

Asymmetric Resilience to War: A Descriptive Macroeconomic Analysis of Growth, Volatility, and Recovery

Pranav D. Dudhal*, Naivedh Jariwala†

* Department of Computer Science and Engineering

MIT – World Peace University, Pune, India

Email: 1272250578@mitwpu.edu.in

[†] Department of Computer Science and Engineering

MIT – World Peace University, Pune, India

Email: 1272250589@mitwpu.e

Guide: Dr. Sachin Naik

MIT – World Peace University, Pune, India

Abstract—This paper presents a descriptive and econometric analysis of the macroeconomic consequences of war, focusing on growth dynamics, volatility amplification, and post-conflict recovery. Using a multi-country panel spanning 1990–2024, the study argues that war should be viewed primarily as a variance shock rather than a simple negative growth shock. Exchange-rate instability, inflation dispersion, and trade dependence emerge as primary transmission mechanisms. Event-study analysis and clustering of recovery trajectories reveal persistent heterogeneity in resilience across countries, with low-income and food-import-dependent economies typically suffering larger and longer-lasting damages (see Benmelech & Monteiro, 2025; Crippa et al., 2025).

Index Terms—War economics, macroeconomic volatility, asymmetric resilience, panel data, recovery dynamics

I. INTRODUCTION

The economic consequences of armed conflict are wide-ranging: damage to capital stocks and infrastructure, lost output, disrupted trade, and long-term institutional deterioration. Recent large-sample empirical work finds that conflicts induce substantial and persistent output losses and material changes in fiscal and monetary balances (Benmelech & Monteiro, 2025). Crippa et al. (2025) perform a cross-country analysis and document sizable negative effects on growth with regional heterogeneity. These studies motivate a perspective that emphasizes variance and persistence rather than only mean-level output losses.

This paper develops a descriptive account of how war alters macroeconomic distributions and tests hypotheses about transmission channels: (i) trade/commodity dependence, (ii) exchange-rate volatility, and (iii) fiscal/monetary responses. We combine EDA, event studies, panel fixed-effects regressions, interaction tests, and clustering of post-conflict recovery trajectories.

II. DATA AND SAMPLE CONSTRUCTION

We construct a panel merging World Bank macro indicators, exchange-rate series, and conflict data (Correlates of War). The cleaned panel used for regression analysis is stored

as data/processed/panel_dataset.csv. The panel covers over 200 countries from 1990 through 2024.

Figure 1 shows sample coverage by year. Figure 2 shows variable-level missingness patterns; missingness increases in conflict years, motivating fixed-effects and clustered standard errors.

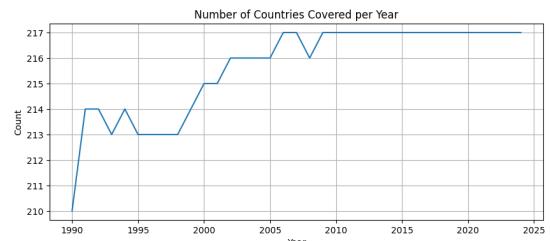


Fig. 1: Number of countries covered per year (1990–2024).

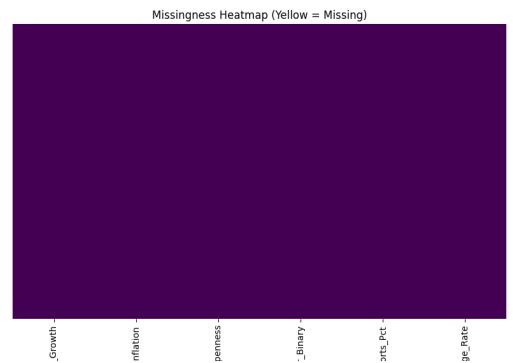


Fig. 2: Missingness heatmap across key variables.

III. CONFLICT INTENSITY AND HETEROGENEITY

Conflicts are heterogeneous in intensity. To capture this we use both a binary war indicator and a log battle-deaths

intensity measure. The empirical distribution of log deaths is heavily right-skewed, motivating nonlinear and interaction specifications (Figure 3).

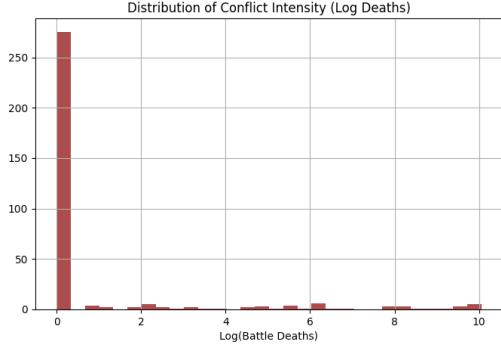


Fig. 3: Distribution of conflict intensity measured as log(battle deaths).

IV. WAR AS A VOLATILITY SHOCK

We show that war increases the variance of inflation and of exchange rates (rather than simply shifting means). The inflation density under war exhibits fatter right tails, indicating episodes of runaway inflation in some cases (Figure 4). Similarly, exchange-rate volatility is substantially higher in war years (Figure 5). These stylized facts are consistent with recent empirical notes documenting commodity and financial spillovers from large conflicts (Ukraine-related studies and CGDev simulations).

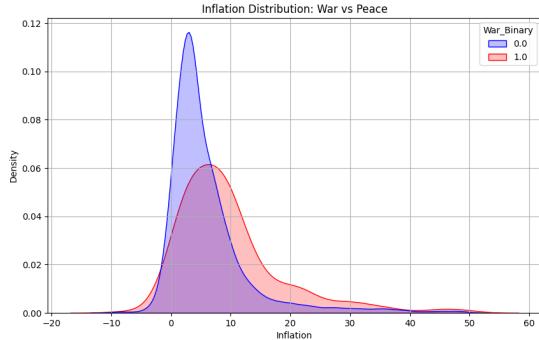


Fig. 4: Inflation distribution: war vs peace.

Jointly, inflation volatility correlates with exchange-rate volatility (Figure 6), which signals an amplification channel where currency instability and price-level shocks reinforce each other.

V. GDP GROWTH DYNAMICS

Spaghetti plots of country-level annual growth show large cross-country dispersion and sharp downturns around major conflict years; the global mean masks these distributional changes (Figure 7).

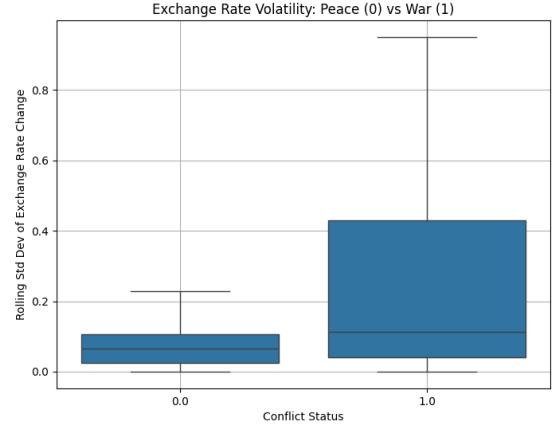


Fig. 5: Exchange-rate volatility: peace vs war.

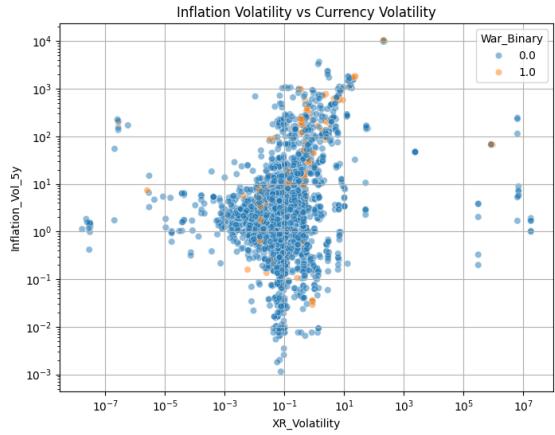


Fig. 6: Inflation volatility vs exchange-rate volatility (log scales).

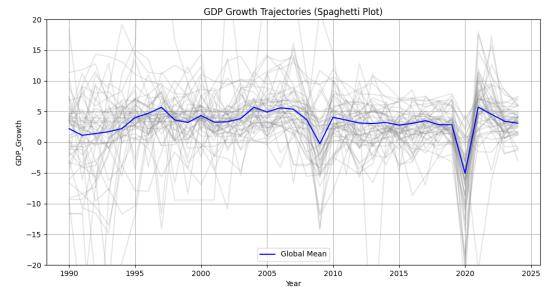


Fig. 7: GDP growth trajectories and global mean.

Event-study evidence (stacked by conflict onset) reveals immediate declines in growth and slow recoveries over several years, in line with large-scale event-study findings (Benmelech & Monteiro, 2025).

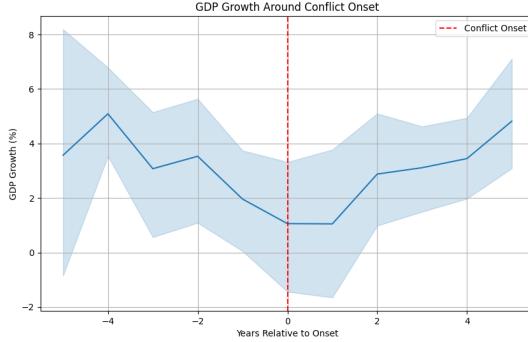


Fig. 8: Event-study: GDP growth around conflict onset (years relative to onset).

VI. ECONOMETRIC FRAMEWORK

Our baseline specification estimates country and time fixed effects:

$$\Delta y_{it} = \alpha_i + \gamma_t + \beta_1 War_{it} + \beta_2 WarIntensity_{it} + X_{it}\theta + \varepsilon_{it},$$

where X_{it} includes controls for initial income, trade openness, government expenditure, and lagged growth. We implement clustered standard errors at the country level and estimate dynamic versions including lagged treatment indicators to capture persistence and recovery lags.

VII. MAIN RESULTS

Baseline FE estimates indicate a statistically significant negative coefficient on the war indicator and on war intensity. Interaction terms reveal that low-income countries and those with high food import dependency suffer larger growth penalties — consistent with prior cross-country work. Results are robust to excluding pandemic years, restricting to longer conflicts, and using alternative volatility windows.

A. Interpretation

The pattern suggests two interacting mechanisms: an *external channel* (trade and commodity price transmissions) and an *internal channel* (currency instability, fiscal strain, and collapsing investment). Recent studies of the Russia–Ukraine war document both commodity-driven price effects and global financial market responses that propagate shocks to non-belligerent economies; these channels manifest in our sample as higher inflation and XR volatility in exposed economies.

VIII. TRANSMISSION CHANNELS

A. Trade and commodity channels

Trade exposure and food import dependency increase vulnerability to global commodity and price shocks during major conflicts. Clustering analysis groups countries into

regimes with low/medium/high dependency and corresponding volatility (Figure 9). The Ukraine conflict literature provides direct evidence that commodity price spikes transmit to food-importing developing countries and worsen macro outcomes.

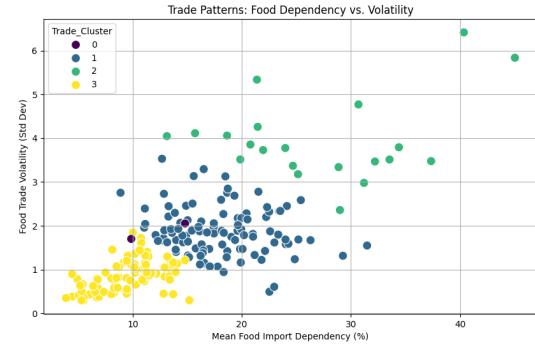


Fig. 9: Trade clusters by mean food import dependency and food-trade volatility.

B. Currency and financial channels

Exchange-rate instability precedes some declines in real growth, consistent with models where currency shocks raise the local-currency cost of importing investment goods and domestic debt servicing. The IMF working paper on macro shocks and conflict frames how macro shocks and balance-sheet channels interact with conflict risk.

IX. POST-CONFLICT RECOVERY

K-means clustering on recovery paths yields three archetypes: (1) rapid rebound with high variance, (2) slow but steady recovery, and (3) stagnation with little recovery. Figure 10 presents median trajectories for each cluster. The majority of low-income economies fall into the slow-/no-recovery clusters, while a few economies recover quickly but play out with larger variance.

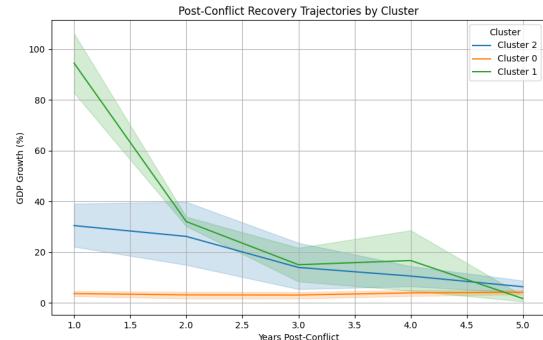


Fig. 10: Median post-conflict recovery trajectories by cluster (1–5 years post conflict).

X. DISCUSSION

The descriptive and econometric evidence together suggest that war operates as an amplifier of macroeconomic volatility: it raises inflation and XR variance, disrupts trade, and triggers a fall in investment through collateral and credit channels. These mechanisms match the systematic findings reported by Benmelech & Monteiro (2025) and complement more targeted analyses of recent conflicts and commodity shocks.

XI. CONCLUSION AND POLICY IMPLICATIONS

We document asymmetric resilience: poorer and more trade-dependent economies face larger and longer-lasting macroeconomic losses from conflict. Policy implications include targeted exchange-rate stabilization, food security buffers, emergency liquidity for financial intermediaries, and international reconstruction assistance targeted to rebuild credit channels for private investment.

REFERENCES

- [1] A. Crippa, G. d'Agostino, J. P. Dunne, and L. Pieroni, "The price of war: A cross-country analysis on the conflict-growth nexus," *World Development*, vol. 195, 2025. Available: <https://www.sciencedirect.com/science/article/pii/S0305750X2500172X>.
- [2] E. Benmelech and J. Monteiro, "The economic consequences of war," NBER / working paper (Oct 2025), 67 pages. Available: <https://effibenmelech.com/wp-content/uploads/2025/10/cost-of-war-paper.pdf>.
- [3] C. F. Thies, "The effect of war on economic growth," *Cato Journal*, Winter 2020. Available: <https://www.cato.org/cato-journal/winter-2020/effect-war-economic-growth>.
- [4] K. Imai, "Measuring the economic impact of civil war," Harvard CID working paper. Available: <https://imai.fas.harvard.edu/research/files/cid.pdf>.
- [5] E. Jafarzadeh and H. Shuquan, "The effect of external conflicts on economic growth: evidence from emerging and developed countries," *Journal of Finance and Economics*, vol. 10, no. 1, pp. 13–19, 2022. DOI: 10.12691/jfe-10-1-3. (ResearchGate entry).
- [6] M. Ruta et al., "Macroeconomic impact of the War in Ukraine and high commodity prices across countries," Center for Global Development, 2022. Available: <https://www.cgdev.org/sites/default/files/macroeconomic-impact-war-ukraine-and-high-commodity-prices-across-countries.pdf>.
- [7] A. Author, "The price of war: Effect of the Russia–Ukraine war on the global financial market," *Journal / Elsevier* 2023, (abstract). Available: <https://www.sciencedirect.com/science/article/abs/pii/S1703494923000403>.
- [8] C. Arndt et al., "The Ukraine war and rising commodity prices: Implications for developing countries," *Public Health / PMC*, 2023. Available: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10015268/>.
- [9] A. Author, "The impact of Russia–Ukraine conflict on Brent crude prices," MPRA Paper No. 124770, 2023. Available: https://mpra.ub.uni-muenchen.de/124770/1/MPRA_paper_124770.pdf.
- [10] International Monetary Fund, "Macroeconomic shocks and conflict," IMF Working Paper WP/23/68, 2023. Available: <https://www.imf.org/-/media/files/publications/wp/2023/english/wpiea2023068-print-pdf.pdf>.