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Mapeo científico de las desviaciones presupuestarias: una revisión sistemática de la literatura

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Resumen

El presente texto realiza una revisión sistemática de la literatura sobre desviaciones presupuestarias y su abordaje desde una perspectiva global y su abordaje. El objetivo es sintetizar la evidencia científica sobre el tema y visualizar los posibles vacíos, evaluar la producción científica y las conexiones de las investigaciones sobre desviaciones presupuestarias del sector público. Se busca, por lo tanto, visualizar la relación entre las palabras clave desviación presupuestaria, transparencia y eficiencia gubernamental, principalmente, o descubrir otros vínculos. Para ello, en la revisión se aborda la posible relación con la eficiencia de los gobiernos locales desde una perspectiva global. Se abarcan todos los artículos dentro del período de 1982 hasta 2024, provenientes de las bases de datos WoS y Scopus, con el fin de identificar sus generalidades, las cuales podrían servir como punto de partida para futuras investigaciones. Finalmente, se proponen clasificaciones para las variables de entrada y salida que posteriormente podrían dar lugar a una taxonomía sobre aspectos de la medición de la eficiencia de la ejecución presupuestaria en las entidades públicas.

Palabras clave: **desviaciones presupuestarias, presupuesto público, control presupuestario, revisión sistemática, mapeo científico.**

Scientific mapping of budget deviations, a systematic literature review

Abstract

The present text aims to carry out a systematic review of the literature on budget deviations from a global point of view and how it has been approached in order to synthesize the scientific evidence on the topic of budget deviations and to visualize the possible gaps; to evaluate the scientific production and connections of research on public sector budget deviations and therefore to visualize the relationship between the keywords budget deviation, government transparency and efficiency mainly, or to discover some other nexus. A systematic review of the existing literature on budget deviations that have existed and their possible relationship with local government efficiency is provided, covering all articles within a time period spanning from 1982 to 2024 from WoS and Scopus databases, in order to distinguish their generalities that may serve as a starting point for future research. Finally, we intend to suggest classifications for input and output variables that could later lead to a taxonomy on aspects of measuring the efficiency of budget implementation in public entities.

Keywords: **budget deviations, public budget, budgetary control, systematic literature review, scientific mapping.**

Mapeamento científico de desvios orçamentários: uma revisão sistemática da literatura

Resumo

O presente texto tem como objetivo realizar uma revisão sistemática da literatura sobre desvios orçamentários sob uma perspectiva global e como a temática tem sido abordada, a fim de sintetizar as evidências científicas sobre o tema e visualizar as possíveis lacunas; avaliar a produção científica e as conexões da pesquisa sobre desvios orçamentários no setor público e, portanto, visualizar a relação entre as palavras-chave desvio orçamentário, transparência e a eficiência governamental, principalmente, ou descobrir algum outro nexo. É apresentada uma revisão sistemática da literatura existente sobre "desvios orçamentários" e sua possível relação com a eficiência dos governos locais sob uma perspectiva global, abrangendo todos os artigos de um período de 1982 a 2024, das bases de dados WoS e Scopus, a fim de distinguir suas generalidades que possam servir de ponto de partida para pesquisas futuras. Por fim, pretendemos sugerir classificações para variáveis de entrada e saída que possam, posteriormente, levar a uma taxonomia sobre aspectos da mensuração da eficiência da execução orçamentária em entidades públicas.

Palavras-chave: **desvios orçamentários, orçamento público, controle orçamentário, revisão sistemática da literatura, mapeamento científico.**

1. Introducción

The public sector has a very important impact on national progress towards the country's economic development, since it provides many essential services and consumes a great number of resources in doing so. Calvo et. al. (2018), López (2012), Revuelta (2012), Sevilla (2006), among others, consider that the public sector has a greater responsibility than the private sector due to the critical impact its actions have on the sustainable development of the country.

Flores et al. (2008) mention that it is a fundamental part of the economic policy, since it defines government priorities and objectives through the amounts assigned to expenditures, but also to revenues, and serves for the search and definition of social efficiency in the allocation of public resources.

Therefore, in the public sector, budget deviations are an important performance space and due to the political and institutional pressures generated during this process, it is crucial that public sector organizations neither overspend nor underspend, then budget deviations highlight the need of strict budget control (Johansson & Siverbo, 2014).

This article contributes to the literature in two main aspects. First, a detailed bibliometric review of studies investigating budget deviations is presented, providing information on the main topics, authors, countries involved in the empirical studies, keywords used, among other general aspects. Second, an in-depth analysis of the main articles in several countries is carried out, comparing the data and samples used, as well as the main results obtained to describe which techniques have been used to measure scientific production in the context of budget deviations.

2. Literature review

2.1. Budget and Budget Deviations

From an economic perspective, the public budget can be linked to a country's macroeconomic performance, since the performance of a system is closely related to the performance of its economy, which is reflected in budget surpluses or deficits, and from here we can see the importance of this interrelation between economic performance and public budgeting. This is why many countries have undertaken budget reforms that allow them to maintain a balance in their public finances in order to sustainably achieve the objectives set in response to society's demands (Chan, 2002).

On the other hand, there are academic works that analyze the behavior of budget forecasts (or budget targets) where they usually find systematic biases, generally due to the setting of unrealistic budget targets, contaminated by political strategy considerations (Boylan, 2008; Moulin & Wierts, 2006; Strauch, 2004).

2.2. Budget Control

According to Díaz-Barrios & Pacheco (2015) the planning of the economic and social development of a Nation is one of the primary responsibilities of the public sector. Currently the planning system is a process that integrates the different plans that lead to the effective fulfillment of each and every one of the specific functions of government, complementing each other. In some countries, the Federal Expenditure Budget specifies the amount and destination of the economic resources that the governmental entity requires during a period, that is, a year, to obtain the results committed and demanded by the different sectors of society. Therefore, it is the legal and financial document that establishes the expenditures to be made by the federal government between January 1 and December 31 of each year.

2.3. Analysis of Previous Research Work

It is of utmost importance to analyze the contributions made by scientists on this topic, however, so far and taking into consideration the scope and limitations of the present research, there are no literature reviews on the specific topic we are dealing with. The closest to it was a systematic literature review conducted by Narbón-Perpiña & De Witte (2018a) and later the second part of this review in the same year, where barely and public budget is mentioned as the protagonist of the study, given that their approach tries to provide an extensive and comprehensive review of the existing literature on local government efficiency from a global point of view, covering all articles from 1990 to August 2016 (Narbón-Perpiñá & De Witte, 2018b); presenting the average efficiency scores by country, measured as the average between the maximum and minimum scores found in previous literature. In the first part of this study, they found 84 empirical papers on the subject, while in the second part they identify 63, using the same time period. Within their main conclusions issued they mention having summarized the environmental variables used in previous literature, as well as the methodologies applied and emphasize that because efficiency results depend largely on the selection of variables and the methods used, their paper provides a good basis for researchers in the field of local government efficiency (Narbón-Perpiñá & De Witte, 2018b). However for the present study there are still many efforts to try to summarize what has been carried out so far in the field of budget deviations.

Taking into consideration the above, it can be said that there is a gap in the literature review studies on the topic of budget deviations, requiring a broad view of what has been revealed up to the present time, and therefore, it is proposed to analyze the works published to fill this gap. In this sense, the in-depth review is based on five previous works that refer to the local government literature on budget deviations.

First, Cuadrado-Ballesteros et al. (2022) provide an empirical analysis on budget slippages in local government in Spain, analyzing the gender variable. Second, Rios et al., (2018) reviewed the impact of transparency on fiscal performance. Third, Benito et al. (2015) analyzed the determinants of the quality of municipalities budget forecasts, showing opportunistic behavior influenced by the electoral cycle. Fourth, Guillamón & Cuadrado-Ballesteros (2021) suggested a variable "Data Envelopment Analysis" to estimate technical efficiency based on linear programming techniques to define an empirical frontier that creates an envelope by the most efficient decision-making units. Finally, Johansson & Siverbo (2014) hypothesized "budget turbulence" (when public sector organizations face budget turbulence, the implementation of strict budget control is a functional response that increases the probability of meeting budget targets) stating that if it is transparent, public sector organizations benefit from valuable budget control when seeking to control budget slippages; but if the turbulence is only lateral, activities can be carried out in the same way and the additional controls put in place will have no effect on budget slippages. However, as far as is known, the literature review presented in this paper is the first approach to a literature review and is also intended to be the most comprehensive source of references on budget variance analysis and, in fact, the only one presented on the particular topic, as it shows a complete overview of the existing literature, the selection of variables and some considerations for future research.

3. Methods

In this review we have used two of the main search engines for scientific text, WoS and Scopus First, a bibliometric exploration was carried out using open citations[1]. This information is relevant and initial, since it was considered for the search query and the extraction of metadata necessary for the research, specifically in obtaining the local citation network.

The search was limited to a time frame from 1982 to 2024; publications in journals mainly and only ten references in books; articles in English language; excluding duplicate studies and limited to social, public administration, economic and business areas, excluding what is not related to public entities, in order to reduce the probability of recovering articles that were not related to the topic such as energy efficiency or budgets used in private civil constructions, as well as health topics in the medical field not related to public performance.

Given that the main focus is "budgetary deviations", in the first instance we searched for an article that previously made some type of analysis of the literature, whether bibliometric or systematic, from which it was found that there were no previous works focused on this particular topic in the search engines used, so we continued with the search for data that would allow us to carry out an SLR. The initial search was carried out through combinations of the following keywords “desviación* presupuestaria or (Budget deviation*)”, “budgeting*”, “variación presupuestaria” or (Budget variance*), “eficiencia gubernamental or (Government Efficiency)” and “transparencia or (transparency)”. From which only 11 articles were derived, thus

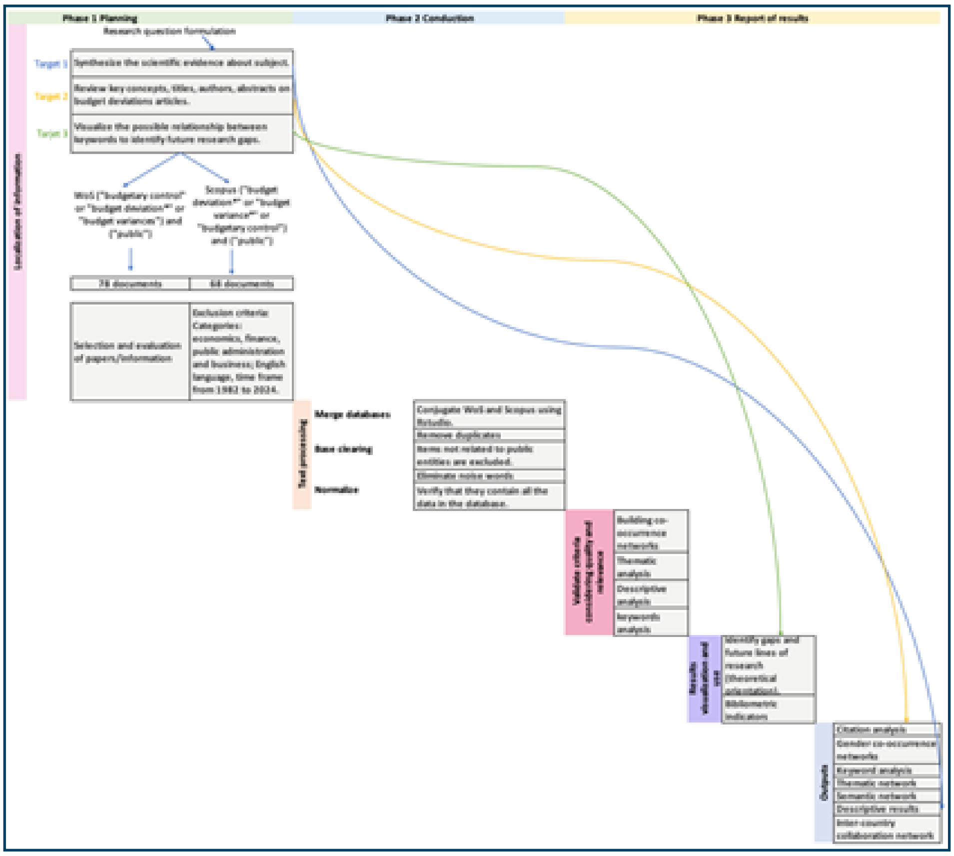
1 Through the following link: https://opencitations.net/index/coci/api/v1/metadata/10.1080/14719037.2021.1912816__10.1002/for.2513__10.1111/auar.12071__10.1080/00343404.2020.1772964__10.1016/j.mar.2014.04.001

broadening the search, reducing the words efficiency and transparency and adding the word "public" to eliminate everything that would have to do with budget and deviations but not in the public sphere, which is the object of study of this paper. Using these keywords, the databases provided us with more than 600 documents; however, to limit the total number of results, we excluded presentations made at conferences and dissertations. The results obtained were then qualitatively filtered to ensure that they addressed the research question, without being so precise in discarding articles that could serve to identify possible areas that were not considered, but that may provide outlines of future research lines or possible gaps.

Figure 1 shows an outline of the methodology used, defining its traceability. The traceability encompasses three phases that go from planning, through conduction, to the report of results. The first stage includes the formulation of research questions that derive in specific objectives and show the results obtained from the searches, both in Scopus and WoS. In phase two, text processing is carried out, ranging from the merging of the databases to their normalization, going through the database cleaning activity. Finally, in phase three, criteria are validated and the outputs generated are visualized, highlighting their use. Among the main networks developed we find the local citation network, the semantic network of papers (including its interactive dashboard) and the keyword network, to then go into particular visualizations that will answer the research questions.

Figure 1

Research traceability



Source: Prepared by the authors

4. Results

The following are some of the findings derived from the bibliometric review with the help of the "Bibliometrix" package, which is derived from the Rstudio version 2022 program. The main bibliometric elements of the analysis of the present study are summarized in Table 1, where a total of 132 articles with the previously mentioned characteristics were compiled from 110 sources and with a total participation of 263 authors. Likewise, the average number of citations is 20.06% and only 52 articles were written by a single author. The temporality of the present study is reiterated, which goes from 1982 to 2024 with an annual growth of 4.11%.

Table 1

Database overview

Timespan	1982:2024
Sources	110
Documents	132
Annual Growth Rate	4.11%
Authors	263
Authors of single-authored docs	52
International Co-Authorship	11.36%
Co-Authors per Doc	2.04
Author´s Keywords	404
References	5926
Document Average Age	10.3
Average citations per doc	20.06

Source: Prepared by the authors, using Bibliometrix.

Given the importance of the budgetary exercise for nations and although the work in this area has not been sufficient, in the last six years there has been an increase in the intention to know what is the destination of public resources and whether or not it is linked to the national strategic objectives that are raised, which is the ultimate purpose of the application of resources. From 1970 to 2014 on average 4 articles were published annually and from 2016 there is an increase in the production of scientific articles reaching its peak in 2020 where 37 scientific articles were published from the base studied.

On the other hand, the analysis carried out with the help of the Bibliometrix package, showed the countries where the greatest number of scientific productions related to the topic of interest has been carried out. The results showed that the United

States, Alaska, Australia and the United Kingdom among the main countries, followed by Turkey, Brazil, the Netherlands, Spain, China, France, Finland, Germany, Sweden, Norway and South Africa.

Connections between the countries mentioned above were also observed with respect to scientific collaboration, which answers the research question "In which countries have empirical studies been carried out on the subject?" and shows the collaboration that has taken place between countries through the red line that shows the collaboration between the United States, Canada, Spain, Australia, Italy, Germany, the United Kingdom, China and Southern Africa mainly.

In addition to showing the production by country, the table 3 shows the relationship between these countries, the authors and the institution to which they belong.

Table 2

Affiliation and author

AFFILIATION	AUTHOR	COUNTRY
Univ Murcia	Guillamon M	Turkey
Univ Murcia	Rios A	Turkey
Univ Murcia	Benito B	Turkey
Beijing Jiaotong University	Pajares J	Turkey
	Alegre J	Turkey
	Gao Z	Turkey
		Brazil
Beijing Jiaotong University	Jiang R	Turkey
		Brazil
University of Nigeria	Ashuri B	USA
	Acebes F	Turkey
	Agboeze M	Netherlands

Source: Prepared by the authors using Bibliometrix data.

Table 2 reveals that in terms of institutions, scientific production is highly centralized, with the University of Murcia being the one that includes three of the main authors of the subject studied. Thus answering the research question of Who are the main exponents of the subject?

To answer the question "Which gender has written the most on the subject", a gender inference network, implemented using the Graphext software, indicates a predominance of male authors in the reviewed articles. Given that the base is conducive to handling, a thorough analysis of author's names within the 132 documents was carried out to ensure that the network inferred by Graphext was correct.

Table 3

Document´s citation

Documents	Global citations
Ittner cd, 2001, J Account econ	453
Van der Stede wa, 2000, Account org soc	176
Molenaar Kr, 1998, J constr eng manage	155
Johnston R, 2011, Manag serv qual	133
Stilley Km, 2010, J consum res	107
Frow N, 2010, Account org soc	96
Uddin S, 2005, Account audit account j	95
Kaplan Se, 2007, J bus ethics	89
Abbott Lj, 2010, Account horiz	89
Oxley H, 1991, OECD economic studies	75

Source: Prepared by the authors, using Bibliometrix.

Table 3 specifies the number of citations corresponding to each article published in this field, showing the first ten most cited of the articles contained in the database.

With respect to the keywords used by the authors revealed in the table 4 generated in this study, "Budget control", "Project management" and "risk assessment" appeared as the the tree main ones, suggesting that the main studies that have been carried out on the subject of budget deviations point to the control that occurs within it.

Table 4

Keywords

Keywords	Participation and percentage	
Budget control	65	29%
Project management	28	12%
Risk assessment	14	6%
Costs	13	6%
Value management	9	4%

Economics	8	4%
Standard deviation	8	4%
Forecasting	7	3%
Public spending	7	3%
Risk management	7	3%
Cost benefit analysis	7	3%
Water Budget	7	3%
Optimization	6	3%
Budget déficit	5	2%
Investments	5	2%
Government	5	2%

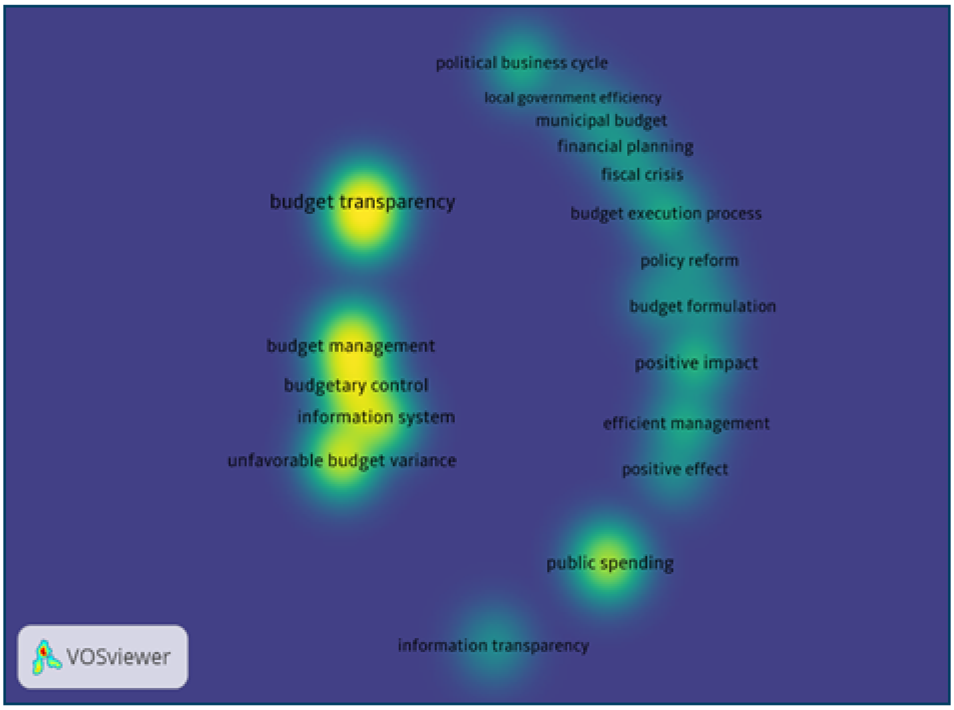
Source: Prepared by the authors, using Bibliometrix.

In the same line, visualization is a task of the communicative process where abstract data and complex phenomena are transformed into messages visible to the human eye, according to Grueso-Gala & Zornoza (2022). The visualization of bibliometric networks, also called scientific mapping, has taken great interest especially by researchers in the field of information metrics, evidencing the need for visualization tools and techniques to represent scientific production (Sajovic et al., 2018).

Using VOSviewer to construct and visualize the following bibliometric network, a density visualization can be seen in figure 2, where the construction of data to create links that distinguish topics adjacent to budget variances is represented and gives a notion of the possible causes that lead to a budget variance and the subtle connection that exists between these causes.

Figure 2

Terms network

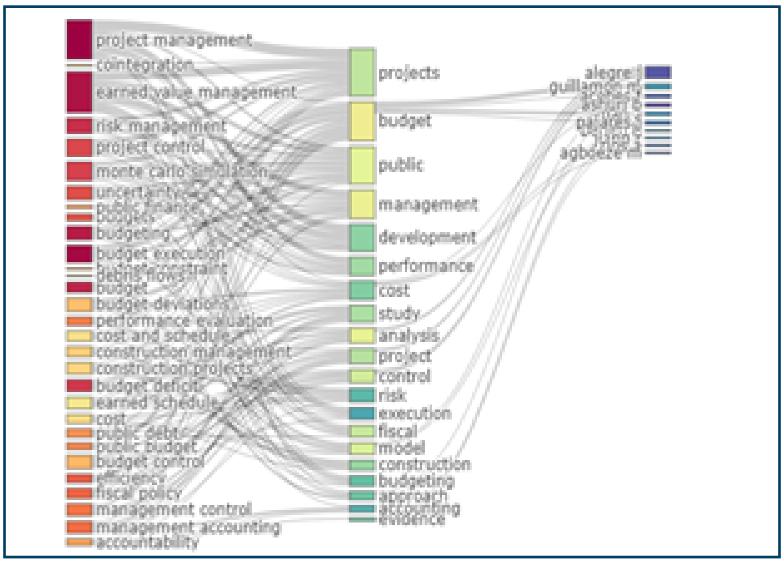


Source: Prepared by the authors using VOSviewer

Finally, we find a relationship between keywords, authors and published articles in the following Sankey diagram as seen in figure 3, where we observe a greater relationship between budget projects, a subject that Alegre and Guillamón address mainly in their various publications.

Figure 3

Relationship topics, keywords and authors



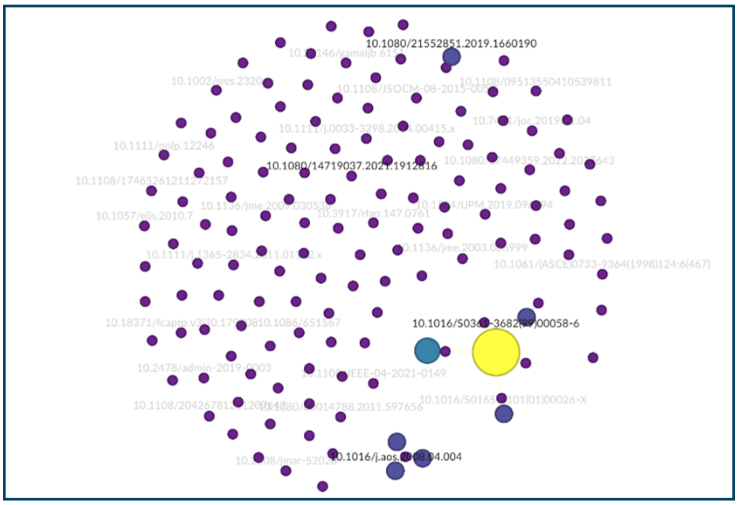
Source: Prepared by the authors using Bibliometrix

The citation gives an objective guideline to the exchange of production and scientific capital and serves as a formal mechanism to have an approach to the dialogue that occurs in the productions of researchers (Rodríguez-Estrada, 2018). To make the drawing of the graph that allows visualizing the connection between authors and their studies on the topic of budget deviations, the tool Open Citations was used[2]; occupying the doi of an article, the massive extraction of data was obtained. The query is carried out within the same platform; however, it requires data homogenization and cleaning to be able to use it with the specific language of other packages, in this case graphext.

In the following network, in the figure 4, the nodes are represented in size and color according to their centrality. The largest node was colored yellow and belonged to the article. The relationship between two consequences of budgetary controls: budgetary slack creation and managerial short-term orientation, published in 2000, concentrates most of the connections, although few of the base of articles studied. Among its keywords determined with the help of graphext we find budgetary and public control. This article has the highest centrality even though its citations are not even half of the article with more citations, since it has 216 citations versus 610. However, based on graph theory, the centrality of a node determines its relevance within the graph and allows comparing or contrasting this vertex with others, showing a really large impact among the topics studied and revealing that budgetary control is one of the topics with the most connections with budgetary deviations.

Figure 4

Local citation network



Source: Prepared by the authors, using Graphext

As mentioned, systematic literature reviews in different fields have used graph theory as a tool to present intermediation and links, having as an indicator the degree

2 The following link was used https://opencitations.net/index/coci/api/v1/metadata/

of entry, the degree of exit and the centrality of the graph (Zuluaga et al., 2016; Gómez-Tabares, 2021; Duque & Tabares, 2021; Pirbhulal et al., 2021). Figure 4 shows the articles identified by their DOI, which are mostly deconcentrated, indicating a field of opportunity if we converge the studies on a link of interest in all fields, such as may be budgetary control in relation to adjacent topics that will be shown in later visualizations defined by keywords. Within this local citation network, the most notorious cluster is made up of the following articles:

1. DOI 10-1007/s10551-006-9226-y "Moral judgment and causal attributions. Consequences of engaging in earnings management" authoring Kaplan, et al. from 2007.
2. DOI 10.1016/S0165-4101(01)00026-X "Assessing empirical research in managerial accounting: a value-based management perspective" authoring Ittner & Larcker from 2001.
3. DOI 10.1108/00251741011053479 "Playing devious games, Budget emphasis in performance evaluation, and attitudes towards the budgetary process" authoring Huang & Chen published in 2010.
4. DOI 10.1007/s00187-018-00273-6 "The role of Rolling forecasting in budgetary control systems: reactive and proactive types of planning" authoring Henttu from 2018.

Within the second most relevant cluster, the paper is in the center of the cluster "Institutions, agency and institutionalization of budgetary control in a hybrid state-owned entity" of the authors Gooneratne & Hoque (2016).

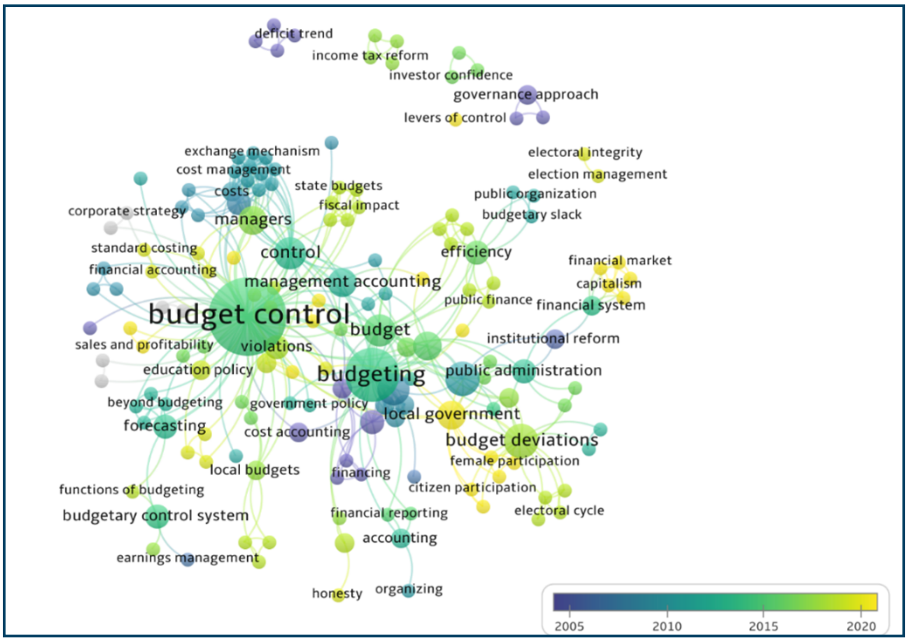
On a different note, in this study a semantic network of papers was derived using the graphext software, to have a view of the connections between the studies carried out on budget deviations. This tool is used when we do not know or have doubts about the meaning of a group, either because of its heterogeneity or because of the generalization we want to make (Christensen & Kenett, 2023). Within the network that is constructed, clusters are defined according to the text analysis carried out with the help of graphext, using the title and summary fields contained in the database of the articles reviewed. Within this semantic network 6 clusters can be observed which according to the degree of importance are placed in the following order: 1) budget and public policies, 2) budgetary social implications, 3) budgetary management, 4) budgetary control, 5) transparency and audit and 6 local studies, showing greater interaction between clusters 2 and 3 and 5 and 6.

On another vein, keywords within the scientific text provide certain information about the properties of the scientific text. Using the free software VOSviewer, it was decided to perform a bibliometric analysis about budgetary deviations taking as a basis the co-occurrences of keywords. The figure 5 shows the words with more than two occurrences and those with a higher linking strength, identified by their size. Moreover, the color of the node indicates the time frame in which they occurred, giving an indication that the latest topics investigated in this area are related to local studies, budgetary function, costs and the gender of the participants included in them.

In terms of node size, the words budgetary control, budget and budget deviations, and local government are among the largest, so it can be said that the results obtained are related to budget management processes and that the empirical studies that have been carried out are mainly at the local level.

Figure 5

Keywords network



Source: Prepared by the authors, using VOSviewer

5. Discussion

The results of this systematic review show a geographic concentration in the scientific production on budget deviations, predominantly in developed countries such as the United States, United Kingdom, Australia and Canada. This trend coincides with previous studies that highlight how fiscal transparency and public expenditure efficiency are more developed in nations with strong institutions and consolidated democratic systems (De Simone et al., 2019).

In contrast, research conducted in developing country contexts, such as the study by Musiega et al. (2023) on health systems in Kenya, reveals that weaknesses in budget monitoring and accountability mechanisms compromise the efficiency of public systems. This finding highlights the need to strengthen institutional capacities in these settings to improve financial management and public service delivery.

In addition, the review identified a paucity of studies focused on the relationship between budget slippage, efficiency and government transparency. However, research such as Ríos et al. (2018) has shown that higher levels of municipal transparency are associated with more prudent budget slippages, suggesting that transparency can act as a control mechanism to improve accuracy in budget estimates.

Likewise, international studies have found that fiscal transparency has a positive impact on the efficiency of government spending and financial sustainability. For example, De Simone et al. (2019) evidence that in democratic countries, greater fiscal transparency correlates with greater efficiency in public spending. Similarly, Bastida & Benito (2007) point out that budget transparency is positively related to the quality of governance and fiscal sustainability.

Regarding the methodologies employed, most of the studies reviewed use cross-sectional data, which limits the understanding of temporal dynamics in budget management. Research such as Peng et al. (2022) in China has used panel data analysis to show that deviations in budget spending have a significant negative impact on the efficiency of government spending, especially in sectors such as education and social security. These longitudinal approaches provide a deeper insight into how budget slippage affects efficiency over time.

Finally, the review highlights the need to standardize concepts and terminology in the study of budgetary deviations. The frequent use of the term “budgetary control” as a substitute suggests a lack of conceptual consensus that could hinder the consolidation of the field of study. Establishing clear definitions and comparable analytical frameworks will be essential to advance toward a more robust understanding of how budget deviations affect efficiency and transparency in public management.

6. Conclusion

The literature review leads us to some main considerations or conclusions. First, we found differences in the popularity of budget deviation analysis between countries, where the United States, Australia, Canada and the United Kingdom are among the countries with the greatest scientific production on this topic, at least within the databases consulted. The European continent shows a greater concentration of countries interested in this topic, with Spain being the country that has analyzed this issue the most, mainly in terms of local governments. Some studies have also attempted to analyze the relationship between local government efficiency and transparency, which makes it a multidisciplinary topic and focuses within the variables considered in the initial hypotheses of this research, however, only 11 articles are found within this assumption. The most important related area is economics, followed by management and public administration.

Second, most previous studies have analyzed cross-sectional data. A minority of articles have an underlying panel structure in the data, being mainly directed at local governments. There is a great opportunity to investigate this topic, mainly in developing countries, and to link it to the issue of economic development and the evolution of local government efficiency over time, since time period analysis provides interesting information on management and policy formulation on the effect of public resource utilization. More research is needed on the analysis of efficiency and transparency to find a direct relationship or not of budget execution.

Based on the literature review, there are several avenues for future research. One of them would be the measurement of effectiveness based on the SDGs, reviewing the specific budget items that could affect the achievement of national goals in each country. The research that can be carried out is broad, since each of the items to which the budget is allocated in different countries has to do with the development of the population and should positively affect the standard of living of the population, so a first approach to know whether or not the public policies applied in each country are effective, has to do with the evaluation of the different options that gave rise to a non-specific use of the budget and its planning and how this had an impact on the nation's objectives, in health issues with the past contingency of COVID-19 and in infrastructure issues could explain the current situation of the country. Also in research and development to link it to the scientific production that has been low among other aspects if we analyze the items according to the expenditure, either at regional or national level.

Therefore, the objective of this research was met, providing a synthesis of the scientific publications on budget deviations, it was found that there are few articles that relate public sector budget deviations to efficiency and/or government transparency through network analysis and the co-occurrence of key words. However, as a substitute, the word budgetary control was frequently found, which although it does not give indications of efficiency or transparency, is the first step in measuring them.

Likewise, other research questions arise, such as: what are the consequences of the misapplication of resources? And how can this bad practice be corrected or minimized within public entities to achieve greater governmental efficiency? Of course, these last questions are not the subject of the present research, so they should be addressed in future research, but they are made clear, since the present systematic analysis of the literature will give way to contextualize what has been addressed so far in this branch, which is practically in its infancy.

Relating the above with the opportunities and the little explored line of research, it can be concluded that there is still a long way to go to discover this area for those who are interested. An important limitation of this study is that the analysis was based exclusively on scientific articles indexed in the Scopus and Web of Science (WoS) databases, which may restrict the representativeness of the research landscape by excluding other relevant sources of literature. Furthermore, only English-language publications were considered, which may bias the findings by not including relevant research published in other languages, especially in regional or local contexts. Finally, the review was limited to articles published up to December 2024, so more recent research was not included in the analysis.

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