Analysis of irregularities in public procurement in the Republic of Serbia – OLS and GLM model

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Abstract

This paper analyzes the financial control of public procurement in the public sector of the Republic of Serbia. The research covers the period from 2008 to 2023. Two regression models were applied in the study: OLS regression and the GLM model. The subject of this research includes identifying irregularities that occurred during the financial control of public procurement in the period from 2008 to 2023, according to available annual audit reports in the Republic of Serbia. The results show a significant impact of irregularities on the total value of observed irregularities, indicating the need for improved procedures and controls. In other words, the results highlight a significant impact of irregularities on the total value of detected issues, directing attention to the need for enhancing procedures and controls. The analysis suggests that irregularities arise due to various factors, such as insufficient transparency, lack of training and education for procurement staff, inadequate implementation of the legislative framework, and the complexity of the procedures themselves.

Keywords: irregularities, public procurement, audit, reports

Introduction

The procurement of goods, works, and services from private suppliers is the focus of public procurement, a branch of public administration. This category includes long-term investments such as new schools, roads, ports, and technology, as well as needs that require swift implementation, such as fuel, office supplies, airline tickets, and vehicles. The public sector accounts for about 15 to 20 percent of GDP, indicating a significant level of government involvement in providing goods and services to the broader public in most countries. The government's ability to perform its duties, as well as the timeliness, quality, and accessibility of the goods and services it provides to the public, largely depend on its procurement practices (Sanchez, 2013).

Given that control is a fundamental managerial role, it is indisputable that financial control of public procurement is of crucial importance for the progress of modern society. Therefore, the significance of this research is clear. The urgent procurement of products, works, and services for public needs has drawn greater attention due to the complex epidemiological scenario worldwide. The shortage of certain types of goods worsened due to restrictions imposed by numerous countries around the world during the pandemic, and corruption increased, necessitating additional budget expenditures. In light of these facts, we can say that good public administration is characterized by a well-coordinated system for the procurement of goods and services and the timely execution of fiscal oversight over its implementation (Kikavets & Tsaregradskaya, 2023). Every time a government agency or another organization uses taxpayers' money to purchase products, services, or construction works, this practice is called public procurement (World Bank, 2003). As we can see in Chart 1, public procurement plays a very important role in society, which necessitates its study.
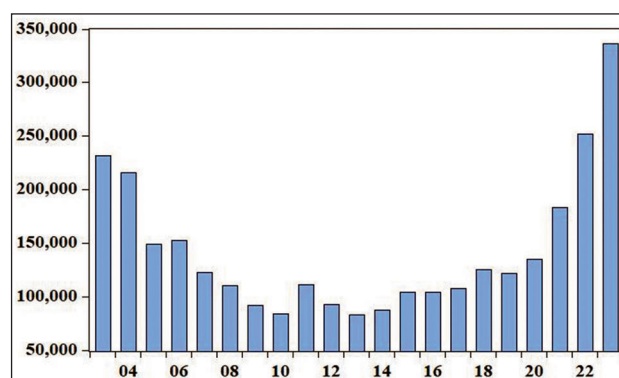

Chart 1. Number of public procurement contracts concluded
Source: Author's Work

As the chart shows the concluded public procurement contracts from 2003 to 2023, several significant trends and exceptions can be observed. The highest number of concluded contracts was recorded in 2023, with 336,116 contracts. This represents a significant increase compared to previous years, especially compared to 2022, when the number of contracts was 251,949. This growth may indicate increased activity or efficiency in the public procurement process. The lowest number of concluded contracts was recorded in 2013, with 83,121 contracts. In other words, this year stands out as the period with the least activity in public procurement during the observed period. Overall, the number of concluded public procurement contracts shows fluctuations over the years, with several periods of significant decreases (e.g., between 2008 and 2010) and periods of growth, particularly from 2020 onwards. These changes may result from various economic, political, and regulatory factors that have influenced the public procurement process.

The subject of this research includes identifying irregularities that occurred during the financial control of public procurement in the period from 2008 to 2023, according to available audit reports in the Republic of Serbia. The contribution of this research lies in the absence of a unified scientific methodology and the insufficient exploration of the financial control system in public procurement.

Literature Review

Gunzynov et al. (2022) in their research provide a detailed description of various aspects of the legal framework regulating public procurement in Russia, Mongolia, and the People's Republic of China. The priorities of state policy in the area of public procurement in these countries are presented in the study, which also highlights the key provisions of financial control and anti-corruption measures. The study aimed to compare and contrast the Russian Federation, the People's Republic of China, and Mongolia in terms of legal regulation of financial control and the implementation of accountability measures for procurement-related crimes. The findings of the study indicate that the legislation in China, Russia, and Mongolia strengthens anti-corruption measures

for crimes related to procurement. Despite numerous legal restrictions, corruption-related crimes involving procurement activities frequently occur. Aboelazm (2018) notes that there is a lack of research within the academic literature that compares the approaches of different countries to public procurement reforms aimed at increasing fiscal oversight and public expenditure accountability, particularly in Africa. At the same time, this type of research can shed light on how public procurement in Africa ensures value for money. This paper uses a comparative approach to highlight some experiences of countries in public procurement processes. The research findings suggest that public procurement systems and PFM (Public Financial Management) in the countries from the case study are influenced by three key elements: government structures, economic variables, and socio-cultural values. Sirotkina & Pavlovskaya (2016) in their research observe that the legislation regulating public procurement in Russia must include public control systems. The structure of public oversight enables the transparency of public procurement, despite the challenges associated with the pace of reforms in this area. There is insufficient use of the potential provided by legislation for establishing public oversight. Although it is likely that public initiatives will expand and that interaction between the public and government bodies regarding budget expenditures will begin, the impact of the public on public procurement authorities remains inadequate, especially in light of the uncertain economic situation. Training and informational support for participants in the public procurement market, along with efforts to dispel the widespread belief among Russian entrepreneurs that competitive procedures are predetermined, are all reasonable extensions of reforms aimed at improving the transparency of government contracts. Kozłowski & Czaplicka-Kozłowska (2020) suggest that the focus of the research is on considering the steps involved in selecting the best bidder under public procurement law. Before delving into the specifics of the problem, this article focused on legislative solutions, the number of amendments to these solutions since the first law was passed in 1994, and the actual implications for managing public financial resources. Research results from specific districts were used to make these diagnoses. The

basic assumption of the study is that local financial resources can be better managed and protected by eliminating excessive debt and implementing public procurement laws. The study concluded with proposals for improving the public procurement process and addressing the issues with existing legislative solutions. Amankwa & Tetteh (2022) observe that addressing agency difficulties has become crucial, as procurement practices in many developing countries are not transparent. Through the lens of agency theory, this research examines the management of public finances and procurement in the context of a comparative study of Asian and African countries. Using a descriptive case study approach, the research relies on data sets from 100 African and Asian countries over the period from 2002 to 2018. The study found that Asian countries had more efficient public financial management (PFM) outcomes compared to African countries, as their procurement methods were more aligned with international standards. Thai (2017) notes that in theory and practice, public procurement is dynamic and constantly changing. Rapid technological advancements, an explosion in product choices, increasing environmental awareness, and the complexity of regional and international trade agreements have contributed to the ever-changing dynamics for procurement professionals. As a result, there is significant diversity in organizational structures, procedures, and methodologies within the public procurement system in a federal system. The attempt of the public procurement system to maximize competition is largely influenced by economic or market conditions. Research findings indicate that good procurement rules and regulations are crucial for the effective functioning of the public procurement system. Allowing procurement staff from different departments to directly interact with suppliers or to make unilateral decisions about procurement sources is an example of decentralization. Fazekas & Cingolani (2017) aimed to deepen the understanding of these phenomena by investigating the potential role of rules on political fundraising in reducing cases of corruption in public procurement. To this end, they use new indicators to assess the likelihood of high levels of institutionalized corruption, using aggregated official microdata on nearly 3 million contracts awarded in 29 European countries between 2009 and 2014. The research results indicate that no statistically significant harmful effect was found from adding political finance restrictions on corruption risks in public procurement in difference-in-differences and panel regression models among countries. Surprisingly, most models show a favorable effect. To a large extent, the relationship found is consistent with the norms regulating political fundraising. Measuring implementation rather than legislation, allowing more time for regulatory impact, or addressing institutional dependencies are some of the remaining barriers preventing a final judgment on the effectiveness of party finance restrictions in limiting corruption. Obura (2023) suggests that procurement planning provides government agencies with the opportunity to evaluate the entire procurement process, which should lead to better decisions that help initiate projects related to the purchase of goods, works, and services. The interaction between the procurement function and broader public financial management is crucial for budget preparation and execution, as it is a critical aspect of management and the public financial system. Research results suggest that organizations should collaborate on everything from planning to payment, as well as on important supply contracts for commonly used goods, and act as an advisory board on procurement-related issues to prevent organizations from facing large unpaid bills at the end of the fiscal year.

Data Set and Research Methodology

In this study, data from annual audit reports in the Republic of Serbia were used (State audit institution, 2008-2023). The data cover the period from 2008 to 2023. This research focuses on analyzing the impact of different types of irregularities that occur in the public procurement process and how they affect the overall value of identified irregularities according to available annual audit reports. To conduct this analysis, two statistical models were employed. First, the Ordinary Least Squares (OLS) model was used. This model is a classical approach to linear regression and was employed to examine the direct effects of certain irregularities on the total value of observed irregularities. The application of the OLS model helps

to estimate the relationship between variables and provides insights into how irregularities impact the overall value (Newman et al., 2010). Since the OLS model has limitations in providing adequate and comprehensive information, the Generalized Linear Model (GLM) was used to confirm or refute the results obtained. This model allows for flexible analysis of different types of data and can be adapted to the specific needs of the research. Additionally, the GLM will be used to assess the degree of impact of various types of irregularities on the total value of observed irregularities, taking into account various factors that may influence the results (Moran et al., 2007).

Table 1 provides a display of descriptive statistics covering irregularities in public procurement, highlighting significant differences among various types of observed irregularities. The findings offer insights into these irregularities, facilitating a deeper understanding. The highest average value of 2.08 and median of 2.36 are recorded for irregularities related to contracts concluded without conducting a procurement procedure, non-compliance with legal requirements, or inadequate application of procedure types. This variable shows a high standard deviation of 0.76, indicating significant variability. Additionally, high kurtosis values of 6.06 and negative skewness of -1.99 are observed. On the other

Table 1. Descriptive Statistics of Observed Variables

Variables	Mean	Median	Std Dev	Kurtosis	Skewenes	Jarque - Bera
Irregularities in Public Procurement: Inadequate Pricing Evaluation, Commencement Without Approval, and Other Failures	1.672014	1.961151	0.702365	4.976677	-1.905594	11.52025
Irregularities in Public Procurement: Procurements Conducted Without Planned Funds, Acceptance of Defective Bids, and Absence of Procedure Regulation Document	1.023177	1.345325	0.711634	1.762715	-0.538476	1.681689
Irregularities in Public Procurement: Contracts Concluded Without Conducted Procedures, Failure to Meet Legal Requirements, and Inadequate Application of Procedure Types	2.084601	2.364714	0.761304	6.055775	-1.997118	15.80730
Irregularities in Public Procurement: Observed Irregularities in Advertising and Conducting Procurement Procedures	2.080173	2.367957	0.680549	6.906265	-2.164922	21.25403
Irregularities in Public Procurement: Changes to Contract Terms Without Decision and Irregularities in Contract Execution	1.233172	1.819745	0.855443	1.494929	-0.566416	2.217841
Irregularities in Public Procurement: Estimated Value Not Determined in the Prescribed Manner	0.971346	1.560184	0.822770	1.174482	-0.394531	2.471961
Other Irregularities	1.744544	2.327577	1.092238	2.101513	-1.034714	3.181133

hand, irregularities concerning procurement procedures where irregularities were observed in advertising or conducting procedures show similar patterns. The average value is 2.08, the median is 2.37, and the standard deviation is 0.68. Kurtosis of 6.91 and skewness of -2.16 suggest a very peaked and negatively skewed distribution. This category has the highest Jarque-Bera test value of 21.25, indicating a significant deviation from normal distribution. For irregularities related to procurements conducted without allocated funds or failure to reject bids with significant defects, the lowest average values of 1.02 and a median of 1.35 are observed. This type of irregularity exhibits lower kurtosis values of 1.76 and mild negative skewness of -0.54, suggesting a relatively more uniform distribution compared to other categories. Furthermore, the highest standard deviation of 1.09 is observed in the category of other irregularities, indicating considerable variability within this group. High negative skewness of -1.03 suggests the presence of low-value irregularities.

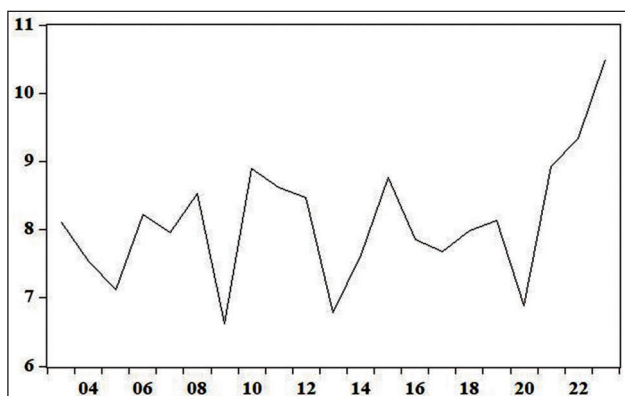The following graph illustrates the share of public procurement in the Gross Domestic Product (GDP).

Chart 2. Participation of public procurement in GDP
Source: Author's Work

Chart 2 shows data representing the share of public procurement in the Gross Domestic Product (GDP) for each year from 2003 to 2023. It can be observed that the highest share of public procurement in GDP was recorded in 2023 at 10.5%, while the lowest share was in 2009 at 6.62%. These data highlight variations in the scope of public procurement over the past 20 years, which may be useful for analyzing trends and economic activity.

The following graph presents the total value of concluded public procurement contracts by year.
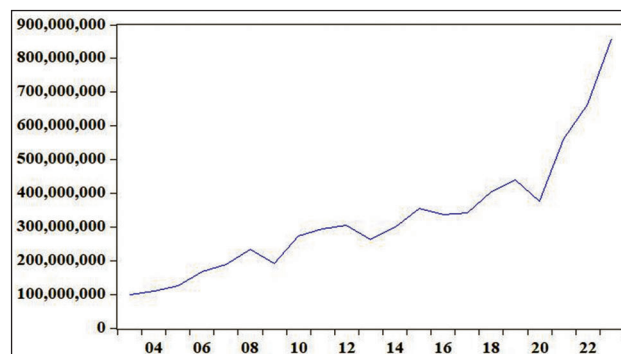

Chart 3. Total value of contracts
Source: Author's Work

In Chart 3, we see the total number and value of public procurement contracts (in thousands of dinars) for each year from 2003 to 2023. The chart illustrates significant variability in the volume of public procurements over this period, with smaller numbers and values in the earlier years and a substantial increase in the later years.

Empirical Research

Common issues in behavioral research include multicollinearity, missing values, and insufficient sample size. The probability that a theoretically valid predictor will be excluded from the regression model as an insignificant variable increases when multicollinearity is high (VIF $\geq$ 10) in Ordinary Least Squares (OLS) regression (Farahani et al., 2010). In other words, the results obtained from applying OLS regression are unreliable in such situations due to the increase in the standard error of the estimated coefficients (Field, 2000).

Since the VIF values are below 10 for all variables describing different types of irregularities in public procurement, we can conclude that multicollinearity is not present in these data.

OLS Regression. In this segment of the research, an analysis was conducted on the impact of different types of irregularities occurring in the public procurement process on the total value of detected irregularities using the OLS regression model. By implementing this model, the study aimed to identify significant effects of each type of irregularity on the total value of irregularities.

Table 2. VIF Test

Variables	VIF
Irregularities in Public Procurement: Inadequate Price Evaluation, Start Violations Without Consent, and Other Omissions	3.003425
Irregularities in Public Procurement: Procurements Conducted Without Planned Funds, Acceptance of Deficient Bids, and Absence of Procedure Regulation Act	1.478194
Irregularities in Public Procurement: Contracts Concluded Without Conducting a Procedure, Failure to Meet Legal Requirements, and Inadequate Application of Procedure Type	2.426503
Irregularities in Public Procurement: Observed Irregularities in Advertising and Conducting Procurement Procedures	2.039991
Irregularities in Public Procurement: Amendments to Contractual Conditions Without Decision and Irregularities in Contract Execution	5.02719
Irregularities in Public Procurement: Estimated Value Not Determined According to Prescribed Method	1.08558
Other Irregularities	4.815352

Table 3. OLS Regression Results

Variables	OLS regression
Irregularities in Public Procurement: Inadequate Price Evaluation, Commencement Violations Without Consent, and Other Deficiencies	-1.266080***
Irregularities in Public Procurement: Conducted Procurements Without Planned Funds, Acceptance of Offers with Deficiencies, and Absence of Procedure Regulation Act	-1.773516**
Irregularities in Public Procurement: Contracts Concluded Without Conducted Procedure, Non-Fulfillment of Legal Conditions, and Inadequate Application of Procedure Type	0.211209***
Irregularities in Public Procurement: Observed Irregularities in Advertising and Conducting Procurement Procedures	1.428155***
Irregularities in Public Procurement: Modification of Contractual Conditions Without Decision and Irregularities in Contract Execution	2.120990***
Irregularities in Public Procurement: Estimated Value Not Determined in Prescribed Manner	-0.434454**
Other Irregularities	-0.614029***

Based on the tabular presentation, we can observe that irregularities related to the disruption of the start of public procurement, such as not obtaining the consent of the competent authority or inadequate evaluation of price as a crucial element of the contract, have a significant negative impact on the total value of irregularities with a coefficient of -1.266080. If there were a reduction in these irregularities, it could significantly contribute to decreasing the overall value of observed irregularities. Additionally, procurements conducted without allocated funds or acceptance of offers with essential deficiencies also had a significant negative impact of -1.773516. Eliminating or reducing these irregularities could significantly contribute to the reduction of the total value of irregularities.

We also observe that the variable related to procurements where the estimated value was not determined as required has a coefficient of -0.434454. This suggests that improvements in the valuation process could contribute to a reduction in the overall value of irregularities. Finally, the results indicate that the variable for other irregularities showed a significant negative impact of

-0.614029, suggesting that reducing or eliminating these irregularities could positively affect the decrease in the total value of irregularities.

On the other hand, the variable related to procurement contracts concluded without the proper procurement process, or without meeting the legal requirements or conditions for applying the procedure, had a positive impact, with a coefficient of 0.211209. This suggests that an increase in these types of irregularities could contribute to an increase in the total value of irregularities. Additionally, the variable related to procurements where irregularities were observed in the advertising or implementation processes also had a significant positive impact, with a coefficient of 1.428155. This indicates the need for improvements in advertising procedures and the implementation of procurement processes. Finally, contracts where changes to the contract terms were made during execution without a formal decision or where there were irregularities in contract performance showed the most significant positive impact, with a coefficient of 2.120990. In other words, these irregularities have the most significant positive impact on the total value of detected irregularities, highlighting the urgent need to address these issues.

The obtained research results and their analysis revealed that different types of irregularities also have varying impacts on the total value of irregularities in public procurement. Notably, irregularities related to changes in contract terms during execution have the most significant positive impact, while irregularities involving procurements conducted without planned funds have the most significant negative impact. These results highlight the paramount importance of adhering to and implementing legal requirements. Additionally, the public procurement plan must be adequately formulated, and areas within the procurement process that need to be prioritized for improvement should be identified to reduce the total value of irregularities and enhance the efficiency and transparency of public procurement. The findings are consistent with research conducted by Asenso-Boakye & Etse (2014) and Abeku (2021).

Generalized Linear Model (GLM). In this research, the Generalized Linear Model (GLM) was also used to further investigate the impact of different types of irregularities in the public procurement process on the total value of observed irregularities. The analysis includes not only the coefficients and standard errors but also the z-statistics for each type of irregularity, providing a better understanding of the significance and direction of the impact of these irregularities.

Based on the tabular display, we can observe that the results indicate that irregularities related

Table 4. GLM Regression Results for Public Procurement Irregularities

Variables	GLM regression (Standard error)	z-statistic
Irregularities in Public Procurement: Inadequate Valuation of Price, Violation of Commencement Without Approval, and Other Omissions	-1.266080 (0.220867)**	-5.732324
Irregularities in Public Procurement: Procured Contracts Without Planned Funds, Acceptance of Defective Offers, and Lack of Procedure Regulation Act	-1.773516 (0.279318)***	-6.349454
Irregularities in Public Procurement: Concluded Contracts Without Conducted Procedure, Non-Compliance With Legal Conditions, and Inadequate Application of Procedure Type	-0.211209 (0.105784)***	-1.996596
Irregularities in Public Procurement: Observed Irregularities in Advertising and Procurement Procedures	1.428155 (0.343118)***	4.162279
Irregularities in Public Procurement: Modification of Contractual Conditions Without Decision and Irregularities in Contract Execution	2.120990 (0.611190)***	3.470263
Irregularities in Public Procurement: Estimated Value Not Determined as Required	-0.434454 (0.637273)***	-0.681740
Other Irregularities	-0.614029 (0.103869)*	3.470263

to the violation of the commencement of public procurement, without obtaining the approval of the competent authority or inadequate valuation of price as a critical element of the contract, show a significant negative impact, with a coefficient of -1.266080 and a z-statistic of -5.732324. We can conclude that these irregularities have a significant negative association with the total value of irregularities, suggesting that a reduction in this type of irregularity could potentially decrease the overall value of observed irregularities.

Examining the next variable, which relates to procurements where no separate funds were planned or where offers containing significant deficiencies were not rejected, reveals the most significant negative impact, with a coefficient of -1.773516 and a z-statistic of -6.349454. This indicates a substantial negative association between these irregularities and the total value of irregularities. Further, the variable concerning procurements where the estimated value was not determined in the prescribed manner shows a coefficient of -0.434454 and a z-statistic of -0.681740. Although this shows less significance compared to the previous irregularities, this variable still demonstrates a negative impact on the total value of irregularities. Additionally, the variable related to other irregularities shows a significant negative impact, with a coefficient of -0.614029 and a z-statistic of 3.470263. This suggests that reducing or eliminating this type of irregularity could positively affect the reduction of the total value of irregularities. Finally, the results for procurements where irregularities were observed in advertising or conducting procurement procedures showed a positive and significant impact, with a coefficient of 1.428155 and a z-statistic of 4.162279. These results collectively indicate a need to improve the procedures for advertising and conducting procurement processes to reduce the total value of irregularities.

Examining the variable related to contracts where changes were made to contractual terms during execution without a decision on the contract modification or where there were irregularities in contract execution, we observe that this has the most significant positive impact, with a coefficient of 2.120990 and a z-statistic of 3.470263. These irregularities have the largest positive impact on the total value of irregularities, indicating

that addressing these issues is crucial for reducing or eliminating them. For the variable concerning contracts where the procurement process was not conducted, legal conditions were not met, or the conditions for applying the type of procedure were not fulfilled, the coefficient is -0.211209 with a z-statistic of -1.996596. Since these results are less significant compared to the previous irregularities, this variable suggests a slight negative impact on the total value of irregularities.

In conclusion, the results suggest that different types of irregularities in the public procurement process have very different impacts on the total value of observed irregularities. The most significant impacts are related to irregularities involving procurements carried out without planned funds and changes in contract terms during execution. In other words, these irregularities have the most significant effect on the overall value of irregularities. These findings highlight critical areas in the public procurement process that should be prioritized for improvement to reduce the total value of irregularities and enhance the efficiency and transparency of public procurement. There is a particular need to focus on the implementation of legislative frameworks and rules for conducting public procurements, which is consistent with the research conducted by Lukhele (2022) and Quashie (2019).

Conclusion

The research results provide a deeper insight into the impact of various irregularities in the public procurement process on the total value of observed irregularities. The analysis revealed that irregularities related to the breach of the commencement of public procurement, irregularities without obtaining the approval of the competent authority, or inadequate valuation of price as a crucial contract element have a significant negative impact on the overall value of irregularities. Reducing or eliminating these irregularities would contribute to a decrease in the total value of detected irregularities. Additionally, procurements carried out without planned funds or where offers containing significant defects were not rejected also had a statistically significant negative impact. Moreover, irregularities related to procurements where the estimated value was not determined in

the prescribed manner showed a smaller but still statistically significant negative impact, indicating that improving the valuation process would further reduce the total value of irregularities. On the other hand, irregularities related to concluding procurement contracts without conducting a public procurement procedure, irregularities in advertising and procurement processes, as well as irregularities concerning changes in contract terms during execution, suggest a statistically significant positive impact on the total value of identified irregularities. Particularly noteworthy are the irregularities related to changes in contract terms during execution, which have the highest positive impact on the total value of observed irregularities, highlighting an urgent need to address this issue.

The application of the additional model, Generalized Linear Model (GLM), further confirmed the significance and direction of the impact of various irregularities on the total value of irregularities. The obtained results clearly indicate the key areas in the public procurement process that should be prioritized and given attention to improve and thus reduce the total value of irregularities, ultimately enhancing the efficiency and transparency of public procurement.

The limitations of the research pertain to several general aspects. Firstly, the quality of available data may vary, which can significantly impact the accuracy and reliability of the results. Additionally, the methodology used in this study, while adequate for basic analysis, could be improved by applying other statistical techniques and models, which would provide deeper insights and results. Thirdly, although the data used in this study are relevant, future research could benefit from utilizing a more diverse range of data and increasing their volume to obtain more comprehensive and extensive results and information. Finally, future research should focus on improving the quality and availability of data and applying analytical approaches to achieve more robust conclusions and recommendations. Furthermore, incorporating certain economic, political, and social factors into the analysis could provide a better understanding of the context in which public procurement occurs, how these factors influence irregularities, and the consequences of these factors.

References

1. Abeku, E. E. (2021), The consequences of public procurement and its associated irregularities in Ghana, AARMS–Academic and Applied Research in Military and Public Management Science, 20(1), 55-65.

2. Aboelazm, K. S. (2018), Reforming public procurement and public financial management in Africa: Dynamics and influences, Journal of Advances in Management Research.

3. Amankwa, M. O., & Tetteh, E. K. (2022), Comparative analysis of public procurement and public financial management within Asia and Africa, International Journal of Procurement Management, 15(2), 133-159.

4. Asenso-Boakye, M., & Etse, D. (2014), Irregularities in Ghana's Public Sector Procurement and Their Possible Reinforcers: A Study of the Auditor General's Report, International Journal of Economics, Commerce and Management, United Kingdom, 2(2).

5. Farahani, H. A., Rahiminezhad, A., & Same, L. (2010), A comparison of partial least squares (PLS) and ordinary least squares (OLS) regressions in predicting of couples mental health based on their communicational patterns, Procedia-Social and Behavioral Sciences, 5, 1459-1463.

6. Fazekas, M., & Cingolani, L. (2017), Breaking the cycle? How (not) to use political finance regulations to counter public procurement corruption, Slavonic and East European Review, 95(1), 76-116.

7. Field, A. (2000), Discovering statistics using SPSS for windows, London: Sage.

8. Gunzynov, Z. P., Dondokova, M. Y., Konovalova, Z. A., Myakhanova, A. N., & Sinkov, D. V. (2022), Legal regulation of procurement activities in Russia, China and Mongolia: some aspects of financial control and anti-corruption, Юридический вестник Самарского университета Juridical Journal of Samara University, 8(1), 88-96.

9. Kikavets, V. V., & Tsaregradskaya, Y. K. (2023), Financial control as a factor of effective public procurement management, Law Enforcement Review, vol. 7, no. 2, pp. 85–95. Available at: DOI 10.52468/2542-1514.2023.7(2).85-95 (accessed 15.08.2024.)

10. Kozłowski, A. J., & Czaplicka-Kozłowska, I. Z. (2020), Security of Public Financial Resources and the Public Procurement Procedure–Analysis of Transparency and Characteristics of Procedures Based on Research, Internal Security, 12, 129-143.

11. *Lukhele, T. M. (2022), Content analysis and ranking of irregularities in public sector construction procurement in South Africa, International Journal of Construction Supply Chain Management.*

12. *Moran, J. L., Solomon, P. J., Peisach, A. R., & Martin, J. (2007), New models for old questions: generalized linear models for cost prediction, Journal of evaluation in clinical practice, 13(3), 381-389.*

13. *Newman, D., Newman, I., & Salzman, J. (2010), Comparing OLS and HLM models and the questions they answer: Potential concerns for type VI errors, Multiple Linear Regression Viewpoints, 36(1), 1-8.*

14. *Obura, C. O. (2023), Procurement planning: The principle of sound balance between procurement control and achieving value for money, International Academic Journal of Procurement and Supply Chain Management, Volume 3, Issue 2, pp. 19-27.*

15. *Quashie, M. K. (2019), Causes and Costs of Procurement Irregularities in Ghana's District Assemblies, International Journal of Law and Society, 2(4), 58.*

16. *Sanchez, A. (2013), The role of Procurement, In The International Handbook of Public Financial Management (pp. 312-335), London: Palgrave Macmillan UK.*

17. *Sirotkina, N., & Pavlovskaya, S. (2016), Public control as a mechanism of the openness of public procurement: Case of Russia, Global encyclopedia of public administration, public policy, and governance, Cham: Springer.*

18. *Thai, K. V. (2017), International public procurement: Concepts and practices. In International handbook of public procurement (pp. 1-24), Routledge.*

19. *World Bank. (2003a), Public Procurement Act of Ghana - Country procurement assessment report, Washington D.C. - The World Bank. Report No. 29055. (4). Available at: http://documents.worldbank.org/curated/en/2003/06/3582686/ghana-countryprocurement-assessment- report-vol-4-5-annex-8-public-procurement-act. (accessed 04.07.2024).*

20. *Državna revizorska institucija. Godišnji izvešaj o radu. Available at: https://www.dri.rs/godisnji-izvestaji-o-radu (accessed 04.07.2024).*

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