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MUNICIPAL FISCAL MANAGEMENT IN TIMES OF PANDEMIC

An analysis of the fiscal performance of Brazilian municipalities between 2017 and 2022

GESTÃO FISCAL MUNICIPAL EM TEMPOS DE PANDEMIA

Análise do desempenho fiscal de municípios brasileiros entre 2017 e 2022

GESTIÓN FISCAL MUNICIPAL EN TIEMPOS DE PANDEMIA

Análisis del desempeño fiscal de los municipios brasileños entre 2017 y 2022

Elizete Aparecida de Magalhães | |
Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM), Minas Gerais (MG), Brazil.

Josiane da Silva Aguilar | |
Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM), Minas Gerais (MG), Brazil.

Luiz Kennedy Cruz Machado | |
Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM), Minas Gerais (MG), Brazil.

Simão Pereira da Silva | |
Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM), Minas Gerais (MG), Brazil.

ABSTRACT

With the emergence of COVID-19, social, fiscal, and political uncertainties were mitigated through measures implemented by the federal government, which enabled the transfer of additional resources to states and municipalities to support their efforts in addressing the pandemic. This study aimed to analyze the relationship between COVID-19 and the fiscal condition of Brazilian municipalities from 2017 to 2022. A

quantitative study was conducted using data from 4,704 Brazilian municipalities. First, the Wilcoxon test was applied to compare the pre-pandemic and pandemic periods. Next, a dynamic panel data model was estimated, using the Fiscal Management Index developed by the Federation of Industries of the State of Rio de Janeiro (IFGF/Firjan) as a proxy for fiscal condition. In addition to the pandemic indicator variable, variables were included in the model to capture the influence of regional and population characteristics. The results showed that municipal fiscal condition is temporally persistent, with fiscal performance in a given period associated with that of the preceding period. During the period studied, the pandemic was associated with changes in fiscal dynamics, but there was no evidence of deterioration in the aggregate indicator. Fiscal results were also associated with regional characteristics and municipal population size. The North and Northeast regions had relatively poorer fiscal performance than the South, while less populous municipalities had poorer fiscal results than more populous ones.

Keywords: fiscal condition; COVID-19; Brazilian municipalities; panel data; Wilcoxon test; IFGF.

RESUMO

Com o surgimento da covid-19, incertezas sociais, fiscais e políticas foram amenizadas por meio da implementação de medidas adotadas pelo governo federal, que possibilitaram transferir mais recursos para estados e municípios, com o intuito de auxiliá-los no enfrentamento da pandemia. Este estudo teve como objetivo analisar a relação entre a covid-19 e a situação fiscal dos municípios brasileiros no período de 2017 a 2022. Realizou-se pesquisa quantitativa, com dados de 4.704 municípios brasileiros. Inicialmente, aplicou-se o teste de Wilcoxon para comparar os períodos pré-pandêmico e pandêmico. Em seguida, estimou-se um modelo de dados em painel dinâmico, utilizando como proxy da situação fiscal o Índice de Gestão Fiscal da Federação das Indústrias do Estado do Rio de Janeiro (IFGF/Firjan). Além da variável indicadora da pandemia, foram inseridas no modelo variáveis para captar a influência de características regionais e populacionais. Os resultados mostraram persistência temporal da situação fiscal municipal, indicando associação entre o desempenho fiscal

observado em determinado período e o registrado no período anterior. Ao longo do período estudado, a pandemia esteve associada a mudanças na dinâmica fiscal, sem evidências de deterioração do indicador agregado. Observou-se, ainda, associação entre os resultados fiscais, as características regionais e o porte populacional dos municípios. As Regiões Norte e Nordeste apresentaram desempenho fiscal relativamente inferior ao observado na Região Sul, enquanto os municípios de menor porte populacional registraram resultados fiscais inferiores aos verificados nos de maior porte.

Palavras chave: *situação fiscal*; *covid-19*; *municípios brasileiros*; *dados em painel*; *teste de Wilcoxon*; *IFGF*.

RESUMEN

Con la aparición de la covid-19, las incertidumbres sociales, fiscales y políticas fueron mitigadas mediante la implementación de medidas adoptadas por el gobierno federal, que permitieron transferir mayores recursos a los estados y municipios con el propósito de apoyarlos en el enfrentamiento de la pandemia. Este estudio tuvo como objetivo analizar la relación entre la covid-19 y la situación fiscal de los municipios brasileños durante el período comprendido entre 2017 y 2022. Se realizó una investigación cuantitativa con datos de 4 704 municipios brasileños. Inicialmente, se aplicó la prueba de Wilcoxon para comparar los períodos prepandémico y pandémico. Posteriormente, se estimó un modelo dinámico de datos de panel, utilizando como variable proxy de la situación fiscal el Índice de Gestión Fiscal de la Federación de Industrias del Estado de Río de Janeiro (IFGF/Firjan). Además de la variable indicadora de la pandemia, se incorporaron al modelo variables destinadas a captar la influencia de las características regionales y poblacionales. Los resultados mostraron una persistencia temporal de la situación fiscal municipal, indicando una asociación entre el desempeño fiscal observado en un determinado período y el registrado en el período anterior. A lo largo del período estudiado, la pandemia estuvo asociada a cambios en la dinámica fiscal, sin evidencias de deterioro del indicador agregado. Asimismo, se observó una asociación entre los resultados fiscales, las características regionales y el tamaño poblacional de los municipios. Las Regiones

Norte y Noreste presentaron un desempeño fiscal relativamente inferior al observado en la Región Sur, mientras que los municipios de menor tamaño poblacional registraron resultados fiscales inferiores a los verificados en los de mayor tamaño.

Palabras-clave: *situación fiscal*; *covid-19*; *municipios brasileños*; *datos de panel*; *prueba de Wilcoxon*; *IFGF*.

1 INTRODUCTION

The COVID-19 pandemic began in China in December 2019, triggering a severe health and economic crisis. Cases of COVID-19 quickly emerged in Asian countries such as Thailand, Japan, South Korea, and Singapore, and subsequently spread to Europe and other continents. This situation led the World Health Organization (WHO) to declare a public health emergency of international concern on January 30, 2020, and a pandemic on March 11, 2020 (Aquino *et al*., 2020).

Against this backdrop, the population had to adapt to the safety measures recommended by the WHO, including social distancing, mandatory mask-wearing in public places, and the suspension of in-person classes, parties, and other activities.

According to the Organisation for Economic Co-operation and Development (OECD) (2020), the COVID-19 pandemic created a global environment marked by social, fiscal, and political uncertainties. In this context, measures adopted to contain the spread of the coronavirus brought changes to various aspects of daily life, including mobility, social interaction, leisure, work, and education (Grossi; Minoda; Fonseca, 2020).

To mitigate the effects of the health emergency, the federal government implemented measures aimed at increasing transfers of resources to states and municipalities. However, such resources were not approved until April 2020, two months after the WHO declared the pandemic. Evidence indicates that the prior fiscal capacity of subnational governments may have been a determining factor in the effectiveness of

the response to the crisis caused by COVID-19 (Barbosa; Barbosa; Nojosa; Sousa, 2022).

On May 27, 2020, Supplementary Law No. 173 (PLP 39/2020) was enacted, establishing the Federative Program to Address COVID-19 (Brazil, 2020a). This legislation enabled the transfer of additional federal resources to states and municipalities, with the aim of assisting them both in addressing the pandemic and in balancing their public finances. It also provided for the suspension of debt payments by the states to the federal government.

To prevent the growth of the fiscal deficit of subnational governments, the aforementioned law imposed restrictions on increases in public expenditure, particularly personnel expenses and the creation of public positions that would result in increased expenditure. The federal government also issued Provisional Measure (MP) No. 938 of April 2, 2020, which provided for financial support from the federal government to subnational governments in response to the reduction in transfers from the Municipalities Participation Fund (FPM) and the States Participation Fund (FPE), resulting from the economic contraction caused by the pandemic. Given that such transfers are, in many cases, the main source of revenue for municipalities, the reduction in these resources may have directly affected the fiscal condition of various local governments (Brazil, 2020b).

During and after the pandemic, the public finances of states and municipalities were significantly affected. On the one hand, governments faced constraints on their revenue-raising capacity as a result of the economic downturn; on the other, they needed to increase investment to strengthen the healthcare system's response capacity. This study aimed to analyze the association between the pandemic period and the fiscal condition of Brazilian municipalities from 2017 to 2022.

Several studies in the literature have analyzed this relationship. Černěnko, Neubauerová, and Zubaľová (2021) investigated the effects of the pandemic on local government budgets in Slovakia. Nemec and Špaček (2020) assessed the repercussions of the crisis on intergovernmental relations and local government budgets in the Czech Republic and Slovakia. In the Brazilian context, Borges (2020)

examined variations in tax revenues and the fiscal condition of states in the Southeast Region, while Barbosa, Barbosa, Nojosa, and Sousa (2022) analyzed the relationship between municipalities' fiscal capacity and COVID-19-related mortality.

Despite these advances, gaps remain regarding the effects of COVID-19 on the fiscal condition of Brazilian municipalities. By investigating this relationship, this study expands the empirical evidence on the dynamics of municipal fiscal condition during the period under analysis. Additionally, it provides insights for improving public management in crisis scenarios and for formulating policies aimed at strengthening local governments' capacity to respond to similar challenges in the future.

2 LITERATURE REVIEW

This section presents the main theoretical aspects related to fiscal management, discusses the effects of the COVID-19 pandemic on public accounts, and addresses the IFGF as a measure used to assess the fiscal condition of Brazilian municipalities.

2.1 Fiscal management

In Brazil, fiscal management was established through Supplementary Law No. 101 of May 4, 2000, known as the Fiscal Responsibility Law (LRF). This legal framework established new obligations for public officials in the Executive, Legislative, and Judicial branches, defining fiscal discipline rules for the preparation and execution of the budgets of the federal government, states, the Federal District, and municipalities (Martins; Marques, 2013).

According to Martins and Marques (2013, p. 153), the LRF defines fiscal management "as planned and transparent action that prevents risks and corrects deviations capable of affecting the balance of public accounts." The adoption of Fiscal Responsibility Laws as an institutional measure has been considered an effective tool for restoring fiscal balance at both the national and subnational levels (Sawhney, 2018).

To establish limits and ensure the sustainability of public accounts, fiscal rules play a vital role in maintaining fiscal discipline. These rules consist of legal provisions aimed at promoting responsible fiscal management (Bergman; Hutchison; Jensen, 2013), constituting long-term constraints on the conduct of fiscal policy (Vilella; Vaz, 2021). Their purpose is to prevent practices that could result in recurring budget deficits or unsustainable growth in public debt.

In Brazil, the fiscal rule that has received the most attention is the golden rule of public finances, which aims to prevent governments from borrowing to finance current expenditures, such as salaries, benefits, and the operation and maintenance of public administration (Afonso; Ribeiro, 2017).

For responsible fiscal management, the Brazilian constitutional system established a new budgetary framework comprising three interconnected instruments: the Pluriannual Plan (PPA), the Budget Guidelines Law (LDO), and the Annual Budget Law (LOA). These are budgetary rules governing the budget preparation process. The PPA is intended to establish medium-term guidelines, objectives, and targets for the public administration over a four-year period, with the aim of ensuring that government actions are properly directed. The LDO is intended to guide public policies and their respective priorities, which must be taken into account when preparing the LOA. The budget law, in turn, aims to estimate revenues and establish expenditure appropriations for the fiscal year (Brazil, 2021).

Thus, fiscal management is geared toward managing revenues and expenditures in a manner that achieves a balance in public accounts, avoiding indebtedness or budget deficits, as established by the LRF (Magalhães; Mattos; Wakim, 2019). With regard to budget balance, Hansen, Houlberg, and Pedersen (2014) state that it is the most important aspect of managing public revenues and expenditures.

Fiscal management should be analyzed at the municipal level, as it reflects the capacity of local governments to finance public policies and manage available resources. According to Silva and Crisóstomo (2019), higher levels of fiscal management tend to be associated with better mechanisms for social oversight of public management. Thus, efficient fiscal management is understood to contribute to more effective public administration, thereby promoting the socioeconomic development of municipalities.

In a dynamic economic environment subject to constant challenges, the importance of fiscal rules emerges as a fundamental pillar of the country's financial stability, directly affecting its capacity to cope with unforeseen crises. A sound fiscal position not only promotes balance in public accounts but also provides a crucial safety net in times of uncertainty.

2.1.1 Public accounts and COVID-19

The management of public accounts in Brazil at the federal, state, and municipal levels is governed by Law No. 4,320/1964 (Brazil, 1964), as well as by the LRF, whose main objective is to ensure a balance between public revenues and expenditures, thereby promoting fiscal responsibility and preventing budgetary and financial imbalances. Before the enactment of this legislation, a lack of control over public finances was common, characterized by expenditures exceeding revenues, which had adverse effects on the national economy (Xerez, 2013). The LRF established public finance rules aimed at promoting fiscal responsibility (Brazil, 2000).

With the emergence of the COVID-19 pandemic, a sharp contraction in economic activity was observed, with negative repercussions for public accounts (Mora, 2020). At the subnational level, responding to the crisis posed additional challenges, given that Brazilian states and municipalities have limited capacity to expand their fiscal space immediately.

The main mechanisms for expanding fiscal capacity – public borrowing and increases in tax revenues – are constrained at the subnational level. In the case of borrowing, states and municipalities are subject to legal and institutional restrictions, with the federal government being the level of government with the greatest financing capacity through the issuance of public debt. With regard to tax revenues, implementing changes to tax legislation requires compliance with constitutionally established time limits, making immediate fiscal responses unfeasible in emergency situations such as the pandemic (Barbosa; Barbosa; Nojosa; Sousa, 2022).

Thus, the existence of fiscal space, understood as the borrowing limit applicable to states, the Federal District, and municipalities participating in the Fiscal Restructuring and Adjustment Program or the Fiscal Monitoring Program (Brazil, 2020c), was essential for addressing the fiscal shock resulting from the pandemic, contributing to the effectiveness of public policies and the continuity of public service provision. Evidence indicates that countries with greater capacity to expand and reconfigure the composition of expenditures were relatively less affected than those with limited fiscal space (Barbosa; Barbosa; Nojosa; Sousa, 2022).

Better fiscal conditions were associated with greater spending capacity among municipalities, enabling them to expand the provision of hospital services. Additionally, expenditure controls were associated with greater effectiveness of non-pharmaceutical interventions in reducing social mobility. These factors were associated with mortality during the pandemic, particularly deaths directly related to SARS-CoV-2 infection (Barbosa; Barbosa; Nojosa; Sousa, 2022).

Public accounts, both in terms of government revenues and expenditures, were affected by the COVID-19 pandemic. With regard to revenues, the contraction in economic activity resulted in a reduction in traditional sources of revenue, such as taxes on consumption and corporate profits. On the expenditure side, increases were observed as a result of investments in public health and social assistance, as well as spending on the acquisition of Personal Protective Equipment (PPE) and medical supplies.

The education sector was also affected, generating new spending needs, as municipal governments began investing in digital tools to enable the provision of remote education. In this context, Ribeiro *et al.* (2023) point out that, in the public sector, tax revenue declined while the need for public policies aimed at preserving economic activity and public health increased.

Mora (2020) highlights that public finances were, to some extent, safeguarded by the measures adopted by the federal government, particularly the expansion of transfers of resources to subnational governments and the adoption of legal provisions that helped mitigate expenditure pressures. These measures included restrictions on salary increases for public servants, limitations on career restructuring with fiscal impacts, and the creation of conditions to expand the fiscal space available for public investment.

The relationship between COVID-19 and public budgets has been investigated in the literature, notably by Vieira, Silva, Silva, and Sá (2022), who analyzed the effects of the pandemic on small municipalities, focusing on variations in budget revenues and expenditures. The results indicate that, in the first year of the pandemic, revenues increased, driven by intergovernmental transfers. At the same time, however, a reduction was observed in transfers allocated to certain budget items.

Ribeiro *et al.* (2023) analyzed the behavior of public accounts, in terms of revenue collection and expenditures related to addressing COVID-19, in the ten most populous municipalities in the state of Paraná. The authors found that, overall, the pandemic did not adversely affect the trajectory of municipal revenues, as most municipalities recorded growth in 2020 and 2021. The exception was Curitiba, which recorded a reduction in revenues in 2020 compared with the previous year. With regard to expenditures, changes in their composition were observed in the municipalities analyzed, with increased spending on healthcare in 2020 and 2021, accompanied by reduced expenditures on culture, sports, and leisure.

From another perspective, Wang, Esteves, and Armani (2023) addressed the case law of the Federal Supreme Court (STF) during the pandemic in cases involving rules governing public accounts. They analyzed how the STF ruled on subnational governments' debts to the federal government, budgetary and fiscal responsibility rules, the use of funds to combat the pandemic, public-sector personnel expenditures, and state rules governing parliamentary amendments. The authors found that, in the context of the pandemic, several decisions concerning budgetary matters were made as legislative measures to adapt public budgets to the new circumstances. In addition, the STF granted requests from subnational governments for financial relief, at the expense of the federal government.

With regard to the effects of the pandemic on fiscal management, Castro (2022) investigated the state capitals in Brazil's Northeast Region between 2019 and 2020. Using the IFGF, discussed in detail in the following subsection, the study found that the municipalities achieved excellent fiscal management (an index above 0.8), even amid the pandemic. Despite the difficulties caused by COVID-19, the capitals employed numerous strategies to achieve sound fiscal management.

Notwithstanding the advances in the literature on the effects of the pandemic on public finances, many studies focus on descriptive analyses or specific geographic areas, such as states or limited groups of municipalities. Empirical research investigating the impact of COVID-19 on the fiscal condition of Brazilian municipalities on a national scale remains scarce. Thus, a gap remains in the literature regarding the analysis of the pandemic's effect on municipal fiscal condition while simultaneously considering regional differences and population size.

2.1.2 Firjan Fiscal Management Index

The IFGF was developed by Firjan based on official fiscal data reported by municipal governments. Municipalities submit their accounts to the National Treasury Secretariat (STN), and this information is made publicly available through the Brazilian Public Sector Accounting and Fiscal Information System (Siconfi) (Brazil, 2023; Firjan,

2025b). The index comprises four dimensions: autonomy, personnel expenditures, liquidity, and investment (Firjan, 2025b).

The autonomy indicator (IA) assesses, in the case of municipalities, the ability of municipal governments to generate sufficient revenues to cover the costs of their own administrative structure. To construct this index, the difference between own-source revenues and the cost of maintaining the City Council and the administrative functions of the Executive Branch is first calculated. The revenues considered are those resulting from local tax collection efforts and the municipality's economic potential. The index is obtained by dividing this difference by Net Current Revenue (RCL), with values ranging from zero to one. Values close to zero indicate a lower capacity of the municipality to generate revenues to finance its own administrative structure (Firjan, 2025b).

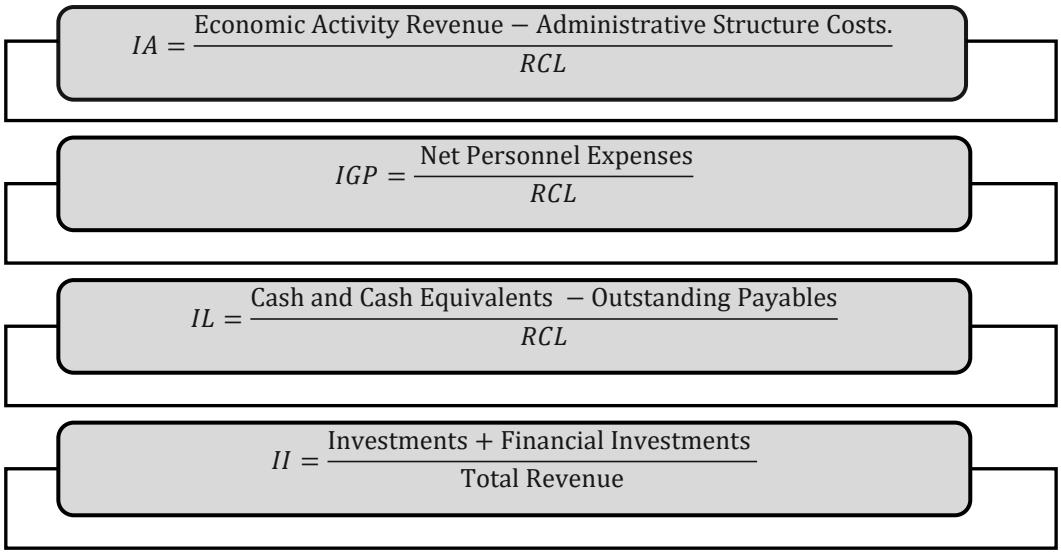
The personnel expenditure indicator (IGP) assesses the extent to which Net Current Revenue is committed to personnel expenditures. Under the LRF, this commitment must be limited to 60%, with the aim of preventing budgetary rigidity and ensuring room for allocating resources to other areas. Given the standardization of the index, values closer to 1 indicate a lower proportion of the budget committed to payroll and, consequently, greater fiscal management capacity to implement public policies (Firjan, 2025b).

The liquidity indicator (IL) measures the relationship between deferred financial obligations and available cash, considering the difference between the total amount of Outstanding Payables at the end of the fiscal year and the amount of cash available to cover these expenses in the following fiscal year. This difference is expressed relative to the RCL for the period. Values close to 1 indicate that the municipality is not carrying obligations over to future fiscal years without corresponding financial coverage (Firjan, 2025b).

The investment indicator (II), in turn, measures the share of total municipal revenue allocated to investments in education, healthcare, urban infrastructure, sanitation, and public lighting. Values closer to 1 indicate a higher volume of investments made by municipal governments (Firjan, 2025b).

Figure 1 shows the equation for each indicator comprising the IFGF.

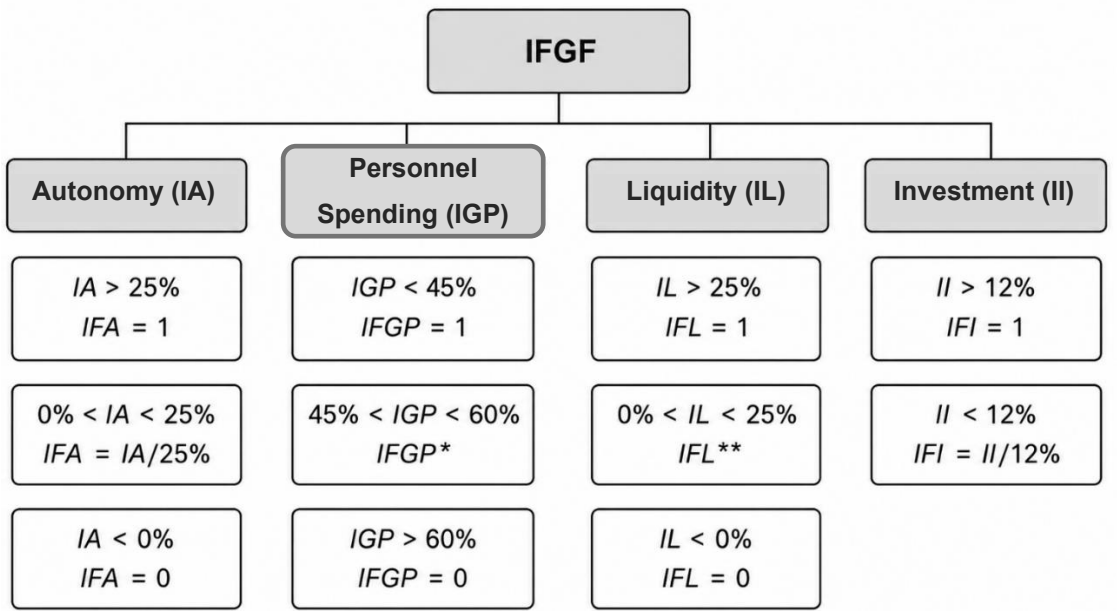
Figure 1 — Equations of the IFGF Indicators



Source: prepared based on Firjan (2025b).
Note: the equations represent the criteria used to calculate the autonomy, personnel expenditures, liquidity, and investment indicators comprising the IFGF.

Based on the indicators obtained from the equations described above, Firjan proposes a standardization whereby both revenue and expenditure indicators are interpreted according to the principle that values closer to 1 indicate better fiscal performance. This standardization is presented in Figure 2.

Figure 2 — Standardization of the IFGF Indicators



Source: prepared based on Firjan (2025b).
Note: the standardization of the indicators follows the formulas $* IFGP = 1 - \left\{\frac{IGP - 45\%}{60\% - 45\%}\right\}$ e $** IFL = 0{,}4 + \left(\frac{0{,}6xIL}{25}\%\right)$.

After each indicator is standardized, as shown in Figure 2, the IFGF is calculated as the mean of the component indicators, with the resulting score ranging from zero to one. Values closer to 1 indicate better fiscal performance by the municipality, both in the specific dimensions and in the aggregate index.

To establish reference values that facilitate analysis, four IFGF classifications were defined, as shown in Table 1.

Table 1 — Classification Criteria for IFGF Indicators

Classification	Score
Excellent fiscal management	Above 0.8
Good fiscal management	Between 0.6 and 0.8
Fiscal management with difficulties	Between 0.4 and 0.6
Critical fiscal management	Below 0.4

Source: prepared based on Firjan (2025b).

The IFGF has been widely used in the literature as an indicator of municipal fiscal condition (Castro, 2022; Oliveira; Magalhães, 2022; Preto; Acar; Aredes; Ney, 2022;

Söthe; Visentini; Writzl, 2020). These studies highlight its usefulness for assessing fiscal management performance, monitoring its evolution, and measuring municipalities' capacity to manage public resources. For this reason, the IFGF was adopted in this study as a measure of the fiscal condition of Brazilian municipalities.

3 METHODOLOGICAL PROCEDURES

The study was conducted based on Brazilian municipalities that had the data required for the analysis for the period from 2017 to 2022. The time frame covered six years, allowing for a comparison between the pre-pandemic and pandemic periods.

To achieve the proposed objective, the onset of the pandemic was adopted as the temporal benchmark for dividing the period under analysis. Thus, the years 2017 to 2019 were classified as the pre-pandemic period, while the years 2020 to 2022 corresponded to the pandemic period. For each municipality, the averages of the fiscal indicators were calculated for each three-year period, allowing for a comparison between the two periods.

Next, the normality of the differences between the means was assessed using the Shapiro-Wilk test (Shapiro; Wilk, 1965), whose null hypothesis assumes a normal distribution. Given the rejection of this hypothesis, the Wilcoxon test (1945) was applied to determine whether there were statistically significant differences in the fiscal condition of municipalities between the pre-pandemic and pandemic periods.

Next, to corroborate the findings, a panel data model was employed, combining information over time and across different units of analysis. According to Gujarati and Porter (2011, p. 587), in panel data, "the same cross-sectional unit (a family, a firm, a state) is followed over time," simultaneously incorporating the spatial and temporal dimensions.

Panel data estimation techniques offer several advantages, notably the ability to capture heterogeneity across units of analysis and over time, making the information

more comprehensive and informative. In addition, they allow for greater variability in observations, reduce collinearity among explanatory variables, and increase the degrees of freedom, thereby contributing to greater efficiency of the estimates.

Among the types of panel data models, static and dynamic, this study adopted the dynamic panel model, as proposed by Arellano and Bond (1991) and subsequently improved by Arellano and Bover (1995) and Blundell and Bond (1998). The choice of this method is supported by empirical evidence in the literature, including the studies by Covre and Mattos (2016), Oliveira and Magalhães (2022), Silva, Nascimento and Silva (2021), and Rosenthal and Wolfson (2013), which indicate the presence of temporal persistence in variables related to budget execution as a result of fiscal management rules. In this regard, the dynamic specification allows the lagged behavior of fiscal condition to be incorporated into the model, making it possible to assess the extent to which fiscal performance observed in period *t - 1* is associated with that recorded in period *t*. This formulation refers exclusively to the temporal dynamics observed during the period analyzed, from 2017 to 2022, and does not imply that the results can be extrapolated to subsequent periods.

The estimated system dynamic panel data model is presented in Equation 1.

$$SF_{it} = \alpha_i + \delta SF_{it-s} + \beta DCovid_t + \theta X_{it} + v_t + \varepsilon_{it} \quad (1)$$

$i = 1, \ldots, 4.704$ municipalities
$t = 2017, \ldots, 2022$

In this equation, SF_{it} represents the fiscal condition of municipality *i* in period *t*, measured by the IFGF; $DCovid$ is the binary pandemic variable; X_{it} represents the control variables, expressed as regional and population-size dummies; δ, β and θ are the estimated parameters; α_i is the unobserved municipality-specific effect; v_t represents the time-specific effect, invariant across municipalities; and ε_{it} is the random error, with a mean of zero and constant variance.

To validate the dynamic panel data model, widely used tests for GMM estimation were performed. The Arellano-Bond (1991) test for autocorrelation was used to assess the

presence of first-order (AR1) and second-order (AR2) serial autocorrelation in the residuals, with significance expected in the first case and no significance in the second, a condition required for the consistency of the estimators. Additionally, the difference-in-Hansen test was applied to assess the validity of the instruments used in the model by testing the hypothesis of exogeneity. Failure to reject this hypothesis indicates that the instruments are appropriate for the proposed estimation.

To measure fiscal condition, the IFGF was used as a proxy variable, as it is an index that assesses the fiscal management of municipalities. The choice of this indicator is justified by its comprehensive nature, as it incorporates indicators aligned with the limits established by the LRF, as well as by its widespread use in empirical studies, such as Almeida (2023), Leite Filho, Cruz, Silva and Nascimento (2018), Louzano, Abrantes, Ferreira and Zuccolotto (2019), Murta Filho, Magalhães and Wakim (2022), Nascimento and Silva (2022), and Oliveira and Magalhães (2022).

The variable of interest refers to COVID-19 and is represented by a dummy variable that captures the association between the pandemic period and public financial management. This dummy variable takes a value of one for the pandemic years (2020, 2021, and 2022) and zero for the remaining years. It should be noted that the pandemic-related dummy variable represents the pandemic period as a whole and does not allow for the identification of specific causal effects, as it simultaneously incorporates different factors, such as extraordinary fiscal transfers, institutional changes, and pre-existing trends. Therefore, the estimated coefficients should be interpreted as evidence of association rather than as an isolated causal effect of the pandemic. The literature indicates that the pandemic period was associated both with increased revenues of government entities, driven by extraordinary transfers, and with higher public expenditures (Castro, 2022; Chieza; Demarco, 2022; Ribeiro *et al*., 2023; Vieira; Silva; Silva; Sá, 2022).

In addition to the variable representing the pandemic, regional dummies were included to control for different social, economic, demographic, political, institutional, and other factors that may affect the level of fiscal condition. Regional dummies are intended to capture the effect of regional characteristics (Magalhães; Mattos; Wakim, 2019;

Quintela, 2011), as well as to control for unobserved, region-specific effects (Ribeiro; Gonçalves; Fialho, 2020).

For this purpose, regional dummies corresponding to the North, Northeast, Southeast, Central-West, and South regions were included, with the South Region adopted as the reference category because it presented, on average, better fiscal performance than the other regions. These variables group municipalities according to their geographic location, taking a value of one when a municipality belongs to the respective region and zero otherwise. The estimation results for Model 1 for these categories make it possible to assess regional differences relative to the reference region. Statistically significant negative coefficients indicate that fiscal condition in the other regions is lower than that observed in the South Region.

The model also included population-size dummies to control for variation in fiscal condition according to municipality size, given the considerable heterogeneity among Brazilian municipalities, particularly in terms of economic activity, demand for public services, and other structural characteristics. Accordingly, municipalities were classified into the following three population ranges: *i)* up to 20,000 inhabitants; *ii)* between 20,000 and 50,000 inhabitants; and *iii)* more than 50,000 inhabitants. Hansen, Houlberg, and Pedersen (2014) state that population size may influence fiscal performance because of budgetary scale. The authors further note that larger municipalities in terms of population execute larger budgets, providing them with better economic conditions to ensure financial and administrative capacities conducive to sound management of public accounts.

For the analysis of the panel data model, the proxy for fiscal condition was obtained from Firjan for the period from 2017 to 2022 (Firjan, 2025a). The regional and population-size dummies were constructed based on information obtained from the website of the Brazilian Institute of Geography and Statistics (IBGE) (Brazil, 2018, 2024).

After collecting the fiscal condition index data, 864 municipalities were excluded from the total of 5,568 municipalities considered by Firjan because they did not have an index value for at least one of the years under study, representing 15.52% of Brazilian municipalities. These municipalities had an average population of 20,800 inhabitants; 49% had up to 10,000 inhabitants, and 25% had between 10,000 and 20,000 inhabitants. Thus, 4,704 municipalities were analyzed, representing 84.48% of the country's total.

It should be noted that the exclusion of 864 municipalities without complete IFGF data for the period analyzed may have introduced selection bias into the sample. Given that some of these municipalities have small populations and potentially lower institutional capacity to provide fiscal information, the results should be interpreted with caution, as the final sample may overestimate the average fiscal performance of Brazilian municipalities and attenuate regional disparities.

4 RESULTS AND DISCUSSION

To understand the association between the pandemic and fiscal condition, the proxy for fiscal condition used was the IFGF, calculated as the average of the autonomy, personnel expenditures, liquidity, and investment indicators. The index ranged from zero to one, with values closer to 1 indicating better fiscal performance.

The study sample comprised 4,704 municipalities, corresponding to 84.48% of the total number of Brazilian municipalities. Based on 2022 data, the distribution by population size indicated that 68% of municipalities had up to 20,000 inhabitants, 19% had between 20,000 and 50,000 inhabitants, and 13% had a population of more than 50,000 inhabitants.

With regard to geographic distribution, the sample comprised 1,502 municipalities from the Southeast Region, 1,459 from the Northeast Region, 1,086 from the South Region, 359 from the Central-West Region, and 298 from the North Region. It should be noted that the North Region had the largest number of municipalities excluded from the

analysis due to the unavailability of IFGF data, according to information provided by IBGE (Brazil, 2018, 2024).

To understand the fiscal condition of the Brazilian municipalities analyzed, Table 1 presents the descriptive statistics for the IFGF for the period from 2017 to 2022.

Table 1 — Descriptive Analysis of the IFGF for the Municipalities in the Sample (2017 to 2022)

Year	Mean	Standard deviation	Minimum	Maximum	Annual change in the index (%)
2017	0.417	0.198	0.000	1.000	-
2018	0.464	0.202	0.003	1.000	10.239
2019	0.495	0.202	0.003	1.000	6.156
2020	0.554	0.207	0.003	1.000	10.656
2021	0.601	0.214	0.012	1.000	7.878
2022	0.635	0.201	0.030	1.000	5.436
Overall	0.528	0.217	0.000	1.000	-

Source: prepared based on Firjan (2025a).

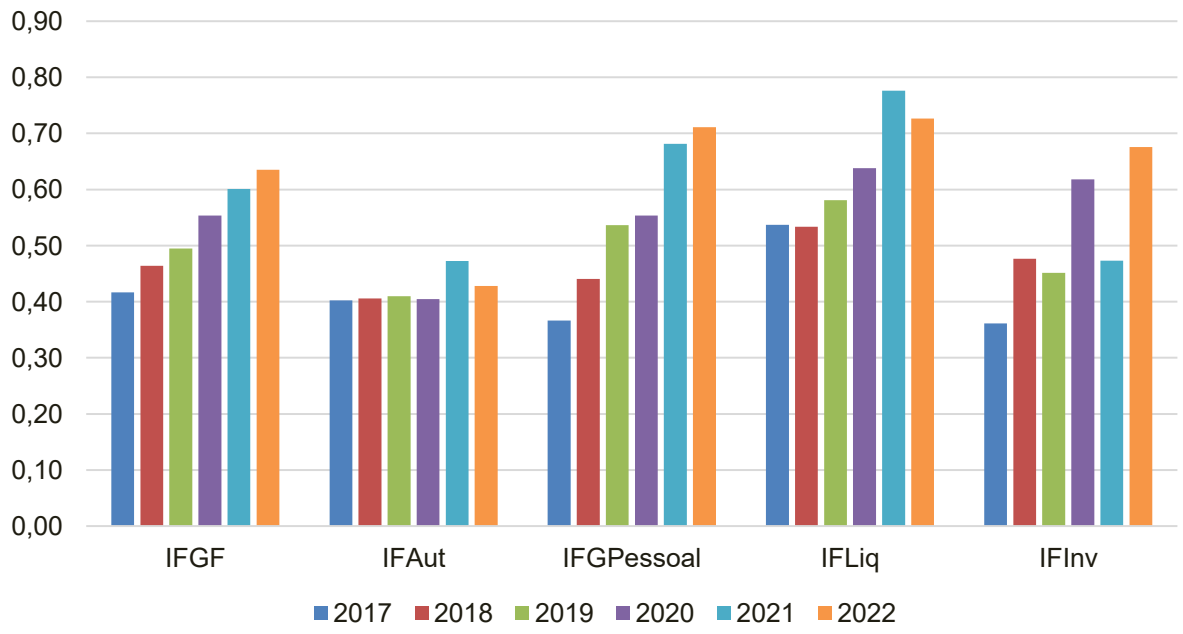
According to Table 1, the municipalities studied had an average IFGF of approximately 0.53 and a standard deviation of 0.22, indicating heterogeneity among municipalities with regard to fiscal condition. Among the years studied, 2017 recorded the lowest index value, with a minimum of zero in the municipalities of Novo Triunfo (BA) and Guimarães (MA), both with populations between 10,000 and 20,000 inhabitants. In all years, a maximum value of 1.000 was observed. However, in 2022, more municipalities recorded this index value, totaling 45 cases, predominantly concentrated in the South, Southeast, and Central-West regions.

With regard to annual variation, 2018 and 2020 showed greater fluctuations compared with the preceding years, with variation of approximately 10%. By contrast, the smallest variation was recorded between 2021 and 2022, at approximately 5.43%.

When analyzing the average fiscal condition by year, it can be observed that the mean values for the pre-pandemic years were lower than those for the years in which the pandemic occurred. These results indicate that fiscal condition did not deteriorate during the pandemic years.

To better understand the behavior of fiscal condition, Chart 1 was prepared, showing the IFGF and its component indicators over the study period: autonomy (IFAut), personnel expenditures (IFGPessoal), liquidity (IFLiq), and investment (IFInv).

Chart 1 — Behavior of the IFGF and Its Indicators in the Municipalities Studied (2017 to 2022)



Source: prepared based on Firjan (2025a).

It is observed in Chart 1 that the mean fiscal condition increased from 0.41 to 0.63 between the first and last years, representing an average annual growth of approximately 11%[1] and the highest value recorded during the period. According to Firjan's classification, the first four years fall within the category of fiscal management with difficulties (0.40 to 0.60), while in the last two years, the indicator moved into the category of good fiscal management (0.60 to 0.80).

[1] The Geometric Growth Rate (TCG) was calculated using the estimated model $lnY_t = \beta_1 + \beta_2 tend. + \varepsilon_t$. Based on the estimated coefficient of the trend variable (tend.), the TCG was determined using the equation: $[antilog\ (\beta_2) - 1] * 100$, as defined by Gujarati and Porter (2011).

Considering the IFGF indicators, the autonomy indicator remained relatively stable throughout the period analyzed. By contrast, the other indicators showed positive trends. The increase in the overall mean index was mainly associated with improvements in the personnel expenditures and investment indicators, whose values nearly doubled between the first and last years of the series.

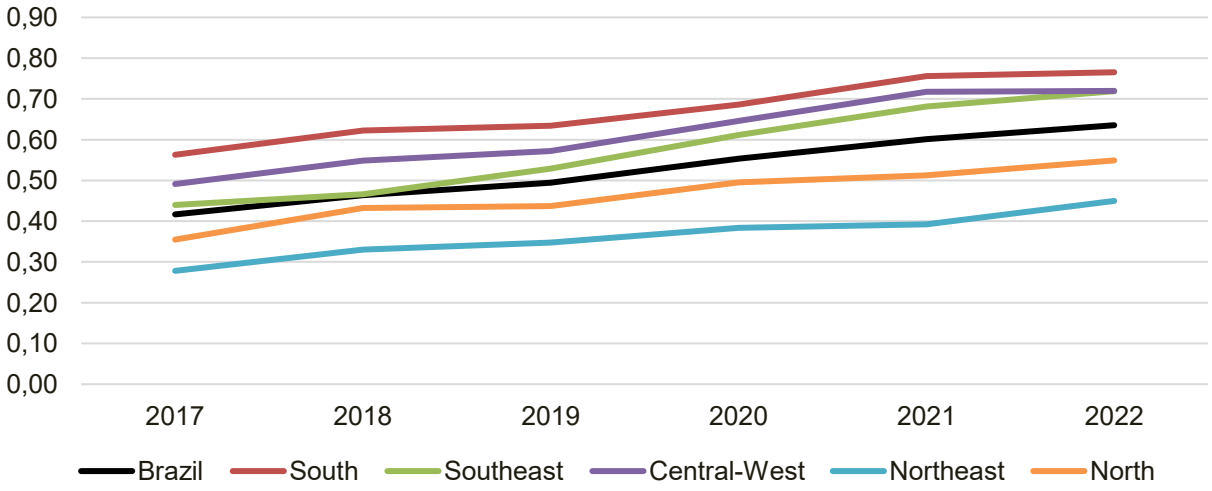
Based on the decomposition of the IFGF presented in Chart 1, the personnel expenditures indicator (IFGPessoal) increased from 0.38 in 2017 to 0.71 in 2022, contributing to the increase in the index over the period. At the beginning of the series, 1,012 municipalities (21.51%) exceeded the 60% RCL limit. In 2022, this percentage fell to 5.20% (245 municipalities), a result that may be associated with the restrictions on expenditure growth, particularly personnel expenditures, imposed by Supplementary Law No. 173 of May 27, 2020.

The IFLiq remained stable during the first two years (mean of 0.53), which recorded the lowest values of the period. In subsequent years, there was an improvement of approximately 0.20 points. At the beginning of the period, approximately 20% of municipalities had a zero liquidity indicator. However, in 2021, this percentage fell to 4.38%.

The IFInv increased by 0.31 points between 2017 and 2022, with peaks in 2020 (0.62) and 2022 (0.68), contributing to the improvement in the overall index. The results suggest an intensification of investment during the pandemic, possibly associated with the strengthening of the healthcare system.

Chart 2 shows the behavior of the municipalities' average annual IFGF, by region, over the study period.

Chart 2 — Evolution of the IFGF of Brazilian Municipalities, by Region (2017 to 2022)



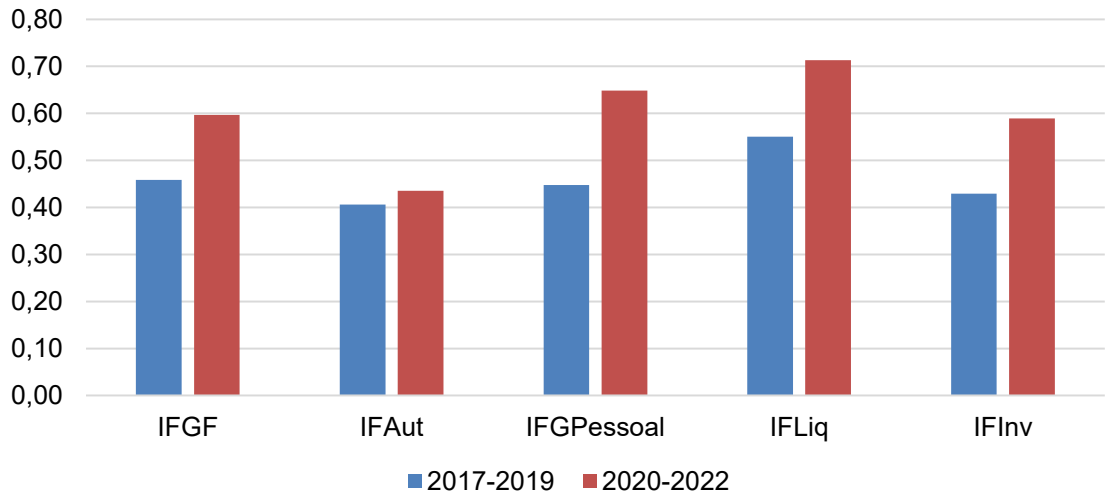
Source: prepared based on Firjan (2025a).

According to the results presented in Chart 2, the Northeast Region recorded the lowest index value, at 0.28 points in 2017 and 0.45 points in 2022. By contrast, the South Region recorded the highest average index, at 0.56 points in 2017 and 0.76 points in 2022, representing an increase of 35.71%.

The Southeast, Central-West, and South regions exceeded the national average in all years analyzed, while the North and Northeast regions remained below the national average. These results indicate that the management of revenues and expenditures in municipalities in the latter two regions tends to be less effective than that in municipalities in the other regions.

Considering that the purpose of the study is to analyze fiscal condition in the context of the pandemic period, Chart 3 presents the average IFGF and its indicators for the municipalities studied before (2017–2019) and during (2020–2022) the COVID-19 pandemic.

Chart 3 — Comparison of Average Fiscal Management in Municipalities in the Pre-Pandemic and Pandemic Periods



Source: prepared based on Firjan (2025a).

The comparison between the pre-pandemic and pandemic periods suggests an improvement in the aggregate indicator and its components, as shown by the results presented in Chart 3.

Considering Firjan's weighting methodology (Figure 2), the maximum score for the personnel expenditures indicator is assigned when personnel expenditures are below 45% of RCL. Before the pandemic, fewer than 500 municipalities reached this threshold each year. By contrast, during the pandemic period, the number exceeded 1,600 municipalities in the last two years analyzed.

At the opposite end of the scale, when personnel expenditures exceed 60% of RCL (zero score), 2,131 municipalities exceeded the LRF limit in the first three years. In the last three years, this figure fell to 1,196. The results suggest improved compliance with the personnel expenditure limit during the pandemic.

When analyzing the investment indicator, which assigns the maximum score when a municipality allocates 12% of Total Revenue to this purpose, the results show that, before the onset of the COVID-19 pandemic, fewer than 300 municipalities reached this threshold each year. By contrast, in 2020 and 2022, approximately 1,000 municipalities achieved the maximum score on the indicator. These data confirm that,

despite the challenges arising from the pandemic, fiscal condition improved from 2020 onward, as evidenced by the behavior of the IFGF over the historical series.

To determine whether the fiscal condition of municipalities differed between the pre-pandemic and pandemic periods, the Shapiro-Wilk normality test was initially applied. The results indicated rejection of the normality hypothesis for all variables analyzed, with p-values below 1%. Given the non-normality of the data, the Wilcoxon test was used to compare the fiscal indicators for the same municipalities between the 2017–2019 and 2020–2022 periods. The results of the Wilcoxon test for the IFGF and its indicators are reported in Table 2.

Table 2 — Wilcoxon Test: Comparative Analysis of the Results for the Pre-Pandemic and Pandemic Periods

Variable	Pre-Pandemic Mean	Pandemic Mean	Difference	p-value
IFGF	0.458	0.596	0.138	0.000
Autonomy	0.405	0.435	0.029	0.000
Personnel Expenditures	0.447	0.648	0.201	0.000
Liquidity	0.550	0.713	0.163	0.000
Investment	0.429	0.589	0.159	0.000

Source: prepared by the authors.
Note: difference calculated as the mean for the pandemic period minus the mean for the pre-pandemic period.

As shown in Table 2, p-values below 1% indicate statistically significant differences between the pre-pandemic and pandemic periods for the IFGF and its four components, leading to rejection of the null hypothesis of no differences between the periods. The descriptive analysis of the means shows that all indicators recorded higher values during the pandemic. The largest increase was recorded for the Personnel Expenditures indicator, followed by Liquidity, Investment, the overall IFGF, and Autonomy. Thus, the results indicate that the pandemic period was associated with a relatively more favorable fiscal condition among the municipalities analyzed.

As an additional robustness strategy, a dynamic panel data model was estimated, with the results presented in Table 3. Considering the set of variables included, the

estimated coefficients were statistically significant at the 1% level, indicating that these factors are associated with the dynamics of fiscal condition over the period analyzed.

The consistency of the estimated model depends on the absence of second-order autocorrelation in the residuals, which was observed in the present study, given the lack of statistical significance at the 5% level, as indicated by the applied autocorrelation test (AR2). With regard to the instruments used to address the endogeneity problem in the estimated model, the results of the difference-in-Hansen test indicated that the instruments were exogenous and therefore suitable for instrumenting the lagged dependent variable.

Table 3 — Results of the Estimated Model for the Municipalities Studied (2017 to 2022)

Variables	Coefficients	Standard Errors
SF $_{(t-1)}$	0.569***	0.011
COVID-19	0.054***	0.002
Southeast	-0.032***	0.003
Central-West	-0.020***	0.004
Northeast	-0.140***	0.004
North	-0.093***	0.006
Municipalities with a population below 20,000 inhabitants	-0.024***	0.003
Municipalities with a population between 20,000 and 50,000 inhabitants	-0.021***	0.004
Constant	0.311***	0.008
Autocorrelation test (AR_1)	*p-value = 0.000*	
Autocorrelation test (AR_2)	*p-value = 0.057*	
Difference-in-Hansen test	*p-value = 0.640*	
Number of municipalities	*4,704*	

Source: prepared by the authors.
Note: *i)* *** significant at 1%; *ii)* estimates obtained using two-step system GMM, with the Windmeijer (2005) correction for bias in standard errors; *iii)* the reference region was the South. Regarding population size, the reference group comprises municipalities with more than 50,000 inhabitants.

In the model analysis, the dependent variable lagged by one period had a positive and statistically significant coefficient, indicating temporal persistence in the fiscal condition of municipalities over the period analyzed. Holding the other model variables constant, a one-unit increase in the fiscal condition index recorded in the previous period (*t - 1*) was associated with an increase of 0.569 in the index observed in the subsequent

period (*t*). This finding suggests that municipal fiscal performance exhibits continuity across consecutive periods, which may be related to the very dynamics of public budget planning and execution, structured around instruments such as the PPA, LDO, and LOA. Similar results were found by Oliveira and Magalhães (2022) and Murta Filho, Magalhães, and Wakim (2022), in their analyses of municipalities in Minas Gerais, and by Covre and Mattos (2016), based on an investigation of Brazilian municipalities.

The COVID-19 dummy variable was included in the model to capture the association between the pandemic and fiscal condition. The estimated coefficient for this variable was positive, suggesting that, during the period, there was an improvement in the behavior of the fiscal indicator relative to previous years.

During the pandemic, although the economic downturn reduced revenue collection by various government entities and limited the immediate expansion of fiscal space, municipalities recorded increased investment, particularly in healthcare. This result may be associated with the allocation of resources by the federal government, as well as the adoption of legal provisions that restricted the growth of certain expenditures, particularly those related to personnel expenditures, and suspended financial obligations to the federal government. In this context, the control of current expenditures, particularly personnel expenditures, may have contributed to maintaining investment without significantly compromising the balance of public accounts.

Given that the proxy for fiscal management adopted in this study results from the combination of indicators of autonomy, personnel expenditures, liquidity, and investment, it is understood that the measures implemented by the federal government to address the pandemic, as well as the administrative strategies adopted by municipalities, may be associated with the maintenance of fiscal management during the period analyzed. Consistent with this perspective, studies such as Ribeiro *et al.* (2023) and Castro (2022) also indicate that fiscal condition did not deteriorate during the pandemic years.

In the estimation, the South Region was adopted as the reference category to control for regional characteristics because it had the highest average fiscal management index. Thus, the coefficients estimated for the dummies for the other regions indicate differences relative to the South Region. The negative and statistically significant results suggest that municipalities in the Southeast, Central-West, Northeast, and North regions, particularly the latter two, have a lower fiscal condition than municipalities in the reference region. This finding corroborates the results shown in Chart 2, in which the Northeast and North regions exhibit poorer fiscal performance than the other regions.

Regarding the population-size variable, the results suggest that smaller municipalities, particularly those with up to 50,000 inhabitants, tend to have relatively lower fiscal indicators compared with more populous municipalities. This pattern is consistent with the literature on the subject, which indicates that larger municipalities have greater budgetary and institutional capacity, favoring the planning and implementation of public policies (Hansen; Houlberg; Pedersen, 2014).

In addition, Vieira, Silva, Silva, and Sá (2022), in their analysis of the effects of the COVID-19 pandemic on the public finances of small municipalities in the Jequitinhonha and Mucuri Valleys, show that although these government entities received resources intended to cover expenditures and investments, such transfers were not always sufficient to meet local needs, reinforcing the fiscal constraints faced by smaller municipalities.

The analysis of the results indicates that there was no evidence of deterioration in municipal fiscal condition over the period analyzed, despite the increase in expenditures, particularly those related to healthcare, and the reduction in revenues associated with the pandemic context. There was also evidence of greater expenditure control, alongside the maintenance of investment levels, with no indication of significant impairment of the balance of public accounts. These findings suggest that, although the economic context was challenging, fiscal management remained relatively stable throughout the period analyzed.

The results point to the existence of regional disparities associated with the fiscal condition of Brazilian municipalities, revealing two distinct patterns. While the South, Southeast, and Central-West have a concentration of municipalities with more favorable fiscal performance, the North and Northeast include municipalities with poorer results than those in these regions. These differences may be related both to the capacity to generate own-source revenue and local economic conditions and to how public resources are managed, including aspects such as expenditure control, personnel management, liquidity, and investment capacity.

5 CONCLUDING REMARKS

The study aimed to analyze the relationship between the COVID-19 pandemic and the fiscal condition of Brazilian municipalities from 2017 to 2022, using the IFGF as a proxy. The analysis, conducted using a dynamic panel data model, made it possible to assess changes in municipalities over time.

Based on the results, it was possible to conclude that, over the period studied, fiscal condition increased from 0.41 to 0.63, representing an improvement of 11% per year. It was also found that, during the pandemic years considered, municipalities had a higher average fiscal condition index than in the years preceding the emergence of COVID-19. The increase in the overall index was mainly associated with increases in the personnel expenditures, liquidity, and investment indicators, as the autonomy indicator showed little variation over the period analyzed. This finding suggests that, even amid the crisis caused by the pandemic, municipalities exercised greater control over public-sector personnel expenditures, which may be associated with the implementation of investments, including those aimed at addressing the pandemic.

Factors that may have contributed to the improvement in fiscal condition included increased federal transfers associated with emergency measures adopted to address the crisis, which resulted in additional investment in healthcare, education, and social assistance, as well as legal restrictions that limited the growth of public expenditures, particularly personnel expenditures and the creation of public positions.

The present study also found that municipalities in the North and Northeast regions had lower fiscal performance than those in the other regions, showing that regional characteristics influence both revenue collection and municipal expenditure execution. These areas, comprising municipalities with precarious economic conditions, face limited capacity to generate their own revenues and insufficient resources – including transfers – to meet social needs, a situation reflected in budget execution outcomes.

With regard to population size and fiscal condition, relevant differences were observed among municipalities. Smaller municipalities were found to face greater difficulties in managing public finances compared with more populous municipalities. This pattern is generally associated with a narrower tax base in smaller municipalities, which limits their capacity to generate their own revenues. By contrast, more populous municipalities tend to have a broader tax base, as well as more robust administrative and budgetary structures, factors associated with better fiscal management conditions.

Finally, it should be noted that this study had several limitations that should be considered when interpreting the results. Although widely used in the literature, the IFGF is a proxy for fiscal condition and does not account for qualitative aspects of governance or the efficiency of public resource allocation. Furthermore, the exclusion of municipalities with incomplete data may have introduced selection bias, since these entities tend to have smaller populations and lower institutional capacity, which may have affected the representativeness of the sample. It should also be noted that, because the variable indicating the pandemic captures a set of simultaneous factors, such as extraordinary fiscal transfers, regulatory changes, and macroeconomic effects, it was not possible to isolate their individual effects in the estimated model. In addition, the study period, which ended in 2022, does not allow for an assessment of whether the fiscal performance observed during the pandemic was sustained after the extraordinary measures adopted by the federal government were withdrawn. Therefore, it cannot be ruled out that some of the improvement in fiscal indicators during the pandemic reflected temporary effects associated with exceptional transfers and institutional flexibilities introduced during that period.

Accordingly, future research should expand the time frame, incorporate additional variables, such as health and education, and analyze the criteria for the allocation of federal resources in the context of the pandemic. In addition, the use of imputation techniques or other methodological strategies for handling missing data is suggested, with a view to improving the robustness of the empirical evidence.

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AUTHOR CONTRIBUTIONS (CREDIT)

Elizete Aparecida de Magalhães: conceptualization; methodology; investigation; data curation; formal analysis; software; review and editing; project administration; supervision; validation; and visualization.

Josiane da Silva Aguilar: conceptualization; methodology; investigation; data curation; formal analysis; writing of the original version; review and editing; and visualization.

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