“Comprehensive quantitative evaluation of municipal budget allocation efficiency: The Portuguese case”

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COMPREHENSIVE QUANTITATIVE EVALUATION OF MUNICIPAL BUDGET ALLOCATION EFFICIENCY: THE PORTUGUESE CASE

Abstract

The study provides a comprehensive quantitative evaluation of municipal budget allocation efficiency in Portugal over the period 2018–2022, based on a comparative and longitudinal analysis of financial data from 308 municipalities. Efficiency was assessed by examining the alignment between budget forecasts and actual financial execution. The results show that 77.6% of municipalities (n = 239) were classified as efficient in 2018, increasing to 82.1% (n = 253) in 2019 and 83.1% (n = 256) in 2020. However, a downward trend followed, with efficiency declining to 74.0% (n = 228) in 2021 and 73.7% (n = 227) in 2022. Over the five-year period, the average efficiency rate across all municipalities was 78.1%. In contrast, 21.9% of municipalities on average (ranging from 16.9% to 26.3%) consistently demonstrated inefficiencies in budget preparation and execution. The study identifies key contributing factors to inefficiency, including political interference, reliance on incremental budgeting approaches, and limited technical forecasting capacity. The data reveal persistent discrepancies between budgeted allocations and actual service demand, leading to resource misallocation and reduced fiscal credibility. Statistical patterns also indicate that municipalities with higher population densities and more diversified revenue sources tended to perform better in efficiency metrics. The findings support the conclusion that the adoption of rigorous, data-driven forecasting methodologies significantly improves financial planning outcomes and institutional trust. These results offer evidence-based recommendations for refining municipal financial management practices, particularly in settings subject to political and economic volatility.

Keywords decentralization, efficiency, municipalities, budgets, forecasts, sustainability

JEL Classification H61, H72, H74, H83

INTRODUCTION

Portugal faces growing pressure to reinforce public sector efficiency and financial and fiscal sustainability (Nogueira & Ramos, 2014) in line with European fiscal guidelines and global sustainable development goals. Within this context, municipal governance plays a vital role in ensuring responsible management of public resources and delivering quality public services at the local level (Granizo et al., 2024). Nonetheless, persistent inefficiencies in budget forecasting have raised concerns about the capacity of municipalities to fulfill their financial and social responsibilities.

Local governments continue to experience significant deviations between forecasted and actual budget execution (Benito et al., 2015), undermining fiscal discipline and the effectiveness of public policy implementation. These challenges are often linked to a lack of technical expertise, rigid planning methodologies, and the absence of reliable forecasting tools (Yahelska et al., 2021). Additionally, political pressures can distort projections, resulting in unrealistic budget expectations that fail to reflect economic realities.

The current conditions demand a transformation in financial management practices at the municipal level, especially in forecasting procedures that guide policy and spending. Addressing this issue requires the adoption of data-driven, transparent, and adaptable tools to improve forecasting accuracy. In this context, the present study applies the data envelopment analysis model to evaluate the efficiency of budget forecasting in Portuguese municipalities. The goal is to identify existing inefficiencies, highlight best practices, and support the development of more sustainable local financial management systems.

1. LITERATURE REVIEW AND HYPOTHESES

Budgetary efficiency, particularly in the municipal context, is one of the essential pillars for effective public finance management, where the rigor of budget forecasting methods affects financial and fiscal sustainability, the efficiency of resource allocation, and the institutional credibility of stakeholders (Agasisti & Sibiano, 2012). The quality of revenue and expenditure forecasts is therefore a critical factor in defining priorities, implementing investment plans, and evaluating the results of public policies (Soares, 2024).

Recent literature and research show that most municipalities face significant difficulties in terms of the efficiency of budget preparation processes. The difficulties are mainly due to the presence of deviations between planned and executed revenue and expenditure (Carneiro & Costa, 2021), inability to execute (Gachithi, 2010), and underutilization of available financial resources (Hendry & Ericsson, 2003). These shortcomings suggest that budget forecasting, especially if it is less rigorous, compromises not only technical rigor but also the sustainability and effectiveness of local governance.

From a doctrinal perspective, budgetary efficiency can be examined as the municipality's ability to allocate financial resources in such a way as to maximize expected results and, at the same time, reduce deviations (Khan, 2019). In the Portuguese context, local governance is characterized by decentralization, and efficiency depends, in addition to technical rigor, on financial autonomy and the ability to respond to local needs (Trenovski & Marjan, 2015). However, the reality is that many municipalities still adopt traditional budgetary practices, such as incremental budgeting, which adjusts appropriations based on historical series from previous years, without carrying out a critical analysis of real needs and/or the effectiveness of spending (Liu, 2015). The model, in fact, although simple, tends to spread inefficiencies and makes it difficult to innovate and/or make adjustments to budget forecasts. At the same time, more developed methods such as zero-based budgeting and performance budgeting still face institutional, cultural, and technical barriers that limit their adoption (Vanderbilt, 1977).

Adopting an efficient budget forecasting methodology is fundamental to guaranteeing municipal financial sustainability. Inaccurate forecasts, especially in relation to expenditure, jeopardize municipalities' ability to define the investments to be made, the quality of public services, and the fulfilment of public actions (Ademmer & Boysen-Hogrefe, 2022; Brändle & Elsener, 2024). Studies indicate that forecast deviations result in notable losses in budgetary efficiency and affect financial stability and citizens' trust in municipal institutions (McQuestin et al., 2022). On the other hand, external factors such as dependence on current state transfers and interference from political actors also exacerbate the problems of budget forecasting (Bhattacharyya et al., 2020). In Portuguese municipalities, where the majority of funding comes from the central state, factors such as high dependence on the state budget and interference from political actors make the challenge of budget efficiency even more complex (Forestiere & Pelizzo, 2008).

It is in this context that data envelopment analysis (DEA) has emerged as an innovative and promising methodology for evaluating and promoting the budgetary efficiency of municipalities. The model makes it possible to compare various decision-making units (municipalities) in various dimensions, simultaneously considering various inputs and outputs without the need to assume or define a prior production/objective function (Ahn et al., 2012).

According to the theory behind analyzing budgetary efficiency, the inputs can include the financial resources allocated, the number of technicians in-

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volved in the budget preparation and monitoring process, and the technological level of the management systems. The outputs, in turn, can include the accuracy of forecasts, compliance with the budget, and the efficiency of the allocation of public resources (Soares et al., 2024). The model makes it possible to identify the municipalities that operate closest to the efficiency frontier, i.e., those that best allocate resources in order to obtain the most accurate budgetary results, from those that are below the frontier and have higher levels of inefficiency (Mergoni et al., 2024). DEA's ability to assess efficiency makes the model a handy tool for the Portuguese context, where there is great heterogeneity between municipalities, and it is essential to identify best practices.

Internationally, several studies have demonstrated the usefulness of DEA for analyzing municipal budget efficiency. In the case of Morocco, Mehdi and Hafner (2014) point out various shortcomings in the budgetary management of municipalities, naming the efficiency levels of each municipality and indicating those below the efficiency frontier. In the context of China (Ou et al., 2020), Kenya (Barasa et al., 2021), and Indonesia (Yatiman & Pujiyono, 2013; Khaerani et al., 2023), the application of the DEA model demonstrated the existence of different levels of efficiency and suggests the need to adopt institutional reforms and new methodological models to promote even more rigorous budgeting methods.

In the Portuguese case, although the use of DEA is still in its infancy, the most recent studies point to its remarkable potential as a tool for analyzing budgetary efficiency. Afonso and Fernandes (2006) applied DEA to examine the efficiency of Portuguese municipalities and identify areas of waste and/or disastrous allocation of financial resources that traditionally escape financial analysis. The results suggest that adopting the DEA model in the budgetary process, especially as a proactive evaluation tool, can substantially increase the rigor and sustainability of municipalities (Okromtchedlishvili, 2022).

Despite the potential, the adoption of the model in municipal budget processes faces real challenges. Most studies apply DEA in ex-post analyses and focus mainly on the retrospective evaluation of efficiency, which limits the usefulness of the tool (Paina et al., 2024). In order for the DEA to make an effective contribution to improving budget forecasts, it must be continuously and actively integrated into the budget cycle and allow for the necessary adjustments and corrections to be made to the budget process in a timely manner. On the other hand, the application of DEA requires specialized technical capacity to ensure the correct use of data and the proper interpretation of results (Machado et al., 2022). In the context of Portuguese municipalities, the limitation of qualified technicians and opposition to organizational changes and the adoption of advanced quantitative methodologies are barriers that hinder the implementation of new analysis tools.

Another critical factor affecting budgetary efficiency is the financial autonomy of municipalities. Jiang and Chi (2024) and Bardhan (2022) point out that the greater the capacity of municipalities to generate their own revenue, the greater the incentive to adopt more rigorous budgetary processes, given the effect they have on local financial decisions. On the other hand, high dependence on current state transfers can generate perverse incentives, reducing efforts to improve the quality of forecasts and budgets (Volden, 2019).

This dualism (technical resources and financial autonomy) is particularly relevant in the Portuguese municipal system, where the decentralization of powers and financial resources between the central state and local authorities has serious structural imbalances, conditioning local budgetary efficiency (Costa & Rodrigues, 2007). Theory suggests that the combination of greater fiscal autonomy and the adoption of quantitative methodologies, such as DEA, could be a proposal for increasing budgetary rigor (Ratner et al., 2024).

In addition to the technical and human challenges, efficiency is also conditioned by organizational and political factors. On the one hand, the lack of specific qualifications of the technicians responsible for drawing up the budget, the absence of advanced management systems, and the use of outdated methods jeopardize the accuracy of forecasts (Buturac, 2022). On the other hand, political cycles and electoral pressures encourage the adoption of practices that distort forecasts,

such as overestimating revenue and underestimating expenditure (Boukari & Veiga, 2018). Neither situation reflects a culture that considers rigorous evaluation and continuous monitoring of budget results, perpetuating structural inefficiencies and limiting the positive effects of adopting tools such as DEA.

Transparency and accountability are essential elements for strengthening budgetary efficiency. The adoption of tools such as DEA can help increase transparency by providing objective and clear indicators of municipalities' budgetary performance (Banker et al., 2007) and promoting an environment of greater rigor and trust.

This study analyses the budgetary efficiency of Portuguese municipalities from 2019 to 2023, highlighting disparities in financial resource allocation and the role of rigorous forecasting in improving governance. To this end, the following hypotheses were defined:

H1: There is a positive and significant relationship between the efficiency of the budget preparation process and the allocation of municipal public resources (e = 1).

H2: There is no positive and significant relationship between the efficiency of the budget preparation process and the allocation of municipal public resources (e < 1).

By addressing these hypotheses, the study not only tests the applicability of DEA in the Portuguese local government but also advances the broader theoretical understanding of how forecasting accuracy can enhance the public sector.

2. METHODS

The study applies additive data envelopment analysis (DEA) to evaluate the efficiency of Portuguese municipalities in the budget process. The DEA model enables the measurement of the efficiency of decision-making units without imposing a specific measure on the relationship between inputs and outputs.

The inputs are the sources of municipal revenue, such as the single road tax (IUC), the municipal tax on onerous property transfers (IMT), the municipal property tax (IMI), the municipal surcharge, municipal funds, the decentralization financing fund, sales of goods and services, other current revenue, sales of investment goods, capital transfers, other capital revenue, financial assets, and financial liabilities. Outputs reflect public expenditure, such as personnel costs, purchase of goods and services, interest and other charges, other current expenditure, purchase of capital goods, current transfers to parishes, capital transfers, other capital expenditure, financial assets and financial liabilities.

The data were obtained from the National Statistics Institute (INE) for the period 2018–2022. At the time of this analysis, more recent data beyond the 2022 fiscal year had not yet been released through official public sources. This constitutes a methodological limitation, as it precludes the inclusion of the most recent economic developments, institutional reforms, or unforeseen fiscal disruptions that may have affected municipal budgeting practices. Then, the findings must be interpreted within the temporal boundaries of the dataset employed. Additive DEA was applied to study the municipalities' optimization, where the objective is to minimize the sum of the slack in inputs (S_i^-) and outputs (S_i^+) (Lotfi et al., 2019). The municipality is efficient when the slack is non-existent (Golany & Rousseau, 2012). The model adopted and adjusted by us is described as follows:

$$Efficiency\ Index(e) = \frac{1}{1+\left(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S_r^+\right)}, \quad (1)$$

where: S_i^- represents the excess revenue collected by the municipalities; S_i^+ translates the possible expenditure values that the municipalities could have executed beyond the budgeted values, considering the level of revenue collected. The municipality is efficient when slack is equal to zero.

The calculations were carried out using Excel software, and the analysis contributes to the discussion on the development of strategies that seek to optimize municipal financial management, promoting the adoption of methods that are more rigorous and efficient in the allocation of public resources.

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3. RESULTS

This paper presents a longitudinal analysis of municipal budget efficiency trends in Portugal over a five-year period, with a particular focus on the trajectory of the results obtained from the additive DEA analysis. The model was generated to capture the misalignments between budget revenue (inputs) and expenditure (outputs) in the 308 municipalities.

The model applies a non-parametric linear programming model that evaluates each municipality against an efficiency frontier defined by the DMU with the best performance. Municipalities that are on the frontier ($e = 0$) are interpreted as efficient in the budget forecasting and execution processes, while those that are below are slack, either overestimating revenue collection or underutilizing expenditure in relation to budget projections. Inefficiency is manifested both through systematic over-budgeting, which results in unused appropriations, and under-budgeting, through the definition of insufficient financing scenarios that affect the execution of municipal expenditure.

The results suggest the existence of a behavioral pattern in the evolution of municipal efficiency (Table A1). In 2018, the results point to 239 municipalities classified as efficient, which represents 77.59% of the national total. The results suggest that, at the aggregate level, a significant proportion of municipalities were able to effectively relate projections between revenue and actual expenditure. On the other hand, 69 municipalities were noted as inefficient, which translates into 22.40% of the total (Figure 1). With regard to the possible factors that may have contributed to this performance, it is possible to mention the adoption of fiscal consolidation measures, implemented in Portugal in the wake of the European sovereign debt crisis, and the reinforcement of budgetary reporting obligations under the national budgetary framework aligned with the criteria of the European Stability Pact.

In 2019, the data pointed to an increase in efficiency, with 253 municipalities (82.14%) achieving an additive DEA efficiency of 0, i.e., there are no revenue and/or expenditure gaps. The increases in efficiency levels presumably reflect the effects of institutional learning and incremental improvements in the use of forecasting tools, internal audit controls, and ex-ante scenario planning in municipal finance departments. Conversely, we noticed 55 inefficient municipalities, corresponding to 17.85% of all municipalities (Figure 1). It should be noted that 2019 in Portugal coincided with a period of relative macroeconomic stability, low inflation, and consistent flows of intergovernmental transfers, which made it possible to correctly forecast revenue and align it with actual expenditure.

Regarding 2020, municipalities' budget efficiency has peaked, with a total of 258 municipalities (83.77%). While the budgetary performance may seem contradictory, given the onset of the COVID-19 pandemic in early 2020, several mitigating factors should be reflected. Firstly, municipal budgets for 2020 were largely drawn up before the period of the pandemic crisis, based on revenue expectations formed in 2019. Secondly, a large part of the expenditure related to the pandemic (such as emergency social services, public health interventions, and temporary infrastructure investments) was financed by extraordinary transfers from the central government and EU recovery mechanisms. These flows from the state budget, obtained in the context of a pandemic crisis, may have increased the precision of future spending, limiting discretionary deviations from initial plans. On the other hand, the pandemic crisis may have led municipalities to postpone and/or reallocate non-essential investments, which led to an improvement in forecasts and a closer match between expected income and realized expenditure. With regard to inefficient budgetary processes, the results suggest a total of 50 municipalities, corresponding to 16.23% of the total (Figure 1).

Compared to previous periods, 2021 marks a turning point in the budgetary trajectory of municipalities. Budgetary efficiency fell from 258 to 228 municipalities (74.0%), a reduction of more than nine percentage points compared to the previous year. Conversely, 80 municipalities were inefficient in their budget preparation processes (25.97%) (Figure 1).

In 2022, we saw a reduction in budgetary efficiency for 227 municipalities (73.70%). The decrease in efficiency probably stems from several causes. The

first is the possible fall in budget revenue collection during the pandemic crisis, especially in municipalities with a high dependence on taxes. Spending rigidity also increased between 2021 and 2022 due to the suspension of planned investments and increases in labor costs as a result of measures to combat COVID-19, as well as costs for purchases of services driven by inflation and disruptions in the supply chains for goods. Another factor was the progressive implementation of policies to decentralize powers to local authorities under Law 50/2018. Although the law aims to extend the autonomy and capacity for action of municipalities, implementation was marked by administrative fragmentation, ambiguous agreements on sharing expenses, and delays in the transfer of financial and technical resources. Due to the increase in municipal competencies and the complexity of budgetary processes, this has likely introduced new forecasting errors, especially in the estimation of expenditure.

Analyzing the statistical dispersion of municipal efficiency levels over the 2018–2022 period reveals considerable variations between Portuguese municipalities. The coefficient of variation (CV), applied as a measure of relative heterogeneity, suggests that there are high disparities between municipalities in all the periods analyzed, ranging from 51.05% (2018) to 44.52% (2019) (Figure 2).

The estimated results indicate that, although the national efficiency average has remained relatively stable, there is substantial dispersion between municipalities in terms of their ability to align budget forecasts with the actual execution of expenditure. In academic terms, a coefficient of variation of more than 30% is already considered an indication of high relative variability, which reinforces the existence of significant structural inequality between Portuguese municipalities in terms of technical and financial competence in drawing up budget forecasts.

The slight reduction in the coefficient of variation in 2019 (44.52%) may reflect a more predictable economic context and the possible adoption of best technical practices by some municipalities. However, the return to levels above 49% in 2021 and 2022 suggests that municipalities have been exposed to the effects of administrative decentralization, the pressure of inflation on public procurement, and the effects of the pandemic crisis on budget execution, particularly in municipalities with less institutional adaptability.

		Number of Inefficient Municipalities by District					
Districts	Aveiro	6	2	6	6	4	9
	Beja	6	3	2	1	0	
	Braga	1	2	1	3	2	8
	Bragança	0	1	3	2	2	
	Castelo Branco	2	4	2	3	1	7
	Coimbra	6	3	3	5	5	
	Évora	2	1	2	2	1	6
	Faro	2	2	2	1	2	
	Guarda	1	5	3	3	4	5
	Leiria	2	5	4	3	5	
	Lisboa	6	2	3	5	4	4
	Portalegre	6	1	2	6	5	
	Porto	1	2	3	1	4	3
	Santarém	7	2	2	5	7	
	Setúbal	2	1	3	3	2	2
	Viana do Castelo	4	3	1	2	1	
	Vila Real	2	0	1	2	1	1
	Viseu	2	5	7	3	9	
Autonomous Regions	Madeira	2	1	2	2	0	0
	Açores	3	6	2	3	3	
		2018	2019	2020	2021	2022	

Figure 1. Heatmap – Number of inefficient municipalities by district (2018–2022)

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Figure 2. Coefficient of variation of municipal efficiency (2018–2022)

Aggregating the results by district and municipality and calculating the annual frequency counts of municipalities that failed to achieve additive DEA efficiency (efficiency scores other than 0) made it possible to carry out a frequency analysis. The data served as the basis for building a data table by municipality/year (Table A1). The aim was to identify which municipalities were inefficient in their budgetary processes (Figure 3).

Analyzing the data suggests a high degree of inter-district variation. That is, districts such as Viseu, Santarém, and Portalegre consistently display the highest clusters of inefficient municipalities over the period analyzed. In 2022, the district of Viseu had nine inefficient municipalities, the highest number observed in a single district (Figure 1). Portalegre and Santarém, in turn, have high numbers of inefficient municipalities. On the other hand, districts such as Braga, Bragança, and Madeira have low aggregates of inefficient municipalities, with small numbers of inefficient municipalities. This means that the results suggest the existence of some level of persistence of regional asymmetry in budgetary forecasting.

According to the analysis carried out, there is some volatility in the efficiency of the forecasts. The estimated results show not only the existence of persistent inefficiencies in certain localities but also reveal a notable group of municipalities whose performance fluctuated sharply over the five years. The temporal variation in DEA efficiency provides an insight into the fragility of municipalities' budget forecasting systems.

While in the districts of Aveiro, Águeda, and Murtosa the results showed the existence of recurring inefficiencies, in Albergaria-a-Velha this fluctuated significantly, i.e., it was efficient in some years and inefficient in others (e.g., 0.073% in 2018, 0.243% in 2019, and 0.137% in 2021). Similarly, São João da Madeira showed marginal inefficiencies in several years, which suggests the presence of challenges in forecasting income and expenditure. The fluctuations are perhaps linked to the narrow budget margins and the high sensitivity of revenues. In contrast, municipalities in the Beja district have seen more consistent improvements. Although the municipalities of Almodôvar, Barrancos, and Ferreira do Alentejo were inefficient in the early years, over the course of the series, they were able to achieve budgetary efficiency. This increase may, to some extent, reflect the implementation of reforms or better technical forecasting capacity.

One situation of persistent inefficiency is that of the municipality of Vila Verde (Braga district), with inefficiencies recorded in three consecutive years (2019–2021). In the Bragança district, Mogadouro is the worst performer, with a record of four years of inefficiency, involving an inefficiency peak of 1.767% in 2021.

Municipalities in the Castelo Branco district, such as Vila Velha de Ródão and Penamacor, have re-

peatedly failed to align revenue forecasts with actual execution. The municipality of Vila Velha de Ródão was inefficient in four of the five years and recorded one of the highest inefficiencies (0.609%) in 2022. In Coimbra, the municipalities of Penacova and Tábua show insufficient budgetary performance, while Montemor-o-Novo and Mira show uneven levels of efficiency. But Montemor-o-Novo was notably inefficient in 2019 (–0.965%), and the difficulties persisted until 2022.

As far as the Évora district is concerned, sporadic inefficiencies can be seen. The municipality of Vila Viçosa was continuously inefficient, with the highest level of inefficiency being –0.202% in 2021. Similarly, in the district of Faro, the municipality of Olhão showed inefficiencies in three of the five years analyzed. As for the Guarda district, the greatest volatility in efficiency is seen in the municipalities of Vila Nova de Foz Côa and Figueira de Castelo Rodrigo, which fluctuated significantly between 2020 and 2021.

In the district of Lisboa, inefficiencies were generally moderate, but the municipality of Arruda dos Vinhos is the one where inefficiency in the budget preparation process was persistent between 2018 and 2022. In other urban municipalities, such as Cascais and Amadora, the deviations in efficiency were smaller compared to the other municipalities, which may possibly reflect a more conservative budgetary process.

In Portalegre, the atypical case is Campo Maior, which recorded an inefficiency of –28.098% in 2018, which could indicate an anomaly in the budget data or a significant inefficiency in the forecasting methods. On the other hand, although it is possible to see some improvements

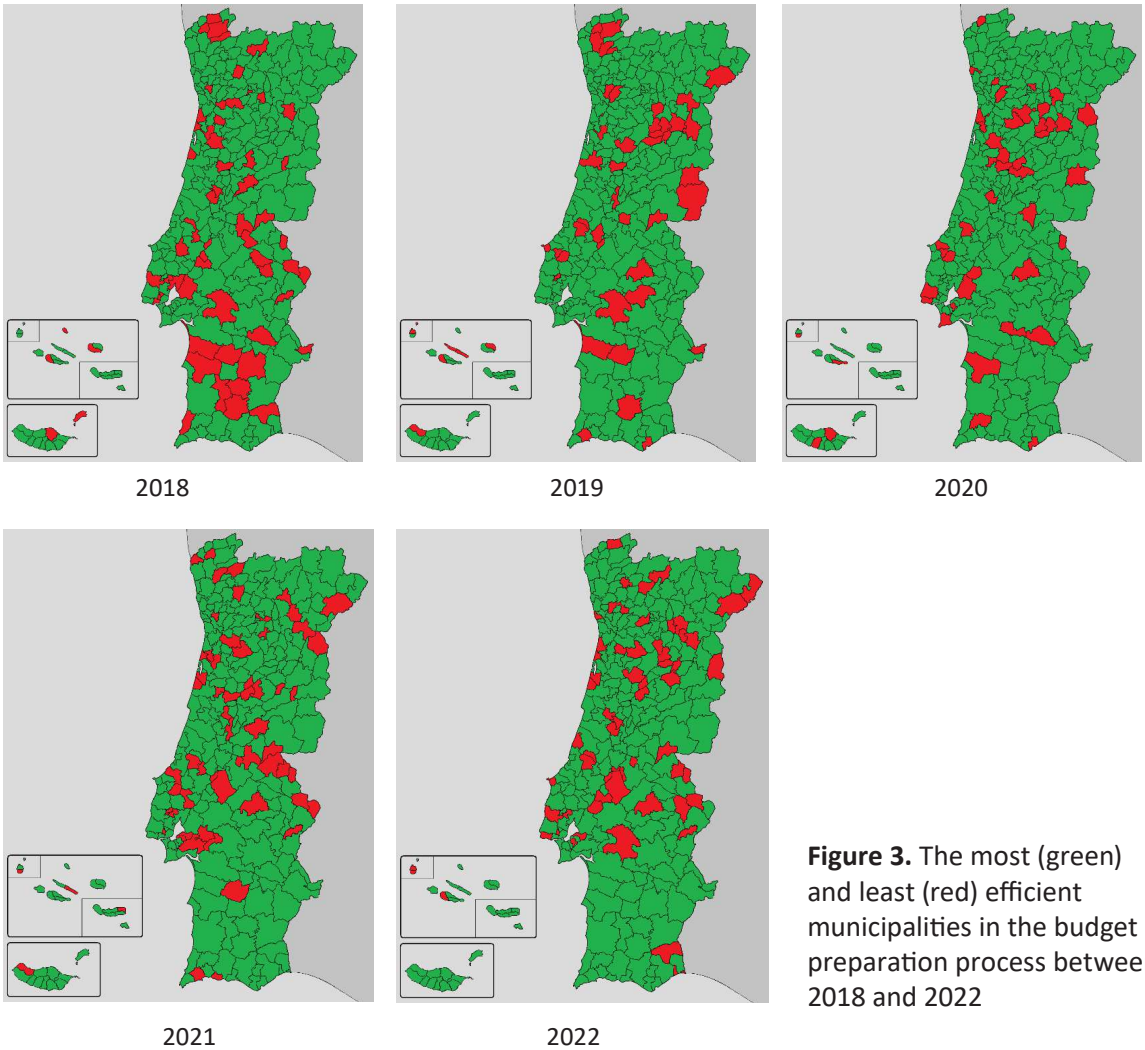

Figure 3. The most (green) and least (red) efficient municipalities in the budget preparation process between 2018 and 2022

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in some of the municipalities – including Avis, Marvão, and Castelo de Vide – inefficiencies remain.

In the case of the district of Santarém, it can be seen that the municipality of Golegã went from a position of positive inefficiency of 1.218% in 2021 (excess revenue forecast) to a situation of negative inefficiency of 1.554% in 2022 (excess actual expenditure), which indicates the volatility of revenue estimates and/or erratic planning of expenditure execution. Similarly, the municipality of Salvaterra de Magos also recorded a highly atypical level of inefficiency of 1.116% in 2022.

As far as the district of Viseu is concerned, at a national level, the level of inefficiency was the highest in 2022. The municipalities of São João da Pesqueira, Sátão, and Vila Nova de Paiva are considerably less efficient, while the municipality of Carregado do Sal has one of the worst results in the country in 2022 (–1.301%).

In the Autonomous Regions, the patterns diverge. Madeira is steadily improving, with all municipalities efficient in 2022. In contrast, the Azores have persistent inefficiencies in municipalities such as Madalena, Lajes das Flores, and Santa Cruz das Flores. Volatility implies that municipalities act on the margins of budgetary stability, and forecasting capacity is vulnerable to small budgetary shocks and/or political inconsistencies. The results highlight the importance of institutionalizing the revision of forecasts, integrating budget scenario analysis, investing in human capital, and improving planning capacity.

The data indicated disparities in budgetary efficiency across municipalities, reflecting difficulties in adhering to balanced budget principles and aligning revenues with service delivery needs. These findings underscore the necessity of enhancing institutional capacity and adopting more robust public financial management practices to ensure efficient and transparent budget execution.

4. DISCUSSION

The analysis of budget allocation efficiency provides critical benefits by enabling the evaluation of municipal assumptions, the identification of inefficiencies, and the promotion of best practices in public financial management (Neal, 2012). The results of this study reveal that while some municipalities allocate resources efficiently, others demonstrate a need for more strategic and methodologically rigorous budgeting practices (Guzman & Ermasova, 2022). This study situates these findings within the broader context of existing literature. As noted by Agasisti and Sibiano (2012), persistent inaccuracies in budget forecasting continue to pose significant challenges, undermining fiscal sustainability and reinforcing the imperative for the adoption of improved forecasting methodologies.

Vanderbilt's (1977) findings underscore significant inefficiencies in municipal budget forecasting processes, which in turn impede effective budget execution and compromise the quality of public service delivery. Empirical results corroborate these concerns, revealing that numerous municipalities encounter persistent challenges in accurately defining revenue streams and aligning expenditures with actual service demands. Such inefficiencies are consistent with Mou et al.'s (2019) analysis, which emphasizes the prevalence of incremental and equity-driven budgeting models that often fail to achieve allocative efficiency. Furthermore, Molinas et al. (2009) identify political interference, limited technical expertise, and inadequately designed preparation processes as critical factors contributing to these inefficiencies. In a similar vein, Lewis (2007) asserts that public budgets fundamentally reflect political choices; the current findings vividly demonstrate how municipal decision-makers allocate spending and revenue in ways that prioritize political imperatives over technical or efficiency considerations.

Danar (2023) attributes observed inefficiencies in municipal budgeting to discrepancies between budgeted allocations and the original policy objectives. This conclusion is reinforced by the results, which reveal that many municipalities struggle to align their budgets with actual service needs or to maintain financial balance. Such misalignments not only suggest significant resource wastage but also highlight municipalities' limited capacity to adequately meet service demands. Although the analysis did not uncover evidence of excessive in-

debtedness, the findings strongly support Krah and Mertens' (2023) argument that the failure to meet financial commitments ultimately undermines institutional credibility and erodes public trust in municipal decision-makers.

The findings lend support to Yatiman and Pujiyono's (2013) conclusion that municipal budgeting processes are, in general, conducted with a reasonable degree of efficiency, even in the context of acknowledged budgetary constraints. However, consistent with the observations of Barasa et al. (2021), the presence of varying levels of expenditure execution efficiency among municipalities indicates that significant room for improvement remains. These variations underscore the need for municipalities to adopt more robust budgeting models specifically designed to enhance the effectiveness and impact of public spending.

Johansson and Siverbo (2014) argue that under conditions of political pressure, accurate budget forecasting becomes indispensable, as lower levels of uncertainty are associated with greater forecasting efficiency. The findings of this study lend strong support to this perspective. Specifically, the data reveal that in 2018, 239 municipalities demonstrated efficiency in budget preparation, while 69 were classified as inefficient. In 2019, 253 municipalities were efficient compared to 55 inefficient; in 2020, 256 were efficient and 52 were inefficient. In 2021, the number of efficient municipalities declined to 228, with 80 identified as inefficient; and in 2022, 227 municipalities remained efficient, while 81 were inefficient. These figures confirm notable variations in forecasting performance over time. Nonetheless, the overall trend supports Hypothesis 1, indicating that most municipalities achieved efficiency in budget preparation across the observed period. These results also align with Derzayeva and Akhmadieva's (2014) conclusion that the application of rigorous methodologies is critical to ensuring accurate expenditure planning and, consequently, to enhancing policy outcomes.

Future research should investigate the impact of decentralization on municipal budget efficiency, particularly in the context of Law No. 50/2018, which significantly expanded the financial responsibilities and decision-making powers of local governments. A further critical area of inquiry involves assessing the dynamics of budget efficiency during periods of economic crisis, given that such conditions typically exert considerable pressure on municipal revenues while simultaneously increasing expenditure demands (Ciaffi et al., 2024). Examining how municipalities maintain or adapt their financial management practices under adverse economic conditions could provide valuable insights into the strategies that support sustained budgetary efficiency and institutional resilience in times of fiscal stress.

CONCLUSION

This study analyzed the budgetary efficiency of municipalities, revealing patterns in financial resource allocation and identifying best practices. It evaluated the accuracy of budget forecasts and municipalities' capacity to optimize expenditure, providing insights that support the adoption of more rigorous forecasting methods. While most municipalities demonstrated efficiency in budget preparation, challenges remain in ensuring forecast accuracy, equitable resource distribution, and fiscal sustainability. The findings underscore the need to enhance budget planning and execution to achieve more transparent, efficient, and outcome-oriented municipal governance.

However, the study has limitations. It relies on publicly available data that may not fully reflect financial realities; it does not measure how budget efficiency impacts service quality; and it lacks a detailed analysis of external influences on budget management. Despite these constraints, the research offers a valuable overview of municipal budget efficiency, helping to identify trends, challenges, and areas for improvement in the management of public financial resources.

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AUTHOR CONTRIBUTIONS

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Methodology: Ricardo de Moraes e Soares, Alexandre Morais Nunes.
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APPENDIX A

Table A1. Index of inefficient municipalities (2018–2022)

DMU (municipalities)	2018	DMU (municipalities)	2019	DMU (municipalities)	2020	DMU (municipalities)	2021	DMU (municipalities)	2022
Águeda	–0.018%	Aguiar da Beira	–0.036%	Águeda	0.090%	Albergaria–a–Velha	0.137%	Alcochete	0.037%
Albergaria–a–Velha	0.073%	Albergaria–a–Velha	0.243%	Aguiar da Beira	–0.023%	Alcanena	0.121%	Alcoutim	0.022%
Alcanena	–0.013%	Almodôvar	–0.173%	Ansião	–0.099%	Alcochete	0.035%	Almeida	–0.223%
Alcoutim	–0.003%	Amares	0.883%	Arganil	0.016%	Amadora	0.028%	Almeirim	–0.238%
Aljezur	–0.010%	Arcos de Valdevez	–0.005%	Avis	1.170%	Arouca	–0.364%	Amadora	–0.044%
Almeirim	–0.115%	Arraiolos	–0.049%	Barrancos	–0.014%	Arronches	–0.005%	Ansião	–0.312%
Almeirim	–0.115%	Avis	–0.068%	Benavente	0.051%	Arruda dos Vinhos	–0.026%	Arronches	–0.012%
Almodôvar	–0.030%	Barrancos	–0.011%	Bombarral	0.034%	Avis	–0.006%	Arruda dos Vinhos	–0.100%
Alpiarça	–0.030%	Batalha	0.355%	Cadaval	0.015%	Azambuja	–0.002%	Avis	–0.007%
Alter do Chão	0.257%	Bombarral	2.173%	Cascais	–0.001%	Belmonte	0.025%	Baião	–0.162%
Amadora	–0.004%	Cadaval	0.042%	Castro Daire	–0.218%	Cadaval	–0.057%	Batalha	–0.025%
Angra do Heroísmo	0.056%	Calheta	0.097%	Castro Daire	–0.218%	Caldas da Rainha	–0.005%	Boticas	–0.051%
Ansião	0.041%	Cantanhede	–0.005%	Cuba	–0.043%	Calheta	0.269%	Cabeceiras de Basto	0.232%
Arcos de Valdevez	–0.021%	Corvo	–0.038%	Estarreja	0.039%	Caminha	–0.019%	Carregal do Sal	–1.301%
Armamar	–0.011%	Ferreira do Alentejo	0.090%	Figueira de Castelo Rodrigo	–0.047%	Campo Maior	–0.013%	Cascais	–0.001%
Arronches	0.148%	Figueiró dos Vinhos	–0.010%	Lajes das Flores	–0.010%	Carrazeda de Ansiães	0.324%	Castelo de Vide	–0.028%
Arruda dos Vinhos	–0.053%	Fornos de Algodres	–0.007%	Lajes do Pico	0.665%	Carregal do Sal	–0.042%	Chamusca	–0.022%
Barrancos	–0.020%	Golegã	0.131%	Marvão	0.298%	Castelo de Vide	–0.027%	Condeixa–a–Nova	0.093%
Batalha	0.064%	Grândola	–0.002%	Mealhada	–0.003%	Chamusca	–0.018%	Constância	–0.061%
Beja	–0.020%	Idanha–a–Nova	–0.129%	Mogadouro	–0.010%	Chamusca	–0.018%	Fornos de Algodres	–0.009%
Benavente	–0.030%	Lagos	–0.009%	Moimenta da Beira	–0.009%	Estarreja	0.028%	Golegã	–1.554%
Boticas	–0.212%	Madalena	0.232%	Moita	–0.005%	Fafe	–0.008%	Gouveia	0.497%
Campo Maior	–28.098%	Mangualde	–0.042%	Monchique	0.014%	Ferreira do Alentejo	0.068%	Lajes das Flores	–0.026%
Castelo de Paiva	–0.012%	Mogadouro	–0.009%	Mortágua	–0.025%	Figueira de Castelo Rodrigo	0.378%	Lousada	–0.007%
Castro Verde	–0.129%	Moimenta da Beira	–0.018%	Óbidos	–0.009%	Figueiró dos Vinhos	0.243%	Madalena	–0.041%
Celorico de Basto	0.081%	Moimenta da Beira	–0.018%	Olhão	–0.001%	Golegã	1.218%	Mafra	–0.007%
Cinfães	–0.006%	Olhão	–0.029%	Ovar	–0.005%	Lagoa	0.266%	Marinha Grande	0.017%
Ferreira do Alentejo	–0.240%	Paredes	0.026%	Paços de Ferreira	–0.001%	Lagos	0.051%	Marvão	–0.041%
Fronteira	–0.027%	Paredes de Coura	0.058%	Penacova	–0.012%	Lajes das Flores	–0.070%	Matosinhos	–0.002%
Gavião	–0.065%	Penacova	–0.006%	Penafiel	–0.001%	Mação	–0.013%	Mêda	–0.080%
Golegã	–0.358%	Penafiel	–0.007%	Penalva do Castelo	–0.018%	Manteigas	–0.035%	Mira	0.051%
Grândola	–0.196%	Penalva do Castelo	–0.010%	Penamacor	–0.029%	Marvão	–0.077%	Miranda do Douro	0.217%

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Table A1 (cont.). Index of inefficient municipalities (2018–2022)

DMU (municipalities)	2018	DMU (municipalities)	2019	DMU (municipalities)	2020	DMU (municipalities)	2021	DMU (municipalities)	2022
Mação	0.075%	Penamacor	–0.032%	Portel	0.146%	Mealhada	–0.030%	Mogadouro	–0.022%
Madalena	–0.019%	Peniche	–0.036%	Porto de Mós	0.056%	Mira	–0.018%	Moita	0.017%
Mafra	–0.018%	Pinhel	–0.009%	Póvoa de Varzim	–0.002%	Miranda do Corvo	–0.035%	Monção	–0.009%
Marvão	–0.009%	Ponte de Lima	0.040%	Ribeira Brava	–0.003%	Mogadouro	1.767%	Monforte	–0.012%
Mêda	–0.004%	Porto de Mós	–0.022%	Salvaterra de Magos	–0.020%	Montijo	0.017%	Montemor–o–Novo	0.035%
Mesão Frio	–0.155%	Porto Moniz	–0.002%	Santa Marta de Penaguião	–0.019%	Murça	–0.043%	Murtosa	–0.089%
Mira	0.307%	Santa Cruz das Flores	–0.240%	Santana	–0.032%	Murtosa	–0.024%	Ovar	–0.017%
Monção	–0.008%	São João da Madeira	–0.011%	Santiago do Cacém	0.011%	Nisa	–0.007%	Penalva do Castelo	–0.019%
Montemor–o–Novo	–0.003%	Sátão	0.099%	São João da Madeira	–0.004%	Nordeste	–0.010%	Penedono	–0.030%
Murtosa	–0.024%	Sobral de Monte Agraço	–0.005%	São João da Pesqueira	–0.006%	Oliveira do Hospital	–0.005%	Penela	–0.127%
Odivelas	0.000%	Tondela	–0.005%	São Pedro do Sul	–0.008%	Palmela	0.015%	Peniche	–0.008%
Oeiras	0.000%	Torres Novas	–0.013%	Sátão	0.055%	Paredes de Coura	–0.002%	Porto de Mós	–0.029%
Oliveira do Hospital	–0.005%	Trancoso	–0.005%	Sesimbra	–0.005%	Penacova	–0.031%	Póvoa de Lanhoso	0.062%
Ourique	–0.161%	Velas	–0.170%	Sever do Vouga	–0.010%	Peso da Régua	–0.006%	Salvaterra de Magos	1.116%
Ovar	0.101%	Vila da Praia da Vitória	–0.085%	Sintra	0.001%	Porto de Mós	–0.003%	Santa Cruz das Flores	–0.311%
Pampilhosa da Serra	–0.088%	Vila de Rei	–0.008%	Tábua	–0.006%	Porto Moniz	0.224%	Santo Tirso	–0.007%
Paredes de Coura	–0.030%	Vila Nova de Foz Côa	–0.004%	Trancoso	–0.004%	São Pedro do Sul	0.120%	São João da Pesqueira	–0.003%
Penacova	–0.088%	Vila Velha de Ródão	–0.028%	Valença	–0.009%	Sardoal	–0.010%	São Pedro do Sul	–0.006%
Penela	–0.291%	Vila Verde	–0.030%	Viana do Alentejo	–0.005%	Sobral de Monte Agraço	–0.013%	Sardoal	–0.247%
Ponte da Barca	–0.056%			Vila Flor	0.052%	Tábua	–0.004%	Sardoal	–0.247%
Portel	–0.004%			Vila Verde	–0.009%	Tarouca	–0.018%	Sátão	–0.038%
Porto Santo	–0.493%			Vinhais	–0.030%	Terras de Bouro	0.747%	Tabuaço	–0.515%
Rio Maior	0.034%					Vagos	0.059%	Tondela	–0.004%
Santa Cruz da Graciosa	–0.004%					Valongo	–0.004%	Vagos	0.127%
Santana	–0.035%					Vendas Novas	–0.006%	Vale de Cambra	–0.019%
Santiago do Cacém	–0.009%	–		–		Vila Nova de Foz Côa	–1.233%	Vila Nova da Barquinha	–0.014%
Vale de Cambra	0.161%					Vila Velha de Ródão	0.077%	Vila Nova de Paiva	–1.065%
Valongo	0.009%					Vila Verde	0.054%	Vila Real de Santo António	0.167%
Vila Franca de Xira	–0.005%					Vila Viçosa	–0.202%	Vila Velha de Ródão	0.609%
Vila Velha de Ródão	–0.017%							Vila Viçosa	–0.003%
Vila Viçosa	–0.012%					–		–	
Other's Municipalities	0.000%	Other's Municipalities	0.000%	Other's Municipalities	0.000%	Other's Municipalities	0.000%	Other's Municipalities	0.000%