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MACROECONOMIC DETERMINANTS OF GOVERNMENT REVENUES UNDER WARTIME STRUCTURAL SHOCKS: EVIDENCE FROM UKRAINE

Abstract

The study aims to assess changes in the influence of macroeconomic factors on government revenues and the transformation of their interrelationships under wartime structural shocks in Ukraine. Two periods are considered: the first period (2017–2020) serves as the baseline for comparison, while the second period (2022–2025) captures the structural shifts associated with the full-scale war. The methodological framework combines correlation and regression analyses, supplemented by a pooled regression with a wartime dummy variable to assess structural differences between periods, and by logarithmic transformations of variables to enhance economic interpretability. The findings indicate a substantial transformation in the relationships between macroeconomic indicators and State Budget revenues within the relatively short wartime observation period (2022–2025). During the baseline period, the model shows limited explanatory power ($R^2 = 0.43$) and no statistically significant coefficients, reflecting the distributed nature of factor influence. In the wartime period, the explanatory power of the model increases to $R^2 = 0.83$; however, it is accompanied by a sharp rise in multicollinearity (VIF for GDP: 38.5; for imports: 22.3), limiting the identification of the individual contribution of explanatory variables and suggesting stronger co-movement among macroeconomic indicators. The logarithmic model suggests that GDP may serve as an aggregate indicator reflecting broader macroeconomic dynamics associated with State Budget revenues, while the elasticity of State Budget revenues with respect to GDP equals 1.4, indicating heightened fiscal sensitivity under crisis conditions. The results suggest that macroeconomic indicators exhibit a more coordinated pattern of interaction in explaining State Budget revenues, within which their interrelationships intensify and acquire a systemic character.

Keywords revenues, fiscal elasticity, macroeconomics, econometrics, structural shocks, wartime

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INTRODUCTION

In contemporary economic research, the impact of macroeconomic factors on government revenues is a key area of study in fiscal sustainability. In the classical understanding, government revenues have a relatively predictable relationship with macroeconomic indicators. Growth in gross domestic product is generally accompanied by an expansion of the tax base. An increase in consumption is reflected in higher indirect tax revenues. Imports generate additional fiscal revenues through customs duties and tax payments. Inflation and the exchange rate affect both the nominal volume of revenues and the overall conditions of economic activity.

However, in the case of Ukraine, this logic is no longer unconditional under current conditions. The full-scale war, the profound restructuring of economic processes, changes in logistics routes, uneven consumer demand, the increasing role of the state in the economy, and

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growing external dependence substantially alter the nature of traditional macroeconomic factors. As a result, a scientific problem arises as to whether the traditional relationships between macroeconomic factors and government revenues persist under structural shocks, and whether their strength, direction, and stability change under the new economic conditions.

At the same time, during the wartime period, the formation of State Budget revenues is influenced to a considerable extent by administrative decisions, financing needs of the security and defense sector, international financial assistance, grant inflows, and other one-off factors, the effects of which are not always fully captured by traditional macroeconomic indicators.

Therefore, it is interesting to identify statistical relationships and assess the extent to which the very mechanism of government revenue formation has changed. Unlike existing studies, this paper hypothesizes that amid structural disruption, not only does the strength of the impact of macroeconomic factors change, but also the very nature of their relationship with State Budget revenues. Against this background, the analysis and forecasting of State Budget revenues acquire particular practical importance, since structural changes in the economy may alter the impact of traditional macroeconomic factors.

1. LITERATURE REVIEW AND HYPOTHESIS

The study of the impact of macroeconomic factors on government revenues is an important focus in contemporary fiscal research, as it enables assessment of the fiscal system's sensitivity to changes in the economic environment and identification of shifts in the mechanisms of government revenue formation under different economic regimes. These issues become particularly relevant during structural shocks and wartime crises, when not only do the dynamics of individual macroeconomic indicators change, but also the nature of their interrelationships. In contemporary international and Ukrainian literature, several main areas of research have emerged, covering tax elasticity, revenue buoyancy, fiscal capacity, the structural instability of macro-fiscal relationships, and the transformation of fiscal processes under crisis conditions.

The classical strand of research on macro-fiscal relationships was formed within the concepts of tax elasticity, revenue buoyancy, tax effort, and tax capacity. Accordingly, government revenues are the result of the interaction between economic growth, the structure of the economy, the characteristics of the tax system, and the institutional environment. Changes in government revenues are not exclusively a mechanical response to GDP dynamics, but also depend on discretionary changes in fiscal policy, the effectiveness of tax administration, and macroeconomic conditions. The theoretical and methodological foundations of this approach were established by Prest (1962), Lotz and Morss (1967), Bahl (1971), Mansfield (1972), and Choudhry (1979). The further development of this concept is associated with Tanzi (1977, 1989), who demonstrated that inflationary processes and administrative time lags may substantially affect the real value of tax revenues. Thus, classical studies developed an approach in which macroeconomic factors influence government revenues through interconnected economic and institutional channels rather than through exclusively linear, mechanical relationships.

The further development of the literature was associated with the study of the instability of fiscal sensitivity and the dependence of government revenues on the economic cycle. Contemporary studies increasingly emphasize that the response of government revenues to macroeconomic changes is not constant over time and may differ substantially depending on the phases of the economic cycle, crisis phenomena, and the institutional environment. Within this approach, revenue buoyancy is not only a characteristic of fiscal efficiency but also an indicator of the transformation of macro-fiscal relationships under different economic regimes. In particular, Sen Gupta (2007) demonstrated that countries' tax capacity depends on income per capita, economic structure, openness, and institutional quality. OECD (2025) also indicates that tax revenues are sensitive to changes

in economic activity and the macroeconomic environment; however, the nature of this response may vary substantially depending on the economic cycle and the structure of the economy. Similar conclusions were reached by Belinga et al. (2014), who found that long-run tax buoyancy in many countries exceeds unity. In contrast, the short-run response of tax revenues is considerably less stable.

Classical studies of fiscal elasticity and revenue buoyancy (Prest, 1962; Lotz & Morss, 1967; Bahl, 1971; Mansfield, 1972; Belinga et al., 2014) predominantly rely on regression-based approaches to assess the responsiveness of government revenues to macroeconomic changes. At the same time, contemporary research increasingly complements these approaches with methodologies to identify structural instability, regime shifts, and time-varying macroeconomic relationships.

A separate strand of contemporary literature focuses on the structural instability of macro-fiscal relationships and regime-switching dynamics in macroeconomic processes. Within this approach, structural disruptions are considered not only as statistical instability in time series but also as manifestations of changes in the economic regime, which may be accompanied by transformations in the interaction between macroeconomic variables and in the channels through which they affect government revenues. This creates the risk of a loss of explanatory power in models constructed on stable time periods, as well as instability in coefficient estimates. In particular, Marfatia et al. (2020) point to the time-varying nature of fiscal effects, while Auerbach and Gorodnichenko (2012, 2014), Afonso et al. (2025), Afonso and Miranda (2026), and Mimir and Ricci (2024) emphasize the regime-dependent nature of macroeconomic processes amid structural shocks. At the same time, Manayubahwe and Umulisa (2026) showed that ignoring multiple structural disruptions may distort the estimates of macroeconomic relationships. From a methodological perspective, contemporary studies increasingly analyze structural disruptions through regime-dependent approaches, structural breaks, time-varying relationships, and comparisons across periods characterized by different macroeconomic conditions. In particular, Auerbach and Gorodnichenko (2012, 2014) apply regime-dependent analysis, Marfatia et al. (2020) examine time-varying fiscal effects, while Mimir and Ricci (2024) and Manayubahwe and Umulisa (2026) emphasize the role of structural shifts when analyzing macroeconomic processes. Overall, these studies indicate the importance of taking structural changes in the economic environment into account when analyzing the impact of macroeconomic factors on government revenues.

In Ukrainian economic literature, the macroeconomic factors influencing the formation of government revenues in Ukraine have predominantly been analyzed under conditions of a relatively stable economic environment. Within this strand of research, studies examined the relationships between government revenues and the dynamics of GDP, inflation, the exchange rate, foreign trade, and household income. In particular, Lukianenko (2003, 2005) established the foundation for macroeconomic modeling of fiscal processes in Ukraine and demonstrated the significance of macroeconomic factors in the formation of tax revenues. At the same time, Lukianenko (2003) found that the value-added tax in Ukraine was characterized by low elasticity with respect to GDP. Similar conclusions were reached by Khmaruk (2011), who identified a statistically significant relationship between State Budget revenues and macroeconomic variables such as real GDP growth, the consumer price index, the exchange rate, and the monetary base. Thus, Ukrainian studies formed an important empirical foundation for the analysis of State Budget revenues in Ukraine; however, they were largely based on the assumption of relative stability in the macroeconomic environment.

Contemporary Ukrainian studies increasingly focus on the transformation of the mechanisms of government revenue under crisis and wartime conditions. Accordingly, the full-scale war changes not only the volume of government revenues but also the nature of macroeconomic relationships through the destruction of the tax base, changes in the structure of the economy, the growing role of external financing, and the increasing influence of non-economic factors. In addition, contemporary studies point to the limited explanatory power of traditional econometric models in an environment of high uncertainty and structural shocks. In particular, Skorba et al. (2021), based on fractal and entropy analyses,

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demonstrate that the dynamics of tax revenues during crisis periods exhibit anti-persistent, difficult-to-predict behavior. Similar conclusions are presented by Chugunov et al. (2022, 2023), T. Bohdan and I. Bohdan (2023), Ljytyj and Miedviedkova (2023), Lyutyy and Moroz (2025), Romenska et al. (2024), Bogdan (2024), as well as Sarana and Zanayev (2025). They emphasize the transformation of government revenue formation mechanisms under wartime conditions, the growing role of adaptive fiscal regulation and external financing, the destruction of the tax base, and the increasing influence of non-economic factors on fiscal stability. Thus, contemporary studies of the wartime economy increasingly focus not only on changes in the volume of government revenues but also on the instability of the mechanisms of their formation under conditions of structural shocks.

Overall, the contemporary literature indicates that the relationship between macroeconomic factors and government revenues is complex, unstable, and dependent on the economic environment. At the same time, most studies are based either on stable time series or on cross-country panel models, which limit the ability to analyze sharp structural disruptions and the transformation of macro-fiscal relationships under wartime conditions. Despite the growing number of studies devoted to the wartime economy and fiscal instability, the issue of changes in the nature of the interaction between macroeconomic indicators and government revenues under conditions of structural shocks, as well as the transformation of the channels through which individual macroeconomic factors affect government revenues, remains insufficiently explored.

The aim of the study is to assess changes in the impact of macroeconomic factors on State Budget revenues and the transformation of the nature of their interrelationships under wartime structural shocks in Ukraine.

The hypothesis is:

H1: Wartime structural shocks altered both the strength and the nature of the relationships between macroeconomic factors and State Budget revenues.

2. METHOD

Within the study framework, two time intervals were identified, reflecting different regimes of economic functioning. The first period (2017–2020) is characterized by relative macroeconomic stability and serves as the baseline. The second period (2022–2025) is associated with the full-scale war and the corresponding structural shifts. Such an approach assesses changes in the relationships between macroeconomic indicators and State Budget revenues across different economic regimes.

The year 2021 was excluded from the baseline period due to the impact of the pandemic and transitional macroeconomic processes to avoid the overlapping effects of different types of shocks and to ensure a proper comparison between a relatively stable period and a period of structural shifts. In addition, the study uses equivalent four-year time intervals before and after the beginning of the full-scale war.

The choice of quarterly data frequency is determined by the need to ensure a sufficient number of observations for the regression model and identifying short-term changes in macroeconomic dynamics.

Total revenues of the State Budget of Ukraine (Revenues) were defined as the dependent variable of the model. The model includes macroeconomic factors most frequently considered in the academic literature to influence government revenue formation: gross domestic product (GDP), the consumer price index (CPI), the hryvnia-to-US dollar exchange rate (Exchange rate), retail turnover (Retail), and imports (Imports). The statistical data for the variables included in the model are presented in Table 1.

To achieve the stated objective, correlation and regression analysis were employed to identify the relationships between indicators and assess their strength. Regression analysis was used to evaluate changes in the strength and direction of the relationships between macroeconomic factors and State Budget revenues under different economic regimes.

Correlation analysis was applied as a separate stage of the preliminary assessment of the strength of relationships between the variables. The regres-

Table 1. Data set for econometric analysis

Source: Own elaboration based on data from the Ministry of Finance of Ukraine (n.d.), the NBU (n.d.), the State Customs Service of Ukraine (n.d.), the State Statistics Service of Ukraine (n.d.a, n.d.b), and Minfin (2019).

Year	Quarter	Revenues, million UAH	GDP, million UAH	CPI	Exchange rate	Retail, million UAH	Imports, million UAH
2017	Q1	174,758.8	591,765	15.1	27.04	173,470.3	380,437
2017	Q2	220,147.2	664,307	15.6	26.09	367,440.3	388,803
2017	Q3	190,849.7	833,640	16.4	26.52	577,569.9	423,232
2017	Q4	207,509.4	891,515	13.7	28.06	815,344.3	474,334
2018	Q1	193,581.3	706,141	13.2	26.54	205,261.2	430,246
2018	Q2	255,425.2	809,938	9.9	26.18	424,129.6	436,342
2018	Q3	225,778.8	994,728	8.9	28.29	665,372.9	517,096
2018	Q4	253,323.1	1,049,495	9.8	27.68	930,629.2	537,618
2019	Q1	210,623.7	820,006	8.6	27.24	241,624.8	463,327
2019	Q2	296,225.6	932,459	9	26.16	503,064.6	490,176
2019	Q3	232,901.7	1,112,771	7.5	24.08	785,716.0	517,496
2019	Q4	258,528	1,112,771	4.1	23.69	1,094,045.8	488,946
2020	Q1	211,033.8	858,415	2.3	28.18	277,108.0	411,051
2020	Q2	308,356.3	879,921	2.4	26.69	536,686.4	334,235
2020	Q3	245,718.5	1,173,113	2.3	28.30	849,844.0	440,859
2020	Q4	310,908.1	1,310,577	5	28.27	1,201,624.0	516,801
2022	Q1	328,956.7	1,091,508	13.7	29.26	335,586.4	536,898
2022	Q2	299,236.7	1,030,900	21.5	29.26	627,715.0	541,567
2022	Q3	623,629.8	1,461,098	24.6	36.57	991,419.6	743,119
2022	Q4	535,572.5	1,655,608	26.6	36.57	1,396,268.8	900,209
2023	Q1	525,888.4	1,388,161	21.3	36.57	403,434.8	857,278
2023	Q2	776,505.5	1,483,162	12.8	36.57	847,404.7	751,741
2023	Q3	714,059.8	1,807,595	7.1	36.57	1,327,633.4	806,630
2023	Q4	655,544.3	1,949,043	5.1	37.98	1,855,384.1	845,914
2024	Q1	642,107.2	1,631,877	3.2	39.22	488,683.5	830,886
2024	Q2	674,605	1,739,266	4.8	40.54	1,003,431.7	931,939
2024	Q3	852,439.1	2,092,488	8.6	41.17	1,565,076.4	992,589
2024	Q4	953,562.1	2,198,745	12	42.04	2,171,984.0	1,077,036
2025	Q1	926,247.6	1,925,991	14.6	41.49	577,931.9	1,025,075
2025	Q2	941,628	2,042,757	14.3	41.64	1,213,355.4	1,103,501
2025	Q3	845,005.2	2,444,768	11.9	41.32	1,891,975.2	1,169,841
2025	Q4	1,121,328.7	2,517,678	8	42.39	2,647,705.0	1,332,116

sion model may lose the ability to clearly identify the individual contribution of specific factors even under conditions of high overall explanatory power.

To address potential concerns regarding the empirical validity of analyzing the two sub-periods separately, the methodology incorporates an additional stability check. Instead of relying solely on visual or contextual justification of the wartime shock, the study uses a pooled regression specification spanning the entire 2017–2025 period. By introducing an exogenous structural dummy variable (Dwartime), which takes the value of 0 for the pre-war years and 1 for the wartime period, the study evaluates whether the wartime period may reasonably be treated as a distinct economic regime.

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To test the robustness of the results and improve the economic interpretability of the estimates, a logarithmic transformation of the variables was applied. This approach reduces the effect of substantial differences in scale between indicators, smooth variation, and moves from the analysis of absolute values to the assessment of elasticities. Thus, the logarithmic model is used as an instrument for a more in-depth verification of the results of the baseline regression model.

3. RESULTS

After the dataset had been formed and the choice of variables substantiated, an econometric analysis was conducted, including the construction of regression models, the assessment of correlation relationships, and the verification of the results through logarithmic transformation. The study was carried out separately for two-time intervals – the baseline period (2017–2020) and the period of structural economic shifts associated with the full-scale Russian invasion of Ukraine (2022–2025) – to assess the relationships between macroeconomic factors and State Budget revenues.

The results of the econometric analysis for the baseline period (2017–2020) are presented in Table 2.

Table 2. Regression model for the baseline period (2017–2020)

Variable	Coefficient	St. Error.	p-value
Constant	332,941.145	210,336.985	0.148
GDP	0.021	0.221	0.928
CPI	–3,299.248	4,114.789	0.443
Exchange rate	–1,968.276	6,986.017	0.785
Retail	0.047	0.088	0.606
Imports	–0.130	0.295	0.669

Note: R2 = 0.434; Adjusted R2 = 0.119; F-statistic = 1.38 (p = 0.318).

The regression model is specified as follows:

$$\begin{aligned} Revenues &= 332,941.145 + 0.021 GDP \\ &-3,299.248 CPI \\ &-1,969.276 Exchange\ rate \\ &+0.047 Retail - 0.130 Imports. \end{aligned} \quad (1)$$

The results of the first (baseline) model indicate a limited explanatory power of the included macroeconomic factors with respect to the dynamics of the dependent variable. Although the coefficient of determination (R^2 = 0.43) formally suggests the presence of a relationship, the adjusted value (Adjusted R^2 = 0.12) shows that a substantial share of the variation remains unexplained by the model.

None of the variables is statistically significant ($p > 0.1$), indicating the absence of a dominant influence of individual factors within this model specification. These results do not allow the identification of statistically significant individual determinants of State Budget revenues during the baseline period, where the effects are realized through the aggregate dynamics of economic activity.

The low statistical significance of the coefficients, combined with a moderate level of R^2, indicates that the observed relationships may reflect interactions among several macroeconomic variables, which complicates the identification of the individual effect of separate variables.

In this context, the question arises: does the issue lie in the absence of relationships, or in their structure? To address this question, a correlation analysis was conducted (Table 3).

The correlation analysis for the baseline period indicates the presence of moderate relationships be-

Table 3. Correlation analysis for the baseline period

Variable	Revenues	GDP	CPI	Exchange rate	Retail	Imports
Revenues	1					
GDP	0.617	1				
CPI	–0.618	–0.646	1			
Exchange rate	–0.065	0.033	–0.057	1		
Retail	0.543	0.893	–0.383	–0.056	1	
Imports	0.205	0.669	–0.100	–0.021	0.630	1

tween State Budget revenues and individual macroeconomic indicators, alongside a high correlation between some of the explanatory variables. The strongest relationships are observed between GDP and retail turnover (0.893) and between GDP and imports (0.669), which complicates the identification of the individual impact of each factor.

The results of the VIF analysis confirm the presence of local multicollinearity for GDP (20.1) and retail turnover (8.7), while the corresponding values for CPI (4.4), the exchange rate (1.1), and imports (3.2) are lower.

Further simplification of the regression model and a reduction in the number of explanatory variables (excluding the consumer price index and the exchange rate of the hryvnia against the US dollar) did not lead to a significant improvement in the results. The coefficient of determination (R^2 = 0.42) indicates limited explanatory power of the model. Thus, changes in the model specification do not substantially affect either the strength or the direction of the impact of the selected macroeconomic factors on the dependent variable in the period under study.

The regression model for the period of structural disruption (2022–2025) reflects a different configuration of macroeconomic relationships. The regression model is specified in Table 4.

Table 4. Regression model for the period of structural disruption (2022–2025)

Variable	Coefficients	St. Error.	p-value
Constant	–739,938.540	582,613.407	0.236
GDP	0.030	0.406	0.476
CPI	681.153	5,914.863	0.911
Exchange rate	23,739.248	21,397.033	0.296
Retail	–0.051	0.116	0.668
Imports	0.068	0.616	0.915

Note: R2 = 0.828; Adjusted R2 = 0.733; F-statistic = 8.69 (p = 0.0029).

$$Revenues = -739,938.540 + 0.030GDP + 681.153CPI + 23,739.248Exchange\ rate - 0.051Retail + 0.068Imports. \quad (2)$$

A high coefficient of determination (R^2 = 0.83) indicates a strong overall relationship between macroeconomic indicators and State Budget revenues; however, the absence of statistically significant coefficients prevents the identification of their individual effects. This may indicate stronger co-movement among macroeconomic indicators during the wartime period.

The correlation analysis for the period after 2022 demonstrates a sharp intensification of the relationships between macroeconomic indicators and State Budget revenues. The correlation coefficients between the key variables exceed 0.94, indicating a high degree of synchronicity in their dynamics (Table 5).

The results of the VIF analysis also confirm a substantial increase in multicollinearity: the VIF for GDP equals 38.5, for imports – 22.3, for the exchange rate – 6.9, for retail turnover – 5.7, and for CPI – 2.2.

To provide an additional robustness check regarding the analytical distinction between the pre-war and wartime periods, a pooled regression model was estimated using the combined observations from the baseline (2017–2020) and wartime (2022–2025) periods. The global model yields an exceptionally high explanatory capacity (R^2 = 0.943, Adjusted R^2 = 0.929) and is statistically significant as a whole (F-statistic p-value = 2.27 x 10^{-14}), with the exchange rate acting as a statistically significant predictor (p = 0.046).

Crucially, the coefficient for the structural intercept-shifting dummy variable ($D_{wartime}$) is statisti-

Table 5. Correlation analysis for the period of structural disruption (2022–2025)

Variable	Revenues	GDP	CPI	Exchange rate	Retail	Imports
Revenues	1					
GDP	0.947	1				
CPI	0.073	–0.014	1			
Exchange rate	0.953	0.921	0.142	1		
Retail	0.703	0.837	–0.066	0.645	1	
Imports	0.957	0.965	0.144	0.949	0.734	1

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cally insignificant (p = 0.786). In econometric analysis, the combination of a highly significant overall model, acute multicollinearity among macroeconomic aggregates (GDP and Imports), and an insignificant parallel-shift dummy may indicate changes in the relationships between macroeconomic indicators and State Budget revenues across the two periods. This result provides additional support for the analytical distinction between the two periods and suggests that the relationships between macroeconomic indicators and State Budget revenues may differ across economic regimes. Consequently, a single unified model may not fully capture the specific features of revenue formation under wartime conditions.

To test the robustness of the results and obtain economically interpretable estimates, a logarithmic transformation was applied. The use of logarithms made it possible to move from absolute values to relative changes, which are more relevant for economic interpretation. As a result, equations were obtained for both study periods.

The log-linear model for the baseline period (2017–2020) does not demonstrate a substantial improvement in the quality of estimates compared to the results of the regression model. The coefficient of determination (R^2 = 0.41) indicates limited explanatory power of the model even after the transition to relative changes.

The log-linear model is specified as follows:

$$\ln(Revenues) = 10.68 + 0.57\ln(GDP) + 0.03\ln(Retail) - 0.51\ln(Imports). \quad (3)$$

The logarithmic model for the baseline period is consistent with the previous conclusion that no dominant macroeconomic factor drives the formation of State Budget revenues. By contrast, the logarithmic model for the period of structural disruption demonstrates substantially different results. Unlike the specification in levels, it provides a partial restoration of the economic interpretability of the coefficients.

The log-linear model for the period of structural disruption (2022–2025) is specified as follows:

$$\ln(Revenues) = -5.68 + 1.43\ln(GDP) - 0.15\ln(Retail) + 0.05\ln(Imports). \quad (4)$$

In this model, the coefficient of determination equals R^2 = 0.82, while the coefficient for GDP approaches statistical significance. The economic interpretation is as follows: a 1% increase in GDP is associated with an approximately 1.4% increase in State Budget revenues.

In this case, the logarithmic transformation improves the economic interpretability of the results and partially mitigates scale differences and multicollinearity.

The results are consistent with the proposed hypothesis that, under conditions of structural disruption, not only does the strength of the impact of macroeconomic factors on State Budget revenues change, but also the nature of the relationships between them changes.

4. DISCUSSION

The results suggest a substantial transformation in the mechanisms by which macroeconomic factors affect State Budget revenues amid structural economic disruption. During the relatively stable period, the impact of macroeconomic indicators was more dispersed, whereas under wartime conditions, macroeconomic dynamics are more strongly synchronized. The results of the correlation and regression analysis indicate that such indicators as GDP, retail turnover, and imports increasingly reflect common macroeconomic dynamics during the period of structural shifts, which complicates the identification of the individual impact of separate factors within the regression model.

In this context, although multicollinearity limits the identification of individual effects, it may also reflect stronger correlations among macroeconomic indicators during the wartime period and the growing interdependence of macroeconomic processes under the influence of systemic shocks. For this reason, the model indicates high overall explanatory power; however, it does not allow for the reliable identification of the individual contribution of separate variables.

The results also indicate that, under conditions of a wartime economy, the impact of macroeconomic factors becomes largely concentrated through a generalized indicator of economic activity. In this context, although the model does not directly test transmission mechanisms, GDP may be viewed as an aggregate indicator capturing broader macroeconomic dynamics during the wartime period.

Overall, the results are consistent with contemporary approaches to the analysis of fiscal sensitivity, revenue buoyancy, and the structural instability of macro-fiscal relationships, according to which the response of State Budget revenues to macroeconomic changes depends on the economic regime and the nature of structural shocks. In this context, the study complements the classical approaches to the analysis of fiscal elasticity presented by Prest (1962), Lotz and Morss (1967), Bahl (1971), and Mansfield (1972), as well as contemporary approaches to the analysis of revenue buoyancy by Belinga et al. (2014) and Lagravinese et al. (2020). Unlike classical models constructed primarily for relatively stable economic environments, the results indicate that under structural shocks, not only does the intensity of the impact of individual macroeconomic factors change, but also the nature of their interaction.

The results for the baseline period (2017–2020) are generally consistent with these approaches, but with an important clarification: in a relatively stable environment, relationships between variables are not dominant but distributed in nature. This may suggest that the classical model of a "single key driver" (for example, GDP) is transformed under real-world conditions into a system of interconnected factors, which corresponds to contemporary approaches to the analysis of the multifactor nature of State Budget revenues formation. At the same time, the findings significantly complement the approaches presented by Tanzi (1977, 1989), where the role of inflation and institutional factors in shaping tax revenues is emphasized. This study suggests that, under structural shocks, the impact of macroeconomic factors may change not only in magnitude but also in the pattern of their interactions, shifting from a more distributed to a more coordinated structure.

The results for the period 2022–2025 indicate the emergence of highly synchronized macroeconomic dynamics, under which the key macroeconomic indicators increasingly respond to common systemic shocks. Similar approaches can be found in contemporary studies on structural instability and time-varying macroeconomic relationships. In particular, Marfatia et al. (2020) demonstrate that the effects of fiscal policy on macroeconomic and financial dynamics may substantially change across historical periods. Afonso et al. (2025), Afonso and Miranda (2026), and Mimir and Ricci (2024) emphasize the regime-dependent nature of macroeconomic processes under crisis conditions. In turn, the IMF (2024) highlights that periods of heightened uncertainty and structural shocks are accompanied by increasing nonlinearities in macrofinancial transmission mechanisms.

It is particularly noteworthy that, under wartime economic conditions, multicollinearity emerges as both a statistical limitation of the model and a possible reflection of stronger correlations among macroeconomic indicators responding to common shocks.

In this context, the responsiveness of State Budget revenues to changes in macroeconomic indicators is not constant and depends significantly on the phase of the economic cycle and the presence of structural shocks. The results also suggest that structural shocks affect not only the magnitude of elasticity, but also the nature of macroeconomic relationships. Under wartime conditions, macroeconomic factors become increasingly interconnected and respond simultaneously to common systemic disturbances, which indicates the formation of a coordinated rather than distributed structure of macroeconomic interactions.

The application of the logarithmic model demonstrated that, amid wartime economy, GDP increasingly appears to capture a substantial share of broader macroeconomic dynamics. This may indicate that such indicators as imports, consumption, and the exchange rate lose their relative autonomy under structural economic disruption and increasingly reflect overall macroeconomic dynamics. In this context, the elasticity of State Budget revenues with respect to GDP exceeding

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unity may reflect not only fiscal sensitivity, but also the strengthening synchronization of macroeconomic processes under crisis.

The results are consistent with the assessments by the Kyiv School of Economics (KSE Institute, 2024) of the large-scale transformation of Ukraine's economic structure during the wartime period. In particular, substantial losses in industry, trade, energy sector, and transport infrastructure led to stronger synchronization of macroeconomic processes and changes in the mechanisms of State Budget revenues formation. Under such conditions, GDP increasingly reflects the integral effect of the simultaneous influence of several macroeconomic factors, which partially explains its dominant role in the constructed regression models. This interpretation is also supported by recent Ukrainian studies. In particular, Chugunov et al. (2023) argue that wartime budget processes are increasingly shaped by structural changes in the economy and emergency fiscal policy measures, while T. Bohdan and I. Bohdan (2023) emphasize the growing importance of external financing and administrative decisions in maintaining fiscal stability under wartime conditions.

This finding allows for a refinement of the interpretation of increased elasticity: in this case, it reflects not only fiscal sensitivity, but also structural transformation of the economy, under which State Budget revenues respond to aggregated changes more rapidly and more strongly than in a stable environment. This partially explains why, even in the absence of statistically significant coefficients in the level model, a high degree of synchronization in the dynamics of the variables is observed.

The results are also partially consistent with OECD (2025) conclusions regarding the increased sensitivity of tax revenues during periods of sharp economic change. At the same time, in Ukraine, this effect is largely shaped by wartime shocks, administrative decisions, and external financing. This also supports contemporary approaches to the analysis of structural breaks, according to which ignoring regime shifts may lead to distorted estimates of macroeconomic relationships and declining explanatory power of econometric models during crises (Manayubahwe & Umulisa, 2026).

This paper provides empirical evidence suggesting that, under wartime conditions, not only does the strength of the impact of individual macroeconomic factors on State Budget revenues change, but so does the mechanism of their interaction. Under such conditions, GDP appears to be a more prominent explanatory variable and serves as an integral indicator of the combined influence of several macroeconomic processes.

CONCLUSION AND LIMITATIONS

The study aimed to assess the transformation of the impact of macroeconomic factors on the State Budget revenues and changes in the nature of their interrelationships under wartime structural shocks. The analysis suggests that macroeconomic indicators remain relevant explanatory factors of State Budget revenues under both economic regimes. Gross domestic product, inflation, the exchange rate, consumption volumes, and imports are associated with the environment of State Budget revenue formation.

The regression analysis for the baseline period (2017–2020) showed that the relationships between State Budget revenues and macroeconomic variables are distributed in nature: no single factor is dominant, and the impact is realized through the aggregate dynamics of economic activity. At the same time, the regression model for the period after 2022 demonstrated a substantial transformation of economic relationships, reflected in the high explanatory power of the model (R^2 = 0.83) and the simultaneous sharp increase in multicollinearity, indicating stronger interdependence among the key macroeconomic indicators.

The correlation analysis and the results of the VIF assessment demonstrated that, under conditions of a wartime economy, multicollinearity represents a statistical limitation of the model and may also reflect stronger correlations among macroeconomic indicators as well as the growing interdependence of

macroeconomic processes under systemic shocks. The logarithmic model clarified the nature of these relationships: during the crisis, gross domestic product appears to serve as an aggregate indicator of broader macroeconomic dynamics, while the estimated elasticity of State Budget revenues with respect to GDP exceeds unity.

The pooled regression analysis provides additional evidence consistent with structural differences between the pre-war and wartime periods. These results support the analytical distinction between the two periods and are broadly consistent with the hypothesis that macroeconomic relationships changed under wartime conditions.

The results support a possible shift from a model of distributed influence to a model of coordinated macroeconomic dynamics during the wartime period. This points to the need to adapt classical econometric approaches to the analysis of economies operating under conditions of prolonged structural shocks.

The results can be used to improve approaches to the analysis and forecasting of State Budget revenues during high macroeconomic uncertainty. Further research may expand the set of macroeconomic variables, apply non-linear models, and conduct cross-country comparisons of economies experiencing structural disruption.

The paper has certain limitations. First, the study is based on relatively short time series, which reduces the statistical power of the estimates and limits the generalizability. Second, the use of aggregated macroeconomic indicators does not allow for the capture of structural changes at the level of individual sectors of the economy. In addition, the analysis is based on nominal macroeconomic indicators and nominal State Budget revenues, the estimated relationships should be interpreted as reflecting observable macro-fiscal dynamics rather than purely real economic effects. Third, during periods of structural disruption, a significant share of economic processes is influenced by non-economic factors (administrative decisions, external assistance, military expenditures) that are not fully reflected in the variables used. This may affect the stability of the estimated relationships.

Therefore, the results should be interpreted with regard to the specific features of the period under study and used primarily for analytical rather than forecasting purposes.

AUTHOR CONTRIBUTIONS

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