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A INFLUÊNCIA DO GASTO *PER CAPITA* SOBRE A DINÂMICA EMPRESARIAL DOS MUNICÍPIOS DO ESTADO DE MINAS GERAIS

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A INFLUÊNCIA DO GASTO *PER CAPITA* SOBRE A DINÂMICA EMPRESARIAL DOS MUNICÍPIOS DO ESTADO DE MINAS GERAIS

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ABSTRACT

This study will examine the behavior of municipal per capital spending in total and in terms of 17 categories using clusters of municipalities in the State of Minas Gerais. It will also seek to evaluate which categories of per capita spending can be considered determinant in increases (positive variations) of the number of businesses operating in these municipalities. Based on a research sample composed of company data and per capita spending for 848 municipalities in Minas Gerais, this study employs cluster analysis and conducts a linear regression which indicates that practically all of the spending categories were significant in the composition of the 4 clusters identified in this study, with the only exception being "agrarian reform and colonization". It may be noted that the spending that falls under "other activities" was greater in comparison with the overall total than the constitutionally mandated spending on "health" and "education". We also found that the linear combination of the independent variables formed by per capita spending on "agrarian reform and colonization", "sanitation", "cultural diffusion" and "economic development" was significant in explaining the positive variation in the number of businesses created in 433 municipalities out of a total of 462 municipalities investigated in Minas Gerais. Thus, even though it is still exploratory, this scientific investigation makes it possible to conclude that the decisions made in terms of the objectives of municipal spending are more important than the decisions made about the overall amount to be spent.

Keywords: Development. Regionality. Public Finance.

RESUMO

Esta pesquisa teve por objetivo analisar o comportamento do gasto municipal *per capita*, total e seu detalhamento em 17 categorias distintas, no processo de formação de agrupamentos (*clusters*) municipais no estado de Minas Gerais, e ainda, dentro desses agrupamentos, buscou avaliar quais categorias de gastos *per capita* puderam ser considerados determinantes do aumento (variação positiva) na quantidade empresas em atividade nos munícipios mineiros. A partir de uma amostra de pesquisa formada pelos dados de empresas e gastos *per capita* de 848 municípios mineiros, a análise de agrupamentos (*cluster*) e a análise de regressão linear permitiram observar que: praticamente todas as categorias de gastos foram significativas para a composição dos 4 agrupamentos identificados neste estudo, caracterizando-se como exceção somente os gastos *per capita* com "reforma agrária e colonização"; os gastos *per capita* classificados como gastos em "outras atividades" apresentam valores mais expressivos, quando comparados ao "gasto total", que aqueles gastos cujo direcionamento está constitucionalmente previsto, isso é, "saúde" e "educação"; a combinação linear das variáveis independentes formadas pelos gastos *per capita* com "reforma agrária e colonização", "saneamento", "difusão cultural" e "desenvolvimento econômico" foi significativa para explicar a variação positiva na quantidade de empresas criadas em 433 municípios, de um total de 462 municípios investigados em Minas Gerais. Dessa forma, ainda que exploratória, esta investigação científica permitiu concluir que mais importante que a tomada de decisão acerca do quanto se gasta é tomada de decisão relacionada ao objetivo do gasto municipal a ser realizado.

Palavras-chave: Desenvolvimento. Regionalidade. Finanças Públicas.

INTRODUCTION

Based on a sample composed of municipalities in the state of Minas Gerais, this study sought to analyze the behavior of municipal per *capita* public expenditure, both in its total form and disaggregated into 17 distinct spending categories, within the process of forming municipal clusters. In addition, the research aimed to assess which categories of per capita expenditure can be considered determinants of the increase (positive variation) in the number of active firms across municipalities in Minas Gerais, within each identified cluster.

The motivation for this investigation lies in the fact that Brazil, composed of 5,570 municipalities, 26 states, and one federal district, operates as a federative republic under the 1988 Federal Constitution, with three levels of government endowed with distinct competencies (federal, state, and municipal). This institutional arrangement makes Brazil one of the most decentralized countries in the world (Café, 2023). Within this context, municipalities play a particularly relevant role, as they constitute the foundational layer of the federal system and directly influence the daily lives of Brazilian citizens. While the federal government is primarily responsible for financing and implementing expenditures related to specific sectors such as labor, social security, and social assistance, municipalities, together with

state governments, are responsible for expenditures associated with services of more universal access, such as health, education, transportation, urban development, and public security (Café, 2023).

By establishing the priorities in terms of the providing of these services to society, the three levels of government (federal, state, and municipal) wield one of the main instruments of fiscal policy, despite the fact that it is difficult to perceive the objectives and effects of public spending in general, when total spending receives the greatest amount of attention (Silva; Cruz; Irffi, 2013). Thus, in allocating resources to society, governments transform family income into consumption, which elevates demand for goods and services and promotes growth in the private sector, generating taxes on consumption and stimulating business activity (Caetano *et al*., 2021).

In this sense, we may consider that providing and maintaining public services through government spending generates positive externalities which encourage private investment and increase business activity, that can help municipalities grow through elevated productivity in various sectors of the local economy (Silva; Cruz; Irffi, 2013). From this perspective, there is a need to develop studies which offer a greater understanding of the influence of public spending on the local economy.

Seeking to provide a better comprehension of the effects of public spending on local economic behavior is even more relevant given the limits imposed on public spending, especially in terms of its influence on each category of spending within the public budget, comparing the levels and types of local economic activity (Serrano; Furtado; Ferreira, 2021). Given that the literature suggests the existence of empirical evidence that relates the reallocation of public spending in various ways with the promotion of the local economy, (Serrano; Furtado; Ferreira, 2021), this may be a very interesting alternative to elevating the level of public spending no matter what the motive (budgets, credit, revenues, etc.).

From a broader perspective, taking into account that it is composed of a group of governmental plans and actions designed to increase or reduce the financial resources circulating in an economy, fiscal policy can be considered a determinant factor in the productivity and quality of municipal life (Bogoni; Hein; Beuren, 2011), which can make a city and/or region more attractive to private business investment. After all, the creation of a favorable business environment by satisfying the needs of society tends to increase the productivity of private initiative, which can therefore generate higher levels of consumption (Reis; Bueno, 2019).

Since it utilizes business data from the Central Business Registry (CEMPRE) of the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2023), and sector spending data within the indicators used to evaluate municipal finances as part of the Minas Gerais Social Responsibility Index (IMRS) of the João Pinheiro Foundation (2023), this investigation provides empirical data which is relevant to decision making involving the effects of municipal spending on the behavior of local business economic activity.

Finally, given its dimensions, the State of Minas Gerais has diverse regional characteristics which tend to be influenced by distinct economic, cultural, geographic, and social factors (Murta Filho; Magalhães; Wakim, 2022) in this scientific study, and we envision the possibility that our analytic methodology can be generalized and used in data collection and analysis processes in other Brazilian municipalities.

Thus, this article is structured into four sections, in addition to this introduction. The second section presents the theoretical framework that underpins the study; the third section describes the composition of the sample, the data processing procedures, and the analytical methods employed; the fourth section details the empirical analysis, presenting and discussing the results obtained throughout the investigation; and, finally, the fifth section offers the concluding remarks and summarizes the main findings of the research.

In general terms, the development of this study is theoretically justified by the relevance of understanding how different patterns of municipal public expenditure allocation influence processes of local economic development—an issue central to the literatures on public finance, fiscal federalism, and regional economics. From an empirical standpoint, the application of clustering techniques and the analysis of expenditure categories associated with the expansion of active firms contribute to addressing existing gaps regarding territorial heterogeneity and the effectiveness of public policies at the municipal level. Socially, the findings provide evidence-based insights that may support improvements in fiscal management and the formulation of more efficient development strategies, thereby strengthening state capacity and enhancing local economic competitiveness. Accordingly, the study aligns directly with the United Nations 2030 Agenda, particularly with SDG 8 (Decent Work and Economic Growth) and SDG 11 (Sustainable Cities and Communities).

THEORETICAL REFERENCES

Deciding where to locate is a critical factor for businesses in general (Sato, 2002; Dantas, 2021). In this process, they take into account factors of the most varied nature, ranging from their economic activities to factors that could influence their performance, possible risks and uncertainties, (Dantas, 2021), and even the possibility of savings from the centralization process, the price and availability of real estate, labor legislation, and union reactions (Button, 2019), among other things.

On the other hand, municipalities are always interested in attracting new businesses (Button, 2019; Riedel; Simmler; Wittrock, 2020) and in this sense, we may suppose that a greater offer of public goods and services may be capable of increasing company productivity through factors such as the possibility of providing public infrastructure which is capable of reducing the workers' cost of transport. This theoretical offer of public services could also affect where workers choose to live, increasing the available workforce, reducing salaries, and as a result, increasing company profits (Riedel; Simmler; Wittrock, 2020), among other things.

Within this context, the effect of government spending can be considered null, productive, or unproductive, that is: the effect is null when it does not affect the private sector; the effect is productive when it positively affects the productivity of the private sector and therefore drives long-term economic growth; and it is unproductive when it competes with the private sector, that is impedes long-term economic growth (Silva; Cruz; Irffi, 2013).

In terms of the nature of public spending, empirical evidence indicates that spending on education, health, housing, transport, energy, and communication has a productive effect on the private sector, that is, this spending elevates local economic growth (Serrano; Furtado; Ferreira, 2021). It is also possible to observe the contrary, in which only spending on health and education is capable of affecting the economy in a positive fashion, and spending on public services in general, along with economic subjects and social assistance, can present negative impacts (Almeida; Santos; Araújo, 2021).

The fact is that economists and public managers have displayed a growing interest in the subject of the impact of public spending on the economy (Almeida; Santos; Araújo, 2021). This investigation is based on the assumption that public spending has some type of influence on the municipal economic context, and this has consequences in terms of the business environment and business activity.

From this perspective, it is assumed that the municipal economic context is a significant variable which the literature describes as the "business environment". Almeida, Santos and Araújo (2021, p. 219) state that "the definition of the business environment should be understood as the group of elements which determine the limits of productive activities in the country, state, region, or municipality." In regard to this, we can highlight "the regulations referring to the opening and closing of businesses, the availability of qualified labor, the size of the market, access to credit, physical and social infrastructure, and the capacity for innovation [...]" (Almeida; Santos; Araújo, p. 219). We should remember that this group of factors can be affected by spending of a public nature, which may generate externalities which are capable of attracting or repelling private investment in local economic activity.

It may be perceived that, from a municipal point of view, the definition of the business environment includes variables which go beyond factors of a national character such as labor and fiscal legislation, and other rules and procedures of a general nature which have to be complied with on a federal and state level (Mation, 2014). Locally, the characteristics of the municipal business environment are related to factors such as the infrastructure of public services, consumer markets, the quantity and quality of the labor force, and the level of organization of public management (Almeida; Santos; Araújo, 2021), among other factors which depend directly on public spending. Unproductive spending leads to undesirable consequences, such as deficient infrastructure, low worker productivity due to poor education, violence and criminality, poor government management, violence, poor healthcare, or in other words, a series of factors which can negatively affect the opening of new businesses (Gelinski Neto, 2015).

However, the size of public spending has increased significantly over time, making it more and more difficult to understand (Neduziak; Correia, 2017). Even though studies have sought to analyze the impact of fiscal policy on economic growth in countries, states, and municipalities to answer questions based on the impact of municipal public spending, few empirical studies have used local data (Bogoni; Hein; Beuren, 2011).

There are practically no scientific investigations which have evaluated municipal per capita spending, and the details of this spending can produce municipal clusters from a state perspective of how spending of a public nature is processed. There are also no studies which seek to evaluate which categories of per capita public spending can be considered determinant (positive variations) of the number of economically active businesses in these municipalities.

In this sense, this investigation is not only innovative, it can also provide important subsidiary information for decision making in terms of possible reallocations of public spending, in an environment in which there is increasing pressure on federal entities to promote fiscal adjustments to impede increases in public spending even though this could promote greater municipal economic activity. In addition, by relating public spending with local business activity, this investigation in and of itself will contribute to the debate concerning municipal economic development, despite the inherent breadth of the concept in question. After all, "like all policy and academic debate, the subject of the impact of the composition of public spending on economic growth has never reached a consensus" (Neduziak; Correia, 2017, p. 619).

In addition, it cannot be ignored that the financing of public spending comes from public revenues which, despite their limitations, are mainly derived from economic activity on the municipal level, and this is why the way municipalities operate in terms of fiscal and tax policy can be considered a critical factor in attracting new businesses, given that by moving from one city to another, or opening for the first time in a region, these entities possess capital and provide new municipal revenue (Gotze.; Hartmann, 2021). This in turn makes local fiscal systems especially relevant and even more so in a context in which municipalities need to acquire greater financial autonomy.

RESEARCH METHODOLOGY

This study's data sample is made up of the total number of businesses and other organizations in a municipality in the years 2019 and 2020, which is available in the Central Business Registry (CEMPRE) of the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2023), as well as the figures for total municipal per capita spending and how it was divided among 17 distinct categories (agricultural and livestock farming, economic development, cultural diffusion, educational activities, sports and leisure, housing, infrastructure, other activities, preservation of the cultural heritage, agrarian reform and colonization, sanitation, healthcare, public safety, the environment, social assistance and good citizenship, worker support, and tourism), in 2019, which make up one of the indicators used to evaluate municipal finances through the Minas Gerais Social Responsibility Index (IMRS) of the João Pinheiro Foundation (2023), for all of the 853 municipalities. However, due to the absence of data for municipal per capita spending in five municipalities (Chalé, Delta, Faria Lemos, Manhumirim, and Ouro Preto) they were eliminated from our sample leaving us with a final sample of 848 municipalities in the State of Minas Gerais.

Based on our sample in this investigation, we calculated the difference between the number of businesses in 2019 and 2020, identifying the variation from one year to the other. Thus, 345 municipalities presented a negative variation or the closing of businesses, while 462 municipalities presented a positive variation or the opening of new businesses, and 41 municipalities presented no variation indicating stability in terms of the number of businesses from 2019 to 2020.

Then, taking into account municipal per capita spending in the year 2019, we analyzed clusters of municipalities in Minas Gerais with similar characteristics, with a confidence level of 95%. First, we realized an exploratory analysis based on hierarchical clusters using the average links among these groups, through which we identified the four most significant clusters with help from the respective dendrogram. Then we realized K-Means cluster analysis to identify the insignificant variables, according to which only per capita spending on "agrarian reform and colonization" was not considered statistically significant (sig. of the Z test > 0.05) in the cluster composition process, as demonstrated by the data summarized in Table 1.

Table 1 | Variance Analysis (ANOVA) of the Variables Used to Compose These Clusters

Per capita municipal spending	Cluster		Error		Z	Sig.
	Average Square	df	Average Square	df		
Total	574,251,546.66	3,00	358,936.79	844,00	1599,87	0,00
Other activities	79,363,560.64	3,00	134,650.25	844,00	589,41	0,00
Healthcare activities	18,728,659.94	3,00	52,879.05	844,00	354,18	0,00
Education activities	14,716,583.67	3,00	39,708.72	844,00	370,61	0,00
Infrastructure	10,181,031.00	3,00	40,506.29	844,00	251,34	0,00
Social assistance and good citizenship	895,096.38	3,00	3,493.07	844,00	256,25	0,00
Sanitation	129,996.23	3,00	8,201.58	844,00	15,85	0,00
Cultural diffusion	197,724.07	3,00	1,960.97	844,00	100,83	0,00
Agricultural and livestock farming	160,473.19	3,00	3,087.30	844,00	51,98	0,00
Sports and leisure	94,004.64	3,00	982.85	844,00	95,64	0,00
Environment	28,359.62	3,00	1,271.25	844,00	22,31	0,00
Economic development	14,372.64	3,00	1,139.46	844,00	12,61	0,00
Tourism	13,425.64	3,00	1,099.16	844,00	12,21	0,00
Worker support	4,444.62	3,00	501.90	844,00	8,86	0,00
Housing	17,866.99	3,00	519.77	844,00	34,37	0,00
Preservation of cultural heritage	35,710.84	3,00	604.58	844,00	59,07	0,00
Public safety	4,301.72	3,00	122.06	844,00	35,24	0,00
Agrarian reform and colonization	2.43	3,00	2.06	844,00	1,18	0,32

Source: elaborated by the authors based on research data.

Then we conducted an analysis of the final clusters using the K-Means method, taking into account only the significant variables to identify the four clusters which *a priori* are the object of this investigation. According to Fávero and Belfiore (2017), this analytical methodology permits the creation of clusters which are internally homogenous and heterogenous in relation to the other clusters based on a group of characteristics referring to a given quantity of observations, which makes it possible to evaluate the representativeness of the analyzed variables within each cluster, as well as conduct analyses referring to the classification of the sample elements themselves.

In addition to this evaluation of the location of the municipalities that are members of each cluster, which are identified by their respective coordinates of latitude and longitude, we conducted analyses of the characteristics of per capita spending in each cluster, analyses of whether the variations in the number of municipalities from 2019 to 2020 were negative (closings), positive (openings) or null (stability), and the estimated average number of businesses opened and closed in each cluster. In this analytical step, we also

calculated the average net flux of businesses per municipality, or in other words, the difference between the average openings and closings, as well as the ratio between the number of businesses opening and closing (opening/closing ratio).

Finally, based only on the municipalities that had more openings than closings in each cluster, or in other words, positive variations between 2019 and 2020, we conducted a multiple regression using the stepwise method to identify the categories of municipal per capita spending (independent variables) for the year 2019 which were statistically significant in relation to the number of businesses opened from 2019 to 2020 (dependent variable).

The multiple regression analysis made it possible to evaluate the behavior of the independent variables (company openings per municipality in each cluster) given the changes that occurred in the respective independent variables (municipal per capita spending in total and by category), through the application of the least squares method (Hair Jr. *et al.*, 2005). The stepwise method is especially productive in this situation, because it tests all of the independent variables one by one in a manner in which each round of testing removes those which are less significant, which makes it possible to identify a model composed of the variables which most contribute to the explanation/forecasting of the dependent variable under analysis (Field, 2009).

Thus, considering its overall objective, the database used, and the analytic methodology employed, this study may be classified as a scientific investigation of an exploratory and empirical nature, based on quantitative methods applied to phenomena within the socioeconomic context of Brazil.

DATA ANALYSIS, PRESENTATION AND DISCUSSION OF THE RESULTS

The evaluation of the characteristics of per capita spending in 2019 in each cluster based on cluster analysis indicates the differences between the calculated averages for each spending category as displayed in Table 2.

The analysis of the respective confidence intervals makes it possible to state that the average variability of municipal spending identified in Cluster 2 (amplitude between the lower and upper limits and their respective averages) is statistically different from the other clusters in terms of total per capita spending and per capita spending on “other activities”. Even so, the spending averages for each category display distinct behavior in the other analyzed clusters.

Table 2 | Evaluation of the Characteristics of 2019 Municipal Per Capita Spending in Each Cluster Based on Cluster Analysis

Municipal per capita spending	Cluster 1			Cluster 2			Cluster 3			Cluster 4		
	Average	Lower Limit.	Upper Limit	Average	Lower Limit.	Upper Limit	Average	Lower Limit.	Upper Limit.	Average	Lower Limit	Upper Limit.
Total	4.239,29	4.156,33	4.322,24	14.488,87	11.828,42	17.149,31	2.559,12	2.521,66	2.596,57	7.108,16	6.766,94	7.449,39
Other activities	1.342,76	1.294,45	1.391,08	5.339,44	4.555,55	6.123,32	753,87	731,82	775,92	2.446,32	2.191,36	2.701,28
Healthcare activities	997,95	964,18	1.031,73	2.596,84	1.257,49	3.936,18	659,38	644,79	673,97	1.487,90	1.389,34	1.586,45
Education activities	873,65	848,05	899,24	2.648,00	1.167,23	4.128,77	592,11	580,23	603,98	1.266,68	1.166,92	1.366,45
Infrastructure	465,96	437,57	494,36	1.784,99	795,91	2.774,07	243,20	233,41	252,98	860,90	718,96	1.002,83
Social assistance and good citizenship	130,82	121,61	140,02	692,39	247,47	1.137,32	70,21	67,46	72,96	207,67	177,35	237,99
Sanitation	74,80	59,13	90,47	63,43	-58,60	185,46	43,56	38,03	49,08	123,29	82,16	164,43
Cultural diffusion	66,24	58,54	73,95	216,47	125,30	307,65	30,58	28,33	32,83	117,26	91,35	143,17
Agricultural and livestock farming	43,74	36,13	51,35	198,67	-76,79	474,13	19,04	16,30	21,77	102,81	63,19	142,43
Sports and leisure	38,35	33,67	43,03	131,05	19,86	242,23	18,58	17,05	20,11	86,00	63,79	108,22
Environment	21,39	16,60	26,19	104,53	-83,48	292,55	13,49	11,49	15,49	46,91	24,06	69,76
Economic development	17,76	13,06	22,47	37,90	-20,49	96,30	8,67	7,16	10,19	35,54	8,01	63,07
Tourism	15,69	11,07	20,31	35,34	-24,76	95,43	6,48	5,09	7,88	31,94	4,28	59,59
Worker support	13,46	10,01	16,90	26,10	-25,05	77,25	6,44	5,37	7,52	17,98	1,80	34,16
Housing	10,24	6,15	14,32	4,44	-2,36	11,25	1,66	1,06	2,25	34,15	16,72	51,58
Preservation of cultural heritage	9,35	6,13	12,58	142,40	-31,96	316,77	3,47	2,70	4,24	29,81	10,57	49,05
Public safety	8,82	7,60	10,04	16,18	7,30	25,05	5,85	5,24	6,46	22,26	13,09	31,43
Agrarian reform and colonization	0,21	-0,15	0,57	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00

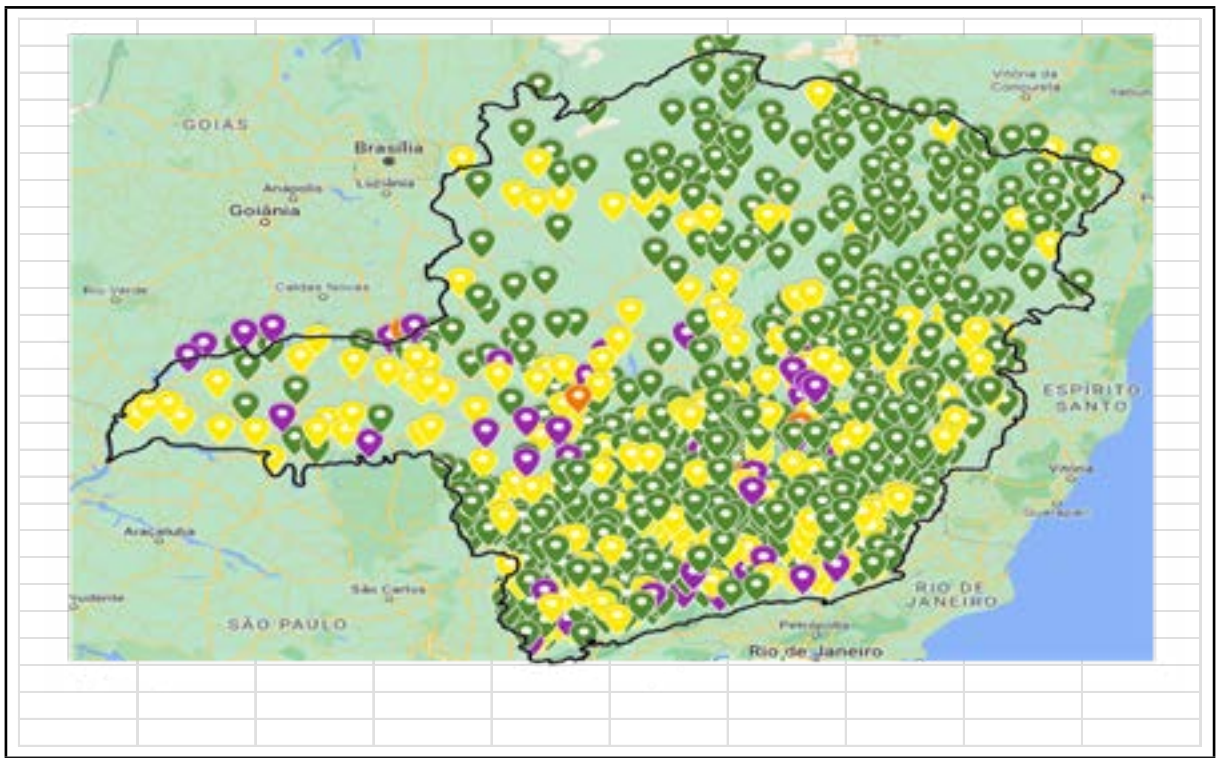
Source: elaborated by the authors based on research data.

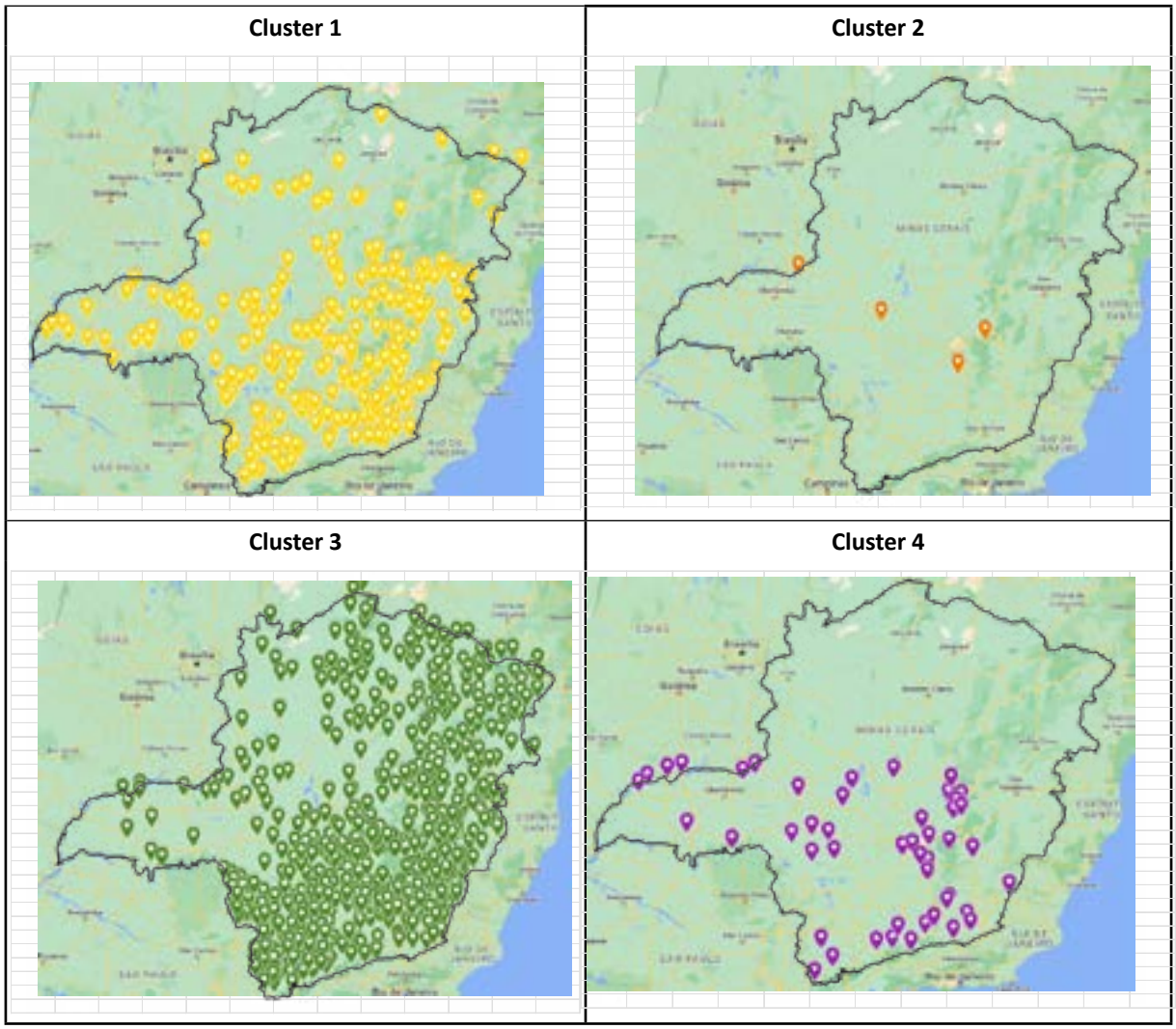
Table 3 | Analysis of the Variation (Δ) in the Number of Businesses from 2019 to 2020

Number of municipalities and their average number of businesses		Cluster 1	Cluster 2	Cluster 3	Cluster 4
Number of municipalities	With business closings ($\Delta_{2019\text{-}2020} < 0$)	108	3	215	19
	With business openings ($\Delta_{2019\text{-}2020} > 0$)	103	1	330	28
	With stability in the number of businesses ($\Delta_{2019\text{-}2020} = 0$)	16	0	23	2
	Total	227	4	568	49
Their average number of businesses	Businesses closed ($\Delta_{2019\text{-}2020} < 0$)	-9	-3	-17	-7
	Businesses opened ($\Delta_{2019\text{-}2020} > 0$)	63	5	22	18
	Municipal flux in terms of businesses (closed ≠ opened)	54	2	5	11
	Ratio (businesses opened / businesses closed)	7,25	1,67	1,31	2,64

Source elaborated by the authors based on research data.

Figure 1 | Located in Clusters Formed by Cluster Analysis





Source: elaborated by the authors based on research data using Google Maps© (GOOGLE©, 2023).

According to the information summarized in Table 2, we may observe that even though the "other activities" generic category for spending was second only to total spending, it was also above the average per capita spending on "healthcare activities" and "education activities", which together represent the three largest observed spending categories. First of all, this evidence demonstrates that given the size of the total for this category there should be a better breakdown of the public expenses that fall into this category. Secondly, these municipalities are clearly concerned with complying with the application of resources related to the minimum spending for the areas of healthcare and education which is mandated by the Federal Constitution of 1988.

On the other hand, the categories that received less spending were "economic development", "tourism", "worker support", "housing", "preservation of cultural heritage" and "public safety",

according to the research sample displayed in Table 2.

Analyzing the number of municipalities in each cluster, the information in Table 3 can be divided into two large groups formed by Clusters 1 and 3, and two other smaller groups formed by Clusters 2 and 4. Cluster 2 can even be broken down into the individual municipalities of Grupiara, Jeceaba, São Gonçalo do Rio Abaixo, and Serra da Saudade.

Considering only the municipalities of Minas Gerais that present some type of variation (positive or negative) in terms of their respective number of businesses from 2019 to 2020, independent of the clusters, it may be observed that there are more cities that increased the number of entities operating in their respective local economies (462 municipalities) than those that decreased their numbers of entities (345 municipalities), according to the information summarized in Table 3. In this way, despite the context of the COVID-19 pandemic in Brazil, Minas Gerais increased the number of businesses in activity from 2019 to 2020. This is supported by an analysis of the average flux in the number of businesses (number of businesses opened – closed), or in other words, all 4 of the clusters had a positive average flux of businesses and an average of business openings which was greater than the average for business closings.

Despite its validity, the analysis of fluxes can hide the effect of the respective average business openings and closings, that is, given that it considers the distance (difference) between the average number of business openings and closings, one could deduce that the 568 municipalities in Cluster 3 have a better average performance than the 4 municipalities which constitute Cluster 2. On the other hand, calculating the ratio between the average number of businesses opened (by municipality) and the average number of businesses closed (by municipality), would capture the relative effect of the number of municipalities in each cluster, as can be observed in the descriptive information in Table 3.

In this way, based on the “ratio between businesses opened and businesses closed” detailed in Table 3, we may observe that the municipalities in Clusters 1 and 3 had the best and worst performance respectively, while the municipalities in Clusters 2 and 4 presented intermediate performance.

In relation to the analysis of the clusters formed by our cluster analysis, Figure 1 demonstrates that the greatest concentration of municipalities occurred in the southeastern region of the State of Minas Gerais which is represented by 3 clusters, that are in contrast with Cluster 2, which is made up of just 4 municipalities with its distribution located longitudinally close to the middle of the state.

In terms of the location of the clusters detailed in Figure 1, we may also observe that the cities in the western region of the state are predominantly in Cluster 1, while the cities in the northern region of Minas Gerais are predominantly in Cluster 3. The central, eastern, and southern regions did not have a concentration in terms of a given cluster.

Considering just those municipalities with positive variations in terms of the number of businesses in operation from 2019 to 2020, which therefore were where business openings predominated within their clusters, we sought to evaluate which per capita spending categories could be thought of as determinant for these increases (positive variations). For this purpose, we used a multiple linear regression and the stepwise method, and the results are summarized in Table 4.

Table 4 | Regression Analysis for the Identification of Statistically Significant Per Capita Spending in Relation to Positive Variations in the Number of Businesses ($\Delta_{2019\text{-}2020} > 0$)

Cluster	R^2	DW[(a)]	ANOVA[(b)]		Pesarán-Pesarán[(c)]		Variables / Per capita spending	Coefficients[(d)]			Collinearity statistics[(e)]	
			F	Sig.	F	Sig.		*B*	t	Sig.	Tolerance	VIF
1	0,89	2,05	392,22	0,000	0,01	0,908	(Constant)	11,71	0,79	0,432		
							Agrar. reform and col.	496,63	27,40	0,000	0,98	1,02
							Sanitation	0,24	2,09	0,040	0,98	1,02
2[(f)]												
3	0,06	2,00	9,61	0,000	0,02	0,881	(Constante)	34,07	9,28	0,000		
							Cultural diffusion	-0,31	-3,99	0,000	0,97	1,04
							Economic development	-0,34	-2,54	0,012	0,97	1,04
4	0,42	2,49	18,90	0,000	123,87	0,000	(Constante)	-5,96	-0,63	0,531		
							Public safety	0,81	4,35	0,000	1,00	1,00

Decision parameters:
a) evaluation of the self-correlation residual = 1.00< DW< 3.00;
b) evaluation of the linear combination of the explanatory variables = ANOVA with sig. of F < 0.05;
c) evaluation of the independence of the residuals = Pesarán-Pesarán Test with sig. of F > 0.05;
d) evaluation of the model coefficients = sig. of t < 0.05;
e) evaluation of the presence of multi-collinearity = Tolerance >0.20 and VIF < 5.00;
f) given that just four municipalities are grouped in Cluster 4, there was not a sufficient number of observations to perform the linear regression analysiS.

Source: elaborated by the authors based on research data.

Initially it was not possible to identify which categories of per capita spending were statistically significant in Clusters 2 and 4 in terms of the positive variation in the number of businesses from 2019 to 2020. In Cluster 2, there were not a sufficient number of observations to perform a linear regression, given that it consists of only 4 municipalities (Grupiara, Jeceaba, São Gonçalo do Rio Abaixo, and Serra da Saudade) and only one city presented an increase in the number of businesses during the analyzed period (Serra da Saudade). Even though Cluster 4 has more municipalities with positive variations in terms of business openings from 2019 to 2020 than Cluster 2, the regression analysis of the observations (28 municipalities) indicates the presence of problems related to the residuals not being independent, as demonstrated by the results of the Pesarán-Pesarán test (with sig. of $F < 0.05$) which are detailed in Table 4.

In terms of the municipalities in Clusters 1 and 3, the linear regression analysis revealed distinct behavior for the categories of per capita spending considered to be determinant in the increases (positive variations) in the number of businesses in activity in their respective local economies. In Cluster 1, the linear combination of the independent variables formed by per capita spending on "agrarian reform and colonization" and "sanitation" explained 89% (R^2) of the observations referring to the 103 municipalities that presented an increase in the number of businesses in operation from 2019 to 2020. In Cluster 3, the linear combination of the independent variables formed by per capita spending on "cultural diffusion" and "economic development" explained just 6% (R^2) of the observations referring to the 330 municipalities which presented an increase the number of businesses in operation from 2019 to 2020.

In the case of Cluster 1, the signs and respective (*B*) coefficients indicated that both of the independent variables have a direct and significant relationship with the number of businesses opened in the respective municipalities, with the per capita spending on "agrarian reform and colonization" having greater impact than per capita spending on "sanitation". Meanwhile in Cluster 3, the signs and the respective (*B*) coefficients indicated that both independent variables, that is per capita spending on "cultural diffusion" and "economic development", have a significant inverse relationship with the number of businesses opened in the respective municipalities, and there was no significant difference in terms of the intensity of the impact caused by both.

It should be noted that the analysis of the intensity of each explanatory variable on the study variable in Clusters 1 and 3 was performed based on the absolute values of the respective (*B*) coefficients. Following the general recommendation that this type of analysis should be based on standardized coefficient values, the values of the explanatory variables used in the regression analysis are given in the same unit of measurement, Brazilian reais (R$).

Finally, as indicated in Table 4, the regression was implemented with 95% confidence, and tests were also conducted in relation to the validation of the respective research models, that is: the Durbin-Watson (DW) test was used to make sure there were no problems with self-correlation; the Pesarán-Pesarán test was used to evaluate the independence of the residuals; and the Tolerance and VIF statistics were employed to evaluate the presence of multicollinearity among the explanatory variables.

FINAL CONSIDERATIONS

The exploratory analysis conducted by this study concerning the behavior of total municipal per capita spending and in terms of 17 distinct categories of this spending has revealed that practically all of the spending categories for the four clusters identified in this study were significant, with the lone exception being per capita spending on “agrarian reform and colonization”.

Through cluster analysis it was possible to perceive that per capita spending on “other activities” presented larger values compared to total spending than per capita spending on the constitutionally mandated areas of “health” and “education”. In fact, except for total per capita spending, the spending on “other activities”, “health”, “education”, “infrastructure” and “social assistance and good citizenship” is much greater than spending on areas that can be considered related to business decisions regarding the selection of their environments (sanitation, cultural diffusion, agricultural and livestock farming, sports and leisure, the environment, economic development, tourism, worker support, housing, preservation of cultural heritage, public safety, and agrarian reform and colonization).

This relative importance can be proved through linear regression analysis. In other words, of the 12 categories with smaller per capita spending, four were considered significant in terms of the number of businesses opened from 2019 to 2020 in most of the municipalities of our study sample

(103 belonging to Cluster 1 and 330 belonging to Cluster 3).

In this sense, the linear combination of the independent variables formed by per capita spending on “agrarian reform and colonization” and “sanitation” was significant in terms of the observations of increases in the number of businesses operating in the municipalities of Cluster 1. Meanwhile, the linear combination of the independent variables formed by spending on “cultural diffusion” and “economic development” was significant in terms of the observations of increases in the number of businesses operating in the municipalities in Cluster 3. Thus, these 4 groups of municipal per capita spending along with the smaller values observed in all of the clusters were significant in explaining the positive variations in the number of businesses opened in 433 municipalities in the State of Minas Gerais.

In this manner, even though it is exploratory, this scientific investigation has made it possible to conclude that decisions regarding the objectives of municipal spending are more important than the total amount spent.

Thus, by relating municipal spending with the number of businesses operating in the local context, and in view of the fact that the financing for public spending comes from public revenues which, directly or indirectly, are mainly derived from economic activity on the municipal level, this investigation proposes an innovative analytical perspective regarding the components of public finances on the municipal level which is empirically observable and intuitive. It is hoped that the presented results together with findings from other correlated studies will contribute to the debate regarding municipal economic development independent of the inherent amplitude of the subject in question.

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