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## COMPARATIVE ANALYSIS OF PAYMENTS WITH BUDGET EXPENDITURES RELATED TO THE TRANSITION TO ELECTRONIC MUNICIPAL SERVICES IN AZERBAIJAN

### Abstract

The transition to electronic municipal services in Azerbaijan increases the quality of life of citizens by stimulating the development of state-oriented service activities. In this regard, conducting a comparative analysis of budget dynamics is of urgent importance for optimizing resource allocation and improving the quality of municipal services. The study highlights new approaches aimed at optimizing financial planning in municipal activities and providing services that meet the needs, interests, and well-being of citizens. This article analyzes the state of payments in e-municipal governance and its various aspects. The purpose of the study is to analyze the financial aspects of the transition to e-municipal services in Azerbaijan. The importance of the research is to study the implementation of electronic services, other expenses, and the efficient use of budget resources within the framework of the modernization process of the municipal system. At the same time, various aspects of these services, their impact on budget expenditures, and financial management in the long term were considered. The analysis component of the study was conducted using the e-views 10 software package. The analyses used econometric research methods such as time correlation, Granger test, cusum analysis, and unit root test (ADF). As a scientific innovation of the study, it was proven that local government maintenance costs and the consumer price index have a significant impact on the tax revenue of municipalities, while social security costs and other expenses do not have a significant impact.

**Keywords:** e-municipality, local self-government, tax revenues

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### 1. Introduction

The management of payments and budget expenditures in municipalities is the main direction of local self-government. The efficient management of these financial processes directly impacts the economic stability of municipalities, the advancement of social initiatives, and the overall well-being of local communities. Revenue generation plays an important role in providing the financial resources necessary to support municipal services, infrastructure development, and various social programs.

The rapid development of technology in recent years has led to the transition of municipal services to the electronic level, as in many other

areas. The purpose of this study is to compare the payments related to the implementation of the transition process to electronic municipal services in Azerbaijan with budget expenditures. The implementation of electronic services is important in terms of both facilitating the activities of municipal bodies and facilitating citizens' access to administrative services. However, questions remain about the financial implications and efficiency of this transition. Therefore, this study aims to examine the impact of relevant payments on the municipal budget and the effectiveness of services, as well as identify ways to more optimally use available financial resources.



## **2. literature review**

Habibova Z.Z., Huseynova X.M., et al. (2022) in the textbook "Contemporary Problems of State and Municipal Administration" touched upon issues such as transparency, participation, governance and efficiency in municipal administration. The textbook offers a comparative analysis of different approaches to understanding urban governance as a social phenomenon. The economic foundations of state and municipal administration are given.

Yusifov S., Ismayilov V., Huseyn A. (2016) The textbook "Local Self-Government, Legal and Financial Fundamentals" provides comprehensive information on the basics of local budgets, revenues and expenditures, and also substantiates the legal aspects of distribution of expenditures, powers and revenues.

Andrlík, B., Martina H., and Lucie Formanová. (2021) The article "The role of fiscal decentralization in municipal budgets: Case of the czech republic" provides a detailed analysis of information on the financial management of municipalities, the amount of property tax revenues and the possibilities of using local coefficients. The study found that although the role of property taxes in municipal budgets has decreased over the comparative period, they still constitute an important source of revenue for Czech municipalities.

Demir E., Mustafa T., and Sevilay B. (2022) "In the study titled "Yerel yönetimlerde uygulanan finansal tablolar analizine yönelik yaklaşımlar: Ankara Metropolitan Municipality Example", information about the financial structures of the municipalities was obtained through financial analyses, and performance results and efficiency and effectiveness analyses were conducted at certain intervals. These analytical studies are useful in making predictions about what municipalities will face in the future and in evaluating municipal budgets.

Leiko E. A., Verşitskaya E. R. (2021) in the study titled "Проактивность и экстерриториальность в предоставлении государственных и муниципальных услуг" the concept of state service is examined, current problems in the provision of state and municipal

services in electronic environment are examined, and statistics on the use of services in electronic environment are determined.

## **3. A conceptual view of municipal administration**

A conceptual overview of municipal administrationA comprehensive comparative analysis of the fiscal impacts of the transition to electronic municipal services in Azerbaijan and the current status of budget expenditures are important for understanding the broader economic impact of this transition. This study will explore the intricacies of how the application of digital platforms to municipal services impacts payment structures and overall budget allocations across government.

Municipalities are local self-government structures established through local elections held among those living within their legal boundaries. Their main goal is to solve problems related to local issues [5,p.16]. The main purpose of the activities of municipalities is to improve the quality of life of citizens, protect their rights and provide basic services to protect the environment. In other words, the activities of municipalities play an important role in influencing the lives of local people and contributing to their socio-economic development. Contemporary approaches to municipal management make significant contributions to both local government and the progress of society more broadly. These approaches facilitate more effective solutions to local problems and increase the active participation of citizens. In addition, local governments contribute to the creation of a broader framework for participatory development in society.

In order for the municipality to work effectively, the municipal administration has been saved from the financial resources provided by the municipalities in solving the tasks assigned to the municipalities. Therefore, financial matters have an important role in the management and administration of municipal affairs. The legal framework for municipal financial issues is established by the Law of the Republic of Azerbaijan "On Fundamentals of Municipal Finances". Article 7 of the Law of the

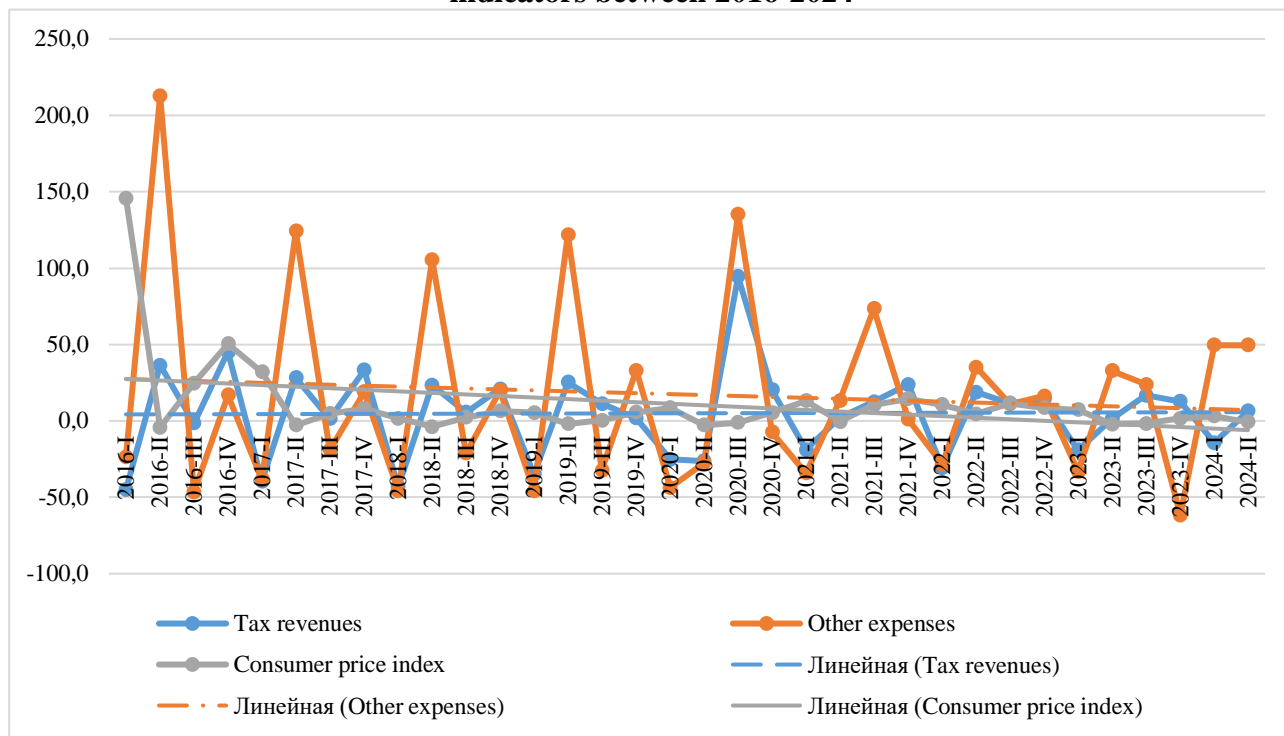


Republic of Azerbaijan "On the Fundamentals of Municipal Finance" states that the property tax collected from individuals is an integral part of local budget revenues [15]. The digitalization of municipalities enables the provision of high quality services to citizens and various institutions through widespread internet connection. This transformation facilitates internal collaboration among employees within the enterprise through computer networks, while also encouraging the exchange of information with important external organizations [3,p.253].

Starting from September 6, 2019, local municipal taxes and payments in Azerbaijan can

be made through the "State Payment Portal" created by the Central Bank[16]. This system offers citizens an accessible form of service that increases the efficiency and transparency of financial transactions. Additionally, the online payment option offers significant advantages such as saving time and creating a fair framework for all users. At the same time, it strengthens the centralized management of municipal fund collection while reducing bureaucratic financial losses caused by improper distribution of resources.

**Chart 1. Dynamic explanation of tax revenues, other expenditures and consumer price index indicators between 2016-2024**



As a result of the analysis, it is seen that the tax revenue indicators shown with the blue line and the trend line corresponding to this line mostly show fluctuations. Reflecting the dynamics, the trend line usually shows an upward or downward trajectory. The tax revenue indicators, shown by the blue line and the corresponding trend line in Chart 1, often exhibit fluctuations. Reflecting the dynamics, the trend line usually shows the movement in the positive or negative direction.

Increases in municipal expenditures in different quarters of the year can lead to a decrease in the quality of public services and an increase in social tension. As a result, high fluctuations in other expenditures of the municipality indicate instability in financial management. At the same time, this issue has important implications for the well-being of local communities. It is imperative that municipalities make more accurate financial planning and develop sustainable financial



strategies that take into account relevant economic variables.

As of 2020, cashless collection of tax revenues within the scope of electronic municipalities has been implemented in Azerbaijan. This change has enabled the tax system to function more easily and more clearly in line with the requirements of the modern age. At the same time, a positive growth dynamic is observed in tax revenues as a result of the measures taken in this direction. This process, which supports economic development in the country, reflects positively on the activities of both taxpayers and municipal officials.

The increase in tax revenues in municipalities is related to the increase in economic activities. Economic activity encompasses the processes of production, exchange and consumption of goods and services within a specific territorial boundary. The increase in economic activity has a positive effect on the volume of tax revenues allocated to the municipal budget. In this context, municipalities need to contribute to the spread of new economic activities by cooperating with various institutions and business people.

#### **4. Electronic service of municipalities in Azerbaijan**

Municipalities in Azerbaijan provide information services as part of their electronic services. Information services are online platforms through which municipalities provide official information to citizens. Through these services, citizens can easily access information about the municipality's activities, legislation, calendars and other important information. For example, the information published on the municipality's official website allows citizens to access the necessary information without applying. This also enables citizens to participate more actively in municipal affairs and make more informed decisions on local issues. In this way, providing clear and transparent information also contributes to increasing trust between the municipality and the citizens.

Interactive services are offered within the scope of electronic municipal services in Azerbaijan. In other words, it is an online service

that allows municipalities to communicate directly with citizens. These services include online applications, complaint and feedback forms, and the ability for citizens to contact the municipality. Such services facilitate citizens' relations with the municipality.

Nowadays, municipalities offer tax payment services through online platforms. In this context, transaction scopes can be listed depending on cashless payment systems. Successful integration of digital financial transactions requires the establishment of a strong financial infrastructure and widespread user acceptance, as well as ensuring high efficiency and transparency. At the same time, we cannot ignore some challenges. Segments of the population with limited internet access or technical literacy may face significant difficulties in using these services, which may affect the overall effectiveness of tax collection. Additionally, municipalities must ensure that their e-services are accessible to all demographic groups to maintain equal service delivery and unimpeded revenue flow.

Resources allocated for the development and maintenance of electronic municipal services are covered by other expenditures of the local budget. The use of resources allocated to electronic municipal services serves more specific purposes compared to other local budget expenditures. For example, these resources are spent on developing municipal websites, creating online application systems, ensuring data security, and implementing various programs to enable citizens to use services more effectively. The allocation of these resources helps municipalities advance in innovation and modernization, while also serving the comfort of citizens. For example, citizens save time and resources by using services provided online (e.g. filing applications, legal assistance, tax-related issues, etc.), and at the same time, contact between authorities and citizens is minimized by reducing bureaucratic processes.

#### **5. Research Methodology**

The analyses in this study were carried out using the Eviews 10 package program. Correlation method was used in the analysis. Correlation distinguishes itself from a



relationship characterized by functional dependence by serving merely as an average for a particular category of events [1,p.224]. The concept of correlation reflects a field of statistics that focuses on quantitatively assessing the relationship between two or more variables. Correlation analysis serves as a widely used methodological approach to examine these relationships and can provide important insights in a variety of contexts encompassing both business practices and everyday scenarios. The correlation matrix is defined as a symmetric positive semidefinite matrix obtained from the correlation coefficients of the elements of a K-dimensional random vector exhibiting zero variance [4,p.372]. (A k-dimensional random vector is defined as a vector consisting of k elements and denoted by  $k_1, k_2, \dots, k_n$ . The correlation coefficients calculated between the elements of this vector serve as a measure to evaluate the relationship between these

elements). A correlation matrix is a statistical tool used to analyze relationships between different variables. In compiling this matrix, the Pearson correlation method was used to measure the correlation between variables. The correlation matrix visualizes the relationship between independent variables or measured parameters, which provides important information for further analysis. Positive correlation is characterized by the scenario where an increase in one variable (X) is associated with an increase in another variable (Y). The strength of this relationship is measured on a scale from 0 to +1, with the maximum value of +1 indicating a perfect positive correlation coefficient [7,p.1107]. Pearson correlation coefficient is widely used in calculating the correlation matrix. The following formula is used in making this calculation. [8]:

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Here,

$r_{xy}$ : Pearson correlation coefficient;

$x_i$ : individual value of independent variable x;

$y_i$ : individual value of independent variables

y;

$\bar{x}$ : mean of variable x;

$\bar{y}$ : mean of variable y;

$(x_i - \bar{x})$ : shows how far  $x_i$  is from the mean;

$(y_i - \bar{y})$ : shows how far  $y_i$  is from the mean.

The CUSUM squared test is a statistical method used to track changes in time series data. This method makes it easier to detect sharp changes in the mean or standard deviation of a series. At the same time, change detection is

In this formula,

$\delta$  value: Measures the difference between two points, plays an important role in determining the appropriate test results and changes

$C_n$ : plane coefficient at current point (n).

$C_m$ : plane coefficient (m) at the previous point.

$n - m$ : Shows the distance between two points.

important to analyze the validity of the model. One methodology used to detect such changes is the CUSUM (Cumulative Sum Control Chart) square test. Bu test, zaman seriyalarının analizi zamanı yığılmış xətlərin cəmini izləyir.

The CUSUM square test helps evaluate the performance of the model at different time intervals while maintaining the normal distribution condition. The best estimator is the slope of the line connecting the first and last points in this segment of CUSUM, ignoring the locations of intermediate points. The CUSUM sloped linear regression estimator, in other words, is [9,p.20]:

$$\delta = \frac{C_n - C_m}{n - m}$$

At the same time, this test is a powerful tool for detecting breaks in time series data. Interpretation of data collected at different stages reveals how the analyzed distortions change over time. It is possible to analyze structural breaks more accurately by using the CUSUM square test, which allows for more accurate results in statistical analyses.

Granger causality test was also used in the study. Granger causality testing is a widely used statistical method to determine whether one time series causes another. Causality conceptualized within the Granger framework can be expressed as follows:

If including past values of X increases the predictive ability of Y beyond what can be achieved using past data alone, then variable X causes another variable Y. In other words, if knowing the previous values of X helps predict Y more accurately, then variable Y is causal with respect to variable X [10,p.326].

The Wald test represents an important statistical procedure used to assess the reliability of results obtained from the Granger test. There is a long tradition of hypothesis testing using the Wald principle in economics. The Wald test is particularly useful in scenarios where estimating an unconstrained model is less complex than estimating a constrained model. For example, when estimating nonlinear constraints on parameters derived from a linear model, an unconstrained model can be estimated using the

ordinary least squares method, provided that all the assumptions found in classical linear regression are met. Under certain regularity conditions, this test statistic exhibits positive asymptotic properties. However, in the context of small sample sizes often encountered in economic research, the Wald test may present a limitation that has not been extensively explored in the econometric literature. The problem arises because in small samples, changing the form of a nonlinear constraint to one that is algebraically equivalent under the null hypothesis can lead to a change in the value of the Wald test statistic [11,p.1465].

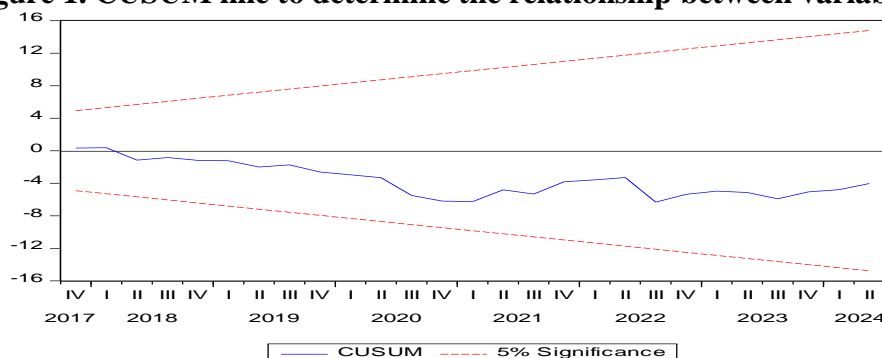
### Dataset

The variables used in the study were obtained from statistical data obtained from the quarterly bulletins of local government units published by the State Statistics Committee of the Republic of Azerbaijan. The analysis covers statistics from the fourth quarter of 2015 to the second quarter of 2024 [2]. The variables used in this study are explained in the table below

Variable name	Variable abbreviation
Tax revenues	VD
Local self-government body maintenance	YOS
Social security expenses	STX
Transport and communication expenses	NRX
Other expense	DX

To analyze the relationship between variables over a specific time period, let's examine the CUSUM (cumulative sum) chart presented below.

**Figure 1. CUSUM line to determine the relationship between variables.**



In the above graph, the blue line shows the cumulative deviations of the process over a

certain period of time. If the line remains relatively horizontal or within predetermined



control limits, it indicates that the process is at steady state. Conversely, if the line deviates significantly from this horizontal or control range, this indicates that the process is destabilizing.

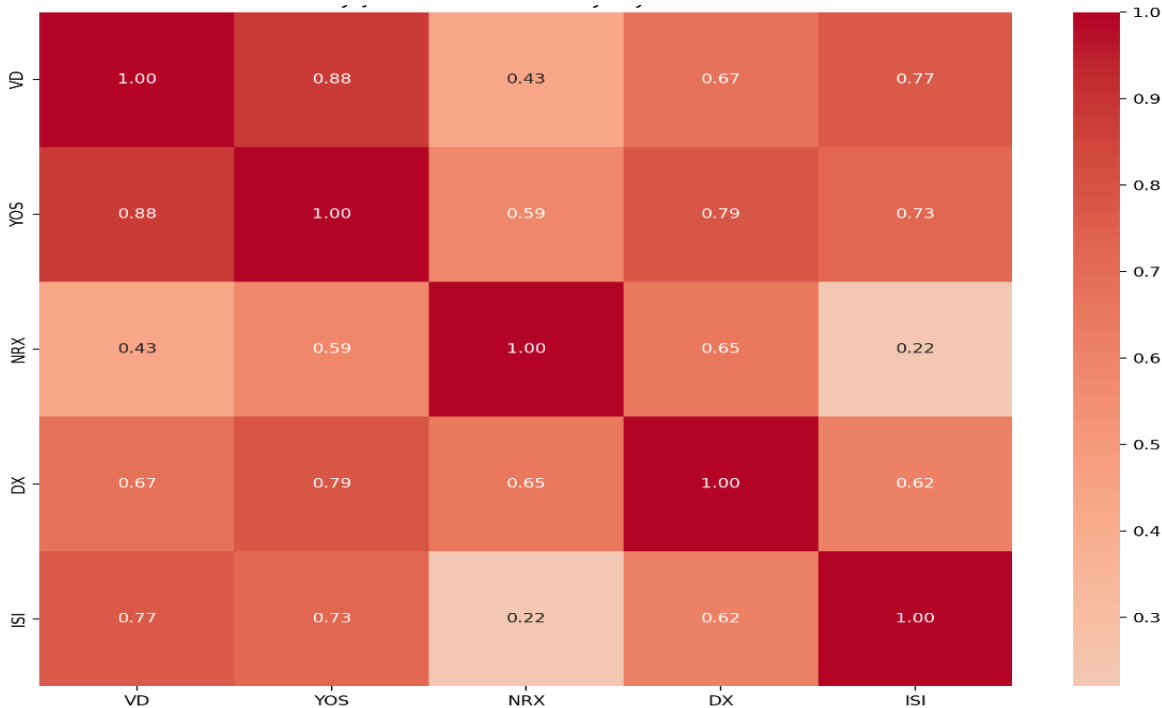
Qrafikdə 5% əhəmiyyətlik səviyyəsini təmsil edən qırmızı qırıq xətlər təhlilin kritik hədlərini müəyyən edir. If the CUSUM line exceeds these specified limits, it indicates that a significant change has occurred in the process, indicating systematic deviation, or that the process is not stable.

Analysis of Chart 1 shows that the CUSUM line has consistently remained within

the upper and lower red control limits over the specified time period. This observation shows that the process is stable and no significant changes or systematic deviations are detected. However, the trend has started to decline slightly after 2020, indicating the potential for the gradual transformation to continue. However, it is emphasized that this change remains within acceptable limits and does not exceed critical limits.

Table 1 below shows the statistical results obtained from the correlation matrix covering the variables.

**Table 1. Correlation matrix between variables**



According to Table 1, there is a strong positive correlation between tax revenues and the costs of maintaining the existence of local governments (correlation coefficient  $r = 0.88$ ). This shows that the increase in tax revenues is associated with the increase in maintenance costs of local governments. There is a positive correlation between tax revenues and the consumer price index ( $r=0.77$  correlation coefficient). There is a weak positive correlation between transportation and communication costs and the consumer price index (correlation coefficient  $r=0.22$ ). This shows that the effect is quite low. In addition, there is a positive

relationship between other expenditures of the municipality and the costs of maintaining the existence of the local self-government body ( $r = 0.79$ ). In general, the relationships between variables mostly exhibit moderate to strong positive correlations.

Performing unit root tests for the variables examined is of great importance in terms of verifying the accuracy of economic models and revealing the relationships between variables.

**Table 2. Unit root test for stationarity assessment.**

<b>At Level</b>						
		DX	ISI	STX	VD	YOS
With Constant	t-Statistic	-0.9986	0.8825	-2.5294	1.2502	2.5654
	<b>Prob.</b>	<b>0.7413</b>	<b>0.9938</b>	<b>0.1182</b>	<b>0.9978</b>	<b>1.0000</b>
		n0	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-6.5014	-4.2738	-4.2225	-0.6578	-0.0161
	<b>Prob.</b>	<b>0.0000</b>	<b>0.0105</b>	<b>0.0113</b>	<b>0.9676</b>	<b>0.9940</b>
		***	**	**	n0	n0
Without Constant & Trend	t-Statistic	0.9284	2.0601	0.5823	3.2754	3.7989
	<b>Prob.</b>	<b>0.9017</b>	<b>0.9886</b>	<b>0.8361</b>	<b>0.9994</b>	<b>0.9999</b>
		n0	n0	n0	n0	n0
<b>At First Difference</b>						
		d(DX)	d(ISI)	d(STX)	d(VD)	d(YOS)
With Constant	t-Statistic	-8.5070	-2.7288	-7.4582	-12.1503	-14.6884
	<b>Prob.</b>	<b>0.0000</b>	<b>0.0814</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

In the At Level section, it is stated that all variables (DX, ISI, STX, VD, YOS) exceed the critical value threshold ( $p$ ) of 0.05. This shows that none of the variables show stationarity at the current level of analysis. At First Difference section, all  $p$  values are below the 0.05 threshold, indicating that the time series has stationarity at the first difference level. Therefore, the fact that

the  $t$ -statistics are significant and the  $p$ -values are below 0.05 indicates that all variables are stationary in their first differences and therefore suitable for econometric analysis.

The Granger causality test results for the variables and the associated hypotheses are presented in the table below.

**Table 3. Results of Granger test on variables**

VAR Granger Causality/ Block Exogeneity Wald Tests				
Sample: 2015Q4 2024Q2				
Included observations: 32				
Dependent variable: LOGVD				
Excluded	Chi-sq	df	Prob.	Evaluation
LOGSTX	0.027337	1	0.8687	$H_0$ – the existence of a relationship is rejected
LOGDX	0.409443	1	0.5223	$H_0$ – the existence of a relationship is rejected
LOGYOS	5.913026	1	0.015	$H_0$ – the existence of a relationship is accepted
LOGISI	7.829655	1	0.0051	$H_0$ – the existence of a relationship is accepted

According to the Granger causality test results, the following comments can be made in line with the hypotheses:

1. The null hypothesis that LOGSTX is not a causal factor for LOGVD, that is, there is no statistically significant relationship between the two variables, is accepted.

2. It can be emphasized that LOGVD is not a causal factor for LOGDX and as a result there is no statistically significant relationship between the two variables.

3. The null hypothesis ( $H_0$ ) indicating the existence of a statistically significant relationship regarding the effect of LOGISI on LOGVD is accepted.





4. It is accepted that there is a statistically significant relationship between the effect of LOGYOS on LOGVD.

The transition to electronic municipal services, where municipal services are provided over the internet, intersects significantly with the Consumer Price Index (ISI). An increase in the consumer price index can have a significant impact on the purchasing power of consumers and consequently reduce the ability of local residents to meet their tax obligations. This impact on tax revenues may limit or strengthen the ability of municipalities to finance and maintain e-services.

#### **6. Conclusion**

The incompatibility between the management system of other expenditures and the tax revenue policy in municipalities is an important factor affecting their performance. First, the ineffectiveness of management systems that regulate other expenditures leads to misallocation of financial resources among municipalities. Failure to adequately control these costs ultimately reduces the quality of the services provided. At the same time, harmonizing tax revenue policies with other expenditures in municipalities is important for financial sustainability and local development. This policy is directly related to the implementation of effective approaches in municipal management. These approaches can help accelerate development by better responding to the needs of local communities. As a result, the implementation of these approaches will enable municipalities to use their resources more efficiently.

The maintenance and operation of local government units requires significant costs, which directly affects the efficiency of tax revenues. Some of the budget burdens that municipalities must manage include administrative costs, employee salaries, maintenance and infrastructure investments. The provision of electronic municipal services can enable the reduction of these costs by simplifying operations, minimizing physical infrastructure needs and optimizing human resources. The initial investment required to implement these advanced systems can be

worthwhile and impact budget allocations and tax revenue allocations.

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## Azərbaycanda elektron bələdiyyə xidmətlərinə keçidlə əlaqədar ödənişlərin büdcə xərcləri ilə müqayisəli təhlili

### Xülasə

Azərbaycanda elektron bələdiyyə xidmətlərinə keçid dövlət yönümlü xidmət fəaliyyətinin inkişafına təkan verməklə vətəndaşların həyat keyfiyyətini artırır. Bu baxımdan, büdcə dinamikasının müqayisəli təhlilinin aparılması resurs bölgüsün optimallaşdırılması və bələdiyyə xidmətlərinin keyfiyyətinin yüksəldilməsi üçün aktual əhəmiyyət kəsb edir. Tədqiqat bələdiyyə fəaliyyətində maliyyə planlaşdırmasının optimallaşdırılması, vətəndaşların tələblərinə maraq və rifah hallarına uyğun xidmətlərin təqdim edilməsinə yönəldilən yeni yanaşmaları özündə göstərir. Bu məqalə, elektron bələdiyyə idarəetməsində ödənişlərin vəziyyətini və onun müxtəlif aspektlərini təhlil edir. Araşdırmanın məqsədi, Azərbaycanın elektron bələdiyyə xidmətlərinə keçidin maliyyə aspektləri təhlil edilməsidir. Tədqiqatın əhəmiyyəti bələdiyyə sisteminin müasirləşməsi prosesi çərçivəsində, elektron xidmətlərin tətbiqi, digər xərclər və büdcə resurslarının səmərəli istifadəsi məsələlərinin öyrənilməsidir. Eyni zamanda, bu xidmətlərin müxtəlif cəhətləri, büdcə xərclərinə təsiri və uzunmüddətli perspektivdə maliyyə idarəetməsi nəzərdən keçirilmişdir. Tədqiqatın təhlili komponenti e-views 10 proqram paketindən istifadə etməklə aparılmışdır. Təhlillər zaman korrelyasiya, qranger testi, cusum analizi, vahid kök testi (ADF) ekonometrik tədqiqat üsullarından istifadə edilmişdir. Tədqiqatın elmi yeniliyi qismində bələdiyyələrin vergi daxil olmaları hissəsinə yerli özünüidarəetmənin saxlanma xərcləri və istehlak qiymət indeksi əsaslı təsir göstərməsi, o cümlədən sosial təminat xərcləri və digər xərclərin əhəmiyyətli təsirə malik olmaması sübut olunmuşdur.

**Açar sözlər:** elektron bələdiyyə, yerli özünüidarəetmə, vergi daxil olmaları.



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**Резюме**

Переход на электронные муниципальные услуги в Азербайджане повышает качество жизни граждан, стимулируя развитие деятельности государственных услуг. В этой связи проведение сравнительного анализа динамики бюджетов имеет актуальное значение для оптимизации распределения ресурсов и повышения качества предоставления муниципальных услуг. В исследовании рассматриваются новые подходы, направленные на оптимизацию финансового планирования в муниципальной деятельности и предоставление услуг, отвечающих потребностям, интересам и благосостоянию граждан. В статье анализируется состояние платежей в электронном муниципальном управлении и его различные аспекты. Целью исследования является анализ финансовых аспектов перехода на электронные муниципальные услуги в Азербайджане. Актуальность исследования заключается в изучении внедрения электронных услуг, прочих расходов и эффективности использования бюджетных ресурсов в рамках процесса модернизации муниципальной системы. В то же время обсуждались различные аспекты этих услуг, их влияние на бюджетные расходы и их долгосрочное финансовое управление. Аналитическая часть исследования проводилась с использованием пакета программ e-views 10. При анализе использовались такие эконометрические методы исследования, как временная корреляция, тест Грейнджера, кумулятивный квадратный тест и тест на единичный корень (ADF). В качестве научной новизны исследования было выявлено, что расходы на содержание органов местного самоуправления и индекс потребительских цен оказывают существенное влияние на налоговые поступления муниципалитетов, тогда как расходы на социальное обеспечение и другие расходы не оказывают существенного влияния.

**Ключевые слова:** электронный муниципалитет, местное самоуправление, налоговые поступления.