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Macroeconomic Divergence under Wartime Shocks: Inflation and Public Debt Dynamics in Eastern EU and Balkan Economies

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Abstract

The Russia–Ukraine war has produced significant macroeconomic shocks across Europe, yet these have been absorbed unevenly across sub-regions with differing institutional arrangements. Existing scholarship has examined inflation and public debt largely in isolation, with limited comparative analysis of how Eastern EU member states and non-EU Balkan states have responded to this asymmetric shock. This study measures and compares the war's association with inflation and public debt across the two regional groups and identifies the structural factors related to their divergent resilience. A longitudinal comparative design covering 2018–2023 was adopted, drawing on data from Eurostat, the International Monetary Fund, and the World Bank. The analytical framework combined descriptive statistics, fixed-effects panel regression with country-clustered standard errors, and structural-break (Chow) tests applied at a harmonised monthly frequency obtained through linear interpolation of lower-frequency fiscal series.

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Eastern EU states experienced a more severe inflationary shock, with average HICP reaching 14.7% in 2022 against 11.3% in the Balkans; the energy-mix composition, proxied by the share of carbon-intensive imports and historical exposure to Russian energy supplies rather than headline import dependency, emerged as the strongest correlate ($\beta = 0.182$, $p < 0.001$). Balkan states, by contrast, faced greater fiscal stress, with public debt rising to 81.7% of GDP by 2023 against 56.1% in the Eastern EU; exchange-rate volatility was strongly associated with this divergence ($\beta = 9.11$, $p = 0.006$). Structural-break tests confirmed February 2022 as a statistically significant turning point for both inflation ($F = 18.72$, $p < 0.001$) and public debt ($F = 9.43$, $p = 0.003$). EU integration appears to constrain debt accumulation but offers limited protection against inflationary pressures. To the authors' knowledge, this study provides one of the first quantitative comparative assessments of wartime inflation–debt dynamics between Eastern EU and Balkan states.

Keywords: energy-mix composition; fiscal policy; inflation; public debt; Russia–Ukraine war; war economics.

JEL Classification: E31; E62; F51; H63; P52; C33.

Introduction

The Russian invasion of Ukraine in February 2022 marked the most significant geopolitical rupture in Europe since the end of the Cold War and set in motion a chain of macroeconomic adjustments whose intensity has varied substantially across the continent's eastern periphery (Enescu & Szeles, 2023). The disruption of energy markets, the reorientation of trade flows, and the surge in import-cost pressures interacted with pre-existing institutional differences to produce strikingly heterogeneous outcomes across the formerly transition economies of Eastern Europe and the Balkans (Zimková et al., 2023). While the war affected every European economy, the depth and persistence of its effects depended on each country's fiscal architecture, exchange-rate regime, and critically, the composition of its energy mix and historical exposure to Russian energy supplies (Markowski & Kotliński, 2023).

Two structural variables, inflation and public debt, capture the principal macroeconomic transmission channels through which the wartime shock has been absorbed. Surging consumer price indices reflect the direct cost-of-living impact of energy and food shocks on households and firms, while public debt trajectories trace governments' fiscal responses to crisis conditions, including stimulus packages, energy subsidies, and emergency borrowing (Arestis, 2021; González Mínguez et al., 2023). The two variables are jointly informative: inflation erodes the real value of outstanding debt but raises debt-service costs through higher policy rates, while sustained debt accumulation can itself become a source of price pressure through monetisation expectations (Cevik & Jalles, 2024). Despite this analytical interdependence, the existing literature has tended to treat inflation and public debt as separate phenomena, examining them in isolation rather than as joint outcomes of a single underlying institutional configuration (Radonjić et al., 2020).

A further consideration is that the wartime shock did not arrive against a stable baseline. The COVID-19 pandemic produced its own macroeconomic disturbances during 2020–2021, including supply-chain disruptions, sectoral demand reallocation, and substantial fiscal stimulus packages that pushed public debt to elevated pre-war levels across both regions (Bonam et al., 2024; Cevik & Jalles, 2024). These overlapping shocks complicate empirical identification but also create the conditions under which structural-break analysis becomes informative: by isolating February 2022 as a discrete turning point in macroeconomic series, the present study aims to distinguish war-specific dynamics from the broader post-pandemic adjustment trajectory.

This separation has been particularly consequential for comparative analyses of Europe's eastern periphery. The Eastern EU member states, Poland, Hungary, the Baltic republics, Romania, Bulgaria, Czechia, and Slovakia, operate within a common regulatory and fiscal framework anchored by the Stability and Growth Pact (SGP), enjoy access to structural and recovery funds, and benefit from coordinated monetary surveillance (Campos et al., 2022; Kraemer & Lehtimäki, 2023). The non-EU Balkan states, Serbia, Albania, North Macedonia, Bosnia and Herzegovina, and Montenegro, sit outside this framework, with weaker fiscal institutions, narrower revenue bases, and a higher reliance on foreign-currency-denominated external borrowing (Kikoni et al., 2019; Slavov, 2017). These institutional differences shape not only the magnitude of crisis-driven shocks but also the channels through which those shocks propagate.

1. Problem Statement

The Russia–Ukraine war has exposed substantial differences in the capacity of European sub-regions to absorb external macroeconomic shocks. Eastern EU states, supported by EU-level coordination mechanisms and disciplined fiscal frameworks, faced historically severe inflationary pressures driven by carbon-intensive energy mixes and pre-existing dependence on Russian fossil fuels, yet maintained relatively stable debt trajectories. Balkan states, by contrast, encountered compounded vulnerabilities arising from elevated pre-existing debt, narrow fiscal space, and pervasive liability euroization, which amplified the impact of global commodity prices and exchange-rate movements on their public finances (Despotović et al., 2023). This asymmetric absorption capacity has implications for regional economic integration, policy coherence, and the broader trajectory of EU enlargement.

Despite the significance of these dynamics, the literature offers limited real-time, comparative evidence on inflation–debt interactions across European sub-regions during the wartime shock. Most existing work either examines individual economies or aggregates European trends without disaggregating by institutional sub-region, restricting insight into structural asymmetries and the policy mechanisms that mediate crisis transmission (Radonjić et al., 2020). Furthermore, much of the literature analyses crises retrospectively, whereas understanding adaptive capacity requires real-time measurement of shock diffusion, fiscal response, and stabilisation paths.

Research Questions

To address these gaps, the study is organised around three research questions:

Q1: How did inflation evolve in Eastern EU and Balkan states during the period surrounding the Russia–Ukraine war, and how distinct was the regional divergence after February 2022?

Q2: How did public debt trajectories develop across the two regions, and what fiscal pressures emerged from the wartime shock?

Q3: Which structural, policy, and institutional factors, including energy-mix composition, exchange-rate volatility, and pre-war fiscal frameworks, are associated with the observed regional asymmetries?

These questions guided the selection of variables, the analytical methods, and the regional classification, enabling the study to capture both the magnitude and the correlates of macroeconomic vulnerability in two structurally distinct European sub-regions.

Research Objectives

In line with these questions, the study pursues three objectives. First, it quantifies and compares the magnitude, timing, and persistence of inflationary pressures across the two regional groups during 2018–2023, isolating structural breaks associated with the onset of the war and identifying cross-country heterogeneity in shock absorption. Second, it analyses public debt responses and fiscal stress indicators, examining how governments reacted to rising inflation and crisis-related expenditure through adjustments in debt-to-GDP ratios, borrowing patterns, and fiscal balances. Third, it identifies the structural, policy, and institutional correlates of these patterns by integrating macroeconomic, fiscal, and institutional variables, including pre-war fiscal discipline, the carbon-intensity of the energy mix, GDP growth, and exchange-rate volatility, to explain why certain economies displayed greater resilience than others.

Significance of the Study

The contribution of this study is both theoretical and practical. From a scholarly perspective, it offers a comparative, regionally disaggregated analysis of wartime inflation and public debt that bridges a documented gap in the European political-economy literature (Bonam et al., 2024; Bulfone, 2023). By integrating fiscal, monetary, and institutional dimensions within a single analytical framework, the study advances understanding of how crisis transmission interacts with pre-existing institutional configurations to produce divergent national outcomes. From a policy perspective, the findings provide evidence-based guidance for national governments and EU institutions on the design of fiscal and monetary measures capable of attenuating asymmetric shocks and supporting long-term macroeconomic stability across European sub-regions (Király et al., 2022; Lipińska et al., 2025).

The study also contributes methodologically by demonstrating how panel regression and structural-break analysis can be combined to identify both the magnitude and the timing of wartime macroeconomic shocks. This integrated approach, applied to a cohort of fourteen Eastern EU and Balkan economies, offers a transferable analytical template for assessing the macroeconomic consequences of future geopolitical disruptions in structurally heterogeneous regions.

The remainder of the paper is organised as follows. Section 2 reviews the relevant literature on wartime macroeconomic shocks, energy-driven inflation, fiscal vulnerability, the role of EU integration in crisis absorption, and the interaction between the COVID-19 pandemic and the war as overlapping shocks. Section 3 describes the data sources, variables, frequency-harmonisation procedure, and analytical methods. Section 4 presents the empirical results. Section 5 discusses the findings in light of existing literature and theoretical frameworks. Last section concludes with policy implications, limitations, and directions for future research.

2. Literature Review

The empirical and theoretical literature on macroeconomic transmission during the Russia–Ukraine war can be organised around five interrelated themes: the historical institutional divergence between Eastern EU and Balkan economies, the channels through which energy shocks translate into domestic inflation, the fiscal dynamics that govern wartime debt accumulation, the theoretical frameworks that link external shocks to differentiated regional outcomes, and the interaction between the COVID-19 pandemic and the wartime

shock as overlapping disruptions. This section reviews these themes in turn and identifies the specific gap that the present study addresses.

The macroeconomic divergence between Eastern Europe and the Balkans is a long-standing structural phenomenon rather than a recent artefact of the wartime shock. With the eastern enlargements of the EU in 2004 and 2007, the Eastern EU member states embedded themselves within a common regulatory and fiscal framework anchored by the SGP, which mandates a budget deficit ceiling of 3% of GDP and a gross public debt ceiling of 60% of GDP (Kraemer & Lehtimäki, 2023). This framework constrained discretionary fiscal behaviour, reduced exposure to balance-of-payments shocks, and disciplined long-run debt accumulation (Campos et al., 2022; Fasone & Lupo, 2024). The institutional convergence was reinforced by access to EU structural and recovery funds, coordinated monetary surveillance, and the credibility benefits that membership conveyed to sovereign borrowers (Leuffen et al., 2022).

Balkan states followed a markedly different trajectory. Although the region has adopted domestic fiscal rules that broadly mirror the SGP, Montenegro caps public debt at 60% of GDP, Serbia at 45%, and Kosovo at 40%, historical compliance has been weak, with countries adhering to their own debt and deficit limits only slightly more than half of the time (Kikoni et al., 2019). Persistent fiscal vulnerabilities have been compounded by narrow revenue bases, weaker public financial management systems, and high reliance on foreign borrowing (Radonjić et al., 2020). By 2020, average public debt across the Western Balkans had already surpassed 55% of GDP, leaving the region with substantially less fiscal space than its EU-integrated neighbours when the wartime shock arrived (Kisin et al., 2020).

These structural asymmetries are not confined to fiscal frameworks. Balkan economies exhibit pervasive liability euroization, with a substantial share of public and private debt denominated in foreign currencies, primarily the euro, while domestic tax revenues and assets are generated in local currency (Slavov, 2017). The euro's share in public and publicly guaranteed external debt for countries such as Albania, North Macedonia, and Serbia rose from a median of approximately 20% in 2001 to roughly 60% by the early 2010s, exposing these economies to currency-mismatch risks that EU member states with euro adoption or close euro pegs largely avoid (Kadić et al., 2022; Slavov, 2017).

A second strand of literature documents how the composition of national energy mixes, rather than the headline import-dependency ratio alone, translates external commodity shocks into domestic price pressures, with magnitudes that depend on fuel-mix carbon intensity, exposure to specific suppliers, and the structure of household consumption (Broadstock et al., 2014; Dokas et al., 2023). The pass-through operates through both direct channels, energy components of the consumer cart, and indirect channels, as higher energy input costs propagate through production chains into food, transport, and manufactured goods (Castro et al., 2017; González Mínguez et al., 2023). Critically, two economies with similar total energy import shares can experience very different inflation outcomes if one relies predominantly on Russian gas and coal while the other diversifies across renewables, nuclear, and non-Russian suppliers.

Empirical evidence from the 2022 energy crisis confirms the centrality of this mechanism for the European inflation surge. In 2021, the EU relied on Russia for 46% of its coal imports, 40% of its natural gas, and 27% of its oil (Enescu & Szeles, 2023). The disruption of these flows after February 2022 generated unprecedented price pressures concentrated in countries with the highest exposure. By December 2022, Harmonised Index of Consumer Prices (HICP) inflation reached 25.0% in Hungary, 20.7% in Latvia, 20.0% in Lithuania, 17.5% in Estonia,

16.8% in Czechia, 15.3% in Poland, and 15.0% in Slovakia — the highest rates across the European Union (Zimková et al., 2023). Using time-varying structural vector autoregression, González Mínguez et al. (2023) document that the contribution of energy prices to core inflation in the euro area rose from approximately zero in early 2021 to 0.6 percentage points by August 2022, while energy-price surprises explained over 7% of the variance in non-energy consumer prices during the 2022 crisis.

Markowski & Kotliński (2023) extend this evidence by demonstrating that the inflation outcomes of 2022 were systematically related to the composition of national energy mixes rather than to aggregate import-dependency ratios. Their cross-sectional analysis of EU economies shows that a 1% increase in the share of renewables was associated with a 0.13% reduction in HICP headline inflation and a 0.10% reduction in core inflation, with wind and solar exhibiting the largest mitigating effects. Countries combining high renewables shares with nuclear generation, such as Finland and Sweden, recorded December 2022 inflation rates of 7.2% and 8.1% respectively, among the lowest in the EU. Conversely, the cluster of states heavily reliant on coal and Russian oil, including Bulgaria, Czechia, Estonia, and Poland, faced average HICP inflation of approximately 15.1% (Markowski & Kotliński, 2023). This evidence establishes the carbon-intensity of the energy mix and exposure to Russian supplies, rather than the headline import-dependency ratio, as the principal energy-related correlate of cross-country inflation divergence during the wartime shock.

A third literature examines how crises reshape public debt trajectories through the combined effects of stimulus spending, revenue declines, and currency-related debt-service shocks. The consistent finding is that economies with well-developed fiscal frameworks accumulate debt more slowly and stabilise it more rapidly than those with weaker institutions (Caselli et al., 2022; Chandia et al., 2022). Within Europe, EU-level recovery mechanisms, including the NextGenerationEU programme and targeted subsidy schemes, helped Eastern EU states limit the need for unilateral emergency borrowing during the 2022 crisis (Fasone & Lupo, 2024; Király et al., 2022).

For the Balkans, the absence of comparable EU-level support, combined with structurally narrower fiscal space, has produced sharper debt responses to external shocks. Radonjić et al. (2020) demonstrate using dynamic panel GMM estimation that the structural characteristics of Western Balkan economies, including politically sensitive and "sticky" social expenditures (averaging over 25% of GDP) and limited revenue bases, systematically force these states into procyclical borrowing during crises. Kadia (2020) finds a statistically significant non-linear, negative relationship between public debt and economic growth in the Balkans, with high debt ratios constraining long-run development capacity. Even within the region, heterogeneity is substantial: Montenegro entered 2022 with an external-debt-to-GNI ratio above 175%, while Bulgaria, an EU member used as a comparative benchmark, maintained a far more stable ratio of approximately 58% (Despotović et al., 2023).

Exchange-rate dynamics amplify these fiscal vulnerabilities. Because a substantial share of Balkan public debt is denominated in euros, currency depreciation automatically inflates the local-currency value of external liabilities, raising debt-service costs without any new borrowing (Slavov, 2017). This "fear of floating" leads even nominally floating-regime states such as Serbia and Albania to intervene in foreign-exchange markets to stabilise their currencies against the euro, constraining the use of exchange-rate flexibility as a shock-absorption mechanism (Shevchuk, 2022). The post-2008 strengthening of exchange-rate pass-through to producer and consumer prices in Eastern Europe, documented by Shevchuk (2022) using a

Kalman-filter time-varying coefficients model across fourteen Central and Eastern European countries, further compounds these vulnerabilities by linking currency depreciation directly to domestic price pressures.

A fourth and methodologically important strand of literature concerns the interaction between the COVID-19 pandemic and the Russia–Ukraine war as overlapping macroeconomic shocks. The pandemic produced a sharp contraction in 2020 followed by a rebound in 2021, with supply-chain disruptions, sectoral demand reallocation, and large fiscal stimulus packages reshaping the macroeconomic baseline against which the wartime shock subsequently arrived (Bonam et al., 2024; Cevik & Jalles, 2024). Across Eastern EU and Balkan states, public debt rose substantially in 2020, by an average of 6.8% and 7.7% respectively, as governments implemented emergency expenditure measures to support households and firms. By the time the war began, pre-existing debt levels had therefore already shifted higher across both regions.

The pandemic also seeded inflationary pressures that crystallised during 2021, prior to the war. Supply-chain bottlenecks, container-shipping cost spikes, and labour-market frictions interacted with pent-up demand to produce inflation rates of 6.9% in the Eastern EU and 5.2% in the Balkans by end-2021, well above pre-pandemic norms but still substantially below the 2022 peaks. The empirical implication is that the wartime shock did not arrive in a state of macroeconomic equilibrium: it interacted with, and was partly amplified by, the residual disturbances of the preceding pandemic episode (Lipińska et al., 2025; Rahman & Rayhan, 2023). The structural-break methodology adopted in this study, combined with the inclusion of pre-war data covering both pre-pandemic and pandemic periods, provides analytical leverage for distinguishing the war-specific component of post-2022 macroeconomic dynamics from this pandemic-driven baseline shift.

The empirical patterns documented above are grounded in several interlocking theoretical frameworks. *Crisis transmission theory* characterises geopolitical events as exogenous shocks that propagate through international commodity, financial, and currency markets to affect domestic macroeconomic variables. Bagchi & Paul (2023) formalise this transmission using a Fractionally Integrated GARCH (FIGARCH) framework, theorising the Russia–Ukraine war as a shock producing "long-memory persistence", that is, volatility effects that do not decay rapidly but fundamentally alter the conditional variance of macroeconomic series over extended horizons. Their breakpoint unit-root tests identify February–March 2022 as a statistically significant structural-break date across G7 stock returns and currencies, providing direct empirical support for treating the war's onset as a discrete structural shock.

Fiscal vulnerability and debt sustainability models provide a complementary lens. Kikoni et al. (2019) formalise these dynamics through fiscal-reaction functions that model government responses when constrained by deficit rules and debt thresholds. Kadia (2020) anchors the analysis in the contrast between Ricardian "debt neutrality", under which debt is merely a tax shift across generations with no long-run demand effects, and the conventional view that high debt stifles growth through crowding-out and risk-premium channels. The empirical record for the Balkans aligns with the conventional view, with non-linear negative effects of debt on growth becoming pronounced above sustainability thresholds (Kadia, 2020).

Political-economy theories of government debt emphasise that fiscal outcomes are shaped not only by economic fundamentals but by institutional design, electoral cycles, and the political feasibility of expenditure adjustment. Radonjić et al. (2020) draw on this tradition to argue that the "stickiness" of social expenditures in the Western Balkans reflects the political

costs of cutting public-sector wages and pensions during downturns, producing procyclical debt dynamics. In a related vein, *historical institutionalism* highlights path dependence in fiscal architectures: pre-existing rules, institutions, and norms constrain policy flexibility when shocks arrive, channelling responses along predetermined institutional tracks (Greener & Powell, 2024).

Together, these frameworks suggest a clear set of empirical predictions: countries with carbon-intensive energy mixes and historical exposure to Russian energy supplies should experience sharper inflation responses to the wartime shock; countries with weaker fiscal frameworks and higher liability euroization should experience sharper debt accumulation; and the war should constitute a statistically detectable structural break in macroeconomic time series around February 2022. The remainder of this study tests these predictions in the joint context of Eastern EU and Balkan economies, while remaining careful, given the correlational nature of the empirical strategy, to express the resulting evidence in associational rather than strictly causal terms.

Despite the extensive literatures summarised above, three specific gaps justify the contribution of the present study. First, comparative analyses of Eastern EU and non-EU Balkan states under a single analytical framework remain scarce. Most existing work either focuses on individual countries (Szyszko et al., 2025, on Ukraine; Mohácsi, 2024, on the Visegrad 4), examines the EU as an aggregate (González Mínguez et al., 2023; Markowski & Kotliński, 2023), or treats the Balkans in isolation (Despotović et al., 2023; Radonjić et al., 2020), leaving the cross-regional comparison underdeveloped. Radonjić et al. (2020) explicitly note this gap, observing that previous research has analysed macroeconomic drivers and public debt components "statically or separately" without integrating them within a comparative cross-regional framework.

Second, the literature has largely treated inflation and public debt as separate outcomes, despite their analytical interdependence during fiscal-monetary crises (Cevik & Jalles, 2024). The joint modelling of these variables within a single empirical strategy, combining panel regression for cross-sectional correlates with structural-break testing for temporal dynamics, remains uncommon, particularly for the European sub-regions examined here.

Third, real-time evidence on wartime macroeconomic asymmetries during 2022–2023 is still emerging, with most existing studies either preceding the war or focusing narrowly on individual transmission channels. The present study addresses these gaps by providing what is, to the authors' knowledge, one of the first quantitative comparative assessments of inflation–debt dynamics across Eastern EU and Balkan economies during the Russia–Ukraine war, integrating panel regression with structural-break analysis within a unified empirical design.

3. Data and Methodology

This section describes the empirical strategy used to assess the association between the Russia–Ukraine war and inflation–public debt dynamics across Eastern EU and Balkan states. The methodology was designed to ensure transparency and replicability while addressing the three research questions outlined in Section 1. All analytical decisions were made to enable systematic comparison between the two regional groups; the limitations of the chosen design are acknowledged at the end of this section and revisited in Section 7.

Research Design

The study adopts a comparative longitudinal design with a cross-sectional component. The comparative dimension supports the analysis of structural and institutional differences between Eastern EU and Balkan economies, the cross-sectional dimension captures variation across countries within a given period, and the longitudinal dimension traces the evolution of inflation and public debt trajectories before and after the war's onset in February 2022. This combination enables the identification of shock-associated changes relative to a stable pre-crisis baseline, while ensuring that observed differences reflect regional structural characteristics rather than short-term fluctuations. The design is correlational rather than causal: the empirical strategy identifies statistical associations between the war dummy and macroeconomic outcomes, conditional on a set of structural controls, but does not implement a quasi-experimental identification strategy.

Data Sources

To maintain accuracy and reproducibility, the study draws exclusively on publicly available, internationally recognised datasets. Macroeconomic time-series data were obtained from Eurostat, the World Bank's World Development Indicators, the European Central Bank Statistical Data Warehouse, and the International Monetary Fund's World Economic Outlook and Government Finance Statistics. Supplementary data on exchange rates, energy-mix composition, and national consumer price indices were collected from the national statistical agencies of the sample countries.

All datasets span at least the period January 2018 to December 2023, providing four pre-war years and approximately two post-war years for comparative analysis. Eurostat and ECB sources ensured harmonised measurement standards for EU economies, while IMF and national databases provided consistent series for the Balkan economies. Where minor discrepancies arose across sources, the convention was to prioritise Eurostat for EU members and IMF World Economic Outlook for non-EU Balkan states, with cross-validation against World Bank data to detect inconsistencies.

Regional Classification

The country sample was classified according to established regional definitions used in European economic and political research. The classification distinguishes between Eastern EU member states, which share a common regulatory framework, access to EU fiscal instruments, and obligations under the Stability and Growth Pact, and non-EU Balkan states, which face greater exposure to exchange-rate volatility and external borrowing constraints. Table 1 presents the country composition of each group.

Table 1. Regional Classification of Sample Countries

Eastern EU member states (n = 9)	Non-EU Balkan states (n = 5)
Bulgaria	Albania
Czechia	Bosnia and Herzegovina
Estonia	Montenegro
Hungary	North Macedonia
Latvia	Serbia
Lithuania	
Poland	

Eastern EU member states (n = 9)	Non-EU Balkan states (n = 5)
Romania	
Slovakia	

Note: Classification follows European Commission and EBRD definitions. Croatia and Slovenia are excluded because their earlier eurozone integration (Slovenia since 2007; Croatia since 2023) may bias the institutional comparison central to this study.

This binary classification enables the study to isolate the association of institutional alignment, economic integration, and governance structures with macroeconomic responses to the wartime shock.

Variables and Indicators

The analysis examines seven core macroeconomic variables, selected because they capture the principal channels through which geopolitical shocks affect economic stability and because they are widely used in the political-economy and crisis-response literatures (Bagchi & Paul, 2023; González Mínguez et al., 2023; Radonjić et al., 2020). Table 2 summarises the variables, their definitions, units of measurement, and sources.

Table 2. Variables, Definitions, and Data Sources

Variable	Definition	Unit	Native frequency	Source
CPI inflation	▪ Year-on-year change in the Consumer Price Index	%	Monthly	Eurostat / National agencies
HICP	▪ Harmonised Index of Consumer Prices	%	Monthly	Eurostat
Public debt	▪ Gross general government debt as a share of GDP	% of GDP	Quarterly / annual	IMF / World Bank
GDP growth	▪ Year-on-year change in real GDP	%	Quarterly / annual	World Bank / Eurostat
Energy-mix exposure	▪ Composite index combining the share of imports met by Russian supplies and the carbon-intensity of the national energy mix	Index (0–100)	Annual	Eurostat / IMF
Exchange-rate volatility	▪ Monthly standard deviation of the national currency against the euro or US dollar	Index (0–1)	Monthly	ECB / National agencies
Fiscal balance	▪ Overall general government balance	% of GDP	Annual	IMF

CPI inflation captures domestic price pressures arising from supply-side shocks and imported inflation, while HICP provides a standardised inflation measure that enables direct comparison between Eastern EU and Balkan states. Public debt as a share of GDP serves as the primary measure of fiscal stress and crisis-driven borrowing requirements. Real GDP growth indicates economic resilience and recovery capacity.

The energy-mix exposure index combines two sub-components, the share of national energy needs met by Russian supplies (capturing the geopolitical channel) and the carbon-intensity of the fuel mix (capturing the world-price-pass-through channel), following the reasoning of Markowski & Kotliński (2023) that headline import-dependency ratios understate

cross-country differences in inflation exposure when fuel-mix and source-country composition vary substantially. Exchange-rate volatility, measured as the monthly standard deviation of the national currency against the euro or US dollar, captures currency instability that can amplify both inflationary pressures and debt-service burdens. Fiscal balance is included to examine the extent to which governments adjusted fiscal policy in response to rising prices and debt pressures. All variables were converted to comparable units and standardised across countries and time periods to ensure cross-country comparability.

Frequency Harmonisation

Because the source variables enter at different native frequencies, monthly for CPI/HICP and exchange-rate volatility; quarterly for public debt and GDP growth in most countries; annual for the energy-mix exposure index and fiscal balance, a frequency-harmonisation step was required before panel estimation. The procedure was as follows. Quarterly debt and GDP series were first linearly interpolated to monthly observations between successive quarterly data points; the resulting monthly series preserve the underlying quarterly turning points while smoothing transitions across them. Annual variables (energy-mix exposure, fiscal balance) were held constant within each calendar year and updated at January transitions. This procedure follows standard practice in panel macro econometrics when integrating series with mixed native frequencies and yields a balanced monthly panel of fourteen countries over seventy-two months (January, 2018 to December, 2023), generating N × T = 1,008 country, month observations.

The harmonisation introduces two well-known caveats. First, monthly observations interpolated from quarterly source data exhibit lower true variability than natively monthly variables; standard errors on the interpolated regressors are therefore likely to be underestimated, biasing inference towards over-rejection. To attenuate this concern, the panel regressions were estimated with country-clustered standard errors (see Section 3.6), which adjust for the within-country serial correlation that interpolation tends to amplify. Second, the Chow test for public debt was conducted on the underlying quarterly debt series rather than on the interpolated monthly series, with the break date set at 2022Q1 rather than at February 2022; this ensures that the structural-break inference for debt is not driven by the interpolation procedure. The Chow tests for inflation and exchange-rate volatility were conducted on natively monthly data and report the February 2022 break date directly.

4. Analytical Methods

The empirical analysis proceeded in four sequential stages.

Stage 1: Descriptive analysis. Aggregate trends in inflation, public debt, and supporting macroeconomic variables were summarised using descriptive statistics. Time-series plots were used to identify turning points and volatility patterns, while group-level summary statistics established baseline differences between Eastern EU and Balkan states.

Stage 2: Panel regression. A series of panel regression models was estimated to identify the correlates of inflation and public debt change. Both fixed-effects and random-effects specifications were tested. Fixed-effects models absorb unobserved country-specific heterogeneity through time-invariant intercepts, while random-effects models treat country-specific effects as drawn from a common distribution. Model selection was guided by the Hausman test, which favoured the fixed-effects specification across all dependent variables ($\chi^2 > 14$, $p < 0.05$). To address the within-country serial correlation arising from both the macroeconomic series themselves and the interpolation procedure described in previous

section, all regressions were estimated with country-clustered standard errors. The general specification for inflation is:

$$\pi_{i,t} = \alpha_i + \beta_1 EME_{i,t} + \beta_2 PD_{i,t} + \beta_3 FXV_{i,t} + \beta_4 GDP_{i,t} + \beta_5 War_t + \varepsilon_{i,t}$$

where: π denotes CPI inflation, EME the energy-mix exposure index, PD public debt as a share of GDP, FXV exchange-rate volatility, GDP real GDP growth, and War a dummy variable taking the value 1 for the post-February 2022 period. The subscripts *i* and *t* index country and month, respectively, and αi denotes country fixed effects. An analogous specification was estimated with public debt as the dependent variable.

A dynamic panel specification, e.g., system GMM following Arellano & Bover (1995) and Blundell & Bond (1998), could in principle address the autoregressive nature of inflation and debt and the resulting potential endogeneity. However, system GMM requires either a relatively long-time dimension or careful selection of internal instruments to avoid weak-instrument bias and instrument proliferation, and the present panel, fourteen countries over six native years, sits below the configurations for which the estimator typically performs reliably. The fixed-effects specification with country-clustered standard errors was therefore retained as the primary strategy, and the consequences of this choice are revisited in Section 7.

Stage 3: Structural-break analysis. To test whether February, 2022 constitutes a statistically significant turning point in regional macroeconomic series, the Chow test was applied to inflation, public debt, and exchange-rate volatility series. The Chow test compares the sum of squared residuals from a pooled regression with that from two separate regressions estimated on pre- and post-break sub-samples; a significant *F*-statistic rejects the null hypothesis of parameter stability across the break date. For inflation and exchange-rate volatility, the test was applied at the natively monthly frequency with the break point set at February 2022. For public debt, the test was applied at the natively quarterly frequency with the break point set at 2022Q1, in order to avoid contaminating the inference with the linear interpolation used for panel estimation. This procedure follows the empirical strategy used by Rahman and Rayhan (2023) and Bagchi & Paul (2023), who employ Chow and breakpoint unit-root tests to identify the onset of the Russia–Ukraine war as a structural break in inflation and asset-price series.

Stage 4: Correlation analysis. Bivariate and partial correlation matrices were computed to examine relationships between inflation, public debt, energy-mix exposure, and exchange-rate volatility during the war period (2022–2023). This stage provided a robustness check on the regression findings and identified amplifying or attenuating fiscal–monetary linkages.

The deployment of multiple analytical techniques, descriptive, regression-based, structural-break, and correlation-based, ensures that the empirical findings do not rest on the assumptions of any single estimator, while the use of clustered standard errors and frequency-aware structural-break testing addresses the principal inferential risks introduced by the panel design.

Two further limitations of the empirical strategy warrant explicit acknowledgement here, complementing the broader discussion. First, the model does not include central-bank policy rates or central-bank-independence indices, both of which are theoretically relevant to inflation outcomes (Mohácsi, 2024). Their omission introduces a potential omitted-variable concern, particularly because monetary tightening cycles unfolded asymmetrically across the sample: EU member states with independent inflation-targeting regimes (Poland, Hungary, Czechia, Romania) raised policy rates aggressively in 2022, while Balkan central banks with managed-

float or euro-pegged regimes faced narrower discretion. The empirical findings should therefore be interpreted as conditional on the included controls; future work incorporating policy-rate dynamics could refine the estimates. Second, the regression specifications are static and treat inflation and debt as contemporaneously determined; the autoregressive persistence of both variables is acknowledged but not modelled explicitly within the primary specification.

4. Research Results

This section presents the empirical findings of the comparative analysis of Eastern EU and Balkan states during the Russia–Ukraine war. Results are organised according to the indicators specified in the methodology and include inflation trends, public debt trajectories, GDP dynamics, the energy-mix and exchange-rate environment, panel regression results, structural-break tests, and correlation patterns. The empirical outputs are summarised in Tables 3–12 and Figures 1–5. Throughout the section, the empirical relationships are described in associational language, consistent with the correlational design discussed in previous section.

Inflation Trends in Eastern EU and Balkan Economies

Inflation dynamics changed markedly with the onset of the war in February 2022. Table 3 summarises annual mean CPI inflation rates for both regions during 2018–2023. Until the war, the two regions exhibited broadly similar inflation patterns, with Eastern EU rates slightly higher in 2018–2020. A strong divergence emerged from 2021 onward and intensified through 2022. Inflation rose sharply in both regions in 2022, but the increase was substantially greater in the Eastern EU. The regional mean climbed from 6.9% in 2021 to 14.7% in 2022 in the Eastern EU, compared with an increase from 5.2% to 11.3% in the Balkans.

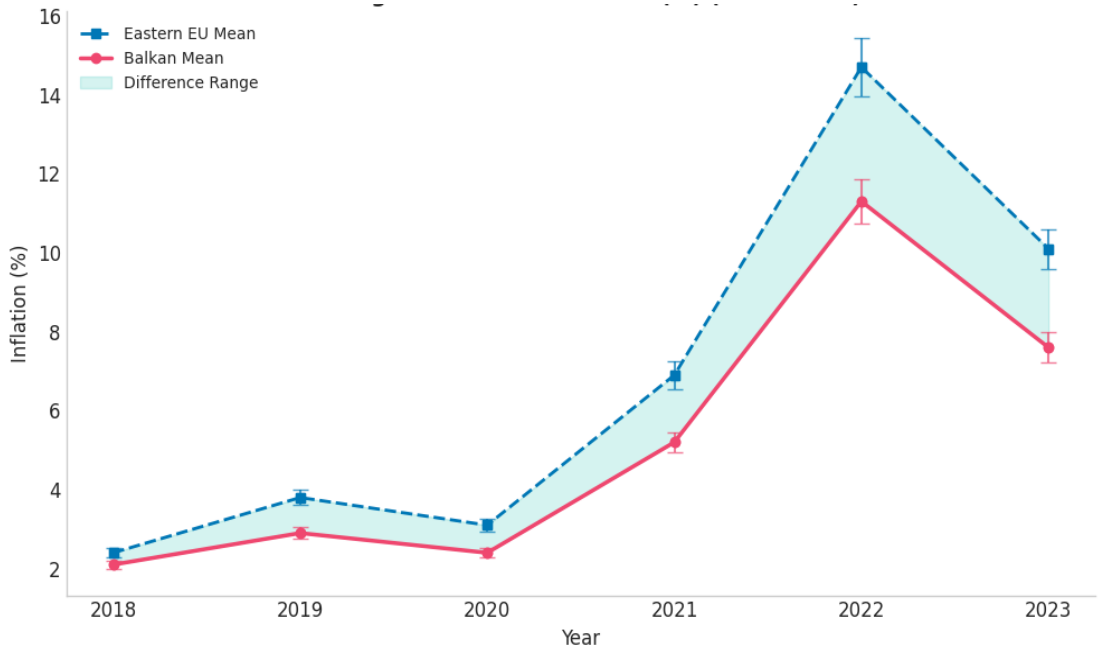
Table 3: Average annual CPI inflation (%) in Eastern EU and Balkan Economies, 2018–2023

Year	Eastern EU Mean	Balkan Mean
2018	2.4	2.1
2019	3.8	2.9
2020	3.1	2.4
2021	6.9	5.2
2022	14.7	11.3
2023	10.1	7.6

Source: Authors' calculations based on Eurostat (HICP) and IMF World Economic Outlook data. Regional means are simple averages across the constituent country observations.

The Baltic states recorded among the highest monthly inflation rates in the EU. Peak monthly inflation reached 23.4% in Lithuania, 22.9% in Latvia, and 24.6% in Estonia in mid-2022, the highest values observed in the dataset. These figures are consistent with the country-level evidence reported by Zimková et al. (2023), who document December, 2022 HICP inflation of 25.0% in Hungary, 20.7% in Latvia, and 20.0% in Lithuania. Within the Balkan group, peak monthly inflation rates of 14.8% in Serbia and 15.6% in Montenegro were lower than the Eastern EU peaks but high relative to pre-war trajectories. Albania and Bosnia and Herzegovina exhibited more gradual inflationary increases without reaching Baltic-level volatility. Inflation eased in both regions during 2023, but disinflation proceeded more slowly in the Eastern EU (regional mean of 10.1%) than in the Balkans (7.6%). Persistent Eastern EU inflation reflected continued pass-through of imported energy prices, wage adjustments, and tighter credit conditions. Neither region returned to pre-2021 inflation levels during the study period.

Figure 1. Average Annual CPI Inflation (%) in Eastern EU and Balkan Economies, 2018–2023



Source: Authors' calculations based on Eurostat and IMF data.

Public Debt Trajectories

Public debt trajectories revealed clear regional differences (Table 4). Eastern EU economies maintained relatively moderate debt levels, remaining below 60% of GDP throughout the study period. Balkan economies carried substantially higher debt burdens, exceeding 70% of GDP in 2020 and continuing to rise through 2023. In both regions, debt levels were stable during 2018–2019, increased sharply in 2020 as a result of COVID-19 fiscal measures, and rose further after 2021, but the magnitude of the post-war increase differed across regions. By 2022, Eastern EU debt reached 57.7%, while the Balkan mean rose to 79.4%.

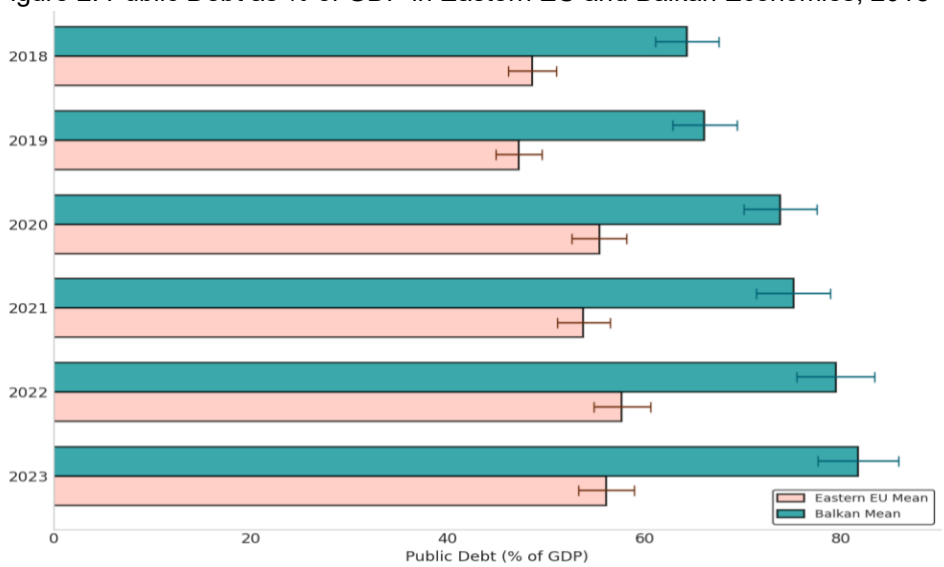
Table 4: Public Debt as % of GDP in Eastern EU and Balkan Economies, 2018–2023

Year	Eastern EU Mean	Balkan Mean
2018	48.6	64.3
2019	47.2	66.1
2020	55.4	73.8
2021	53.8	75.1
2022	57.7	79.4
2023	56.1	81.7

Source: Authors' calculations based on IMF Government Finance Statistics and World Bank World Development Indicators.

Within the Eastern EU, Poland and Hungary recorded the largest increases in public debt between 2021 and 2022 (6.4% and 7.1%, respectively). Among the Balkan economies, Albania and Montenegro registered the most pronounced increases (8.6% and 10.2%). These movements reflected widening borrowing requirements and narrowing fiscal space in Balkan economies, patterns consistent with the structural vulnerabilities documented by Despotović et al. (2023) and Radonjić et al. (2020). By 2023, debt levels in neither region had declined: Eastern EU debt eased marginally to 56.1%, while Balkan debt continued to rise to 81.7%, indicating sustained fiscal stress in the latter region.

Figure 2: Public Debt as % of GDP in Eastern EU and Balkan Economies, 2018–2023.



Source: Authors' calculations based on IMF and World Bank data.

GDP Growth and Economic Activity

GDP growth exhibited substantial fluctuations across the study period, including post-pandemic recovery in 2021, the war's negative association in 2022, and partial stabilisation in 2023. Table 5 reports annual mean GDP growth rates. Both regions experienced strong rebounds in 2021, with the Eastern EU averaging 6.6% and the Balkans 6.0%. Growth decelerated significantly in 2022, to 2.1% in the Eastern EU and 1.4% in the Balkans, reflecting inflationary cost pressures, supply-chain disruptions, and weakened net exports. Moderate recovery in 2023 raised Eastern EU growth to 2.8% and Balkan growth to 2.0%, but neither region returned to pre-war growth rates.

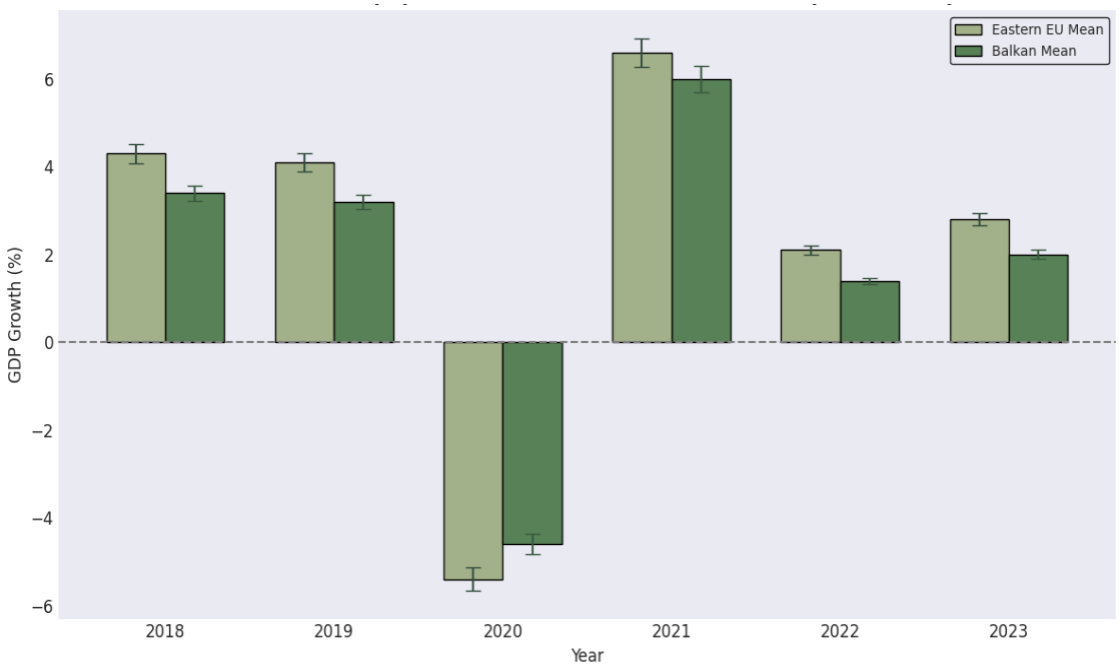
Table 5: GDP growth (%) in Eastern EU and Balkan Economies, 2018–2023

Year	Eastern EU Mean	Balkan Mean
2018	4.3	3.4
2019	4.1	3.2
2020	-5.4	-4.6
2021	6.6	6.0
2022	2.1	1.4
2023	2.8	2.0

Source: Authors' calculations based on Eurostat and World Bank data.

Eastern EU growth remained slightly higher than Balkan growth throughout the study period, consistent with deeper integration into the European single market and access to a wider set of financial support mechanisms. Balkan recovery proceeded more slowly and exhibited greater cross-country variability.

Figure 3. GDP Growth (%) in Eastern EU and Balkan Economies, 2018–2023.



Source: Authors' calculations based on Eurostat and World Bank data.

Country-Level Inflation and Debt Detail

To support the regional averages reported above and clarify the within-region heterogeneity that underlies the comparative analysis, Table 6 reports country-level inflation and public debt values for 2021 (the pre-war reference year) and 2022 (the year of the wartime shock). The within-region heterogeneity is substantial: among Eastern EU members, Czechia and Hungary recorded inflation rates above 14%, while Bulgaria and Slovakia remained below 13%; among Balkan members, Serbia and Montenegro exceeded 13% inflation while Albania remained at 6.7%.

Table 6. Country-Level Inflation and Public Debt: 2021 and 2022

Country	Inflation 2021 (%)	Inflation 2022 (%)	Debt 2021 (% GDP)	Debt 2022 (% GDP)
Bulgaria	3.3	13.0	23.9	22.6
Czechia	3.8	15.1	41.9	44.2
Estonia	6.4	19.4	17.6	18.5
Hungary	5.2	14.5	76.8	73.9
Latvia	3.3	17.2	44.4	41.0
Lithuania	4.7	18.9	43.4	38.1
Poland	5.1	14.4	53.6	49.3
Romania	5.1	13.8	48.6	47.9
Slovakia	3.2	12.1	61.1	57.7
Albania	2.0	6.7	74.4	65.6
Bosnia & H.	2.0	14.0	33.8	30.0
Montenegro	2.4	13.0	83.4	69.3
North Macedonia	3.2	14.2	53.0	51.0
Serbia	4.1	11.9	57.0	55.6

Source: Authors' compilation based on Eurostat, IMF, and World Bank data. Balkan countries are shown in bold. Regional averages in Table 4, derived from harmonised monthly data, are used in the regression analysis.

Energy-Mix Exposure and Exchange-Rate Behaviour

Table 7 compares energy conditions and exchange-rate volatility. Although the Balkans show higher energy import dependency (71.9% vs. 63.4%), the Eastern EU records greater energy-mix exposure (68.2 vs. 51.4), reflecting stronger reliance on Russian supplies and carbon-intensive fuels. This suggests that inflation differences are driven more by energy composition than by import dependency alone.

Table 7. Energy-mix Exposure, Headline Energy Dependency, and Exchange-Rate Volatility

Region	Energy-mix exposure index (0–100)	Headline energy import dependency (%)	Exchange-rate volatility (0–1)
Eastern EU	68.2	63.4	0.21
Balkans	51.4	71.9	0.37

Source: Authors' calculations based on Eurostat, ECB, and IMF data. Higher energy-mix exposure indicates stronger inflation transmission from fossil-fuel price shocks; the energy-dependency ratio is reported for comparison.

Exchange-rate volatility was substantially higher in the Balkan group (0.37) than in the Eastern EU (0.21). Volatility surged after February 2022, particularly for the Serbian dinar and Albanian lek, coinciding with global energy-price increases and broader financial-market disruptions. Eastern EU currencies, most of which are pegged or closely aligned with the euro (for example, Bulgaria) or supported by credible monetary frameworks (Poland, Czechia), displayed more stable behaviour, consistent with the lower regional volatility index. These patterns align with the time-varying exchange-rate pass-through dynamics documented by Shevchuk (2022) for Central and Eastern European economies.

Panel Regression Results: Correlates of Inflation

Table 8 reports fixed-effects panel regression results for CPI inflation, based on harmonised monthly observations across all sample countries for 2018–2023. The Hausman test rejected the random-effects specification in favour of fixed effects ($\chi^2 = 14.62$, $p = 0.012$). Country-clustered standard errors were used throughout to address within-country serial correlation. All variables were significant at $p < 0.05$.

Table 8. Fixed-Effects Panel Regression: Correlates of Inflation (Dependent Variable: CPI Inflation)

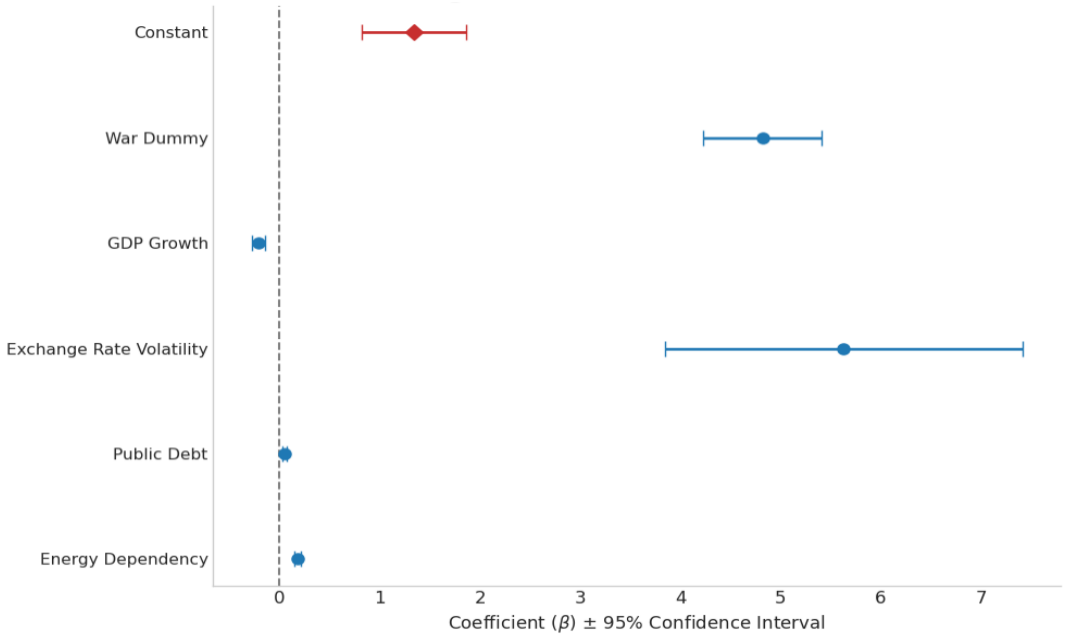
Variable	Coefficient (β)	Cl. Std. Error	t-value	p-value
Energy-mix exposure	0.182	0.031	5.87	< 0.001
Public debt	0.047	0.019	2.41	0.016
Exchange-rate volatility	5.63	1.78	3.15	0.002
GDP growth	-0.211	0.066	-3.20	0.001
War dummy (post-Feb 2022 = 1)	4.82	0.59	8.15	< 0.001
Constant	1.34	0.52	2.57	0.010
Observations (N × T)	1,008			
R^2 (within)	0.612			
Adjusted R^2	0.598			
F-statistic	38.74 (p < 0.001)			

Source: Authors' estimations. Country-clustered standard errors. Country fixed effects included.

Energy-mix exposure emerged as the strongest correlate of inflation ($\beta = 0.182$, $p < 0.001$), consistent with the hypothesis that the carbon-intensity of the fuel mix and exposure to Russian supplies translate into larger price-level responses during the wartime shock. Public debt entered with a small positive coefficient ($\beta = 0.047$, $p = 0.016$), suggesting a modest reinforcing relationship with prices.

Exchange-rate volatility exerted a substantial positive association (β = 5.63, *p* = 0.002), consistent with the pass-through evidence reported by Shevchuk (2022). GDP growth carried a significant negative coefficient (β = -0.211, *p* = 0.001), indicating that stronger output growth was associated with attenuated inflationary pressures. The large positive coefficient on the war dummy (β = 4.82, *p* < 0.001) confirmed a substantial level shift in inflation after February 2022. The model explained approximately 61% of the within-country variation in inflation. All coefficients remained stable under alternative specifications, including random-effects and lagged variants.

Figure 4. Fixed-Effects Regression Coefficients (β) and 95% CIs for CPI Inflation



Source: Authors' estimations.

Panel Regression Results: Correlates of Public Debt

Regression estimates for the correlates of public debt are reported in Table 9. Inflation entered with a statistically significant positive coefficient (β = 0.726, *p* = 0.001), implying that debt-to-GDP ratios rose alongside elevated prices.

Table 9. Fixed-effects panel regression: correlates of public debt (Dependent variab: Debt as % of GDP)

Variable	Coefficient (β)	CI. Std. Error	t-value	p-value
Inflation	0.726	0.213	3.40	0.001
GDP growth	-1.84	0.71	-2.59	0.010
Exchange-rate volatility	9.11	3.24	2.81	0.006
War dummy	3.92	1.31	2.99	0.004
Constant	49.72	4.62	10.76	< 0.001
Observations (N × T)	1,008			
R^2 (within)	0.547			
Adjusted R^2	0.531			
F-statistic	29.18 (p < 0.001)			

Source: Authors' estimations. Country-clustered standard errors. Country fixed effects included.

GDP growth carried a negative coefficient (β = -1.84, p = 0.010), confirming that stronger economic performance was associated with moderated debt accumulation. Exchange-rate volatility exerted a large positive association with public debt (β = 9.11, p = 0.006), reflecting the sensitivity of debt ratios in economies with substantial foreign-currency liabilities — a pattern consistent with the liability euroization documented by Slavov (2017). The war dummy was statistically significant (β = 3.92, p = 0.004), indicating a structural increase in debt levels after the war's onset.

Structural-Break Analysis

The structural-break tests assessed whether February 2022 represents a statistically significant shift in inflation, public debt, and exchange-rate volatility series. Following the methodological clarification in previous section, the tests for inflation and exchange-rate volatility were conducted at monthly frequency; the test for public debt was conducted at the underlying quarterly frequency with the break date set at 2022Q1, in order to avoid contaminating the inference with the interpolation used for panel estimation. Chow test results are summarised in Table 10. All three indicators registered significant discontinuities at p < 0.01. The strongest break was observed in inflation (F = 18.72), followed by exchange-rate volatility (F = 12.58) and public debt (F = 9.43). These results confirm that the Russia–Ukraine war altered macroeconomic dynamics across both regions in a statistically detectable manner, providing direct empirical support for the conceptualisation of the war as an exogenous structural shock (Bagchi & Paul, 2023; Rahman & Rayhan, 2023). The magnitude of the break varied across regions: Eastern EU states recorded stronger inflation breaks, while Balkan states exhibited more pronounced exchange-rate breaks.

Table 10. Structural-break test (Chow test)

Indicator	Frequency	Break date	F-statistic	p-value
CPI inflation	Monthly	Feb 2022	18.72	< 0.001
Public debt	Quarterly	2022Q1	9.43	0.003
Exchange-rate index	Monthly	Feb 2022	12.58	< 0.001

Source: Authors' estimations. All three F-statistics are significant at the 1% level.

Correlation Patterns during the War Period

To examine relationships between the key variables during the wartime period (2022–2023), a correlation matrix was computed (Table 11). The strongest association was observed between inflation and energy-mix exposure (r = 0.77). Inflation was also moderately and positively correlated with public debt (r = 0.61) and with exchange-rate volatility (r = 0.69).

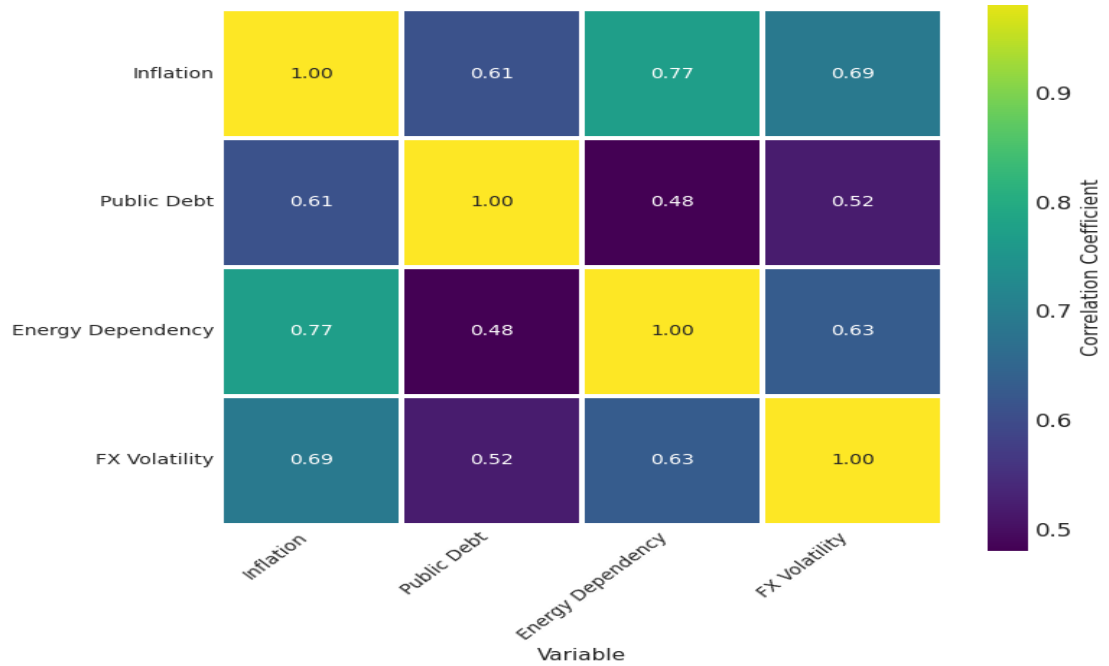
Table 11. Correlation matrix (war period only, 2022–2023)

Variable	Inflation	Public Debt	Energy-mix exposure	FX Volatility
Inflation	1.00	0.61	0.77	0.69
Public Debt	0.61	1.00	0.48	0.52
Energy-mix exposure	0.77	0.48	1.00	0.63
FX Volatility	0.69	0.52	0.63	1.00

Source: Authors' calculations.

Exchange-rate volatility was positively correlated with energy-mix exposure (r = 0.63), indicating that economies with carbon-intensive energy mixes tended also to face greater currency instability. Public debt and energy-mix exposure exhibited a moderate correlation (r = 0.48). All correlations were consistent with the regression findings and remained stable across the study period.

Figure 5. Correlation matrix of key macroeconomic variables during the war period (2022–2023).



Source: Authors' calculations.

Cross-Regional Comparison of Shock Intensity

Table 12 reports a difference-in-means analysis comparing pre-war and post-war average values across the two regions. Inflation rose more sharply in the Eastern EU (+8.6%) than in the Balkans (+5.2%). Conversely, public debt increased more in the Balkans (+6.6%) than in the Eastern EU (+4.3%). Exchange-rate volatility rose in both regions but more substantially in the Balkans (+0.19) than in the Eastern EU (+0.12). These patterns indicate that Eastern EU economies absorbed a larger share of the inflationary shock, while Balkan economies absorbed a larger share of the fiscal and currency-related shock.

Table 12. Mean Difference in War Association (Pre- vs. Post-War)

Indicator	Eastern EU (Δ)	Balkans (Δ)
Inflation (%)	+8.6	+5.2
Debt (% of GDP)	+4.3	+6.6
FX volatility	+0.12	+0.19

Source: Authors' calculations. Differences computed as the post-war mean (2022–2023) minus the pre-war mean (2018–2021) for each indicator within each region.

Taken together, these results document a clear and statistically significant divergence in the macroeconomic absorption of the wartime shock across the two regional groups. Eastern EU economies bore the brunt of the inflationary shock, while Balkan economies bore the brunt of the fiscal and currency-related shock, a pattern interpreted in detail in the following section.

5. Discussion

This study examined the macroeconomic transmission of the Russia–Ukraine war into inflation and public debt dynamics across Eastern EU and Balkan states. The empirical findings document a clear asymmetry: Eastern EU economies bore the brunt of the inflationary shock, while Balkan economies absorbed a disproportionate share of the fiscal and currency-related stress. This section interprets these patterns in relation to the three predictions implied by the literature, compares the findings with prior studies, explains the underlying transmission mechanisms, draws out the policy and theoretical implications, and identifies the study's distinctive contributions. Throughout the section, the empirical relationships are described in associational rather than causal language, in line with the correlational design discussed in Section 3.

The literature review identified three predictions: (P1) countries with carbon-intensive energy mixes and historical exposure to Russian energy supplies would experience sharper inflation responses to the wartime shock; (P2) countries with weaker fiscal frameworks and higher liability euroization would experience sharper debt accumulation; and (P3) the war would constitute a statistically detectable structural break in macroeconomic time series around February 2022. The empirical results are consistent with all three predictions.

Prediction P1 is supported by the strong association of energy-mix exposure with inflation in the panel regression ($\beta = 0.182$, $p < 0.001$) and by the strong bivariate correlation between the two variables ($r = 0.77$). It is important to note, in response to the apparent puzzle that headline energy import dependency is higher in the Balkans (71.9%) than in the Eastern EU (63.4%) while inflation moved in the opposite direction, that the relevant inflation channel is not the headline import ratio but the carbon-intensity and source-country composition of the energy mix.

The Balkans, despite higher aggregate import dependency, sourced more diversified non-Russian supplies and relied more heavily on hydropower and imports from neighbouring non-Russian markets, while the Eastern EU group, particularly Bulgaria, Czechia, Estonia, and Poland, depended on Russian gas and coal-intensive generation profiles that translated quickly into domestic price pressures. The Baltic states, with the highest energy-mix exposure scores in the sample, recorded peak monthly inflation rates of 22.9–24.6% in mid-2022, the highest values observed across both regions. This finding aligns directly with the cross-country evidence reported by Markowski & Kotliński (2023), who attribute approximately one-third of EU inflation divergence in 2022 to differences in the composition of national energy mixes.

From an applied economics perspective, this result also has implications beyond short-run price stability. Energy-mix exposure may weaken long-term productivity by raising input-cost uncertainty, compressing firms' margins, and delaying investment in more efficient production technologies. The war exposed the vulnerability created by dependence on imported fossil fuels and accelerated the policy debate on sustainable energy transformation in Europe (Kuzemko et al., 2022). For the Western Balkans, the challenge is particularly relevant because climate-mitigation strategies and EU Green Deal alignment remain constrained by coal dependence and uneven implementation capacity (Knez et al., 2022). In this sense, the inflationary channel identified in this study is not only a short-run cost-of-living problem; it also reflects a structural allocation problem in which capital continues to be tied to energy-intensive activities rather than redirected toward more resilient and productivity-enhancing sectors.

Prediction P2 is supported by the substantially larger debt increases observed in Balkan states (+6.6%) relative to Eastern EU states (+4.3%), combined with the strong positive coefficient on exchange-rate volatility in the public debt regression (β = 9.11, p = 0.006). The pattern is consistent with the liability euroization argument of Slavov (2017) and the procyclical-borrowing dynamics documented by Radonjić et al. (2020) for the Western Balkans. The absence of comparable EU-level support mechanisms required Balkan states to rely more heavily on external borrowing during the crisis, while currency depreciation amplified the local-currency value of foreign-denominated obligations.

The same applied economics logic applies to liability euroization. When public debt is denominated in foreign currency, exchange-rate volatility can raise the domestic-currency value of public liabilities without an equivalent increase in productive capacity. Evidence from Serbia and the wider Western Balkan context shows that currency risk remains a central feature of public-debt management in economies with high euroization and weaker confidence in domestic currencies (Radosavljević & Tomov, 2018).

Similar evidence from the Macedonian economy suggests that euroization can restrict monetary-policy transmission and increase the need for macroprudential coordination (Boshkov et al., 2017). The implication is that debt accumulation under wartime exchange-rate pressure can reduce capital-allocation efficiency by diverting fiscal resources from infrastructure, innovation, and human-capital investment toward interest payments and debt-service obligations. This interpretation is consistent with evidence that rising interest expenditure may crowd out more productive public spending in Serbia (Ranđelović, 2023) and with findings that debt-financed consumption in Western Balkan economies may undermine long-run development sustainability (Ćosović, 2020).

Prediction P3 is directly supported by the Chow-test results, which confirm statistically significant structural breaks in inflation (F = 18.72, p < 0.001), public debt (F = 9.43, p = 0.003), and exchange-rate volatility (F = 12.58, p < 0.001) around February 2022. These results parallel the breakpoint findings of Bagchi & Paul (2023) and Rahman and Rayhan (2023), reinforcing the conceptualisation of the war as an exogenous structural shock rather than a continuation of pre-existing trends.

The findings of this study are broadly consistent with, and extend, the recent literature on wartime macroeconomic shocks. González Mínguez et al. (2023), using time-varying SVAR for the euro area, document that energy-price surprises explained over 7% of the variance in non-energy consumer prices during the 2022 crisis. The present results extend this finding to the Eastern EU and Balkan sub-regions, where the energy-mix exposure index emerged as the single strongest correlate of cross-country inflation divergence.

The country-level inflation rates reported here closely match those documented by Zimková et al. (2023), who identify Hungary (25.0%), Latvia (20.7%), and Lithuania (20.0%) as the EU states with the highest December 2022 HICP inflation. Markowski and Kotliński (2023) report that EU countries combining high renewables shares with nuclear generation recorded substantially lower inflation than coal- and Russian-oil-dependent economies, with a one-percentage-point increase in the renewables share associated with a 0.13% reduction in HICP inflation. The present analysis confirms this pattern by demonstrating that the cluster of high-energy-mix-exposure, coal-reliant Eastern EU states (Bulgaria, Czechia, Estonia, Poland) experienced the most severe price shocks despite, in some cases, lower headline import-dependency ratios than their Balkan counterparts.

For public debt dynamics, the findings align with the structural analyses of Kikoni et al. (2019) and Radonjić et al. (2020). Kikoni et al. demonstrate that Western Balkan states historically comply with their own fiscal rules only slightly more than half of the time, leaving them poorly positioned to absorb external shocks. Radonjić et al. (2020), using dynamic panel GMM, document that the structural characteristics of Western Balkan economies — including "sticky" social expenditures and narrow revenue bases — systematically generate procyclical borrowing during crises. The present results corroborate this pattern, with the 10.2-percentage-point increase in Montenegrin debt between 2021 and 2022 representing the most extreme case in the sample.

The exchange-rate findings are consistent with Shevchuk (2022), whose Kalman-filter analysis of fourteen Central and Eastern European economies demonstrates that exchange-rate pass-through to producer and consumer prices strengthened substantially after 2008. The present analysis extends this finding to the wartime period, showing that the post-2022 surge in Balkan currency volatility moved together with both inflationary pressures and debt-service stress. Slavov's (2017) IMF analysis of euroization in Central, Eastern, and South-eastern Europe provides the theoretical foundation for these dynamics, identifying liability euroization as the central mechanism linking exchange-rate movements to fiscal vulnerability.

Several interlocking mechanisms account for the observed patterns. The sharper inflation response in Eastern EU states reflects the rapid pass-through of global energy prices into domestic markets through carbon-intensive fuel mixes, amplified by wage-price adjustment dynamics and tight labour-market conditions in the Baltic and Visegrad economies (Mohácsi, 2024). Energy-mix composition operated as a multiplier of external supply disruptions: structural reliance on Russian gas and coal-intensive generation, particularly in the Baltic states and Czechia, translated quickly into domestic producer and consumer prices as energy markets tightened in the wake of the conflict.

The larger public debt increases in the Balkans reflect three reinforcing mechanisms. First, narrower fiscal space, manifested in pre-existing debt levels above 70% of GDP, limited the room for non-borrowing fiscal responses. Second, weaker tax bases and slower nominal revenue adjustment meant that inflation eroded real public revenues without proportionate increases in nominal collections. Third, exchange-rate depreciation amplified foreign-currency debt liabilities, particularly in Serbia and Montenegro, as captured by the large positive coefficient on FX volatility in the debt regression ($\beta = 9.11$). These dynamics align with the channels modelled by Slavov (2017) and empirically tested by Kadić et al. (2022) for the Balkans.

The negative coefficient on GDP growth in both regressions reflects standard macroeconomic theory: stronger output performance expands tax revenues, reduces the relative size of nominal expenditure, and dampens the inflationary impulse of demand-side pressures. The bidirectional relationship between inflation and debt, evident in the joint regression results, captures a feedback loop in which inflation initially erodes the real value of nominal debt but subsequently raises debt-service costs through higher policy rates and risk premia, a dynamic emphasised by Cevik & Jalles (2024) in their analysis of climate-related macroeconomic shocks.

The structural-break results provide additional empirical leverage. By documenting February 2022 as a discrete and statistically significant turning point, the analysis supports the theoretical treatment of the war as an exogenous shock rather than as the continuation of pre-existing trends. This finding is methodologically important because it justifies the use of a binary war dummy in the panel regressions and supports the interpretation of post-2022 macroeconomic divergence as a war-specific phenomenon, separable from the COVID-19 pandemic baseline shift discussed in Section 2.

The empirical findings carry concrete implications for policymakers in the Western Balkans and Eastern EU member states, for EU institutions, and for the broader scholarly literature on crisis transmission. As correlational evidence, these implications should be read as analytical guidance rather than as direct causal prescriptions.

Given that energy-mix exposure emerged as the strongest correlate of inflation, accelerating the deployment of renewable energy and the substitution of coal-intensive generation in the Balkans should be a top policy priority. Markowski & Kotliński (2023) estimate that each 1% increase in the renewables share is associated with a 0.13% reduction in HICP inflation. The feasibility of this transition depends critically on access to EU financing and on domestic administrative capacity. The Western Balkans Investment Framework and EU Green Deal pre-accession instruments offer substantial pooled funding, but absorption capacity has historically been constrained by weak project pipelines, fragmented sub-national administrative capacity, and political contestation over the role of coal in national economies (Despotović et al., 2023; Knez et al., 2022). Strategic energy reserves, regional energy market integration with the EU, and infrastructure investment in cross-border interconnectors would reduce the price-shock transmission documented in this study. Over the longer run, these measures would also improve capital allocation by shifting investment away from high-exposure energy structures toward sectors with stronger productivity potential.

The exchange-rate vulnerability of Balkan public finances calls for a coordinated reduction in foreign-currency-denominated public debt. Slavov's (2017) IMF framework offers concrete policy tools: lengthening domestic-currency debt maturities, developing local capital markets, and incrementally shifting new sovereign issuance towards domestic-currency bonds. Evidence on Serbia and Macedonia further suggests that high euroization increases currency-risk exposure and can weaken the effectiveness of domestic monetary transmission (Boshkov et al., 2017; Radosavljević & Tomov, 2018). Implementation challenges include the limited depth of domestic investor bases in countries such as Albania and Montenegro and the higher nominal yields demanded by local-currency lenders, which can crowd out fiscal space in the short run. Nevertheless, these measures would attenuate the FX-to-debt transmission channel that was associated with 6.6-percentage-point debt increases in the Balkans during 2022 and would gradually improve the allocation of public resources toward productivity-enhancing expenditure.

The substantial divergence in fiscal absorption capacity between Eastern EU members and non-EU Balkan candidates underscores the value of extending EU-level fiscal support mechanisms, such as the NextGenerationEU framework, to candidate states during accession. Kikoni et al. (2019) and Despotović et al. (2023) argue that pre-accession fiscal frameworks could substantially improve Western Balkan macroeconomic resilience. The present findings provide empirical context for this argument by quantifying the gap in shock-absorption performance between EU members and candidates. Linking energy diversification, fiscal-rule credibility, and lower liability euroization to the broader objective of structural

convergence is especially important because Western Balkan convergence with the EU has historically been slow and vulnerable to crisis-related interruptions (Krstevska, 2018). Implementation will require both political consensus within the EU on the conditionality of such support and improved fiscal-governance arrangements in the recipient states.

The positive correlation between inflation and public debt (r = 0.61) highlights the value of counter-cyclical fiscal policy, particularly in economies where standard fiscal rules constrain discretionary response. Király et al. (2022) discuss the design of such frameworks within the constraints of EU fiscal governance, offering a template for adaptation in the Western Balkans.

From a theoretical standpoint, the findings reinforce the value of integrating crisis transmission theory, fiscal vulnerability frameworks, and historical institutionalism within a single analytical strategy. The empirical results demonstrate that the same exogenous shock produced asymmetric outcomes precisely because pre-existing institutional configurations, fiscal rules, energy mixes, currency regimes, channelled the shock through different transmission paths. This pattern aligns with the institutional path-dependence emphasised by Greener & Powell (2024) and provides a transferable framework for analysing the macroeconomic consequences of future geopolitical disruptions in structurally heterogeneous regions.

The study makes three specific contributions to the literature. First, it provides what is, to the authors' knowledge, one of the first systematic, regionally disaggregated comparisons of inflation–debt dynamics across Eastern EU and non-EU Balkan states during the Russia–Ukraine war, addressing the gap identified by Radonjić et al. (2020), who noted that prior research had analysed these economies "statically or separately," without integrating them in a comparative framework.

Second, the study integrates multiple macroeconomic variables, CPI inflation, HICP, public debt, GDP growth, energy-mix exposure, and exchange-rate volatility, within a single empirical framework that combines fixed-effects panel regression with structural-break testing and correlation analysis. This methodological integration moves beyond the single-channel focus typical of prior studies, capturing the joint dynamics of inflation and debt during a coordinated external shock.

Third, by documenting the asymmetric pattern in which Eastern EU states absorbed disproportionately greater inflation while Balkan states absorbed disproportionately greater fiscal stress, the analysis provides new evidence on the institutional moderators of crisis transmission. This finding refines existing accounts of EU integration's stabilising role by showing that EU membership is associated with constrained debt accumulation more strongly than with suppressed inflationary pressures, a nuance with implications for the design of future EU support mechanisms.

Conclusion

This study provided a comparative empirical assessment of inflation and public debt dynamics in Eastern EU and non-EU Balkan states during the Russia–Ukraine war. Drawing on monthly and annual data for fourteen economies over 2018–2023 from Eurostat, the IMF, and the World Bank, the analysis combined descriptive statistics, fixed-effects panel regression with country-clustered standard errors, and structural-break testing to identify regional asymmetries, isolate the underlying correlates of price instability and fiscal stress, and assess whether pre-war institutional configurations shaped each region's capacity to absorb the external shock.

Three principal conclusions emerge. First, the wartime shock was associated with statistically asymmetric outcomes across the two regions: Eastern EU economies experienced a more severe inflationary shock (average 2022 CPI of 14.7% versus 11.3% in the Balkans), while Balkan states experienced a more severe fiscal shock (debt rising to 81.7% of GDP by 2023, compared with 56.1% in the Eastern EU). Second, the energy-mix exposure index, capturing both the carbon-intensity of the fuel mix and exposure to Russian supplies, emerged as the dominant correlate of inflation divergence ($\beta = 0.182$, $p < 0.001$), while exchange-rate volatility, operating through liability euroization, emerged as the dominant amplifier of debt accumulation ($\beta = 9.11$, $p = 0.006$). Third, structural-break tests confirmed February 2022 as a statistically significant turning point for inflation, public debt, and exchange-rate behaviour, validating the conceptualisation of the war as an exogenous structural shock rather than a continuation of pre-existing trends.

These findings carry three concrete policy implications. First, accelerating energy diversification, particularly through renewables deployment, the substitution of coal-intensive generation, and regional integration of energy markets, represents the most powerful single lever for reducing inflation vulnerability across both regions, given the magnitude of the energy-mix-inflation association documented here and by Markowski & Kotliński (2023). Second, reducing liability euroization through the development of domestic capital markets and the gradual reorientation of new sovereign issuance towards local-currency instruments would attenuate the exchange-rate-to-debt transmission channel that was associated with the disproportionate fiscal stress in the Balkans. Third, extending EU-level fiscal support mechanisms, such as the NextGenerationEU framework, to candidate states during pre-accession would help narrow the gap in shock-absorption performance documented in this study. These measures should not be understood only as short-term crisis-management tools. They are also instruments of structural convergence, because they can improve the capacity of Balkan economies to allocate capital toward productive investment, reduce exposure to currency and energy shocks, and move closer to the macroeconomic resilience standards of EU member economies (Krstevska, 2018).

Beyond its substantive contributions, the study advances scholarly understanding of crisis transmission in structurally heterogeneous regions by demonstrating that the same exogenous shock produces asymmetric outcomes precisely because pre-existing institutional configurations channel the shock through different transmission paths. The integrated empirical framework, combining panel regression with structural-break analysis, offers a transferable analytical template for assessing the macroeconomic consequences of future geopolitical disruptions. Future research should extend this framework by incorporating household-level welfare data, modelling long-run debt sustainability under sustained instability, employing dynamic-panel and quasi-experimental identification strategies, and investigating how EU integration strategies or energy diversification policies could be calibrated to mitigate similar future shocks. The Russia–Ukraine war has provided a natural experiment in macroeconomic stress testing, and the divergence documented here offers a benchmark against which the design of future European fiscal and monetary architectures may be evaluated.

Several limitations of this study should be acknowledged. They are organised below into data-related, methodological, and substantive considerations, each accompanied by a corresponding direction for future research.

First, the use of aggregate national-level data may mask sub-national heterogeneity in inflation, debt distribution, and fiscal responses, particularly in countries with significant regional disparities. Future research drawing on regional or household-level data could refine the inflation–welfare nexus that is only implicit in the present national aggregates. Second, the empirical panel relies on the harmonisation of macroeconomic series of different native frequencies through linear interpolation. While the procedure is standard and the country-clustered standard errors attenuate the inferential consequences, finer-grained policy or transaction-level data. for example, monthly tax revenues, customs receipts, or sovereign bond auction outcomes, would reduce the reliance on interpolation and allow sharper identification of short-run dynamics.

Third, the empirical specification, though grounded in established panel-data methodology, does not formally address potential endogeneity between inflation and public debt; future work employing instrumental variables or system GMM estimation (Arellano & Bover, 1995; Blundell & Bond, 1998) could provide stronger causal identification, provided that a longer time dimension is available to support the validity of internal instruments. Fourth, the study does not separately test for unit-root behaviour in the macroeconomic series; while the fixed-effects specification mitigates concerns about non-stationarity through within-country demeaning, dedicated panel unit-root tests (such as Im–Pesaran–Shin or Levin–Lin–Chu) would strengthen the inferential basis in future work. Fifth, the analysis does not estimate cointegrating relationships among the variables; future work using panel cointegration techniques (Pedroni; Westerlund) could examine the long-run equilibrium dynamics between inflation, debt, and energy-mix exposure. Sixth, the estimation does not include lagged dependent variables to control for autoregressive persistence; dynamic-panel specifications, such as system GMM applied to extended datasets, would address this concern more directly. Seventh, the inflation regression does not include central-bank policy rates or central-bank independence indices, raising a potential omitted-variable concern that the panel fixed-effects specification only partially addresses; future work incorporating monetary-policy variables could refine the inflation estimates.

Eighth, the empirical strategy treats the COVID-19 pandemic and the Russia–Ukraine war as overlapping but analytically separable shocks; further work could explicitly decompose the contributions of each event using counterfactual simulations or local-projection methods. Ninth, the regression results are correlational rather than causal: although the structural-break analysis supports the interpretation of February 2022 as an exogenous discontinuity, the panel regressions identify statistical associations rather than direct causal effects. Quasi-experimental designs, such as difference-in-differences with appropriate control groups, event-study specifications, or synthetic-control comparisons, could strengthen causal claims in future work. Tenth, the focus on macroeconomic indicators, though analytically sharp, sets aside broader social, political, and institutional dimensions that may also have shaped national responses. Eleventh, while the study covers 2018–2023, the long-run macroeconomic consequences of the war remain to be analysed; extension of the dataset through 2024 and beyond, as more data become available, would enable a fuller assessment of post-shock stabilisation patterns.

Despite these limitations, the systematic comparative design, the use of authoritative international datasets, the integration of multiple analytical techniques, the application of country-clustered standard errors, the frequency-aware structural-break testing, and the transparent documentation of variables and methods ensure that the findings provide a reliable empirical foundation for both the policy implications discussed above and the future research agenda outlined here.

Credit Authorship Contribution Statement

Gasimov, J.: Conceptualisation; methodology design; theoretical framework development; supervision of the regional comparative strategy; writing, review and editing; final approval of the manuscript. Babayev, F.: Data curation; macroeconomic data extraction from Eurostat and IMF databases; formal analysis of inflation dynamics; writing original draft, especially the Results section. Huseynli, I.: Methodology; panel regression and structural-break testing; statistical analysis; econometric model specification; frequency harmonisation; validation; software; visualisation of regression outputs. Khudaverdili, U.: Literature review; investigation of theoretical frameworks; writing original draft, especially the Introduction and Literature Review; reference management.

All four authors discussed the results, contributed to the final manuscript, and approved the version submitted for publication.

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Conflict of Interest

The authors declare no conflict of interest. The views and conclusions expressed in this study are solely those of the authors and do not necessarily reflect the positions of their affiliated institutions.

Use of Artificial Intelligence

During the preparation of this work, the authors used Claude (Anthropic) for language refinement and Grammarly for grammar and style checking of the English text. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of this publication. No AI tools were used to generate research ideas, design the methodology, analyse data, or draw conclusions. All figures retained in this version are exclusively data-driven visualisations produced through standard statistical software (Python's matplotlib and seaborn libraries) using the authors' compiled dataset from Eurostat, the International Monetary Fund, and the World Bank.

Data Availability Statement

The data supporting the findings of this study are publicly available from the following sources: Eurostat: https://ec.europa.eu/eurostat; International Monetary Fund (World Economic Outlook and Government Finance Statistics): https://www.imf.org/en/Data; World Bank (World Development Indicators): https://databank.worldbank.org/source/world-development-indicators; European Central Bank Data Portal: https://data.ecb.europa.eu.

The harmonised datasets used for the panel regressions, structural break tests, and correlation analyses, including the monthly panel database and frequency-harmonisation procedures, are available from the corresponding author upon reasonable request.

Ethical Approval Statement

This study is based exclusively on secondary, publicly available macroeconomic data and does not involve human participants, animal subjects, personal data, or confidential information. Consequently, ethical approval from an institutional review board or ethics committee was not required.

All data were obtained from authoritative international sources, including Eurostat, the International Monetary Fund (IMF), and the World Bank, and were used in accordance with their respective terms of use. To ensure data integrity and reliability, the authors applied consistent variable definitions and cross-validated data across sources when discrepancies arose. The exclusive use of publicly accessible databases ensures transparency and facilitates the replication of results. Documentation of data collection, harmonisation, interpolation, and analytical procedures is available from the corresponding author upon reasonable request.

References

Arellano, M., & Bover, O. (1995). Another look at the instrumental-variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Arestis, P. (2021). Macroeconomic and financial policies for sustainability and resilience. In P. Arestis & M. Sawyer (Eds.), *Economic policies for sustainability and resilience* (pp. 1–44). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-84288-8_1

Bagchi, B., & Paul, B. (2023). Effects of crude oil price shocks on stock markets and currency exchange rates in the context of Russia–Ukraine conflict: Evidence from G7 countries. *Journal of Risk and Financial Management, 16*(2), 64. https://doi.org/10.3390/jrfm16020064

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bonam, D., Ciccarelli, M., Gomes, S., Aldama, P., Bańkowski, K., Buss, G., Checherita-Westphal, C., Freier, M., Jacquinot, P., Muggenthaler, P., Nerlich, C., Rodríguez-Vives, M., & Warmedinger, T. (2024). Challenges for monetary and fiscal policy interactions in the post-pandemic era (ECB Occasional Paper No. 337). European Central Bank. https://doi.org/10.2139/ssrn.4715240

Boshkov, T., Temelkov, Z., & Zezova, A. (2017). Euroisation in the Western Balkans: The evidence for Macedonian economy. Mediterranean *Journal of Social Sciences*, *8*(2), 307–315. https://doi.org/10.5901/mjss.2017.v8n2p307

Broadstock, D. C., Wang, R., & Zhang, D. (2014). Direct and indirect oil shocks and their impacts upon energy related stocks. *Economic Systems, 38*(3), 451–467. https://doi.org/10.1016/j.ecosys.2014.02.002

Bulfone, F. (2023). Industrial policy and comparative political economy: A literature review and research agenda. *Competition & Change, 27*(1), 22–43. https://doi.org/10.1177/10245294221076225

Campos, N. F., Coricelli, F., & Franceschi, E. (2022). Institutional integration and productivity growth: Evidence from the 1995 enlargement of the European Union. *European Economic Review*, 142, 104014. https://doi.org/10.1016/j.euroecorev.2021.104014

Caselli, F., Davoodi, H., Goncalves, C., Hong, G. H., Lagerborg, A., Medas, P., Nguyen, A. D. M., & Yoo, J. (2022). The return to fiscal rules (IMF Staff Discussion Note No. 2022/002). *International Monetary Fund*. https://doi.org/10.5089/9781513576046.006

Castro, C., Jiménez-Rodríguez, R., Poncela, P., & Senra, E. (2017). A new look at oil price pass-through into inflation: Evidence from disaggregated European data. *Economia Politica, 34*(1), 55–82. https://doi.org/10.1007/s40888-016-0048-9

Cevik, S., & Jalles, J. T. (2024). Eye of the storm: The impact of climate shocks on inflation and growth. *Review of Economics*, *75*(2), 109–138. https://doi.org/10.1515/roe-2024-0005

Chandia, K. E., Iqbal, M. B., & Bahadur, W. (2022). An analysis of the linkages among fiscal vulnerability, financial stress and macroeconomic policies: An econometric study. *Fulbright Review of Economics and Policy, 2*(1), 35–60. https://doi.org/10.1108/FREP-06-2021-0036

Ćosović, M. (2020). The impact of debt on economic development of the Western Balkan countries. *Economic Themes*, *58*(3), 363–379. https://doi.org/10.2478/ethemes-2020-0021

Despotović, L., Ćetković, S., & Krstić, M. (2023). External debt and economic growth in Western Balkans: A panel data analysis. BizInfo (Blace*) Journal of Economics, Management and Informatics*, *14*(2), 39–48. https://doi.org/10.5937/bizinfo2302039D

Dokas, I., Oikonomou, G., Panagiotidis, M., & Spyromitros, E. (2023). Macroeconomic and uncertainty shocks' effects on energy prices: A comprehensive literature review. *Energies*, *16*(3), 1491. https://doi.org/10.3390/en16031491

Enescu, A.-G., & Szeles, M. R. (2023). Discussing energy volatility and policy in the aftermath of the Russia–Ukraine conflict. *Frontiers in Environmental Science,* 11, 1225753. https://doi.org/10.3389/fenvs.2023.1225753

Fasone, C., & Lupo, N. (2024). Learning from the euro crisis: A new method of government for the European Union's economic policy coordination after the pandemic. *International Journal of Constitutional Law, 22*(3), 882–904. https://doi.org/10.1093/icon/moae064

González Mínguez, J. M., Pacce, M., & del Río, A. (2023). The pass-through of energy prices to the components of core inflation in the euro area, Banco de España Working Paper No. 2331. Banco de España. https://doi.org/10.53479/35124

Greener, I., & Powell, M. (2024). Historical institutionalism and social policy. In K. Petersen & J. F. Petersen (Eds.), Handbook on the political economy of social policy (pp. 14–24). Edward Elgar Publishing. https://doi.org/10.4337/9781035306497.00007

Kadia, J. (2020). The relationship between public debt and economic growth in Balkan countries. European *Journal of Economics and Business Studies,* *6*(1), 28–40. https://doi.org/10.26417/116atq79f

Kadić, A., Aidoo, A. W., & Riđić, O. (2022). The determinants of currency euroization in the Balkans. Economic Review: *Journal of Economics and Business,* *20*(2), 41–52. https://doi.org/10.51558/2303-680X.2022.20.2.41

Kikoni, E., Madžarević-Šujster, S., Sahay, S., Saka, O., & Sanfey, P. (2019). Fiscal rules for the Western Balkans, *World Bank Policy Research Working Paper* No. 8990. World Bank. https://doi.org/10.1596/1813-9450-8990

Király, J., Csontó, B., Jankovics, L., & Mérő, K. (2022). Monetary, macroprudential and fiscal policy. In L. Mátyás (Ed.), Emerging European economies after the pandemic (pp. 121–151). Springer. https://doi.org/10.1007/978-3-030-93963-2_3

Kisin, J., Šuminas, A., & Stefanovski, S. (2020). The implications of the public debt for the economies of the Western Balkans during the COVID-19 pandemic. Poslovna Ekonomija, 14(2), 1–14. https://doi.org/10.5937/poseko18-2954

Knez, S., Štrbac, S., & Podbregar, I. (2022). Climate change in the Western Balkans and EU Green Deal: Status, mitigation and challenges. *Energy, Sustainability and Society*, 12, Article 1. https://doi.org/10.1186/s13705-021-00328-y

Kraemer, R., & Lehtimäki, J. (2023). Government debt: The impact of fiscal rules at the European and national level. *Empirica*, 50(3), 783–805. https://doi.org/10.1007/s10663-023-09582-z

Krstevska, A. (2018). Real convergence of Western Balkan countries to European Union in view of macroeconomic policy mix. *Journal of Central Banking Theory and Practice*, 7(2), 187–202. https://doi.org/10.2478/jcbtp-2018-0018

Kuzemko, C., Blondeel, M., Dupont, C., & Brisbois, M. (2022). Russia's war on Ukraine, European energy policy responses & implications for sustainable transformations. *Energy Research & Social Science*, 90, 102842. https://doi.org/10.1016/j.erss.2022.102842

Leuffen, D., Rittberger, B., & Schimmelfennig, F. (2022). Integration and differentiation in the European Union: Theory and policies (2nd Edition). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-76677-1

Lipińska, A., García-Cicco, J., & Schwartzman, F. (2025). Pandemic and war inflation: Lessons from the international experience Finance and Economics Discussion Series No. 2025-071. *Board of Governors of the Federal Reserve System*. https://doi.org/10.17016/FEDS.2025.071

Markowski, Ł., & Kotliński, K. (2023). The energy mix of the EU countries and inflation rates in 2022. *Energies*, *16*(13), 5202. https://doi.org/10.3390/en16135202

Mohácsi, R. M. P. N. (2024). Fighting inflation within the monetary union and outside: The case of the Visegrad 4. *Financial and Economic Review*, *23*(4), 102–131. https://doi.org/10.33893/FER.23.4.102

Radonjić, O., Bodroža, D., & Đukić, M. (2020). The structural causes of public debt growth in Western Balkan countries: A dynamic panel data analysis. *Revija za Socijalnu Politiku*, *27*(2), 137–158. https://doi.org/10.3935/rsp.v27i2.1668

Radosavljević, G., & Tomov, V. (2018). Currency risk of public debt in Serbia: Current status and European lessons. *Industrija*, *46*(3), 71–91. https://doi.org/10.5937/industrija46-15840

Rahman, M. M., & Rayhan, M. A. (2023). Chow test and Bai–Perron test on the inflation in South and Southeast Asian countries: Investigating the war in Ukraine and the COVID-19 pandemic. *Dhaka University Journal of Science*, *71*(2), 121–129. https://doi.org/10.3329/dujs.v71i2.71273

Ranđelović, S. (2023). Sustainability of fiscal framework and economic growth in Serbia. *Ekonomika preduzeća*, *71*(1–2), 101–112. https://doi.org/10.5937/EKOPRE2302101R

Shevchuk, V. (2022). Estimating exchange-rate exposure of macroeconomic variables in Central and Eastern European countries: A Kalman-filter approach. *Quantitative Methods in Economics*, *23*(2), 79–93. https://doi.org/10.22630/MIBE.2022.23.2.7

Slavov, S. T. (2017). Exchange rate regimes in Central, Eastern and South-Eastern Europe: A euro bloc and a dollar bloc? IMF Working Paper No. 17/83. *International Monetary Fund*. https://doi.org/10.5089/9781475591217.001

Szyszko, M., Rutkowska, A., & Motuzka, O. (2025). Inflation expectations proprieties during the war: The case of Ukraine. *Economics and Business Review, 11*(1), 108–132. https://doi.org/10.18559/ebr.2025.1.1813

Zimková, E., Pinter, Ľ., & Tkáčová, A. (2023). EU countries and the inflation crisis caused by the COVID-19 pandemic and the Russia–Ukraine war. Acta *Aerarii Publici*, *20*(2), 27–47. https://doi.org/10.31262/1336-8818/2023/20/2/27-47