELs. According to Ribeiro et al. (2017), electoral logic, political cycles, and the profile of administrators all directly influence the allocation of resources and the implementation of fiscal policy. Araujo and Tejedo-Romero (2016) empirically demonstrate that political and institutional variables largely explain variation in the government transparency index across municipalities, indicating that agents' strategic behavior is strongly present in local public administration.

Therefore, applying PCT to the analysis of budgetary effectiveness enables a broader understanding of the institutional and political limits of public governance, as well as the incentives that shape public managers' behavior, thereby guiding the development of more robust control and accountability mechanisms.

Methodology

Sample and Research Data Collection

To achieve the purpose of this research, data were collected from the 39 municipalities of the Paraíba Valley and the North Coast of the State of São Paulo, which constitute the work sample. Data collection took place between 2013 and 2023. This region is characterized as the Metropolitan Region of the Valley and North Coast (RMVale-LN), occupying 6.52% of São Paulo's area, equivalent to 16,178 km^2, and is divided into five sub-regions. According to data from the Instituto Brasileiro de Geografia e Estatística (IBGE, 2024) survey, the region currently has approximately 2.6 million inhabitants and contributed 4.8% of São Paulo's GDP in 2023.

The selection of the RMVale-LN is justified by its economic, territorial, and socioeconomic relevance within the context of São Paulo. The region comprises 39 municipalities, exhibiting substantial economic and demographic heterogeneity, a characteristic that facilitates comparative analyses of municipal public management (Agemvale, 2026). Furthermore, the RMVale-LN holds strategic importance for São Paulo's economy, concentrating significant industrial, technological, logistical, and tourism-related activities, thereby contributing substantially to the state's economic indicators (Rossini et al., 2023).

Data were collected from the IBGE and the municipal development index portals of FIRJAN (Federação das Indústrias do Estado do Rio de Janeiro). Due to data availability issues, the period from 2013 to 2023 is the most recent in the database. Hence, a timeframe was necessary as a scientific criterion for continuing to study advances and setbacks in budgetary effectiveness and their relationship to socioeconomic and environmental indicators.

Regression Models and Formulated Hypothesis

The Generalized Method of Moments (GMM) has become one of the most widely used econometric techniques in empirical economics and finance, particularly in studies involving dynamic panel data. Dynamic panel models incorporate lagged dependent variables among the regressors, allowing current outcomes to depend on past realizations. Although this specification adequately captures persistence and adjustment dynamics, it also introduces econometric challenges that render conventional estimation techniques, such as pooled Ordinary Least Squares (OLS) and Fixed Effects (FE), inconsistent (Blundell et al., 2001).

The seminal contributions of Arellano and Bond (1991) and Blundell and Bond (1998) demonstrated that GMM estimators can consistently estimate dynamic panel models by exploiting internal instruments derived from the panel structure itself. The method has become particularly valuable when researchers face endogeneity, omitted variable bias, measurement error, and simultaneity problems (Kiviet et al., 2017).

The standard dynamic panel specification can be represented as follows (Equation 1):

$$y_{it} = \alpha y_{i,t-1} + X_{it}'\beta + \mu_i + \varepsilon_{it} \quad (1)$$

where y_{it} denotes the dependent variable for unit (i) at time (t), $y_{i,t-1}$ represents the lagged dependent variable, X_{it} corresponds to the vector of explanatory variables, μ_i captures unobserved individual-specifi effects, and ε_{it} is the idiosyncratic error term.

The inclusion of lagged dependent variables generates endogeneity because the lagged term becomes mechanically correlated with the unobserved individual effects. Consequently, pooled OLS estimators become biased and inconsistent. Although FE models eliminate time-invariant heterogeneity through within transformation, they still suffer from the so-called Nickell bias, especially when the time dimension of the panel is relatively small. In addition, conventional regression methods are unable to adequately address simultaneity, omitted variable bias, measurement errors, and dynamic feedback effects.

To mitigate these problems, GMM estimators employ internal instrumental variables generated from lagged observations of the endogenous regressors. Accordingly, the method uses orthogonality conditions in which valid instruments must simultaneously satisfy two requirements: relevance, meaning correlation with the endogenous variables, and exogeneity, meaning absence of correlation with the contemporaneous error term (Blundell et al., 2001; Kiviet et al., 2017).

The literature presents GMM through two main approaches: Difference GMM and System GMM. The Difference GMM estimator, proposed by Arellano and Bond (1991), removes unobserved individual effects

through first-difference transformations and uses lagged levels of the endogenous variables as instruments. Formally, the transformation can be expressed as (Equation 2):

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \Delta X_{it}'\beta + \Delta \varepsilon_{it.} \quad (2)$$

Although Difference GMM provides consistent estimators, it has important limitations. According to Roodman (2009), the estimator may yield weak instruments when regressors exhibit highly persistent behavior or follow approximate random-walk processes. Furthermore, first-difference transformations may exacerbate panel imbalance by reducing the available time-series observations.

Given these limitations, the present study adopts the System GMM estimator, considered a more robust alternative. Proposed by Blundell and Bond (1998), System GMM combines equations in first differences instrumented with lagged levels and equations in levels instrumented with lagged differences. This specification improves the efficiency of parameter estimation, increases the instruments' informational content, and substantially reduces finite-sample bias, particularly in panels with persistent variables.

The central contribution of System GMM lies in its ability to control for endogeneity through internally generated instruments derived from the data structure itself. Consequently, the estimator becomes especially appropriate when explanatory variables are endogenous, predetermined, simultaneously determined, or measured with error. Moreover, GMM procedures inherently mitigate collinearity concerns by using lagged instruments (Roodman, 2009). Therefore, collinearity diagnostics such as the Variance Inflation Factor (VIF) are methodologically more appropriate in static estimators, including FE and random-effects models.

The validity of GMM estimation depends on a set of econometric assumptions and specification tests. First, the absence of second-order serial correlation in the differenced residuals must be verified through the Arellano-Bond AR (2) test (Blundell et al., 2001; Genaro & Astorino, 2022). While first-order serial correlation is expected due to differencing, the presence of second-order autocorrelation invalidates the instruments used in the estimation.

Second, the validity of the overidentifying restrictions is evaluated using the Hansen or Sargan tests, whose null hypothesis is that the instruments are jointly exogenous (Blundell et al., 2001). Non-significant *p*-values indicate instrument validity. Additionally, difference-in-Hansen tests may be employed to assess the validity of specific subsets of instruments incorporated in the System GMM framework.

Another important aspect concerns instrument proliferation. To avoid instrument proliferation, the instrument matrix was collapsed, and the number of instruments was kept below the number of cross-sectional units (39 municipalities). An excessive number of instruments may overfit endogenous variables and weaken the power of specification tests, generating misleadingly favorable Hansen statistics. Therefore, the number of instruments should remain substantially smaller than the number of cross-sectional units, and instrument-reduction procedures, such as collapsing instruments, should be implemented when necessary.

Overall, dynamic panel GMM estimation constitutes a robust econometric framework for empirical analyses involving persistence, endogeneity, omitted variable bias, simultaneity, and unobserved heterogeneity.

To answer the initially formulated research question, a baseline model was developed based on Equation 1 to assess the degree of budgetary efficiency. Stata software was used to perform the calculations, develop the tests, and present the regression results. The dynamic GMM model was adopted, in which the data were organized into a short dynamic panel, with the number of individuals exceeding the number of years and the panel balanced, ensuring the same number of periods for each observed variable (Equation 3).

$$BEL_{i,t} = \alpha + \beta_1 BEL_{i,t-1} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (3)$$

The dependent variable in this research is a proxy measured as in Bezerra et al. (2022), where the BEL is calculated as the ratio of settled expenses to committed expenses. Therefore, its interpretation considers that the closer the BEL value is to 1, the more efficient the budget execution will be.

Considering this information, based on the study by Bezerra et al. (2022), it is noteworthy that the rationale behind the use of the BEL variable lies in its ability to demonstrate the level of execution of expenditures previously committed during the fiscal year, thereby indicating the municipalities' capacity to transform committed expenditures into effectively liquidated expenditures. In this sense, higher percentages tend to indicate greater efficiency in budget management, particularly in reducing unpaid, unprocessed liabilities and fulfilling obligations assumed by the public administration.

However, as highlighted by the aforementioned authors, caution is warranted when analyzing this indicator, as it should not be interpreted as a single, absolute measure of budgetary efficiency, since budgetary efficiency is a multidimensional phenomenon. Although, for the purposes of the present study, the variable is suitable for capturing aspects related to the financial execution of the budget, it does not encompass elements such as the quality of public spending, the effectiveness of implemented policies, administrative capacity, and the social impacts resulting from the allocation of public resources. Therefore, it represents an operational and objective measure of budgetary efficiency, appropriate for the analytical purpose of this study, but whose results should be interpreted alongside other institutional, economic, and social factors.

To assess whether the degree of budgetary efficiency is not influenced by itself—that is, whether the BEL of one fiscal year influences the BEL of the subsequent fiscal year—the predictor variable lagged BEL (BEL_{it-1}) was adopted, which uses BEL in the previous fiscal year as an explanatory variable for the BEL in the current fiscal year. Therefore, the dependent variable with a lag is intended to capture the inertial effect of the BEL.

The analysis controls for variables (X, a vector of control variables) to eliminate their effect on the main coefficients analyzed in relation to the hypotheses. The model's control variables are those that affect municipalities' BEL and, in other words, may interfere with the relationship between the main independent variables analyzed and the dependent variable. Therefore, the control variables include:

- HAB: dummy variable which assumes a value equal to 1 for large cities (over 100,000 inhabitants) and zero otherwise, following the IBGE classification criteria;
- HEALTH: measure the level of development and vulnerability of the local population from a public health perspective;
- EDUCATION: evaluate both the supply and quality of basic education offered in public and private schools, ranging from Early Childhood Education to High School;
- EMPLOYMENT: reflects the economic reality of municipalities based on the insertion of the population into the job market and the appropriation of local wealth.

These last three variables are part of the Firjan Municipal Development Index (Índice FIRJAN de Desenvolvimento Municipal, IFDM), a key instrument for measuring the socioeconomic development of Brazilian municipalities. The proposed method aims to continuously and annually assess progress and setbacks in fundamental aspects of collective life, promoting a careful and decentralized view of the country's territorial dynamics (IFDM, 2025). This approach enables us to capture local specificities, which are often overlooked in aggregated analyses at the state or national level.

The IFDM framework is anchored in three fundamental dimensions, internationally recognized as pillars of human development: Employment & Income, Health, and Education. These pillars integrate indicators that not only measure the population's access to essential services but also assess their effectiveness and quality, offering a more robust perspective on living conditions in Brazilian municipalities (IFDM, 2025). Thus, the index reveals not only the progress achieved but also the persistent obstacles, contributing to the debate on more equitable, effective, and territorially sensitive public policies.

In line with the model developed in Equation 3 above, Table 1 presents the formula for the dependent variable—the degree of budgetary efficiency—and the corresponding independent variables, which are socioeconomic variables.

TABLE 1.
Description of Regression Model Variables

Variable	Acronym	Formula	Authors
Budget Efficiency Level	BEL	Settled expense / Committed expense	Bezerra et al. (2022)
Number of Inhabitants	HAB	Dummy variable that assumes a value equal to 1 for large cities (over 100,000 inhabitants) and zero otherwise	Divino et al. (2019)
Health	HEALTH	(Hospitalizations due to primary care conditions * 17.5%) + (Avoidable infant deaths * 17.5%) + (Proportion of 7 or more prenatal consultations * 17.5%) + (Proportion of doctors per thousand inhabitants * 17.5%) + (Vaccination coverage * 10%) + (Teenage pregnancy * 10%) + (Hospitalizations due to inadequate environmental sanitation * 10%)	IFDM (2025)
Education	EDUCATION	(Enrollment rate of children up to 3 years old in daycare centers * 20%) + (Adequacy of teacher training in elementary school * 10%) + (Adequacy of teacher training in secondary school * 15%) + (Age-grade distortion in elementary school * 10%) + (Age-grade distortion in secondary school * 15%) + (IDEB initial years of elementary school * 5%) + (IDEB final years of elementary school * 5%) + (Elementary school dropout rate * 5%) + (High school dropout rate * 5%) + (Comprehensive education in secondary school * 5%) + (Comprehensive education in elementary school * 5%)	IFDM (2025)
Employment and Income	EMPLOYMENT	(Formal labor absorption * 30%) + (Economic diversity * 10%) + (Proportion of voluntary layoffs * 20%) + (GDP per capita * 15%) + (Share of wages in GDP * 15%) + (Poor or low-income population * 10%)	IFDM (2025)

Source: Prepared by the authors (2025).

After detailing the regression model, the research formulates two hypotheses to assess whether socioeconomic and environmental indicators affect budgetary effectiveness in the municipalities of RMVale-LN.

Hypothesis 1 was based on the premise that the relationship between municipalities and their socioeconomic indicators offers an opportunity to observe budgetary behavior in response to various issues and challenges within municipalities' social and economic spheres (Bárbara & Rodrigues, 2005; Lanis & Bueno, 2020; Nobre et al., 2017).

H_1 : The socioeconomic coefficients of the IFDM positively influence the degree of budgetary efficiency.

Based on the arguments presented and the results of the reported empirical research, the first research hypothesis was subdivided across the socioeconomic coefficients.

H_{1a}: *Ceteris paribus*, the coefficient related to education positively influences the degree of budgetary effectiveness.

H_{1b}: *Ceteris paribus*, the coefficient related to health positively influences the degree of budgetary effectiveness.

H_{1c}: *Ceteris paribus*, the coefficient related to employment positively influences the degree of budgetary effectiveness.

Thus, Hypothesis 2 is based on the view that municipalities with larger populations should have higher tax collection. Since greater municipal economic development typically translates into greater collection capacity and greater pressure for spending, influencing budgetary effectiveness (Avellaneda & Gomes, 2015; D'Inverno et al., 2018; Mendes et al., 2008; Nobre et al., 2017; Revorêdo et al., 2021; Silva et al., 2015). Furthermore, spending needs are influenced by population size and growth.

H_2 : Municipalities with larger populations have a greater degree of budgetary efficiency when compared to smaller municipalities.

Analysis and Discussion of Results

Descriptive Analysis and Validation Tests

Building a robust econometric model, such as a GMM model, requires rigorous preliminary testing to ensure statistical validity and the adequacy of the data for the proposed model. These tests include descriptive analysis, the correlation matrix, the unit root test, the definition of fixed or random effects, the Arellano and Bond autocorrelation test, and the Hansen overidentification test, all of which play fundamental roles in the exploratory stage of research.

Therefore, these preliminary tests not only guide the appropriate specification of the GMM model but also ensure that the fundamental statistical assumptions are met, thereby providing greater reliability and robustness to the results.

Descriptive analysis allows us to understand the behavior of the variables involved, providing an initial insight into their distribution, central tendency, dispersion, and the presence of skewness or kurtosis. Table 2 presents the descriptive statistics of the variables used in the regression. The results enable us to draw important inferences about the budget execution capacity and the distribution of public services in key areas, such as education, health, and employment.

TABLE 2.
Descriptive Statistics of Model Variables

	BEL	IFDMEducation	IFDMHealth	IFDMEmployment
Observations	429	429	429	429
Average	0.952316	0.623050	0.625391	0.676038
Standard deviation	0.044186	0.101742	0.098048	0.128392
Minimum	0.721189	0.377300	0.313500	0.430700
P25	0.935630	0.547500	0.568600	0.557200
P50	0.961942	0.621100	0.630000	0.670000
P75	0.982705	0.698000	0.699900	0.788100
Maximum	1,000000	0.835900	0.878300	0.968400
Median	0.961942	0.621100	0.630000	0.670000
Asymmetry	-1.980840	0.041965	-0.390150	0.086581
Kurtosis	5.701337	-0.799713	-0.148480	-1.126060

Source: Prepared by the authors (2025).

The BEL had a mean of 0.952, indicating a high level of budget execution among the municipalities in the sample. The median of 0.9619, combined with tightly clustered quartiles near 1, reinforces the predominance of efficient behavior in the allocation of public resources. The data distribution is characterized by a marked negative skewness (-1.98) and a high kurtosis (5.70), indicating a pronounced concentration of results to the right of the distribution and a long left tail. This statistical profile reveals that although most municipalities exhibit satisfactory budget performance, a small portion shows low execution, constituting exceptions to the observed pattern.

Regarding IFDMEducation, the mean of 0.623 and the standard deviation of 0.10 indicate moderate variation among municipalities. The distribution is approximately symmetric (skewness ≈ 0) and slightly platykurtic (kurtosis ≈ -0.80), suggesting that the data are relatively evenly distributed, with low concentration near extreme values. For the IFDMHealth dimension, the mean was 0.625, and the median was close to 0.63, indicating a symmetrical distribution. The slightly negative skewness (-0.39) and the kurtosis close to zero (-0.15) confirm an approximately mesokurtic distribution, with slight left-skewed asymmetry, indicating a general balance in municipalities' performance regarding this public policy.

Finally, the IFD Employment indicator had a mean of 0.676, with the largest standard deviation among the three domains analyzed (0.128), indicating greater heterogeneity among municipalities in labor market development and income generation. The slightly positive skewness (0.086) and negative kurtosis (-1.13) indicate a slightly right-skewed, platykurtic distribution, with less concentration around the mean and a lower incidence of extreme values. These results suggest that, unlike the education and health dimensions, the employment and income dimension exhibits greater dispersion and inequality in municipal performance.

Taken together, the results point to high efficiency in budget execution, accompanied by relatively balanced performance in the health and education sectors, but with greater variation and disparities in the employment and income dimensions, which may reflect more complex structural and contextual differences among the municipalities analyzed.

Next, Pearson's correlation test was performed, as shown in Table 3, to determine the correlations between the dependent variable and the primary explanatory indicators used in the analysis. This analysis helps verify the presence of linear relationships among the explanatory variables, thereby aiding in identifying potential multicollinearity. This factor can distort the coefficients and compromise statistical inference.

TABLE 3.
Pearson's Correlation Matrix

Variables	BEL	IFDMEducation	IFDMHealth	IFDMEmployment	HAB
BEL	1				
IFDMEducation	-0.247*	1			
IFDMHealth	-0.186*	0.430*	1		
IFDMEmployment	-0.053	0.641*	0.349*	1	
HAB	0.016	0.429*	0.341*	0.466*	1

Source: Prepared by the authors (2025).

The BEL index demonstrated a negative and statistically significant correlation with the IFDMEducation index (-0.247, $p < .10$) and with the IFDMHealth index (-0.186, $p < .10$). These results indicate that municipalities with better performance in these areas tend, on average, to have lower budget execution efficiency. This finding may reflect the fact that more developed municipalities face more complex budgets or greater pressure to allocate resources efficiently.

The correlation between BEL and IFDMEmployment was not statistically significant (-.053, $p > .10$), suggesting a weak relationship between these variables. Similarly, there was no significant correlation between population size (HAB) and budget efficiency ($r = .016, p > .10$), indicating that the size of the municipality, by itself, is not directly associated with the level of budget execution.

Thus, Figure 1 below visually illustrates the statistical relationship between the variables, the direction of the relationship, and the strength of the correlation. It examines whether there is a correlation between a municipality's level of budget execution and its health, education, or income indicators.

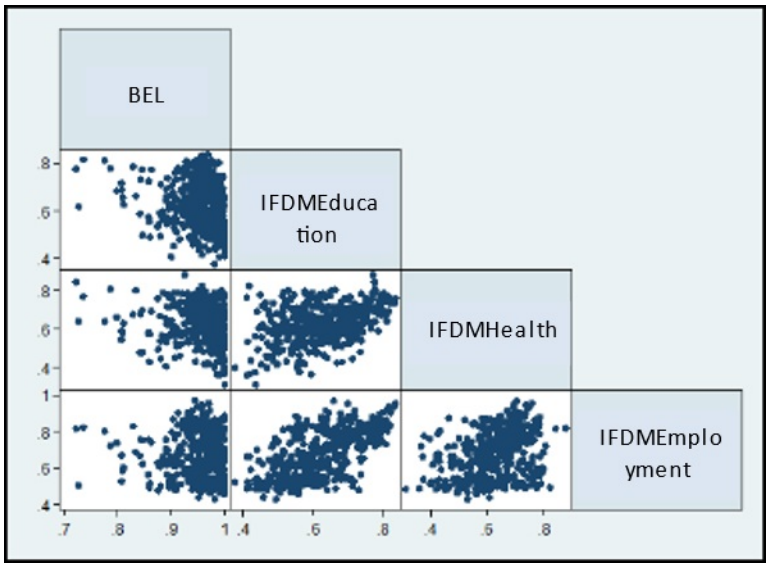

FIGURE 1.
Correlation of Model Variables
Source: Prepared by the authors (2025).

The independent variables showed significant correlations among themselves, especially between IFDMEducation and IFDMEmployment (.641, $p < .10$), IFDMEducation and IFDMHealth (.430, $p < .10$), and IFDMHealth and IFDMEmployment (.349, $p < .10$). These associations suggest structural relationships among the socioeconomic indicators, which may indicate some degree of collinearity, although the correlations are not high enough to compromise the analysis.

In general, the results underscore the complexity of the relationship between socioeconomic determinants and budgetary efficiency, reinforcing the suitability of robust econometric models, such as GMM, which can address potential endogeneity and collinearity (Genaro & Astorino, 2022; Roodman, 2009).

To assess the appropriate framework for econometric modeling of panel data, the Hausman test was performed to determine whether the model should be estimated with fixed or random effects, as it tests whether the intercepts are correlated with the explanatory variables. The result, χ^2 (chi-squared) = 13.16, $p = .0043$ (less than 5%), rejects the null hypothesis that the differences between the model coefficients are non-systematic. This demonstrates that each municipality has its specific characteristics, independent of those of the other municipalities. Therefore, the analysis suggests that fixed effects are more suitable for the context analyzed. It reinforces the need to control for the specific effects of each municipality, which may be correlated with the regressors, thereby minimizing bias in the estimates (Wooldridge, 2010).

The unit root test is crucial for assessing the stationarity of time series, since the presence of non-stationary variables can generate spurious results in dynamic models. In the context of GMM, where lagged variables are frequently used as instruments, stationarity is an essential condition for ensuring the validity of the moments and the consistency of the estimators.

To verify the appropriateness of using level variables in panel models, Levin-Lin-Chu (LLC) unit root tests were conducted. The LLC test assumes, as a null hypothesis, that the series has a unit root (non-stationary), against the alternative hypothesis of common stationarity among the panels; this implies an improvement in statistical power (Levin et al., 2002). Table 4 presents the results of the unit root tests for the variables with one lag and a single intercept.

TABLE 4.
LLC Unit Root Tests

Variable	t^* statistic	p-value	Conclusion
BEL	–3.931	.0000	Stationary
IFDMEducation	–4.594	.0000	Stationary
IFDMHealth	–6.481	.0000	Stationary
IFDMEmployment	–5.505	.0000	Stationary

Note. LLC test: H_0 = presence of a unit root (non-stationary); H_1 = panel stationarity. All tests were performed with a 1-period lag, without temporal bias, and with panel averages included.
Source: Prepared by the authors (2025).

The analysis shows that all variables analyzed—BEL, IFDMEducation, IFDMHealth, and IFDMEmployment —presented negative and statistically significant adjusted t-statistics ($p < .001$), allowing the null hypothesis to be rejected in all cases. These results indicate that the series are stationary over time, suggesting a good BEL. They also validate the use of variable levels in subsequent econometric models, including dynamic GMM estimates.

The evidence of stationarity reinforces the robustness of the variables of interest. It contributes to the consistency of the results, especially in models that incorporate lags of the dependent variable, as suggested by Arellano and Bond (1991) and Blundell and Bond (1998).

Finally, the Arellano-Bond test is performed to verify the presence of serial autocorrelation in the first-difference errors, which is fundamental to the validity of the GMM estimator in difference. As indicated by Arellano and Bond (1991), the presence of first-order autocorrelation (AR(1)) is expected in the results, but not second-order autocorrelation (AR(2)), as this would indicate problems with the model specification.

The findings reveal first-order autocorrelation (AR(1), $p = .0012$), as expected given the use of first differences. However, no second-order autocorrelation (AR(2), $p = .6762$) was identified, an essential condition for the validity of the model specification, indicating that the GMM regression in difference is correctly specified and that the instruments used are valid for estimating the dynamic panel model.

The Hansen test, in its null hypothesis, assumes the absence of correlation between the generated instruments and the model's error term and uses a chi-square statistic as the decision criterion for the null hypothesis (Wooldridge, 2010). The Hansen test, which is robust to heteroscedasticity, does not reject the null hypothesis of instrument validity (chi-square = 37.76, $p = .697$), indicating a p-value greater than .05 and suggesting that the instruments are valid.

In other words, the results of this study also contribute to the theoretical advancement of PCT by highlighting how institutional and political dynamics can directly affect budgetary efficiency and fiscal performance. Considering the context, the findings suggest that budgetary outcomes are determined not solely by technical or economic factors but also by political incentives, institutional arrangements, and socioeconomic conditions. From a practical perspective, these results have important implications for public managers and policymakers, emphasizing the need to consider socioeconomic indicators, political cycles, and institutional limitations when planning and executing municipal budgets. Understanding these relationships may support the development of more efficient and sustainable fiscal policies, reducing the likelihood of inefficient expenditures motivated by short-term political interests or external pressures that may weaken fiscal effectiveness.

Robustness Check

Regression Models Relating BEL and FIRJAN Indices

In Table 5 below, the results of the three regressions are shown and analyzed. Column BEL 1 shows only the relationship between the degree of budgetary efficiency and the lagged variable. Column BEL 2 includes all three control variables (Education, Health, and Employment). Finally, in the last column, BEL 3 adds the dummy variable (HAB) to the model.

TABLE 5.
Regression Models Relating BEL and FIRJAN Index

Variables	**GMM fe (BEL) 1**	**GMM fe[1] (BEL) 2**	**GMM fe[2] (BEL) 3**
Constant	1.08***	1.655***	1.655***
	(0.000)	(0.000)	(0.000)
BEL.L1	-0.136***	-0.379***	-0.379***
	(0.084)	(0.000)	(0.000)
IFDMEducation		-0.213***	-0.213***
		(0.003)	(0.003)
IFDMHealth		-0.031	-0.031
		(0.395)	(0.395)
IFDMEmployment		-0.280***	-0.280***
		(0.000)	(0.000)
HAB			0
			Omitted
AR(1)	**-3.526**	**-3.238**	**-3.238**
AR(2)	2.068	-0.418	-0.418
Hansen	**35.06**	**37.76**	**37.76**
Sargan	102.53	90.86	90.86
Wald	**2.978**	**45.456**	**45.456**
N	351	351	351
Mean dependent var	0.95	0.95	0.95
SD dependent var	0.045	0.045	0.045
Chi-square	2.978	45.456	45.456

*** p < .01, ** p < .05, * p < .10

[1] Estimation performed using xtabond (1st difference GMM), with robust errors. The BEL.L1 variable was treated as endogenous and instrumented from the 2nd lag onwards.

[2] Model estimated via xtabond with robust errors. The HAB variable was omitted due to collinearity. The BEL lag was also excluded as a direct instrument but used via GMM.

Source: Prepared by the authors (2025).

To assess the persistence of municipal budgetary efficiency over time, the first dynamic model was estimated, as shown in column 1 of Table 5. Considering only the lag of the dependent variable BEL, the results indicated that the coefficient for $BELt\text{-}_1$ was negative and marginally significant (-0.136, *p*-value = .084), suggesting a slight mean-reversion effect on municipal budgetary efficiency from one year to the next. Although the coefficient was close to the conventional statistical significance threshold ($p < .05$), it suggests

that high levels of efficiency in the previous period tend to decline moderately in the subsequent period. The simple model yielded Wald $\chi^2(1) = 2.98$ with a *p*-value of .084, indicating that the lagged variable is relevant to the model. However, caution should be exercised in interpreting the dynamic effect in isolation.

This result serves as a baseline for comparison with subsequent models that include control variables. This is evident in column 2 of Table 5, where the application excluding the dummy variable HAB provides important empirical evidence on the determinants of budget efficiency.

The BEL.L1 variable, which represents the budgetary efficiency lag, had a negative and statistically significant coefficient (-0.379; *p*-value = .000), indicating a pattern of reversal over time. This suggests that municipalities that achieved higher BELs in prior periods tend to experience a slight decline in subsequent performance, possibly due to budgetary cycles, institutional pressures, or operational constraints. This result is consistent with the literature on dynamic models, in which intertemporal adjustment effects or diminishing returns in public performance indicators are common.

Another notable result concerns the IFDMEducation, whose estimated coefficient was -0.213, statistically significant at the 1% level (*p*-value = .003). Contrary to H_{1a}, it is understood that the observed negative relationship may indicate that municipalities with higher levels of educational performance face, paradoxically, greater challenges in budgetary efficiency, possibly due to the complexity and rigidity of expenditures in this area or the need for less flexible allocations, i.e., difficulty in translating socioeconomic improvements into fiscal performance (Barro, 1990; Tanzi & Schuknecht, 2000). This finding creates an opportunity to reflect on the trade-off between long-term public policy and budget execution mechanisms.

On the other hand, the IFDMHealth presented a negative but statistically insignificant coefficient (-0.031; *p*-value = .395); therefore, although the coefficient is negative, the relationship is not strong enough to contradict the previously expected sign in H_{1b}. The lack of statistical significance indicates that, in the estimated model, health performance does not have a systematic effect on municipal budget efficiency. One possible explanation for this result may be sectoral heterogeneity, differences in spending composition, or methodological issues in measuring the indicator.

The variable IFDMEmployment, which represents the municipal development index in the employment and income dimension, presented a negative coefficient of -0.280 and a .-value of .000. These findings indicate a statistically significant relationship between municipal performance in terms of employment and income and the degree of budgetary efficiency at the 1% significance level, contrary to the expected relationship in H_{1c}. The negative coefficient suggests that as the municipality shows better employment and income indicators, the degree of budgetary efficiency decreases. This relationship, at first glance counterintuitive, can be explained by several factors. Municipalities with greater economic dynamism may face increasing pressure to invest in infrastructure, social assistance, or public services, which can compromise their budgetary balance and the regularity of resource allocation (Revorêdo et al., 2021). Furthermore, the complexity of social demands in growth contexts can create operational rigidities, hindering the efficient execution of budgets.

Overall, in this scenario, the statistical significance of the variables BEL.L1, IFDMEducation, and IFDMEmployment suggests a possible general trend: advances in structural areas of human development (education and employment) are not necessarily accompanied by immediate gains in budgetary efficiency. The model presents relevant explanatory validity, with a Wald χ^2 value of 45.45, which is statistically significant ($p < .05$). It is possible to infer that the Wald test, when evaluating the joint hypothesis of the null coefficients, will likely indicate rejection of the null hypothesis, thereby conferring robustness to the set of estimates.

Finally, column 3 of Table 5 presents the full GMM regression model, which includes the lagged variable, control variables, and the HAB dummy variable. Note that the HAB variable was automatically omitted by the model due to structural collinearity, demonstrating that the dummy and another independent variable move together in a predictable manner, which can cause problems in interpreting the results and in the accuracy of the coefficient estimates. Thus, the GMM model presented in column 3 is identical to the model

seen and evaluated in column 2, exhibiting the same behavior regarding coefficient values and statistical significance.

Discussion of the Results Considering the Literature and Public Choice Theory

The GMM model estimates indicate that the variables BEL.L1, IFDMEducation, and IFDMEmployment have a statistically significant influence on municipal budgetary efficiency, whereas IFDMHealth has no significant effect. These findings are consistent with the literature on the determinants of fiscal and budgetary management in Brazilian municipalities, revealing consistent patterns but also significant contrasts compared with previous studies.

The negative and significant coefficient of BEL.L1 (-0.379; $p < .000$) corroborates the article by D'Inverno et al. (2018) that addresses the Tuscany region in Italy and confirms the existence of a reversal pattern in budgetary performance over time, suggesting that efficiency gains in one period tend to be followed by reductions in the subsequent period. This pattern is consistent with the findings of Silva et al. (2015), who observed performance fluctuations resulting from planning and execution cycles, as well as fiscal constraints imposed by the LRF.

According to this, fiscal cycles, constraints imposed by liability rules, and macroeconomic adjustments induce fluctuations in budget execution. Similar results were observed by Silva and Revorêdo (2005) and Vecchia and Montoya (2002), who emphasize that maintaining high efficiency rates over time is challenged by institutional pressures and operational constraints. From the perspective of PCT (Buchanan & Tullock, 1962), this effect may result from managers prioritizing actions with high immediate political returns, which do not always favor the long-term sustainability of efficiency.

The negative impact of IFDMEducation (-0.213; $p < .003$) diverges from the findings of Barroso et al. (2022) and Nobre et al. (2017), contradicting the intuitive perception that better educational indicators would lead to more efficient management. Research, such as that of Lanis and Bueno (2020), has identified a positive relationship between social indicators and the quality of budget management, while also emphasizing that institutional and political factors mediate this relationship. However, the evidence from this study corroborates the article by Silva et al. (2022), which suggests that a negative relationship may indicate that educational advances (i.e., education expenditures) imply greater financial commitments and expenditure rigidity, hindering budgetary adaptation and reducing flexibility for implementation adjustments. This interpretation is reinforced by PCT (Andrews, 2004), which predicts that pressure from public actors or decisions by managers seeking to maximize political gains (political visibility or benefits) can direct resources to socially valued sectors, but without due concern for intertemporal efficiency (maximization).

Similarly, IFDMEmployment presented a negative and significant coefficient (-0.280; $p < .000$), suggesting that municipalities with greater economic dynamism and better employment and income indicators face additional challenges in maintaining budgetary efficiency, contrary to the article by Nobre et al. (2017), which found a positive relationship. The findings of this research are consistent with the conclusions of the works of Revorêdo et al. (2021), Silva et al. (2015), and Vecchia and Montoya (2002), who associate increased revenue and economic activity with an expansion of social and political demands for investments in infrastructure and services, often carried out with little adherence to the original planning. PCT explains this phenomenon by indicating that managers, faced with new revenues and increased social pressure, may increase spending for electoral or image benefits, even if this compromises efficient budget execution (Sedmihradska, 2015).

On the other hand, IFDMHealth showed a negative coefficient, although not statistically significant (-0.031; $p = .395$), which corroborates studies such as Diniz et al. (2012), who identified a weak or non-existent relationship between health spending and municipal financial efficiency. The strong constitutional and legal link between health resources and the standardization of their allocation limits managers'

discretion, which may explain the lack of a systematic effect on budgetary efficiency (Caamaño-Alegre et al., 2013).

Finally, the Wald test ($\chi^2 = 45.45$; $p < .05$) confirms the joint significance of the regressors, lending robustness to the estimates and reinforcing the conclusion that the selected variables significantly explain variation in municipal budgetary efficiency. Taken together, the results suggest that advances in structural areas of human development, education, and employment do not automatically translate into greater budgetary efficiency, primarily when mediated by institutional factors and behaviors predicted by PCT, such as maximizing resources and political power at the expense of fiscal productivity gains.

Final Considerations

This article aimed to analyze the influence of socioeconomic indicators on the BEL in municipalities in the Paraíba Valley and North Coast of São Paulo, seeking to understand how these determinants can affect municipal budget execution. This objective was achieved through the application of the GMM econometric model, which enabled us to assess the impact of explanatory variables, including education, employment, health, and population, on the BEL.

The main findings of the regression analyses reveal a mean-reversion pattern in budgetary performance, evidenced by the negative and significant coefficient of the efficiency lag (BEL.L1), reinforcing the existence of budgetary cycles and institutional pressures that challenge the maintenance of efficiency in the long term (D'Inverno et al., 2018; Silva et al., 2015). In addition, this variable represents an operational and objective measure of budgetary efficiency, suitable for the study's analytical purposes, but its results should be interpreted alongside other institutional, economic, and social factors.

Regarding education and employment indicators, the coefficients are negative and statistically significant, indicating improved budgetary efficiency. These corroborating studies highlight the complexity of this relationship and the influence of institutional and behavioral factors in public managers, as predicted by PCT (Sedmihradska, 2015).

On the other hand, the health indicator presented a negative and statistically insignificant coefficient, which points to a weak relationship between health spending and municipal financial efficiency, possibly due to the constitutionally linked nature of health resources that limits the discretion of managers (Caamaño-Alegre et al., 2013; Diniz et al., 2012). Furthermore, Hypothesis 1 was not accepted because the IFDMEducation and IFDMEmployment variables had negative effects on BEL. In the case of Hypothesis 2, it could also not be accepted because the HAB dummy was omitted from the regression model due to collinearity with another variable.

The results of this study contribute theoretically to reinforcing the applicability of PCT in the analysis of budgetary efficiency, demonstrating that institutional and political factors have a decisive influence on fiscal outcomes. In practice, these findings provide valuable insights for public managers, who should consider the impact of socioeconomic indicators, as well as institutional cycles and constraints, when preparing and executing municipal budgets. Recognizing these dynamics can lead to public policies that are more aligned with fiscal efficiency and sustainability, thereby avoiding excessive spending driven by political interests or pressures that compromise fiscal effectiveness.

However, the research has limitations that should be considered. The study is limited to the Paraíba Valley and North Coast region of São Paulo, which may restrict the generalizability of the results to other regional contexts. Qualitative variables related to institutional and behavioral factors, as well as some socio-environmental variables, were not considered, suggesting the need for future research that incorporates qualitative analyses and other macroeconomic data to capture these aspects. We suggest expanding the regional scope and jointly exploring institutional, political, socioeconomic, and environmental determinants

to deepen understanding of the mechanisms influencing municipal budgetary efficiency. Furthermore, use an alternative BEL indicator as a robustness check in the model, as it is calculated differently based on the ratio of committed value to updated expenditure allocation.

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Notes

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