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Assessing Impact of the Russia–Ukraine War on Germany's Economic Growth

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This paper quantifies the impact of the Russia–Ukraine war on Germany's economic growth using time-series regression analysis for the period 1996–2025. Controlling for eurozone-wide economic conditions, the results indicate that the war has reduced Germany's annual GDP growth by approximately 1.5 to 1.6 percentage points since 2022. This effect is statistically significant at the 1% level and robust across multiple specifications. The magnitude of this impact makes the war the fourth most severe negative shock to Germany's economy in the post-reunification period, after the 2009 Great Recession, the 2020 COVID-19 pandemic, and the 1992–1993 Exchange Rate Mechanism crisis. The findings highlight Germany's particular vulnerability and suggest that the war represents a substantial structural break in the country's growth trajectory. These results have important implications for understanding the economic costs of geopolitical conflicts and for designing appropriate policy responses.

Keywords: *Russia–Ukraine war, economic growth, Germany, eurozone, structural shock, GDP impact, regression analysis, geopolitical risk, macroeconomic effects*

Introduction

The Russia–Ukraine war, which escalated dramatically with Russia's full-scale invasion in February 2022, represents one of the most significant geopolitical and economic shocks to Europe since the end of the Cold War. Beyond its devastating humanitarian consequences, the conflict has triggered profound disruptions to energy markets, commodity supplies, and trade networks across the continent. Among European economies, Germany has emerged as particularly vulnerable to these disruptions. As Europe's largest economy and industrial powerhouse, Germany's heavy reliance on Russian energy imports and its deeply integrated manufacturing sector have exposed it to substantial economic headwinds. Understanding the magnitude and persistence of these effects is crucial not only for assessing Germany's economic trajectory but also for informing policy responses aimed at mitigating the war's ongoing impact.

This paper contributes to the growing literature on the macroeconomic consequences of the Russia–Ukraine war by providing quantitative evidence on its specific impact on Germany's economic growth.[1] While existing studies have largely focused on energy price volatility, trade disruptions, or broad cross-country comparisons across Europe, this analysis adopts a more targeted approach by

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[1]For related analyses of the Russia–Ukraine war, see Papanikos (2022a, 2022b, 2022c, 2022d, 2024a).

isolating a Germany-specific growth effect. By controlling for eurozone-wide economic conditions, the study seeks to identify the extent to which Germany's post-2021 growth slowdown reflects factors unique to the German economy rather than generalized regional weakness. The central research question is straightforward yet consequential: What is the measurable impact of the Russia–Ukraine war on Germany's GDP growth, after accounting for broader macroeconomic trends in the eurozone?

The significance of this inquiry extends beyond academic interest. Germany's economic performance has far-reaching implications for the stability and prosperity of the European Union as a whole. As the anchor economy of the eurozone, Germany's growth dynamics influence fiscal policy coordination, monetary policy effectiveness, and the economic fortunes of smaller member states with which it maintains dense trade relationships. Moreover, Germany's response to the war—including its accelerated energy transition away from Russian fossil fuels, increased defense spending, and support for Ukraine—has required substantial fiscal resources and structural adjustments that may reshape its economy for years to come.[2] Quantifying the war's growth impact provides policymakers with essential information for calibrating these responses and for evaluating whether current policy measures are sufficient to offset the shock.

The theoretical framework underlying this study draws on the extensive literature examining how armed conflicts affect economic growth. Wars constitute extreme shocks to national economic systems, disrupting physical and human capital, production capacity, trade flows, and institutional structures (Papanikos, 2000). The mechanisms through which conflicts influence growth are well documented: destruction of productive assets, diversion of resources to military purposes, heightened macroeconomic uncertainty that deters investment, disruption of supply chains and external economic relations, and the opportunity cost of foregone civilian investment. While most theoretical models predict negative long-run effects, the magnitude and persistence of these effects depend critically on factors such as whether the conflict is fought on domestic territory, its duration, the intensity of destruction, and the resilience of pre-existing economic structures.

The Russia–Ukraine war, though fought outside German territory, has nonetheless transmitted powerful economic shocks to Germany through several channels. Most prominently, Germany's industrial model—built on energy-intensive manufacturing sectors such as chemicals, steel, and automotive production—made it exceptionally dependent on affordable Russian natural gas. The abrupt disruption of these energy flows, combined with soaring global energy prices, imposed a severe terms-of-trade shock on the German economy.[3] Simultaneously, supply chain disruptions affecting key inputs and components, heightened geopolitical uncertainty dampening business investment, and the inflationary pressures that prompted monetary tightening across

[2]In one of my early papers on the Russia–Ukraine war (Papanikos, 2022a), I speculated that the Russian invasion was prompted by the United States in order to eliminate Germany's dependence on Russia. It appears that this objective has been achieved, and, in that sense, the war has ended, as I argued in Papanikos (2024a).

[3]According to the Global Price of Energy Index reported by the Federal Reserve Bank of St. Louis, the price of energy increased by 64%. However, in 2021, the energy index doubled.

Europe have all contributed to a challenging economic environment. These factors suggest that the war represents not merely a temporary disruption but potentially a structural break in Germany's post-reunification growth trajectory.

Empirically assessing this proposition requires careful econometric modeling capable of distinguishing war-specific effects from other concurrent influences on German economic growth. The methodological approach adopted in this paper employs a time-series regression framework covering the period for which data are available, from 1996 to 2025, supplemented by European Commission forecasts extending to 2027. The model incorporates two key explanatory variables: euro area GDP growth (excluding Germany), which serves as a control for regional economic conditions, and a binary dummy variable capturing the war period beginning in 2022. This specification allows the analysis to isolate the portion of variation in Germany's growth that can be attributed specifically to the war, rather than to synchronized business cycles or common shocks affecting all euro area economies. The use of heteroskedasticity- and autocorrelation-consistent (HAC) standard errors ensures that statistical inference remains valid despite potential time-series complications.

The empirical strategy draws on descriptive evidence of Germany's economic performance from 1992 to 2027. GDP growth showed notable fluctuations, with expansions interrupted by sharp contractions during major crises, most notably the 2009 global recession and the 2020 COVID-19 pandemic.[4] Average annual growth was about 1.2%, though volatility and extreme negative shocks were significant. The outbreak of the war on 24 February 2022 triggered a pronounced slowdown persisting into 2024, the fourth most severe in Germany's post-reunification history, suggesting a discrete structural shock warranting formal econometric analysis.

The structure of this paper proceeds as follows. The next section provides a brief review of the theoretical and empirical literature on war and economic growth, drawing on both historical analyses of major conflicts and recent studies specifically addressing the Russia–Ukraine war. This review establishes the conceptual foundation for understanding how armed conflicts transmit economic effects and contextualizes Germany's experience within broader patterns documented in the literature. The subsequent section presents detailed descriptive evidence on Germany's economic growth from 1992 to 2027, including summary statistics, distributional characteristics, and a discussion of major shocks that have shaped growth dynamics over this period. The core analytical section then develops and estimates the regression model designed to quantify the war's impact on German growth, presenting results across multiple specifications and conducting robustness checks. The final section offers concluding remarks, discusses policy implications, and identifies directions for future research.

Literature Review: The Impact of War on Economic Growth

The impact of war on economic growth has long been a central concern in macroeconomics. Wars constitute extreme shocks to national economic systems,

[4]The impact of COVID-19 has been examined by numerous studies; see, among others, Bäckman (2021), Boutsioli, Bigelow, and Gkounta (2022a, 2022b), Jones (2022), Jones and Comfort (2020), Papanikos (2020b, 2020c, 2022f), and Reid (2022).

affecting physical and human capital, production capacity, and institutional structures. Understanding how these disruptions propagate through economic aggregates—such as GDP, investment, and trade—is essential for both economic theory and policy. A substantial literature has examined the effects of war using theoretical models and empirical analyses, with findings differing according to the type of conflict, its duration, and the prevailing economic context. Previous work has reviewed much of this literature (Papanikos, 2020) and has further analyzed the effects of the two world wars on per capita GDP (Papanikos, 2026) as well as on human losses (Papanikos, 2025a). This brief literature review draws primarily on these contributions, particularly Chapters 2 and 3 of Papanikos (2020), as well as more recent studies addressing the Russian–Ukrainian war.

At its core, theoretical analysis of wars focuses on the mechanisms by which armed conflict can alter growth dynamics: War destroys physical capital — factories, infrastructure, and technology — reducing productive capacity and lowering output. Human capital is depleted through casualties, emigration, and disruption of education and health services. Resources are diverted to military production and defense at the expense of consumption and investment in growth-enhancing sectors. The opportunity cost of war includes foregone civilian investment and lost output that could have been achieved in peace. War increases macroeconomic uncertainty, deterring private investment and reducing risk appetite. Governments may adopt inflationary financing or distort fiscal policy to support military spending.

Wars often disrupt trade flows, supply chains, and external economic relations, reducing export and import opportunities. These channels find formal expression in extensions to standard growth models. For example, recent work on war and growth (Filipowicz et al. 2025) uses an extended neoclassical (Solow) framework to incorporate war-induced shocks to capital accumulation and productivity, illustrating theoretically how conflicts can reduce long-run growth paths by lowering investment incentives and increasing depreciation of productive assets.

Although most growth theory anticipates a negative effect of war due to destruction and heightened uncertainty, some frameworks emphasize short-term "military Keynesianism" or demand stimulation through wartime production. Increased government expenditure can temporarily raise output, and labor may be reallocated from non-market or leisure activities into war-related production (Thies & Baum, 2020). This appears to have been the case in Russia, as shown in Papanikos (2025b).

Despite these potential short-term effects, most long-run theoretical models predict that sustained growth suffers because wars crowd out productive investment and accumulate inefficiencies in the economy. Empirical research on war's impacts is diverse, covering cross-country analyses, conflict-specific case studies, and panel data approaches. Several broad empirical studies examine war's impact across countries and historical periods.

A large body of literature finds that wars, especially those fought on a country's own territory, tend to reduce GDP per capita relative to synthetic or counterfactual scenarios where war did not occur. Inter-state wars have smaller effects than wars fought on territory; civil wars are often more destructive and persistent (Papanikos, 2020, 2026).

Cross-country analyses that account for both short-run and long-run effects generally conclude that conflict is associated with negative growth outcomes for most countries, particularly lower-income nations and those reliant on physical capital accumulation (Crippa et al., 2025).

Interstate wars fought primarily outside national borders may show smaller GDP impacts, and in rare cases output may even grow through wartime stimulus if domestic industries are absorbed into war production.[5] However, when war directly affects infrastructure and human capital within a country, losses tend to be substantial and persistent. The severity and duration of conflict interact strongly with economic outcomes. Prolonged wars, characterized by chronic uncertainty and repeated disruption, exhibit larger and more persistent declines in growth compared with brief conflicts, where reconstruction and recovery are relatively swift (Papanikos, 2020).

The full-scale Russian invasion of Ukraine in February 2022 constitutes a major contemporary conflict with significant economic repercussions. Empirical assessments indicate that the war has acted as a negative supply and demand shock to the global economy, contributing to slower GDP growth, elevated inflation, and persistent uncertainty (International Monetary Fund [IMF], 2022, 2023a, 2023b). The OECD reported that war-related disruptions substantially slowed global growth forecasts for 2022 and 2023, as energy prices surged and trade disruptions rippled across markets (Jenkins, 2023). Higher energy and commodity prices linked to the war's supply shocks have dampened consumption and investment growth in many countries. Disruptions to agricultural and manufactured exports have also contributed to weaker GDP growth.

According to the IMF's *World Economic Outlook* (2022), euro area GDP growth for 2022 was revised down to approximately 2.8%, about 1.1 percentage points lower than pre-war forecasts, with the conflict cited as a major contributor to the downgrade. The war triggered sharp energy price shocks and disrupted commodity markets, reducing real incomes and dampening both consumption and investment.

Germany, owing to its energy-intensive industries and reliance on Russian energy imports, experienced even weaker growth. IMF projections indicated minimal growth of around 0.1% in 2023. The IMF's 2023 outlook emphasized that lingering inflationary pressures, tighter financial conditions, and persistent uncertainty stemming from the war continued to weigh on growth in both the euro area and Germany, keeping output below pre-war potential. Overall, IMF assessments underscore that the war has acted as a significant structural shock to the region, slowing the recovery from the post-pandemic downturn and highlighting the vulnerability of energy-dependent economies to geopolitical disruptions.

The next section examines in greater detail the trajectory of Germany's economic growth from 1992 to 2027 using European Commission GDP data as reported in the AMECO database.

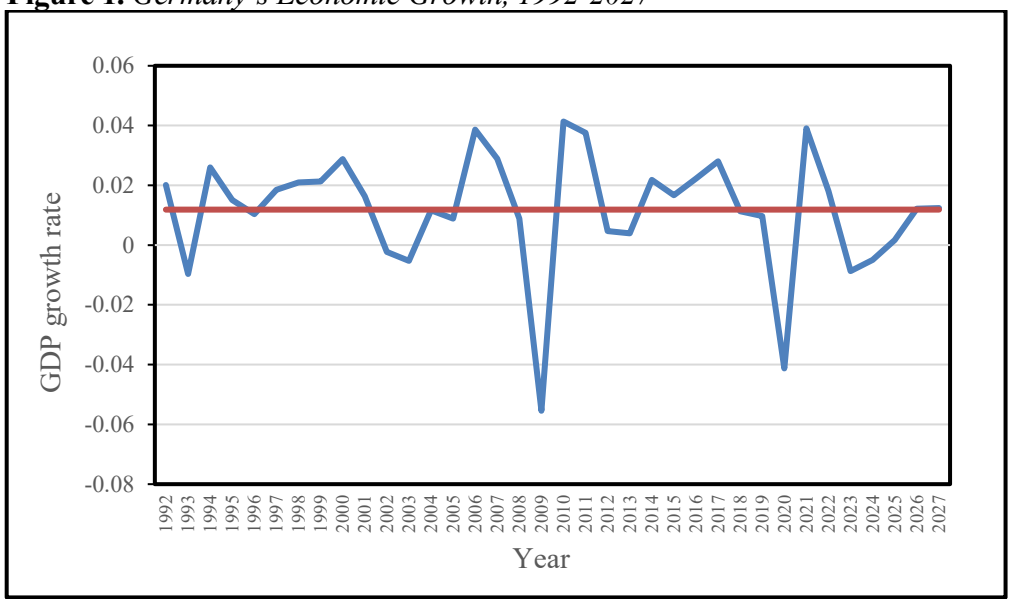
[5]Although this issue is not examined in the present paper, it has been discussed in my previous work on the Russia–Ukraine war. In particular, those studies suggest that Germany's economy has undergone a reallocation of resources toward military production in response to heightened security risks associated with Russian actions (Papanikos, 2024a).

Germany's Economic Growth, 1992-2027

Data from Eurostat on Germany's GDP in constant euros are available from 1991, with projections extending through 2027. This section seeks to outline the stylized facts of Germany's growth over a period shaped by a number of severe global, continental, and national shocks, both natural and man-made. During this time, Germany faced two major global crises—the Great Recession and the COVID-19 pandemic—as well as significant continental structural shocks, including (a) reunification, (b) the introduction of a new currency, and (c) the Russia–Ukraine war.

Economic growth is defined as the annual change in constant GDP. Figure 1 illustrates the evolution of Germany's GDP growth from 1992 to 2027. Figure 2 presents the annual growth rates for the full period (1992–2027) arranged in ascending order. Table 1 reports summary statistics for the period 1992–2025. The remainder of this section provides a more detailed discussion of these data and statistics.

Figure 1. *Germany's Economic Growth, 1992-2027*



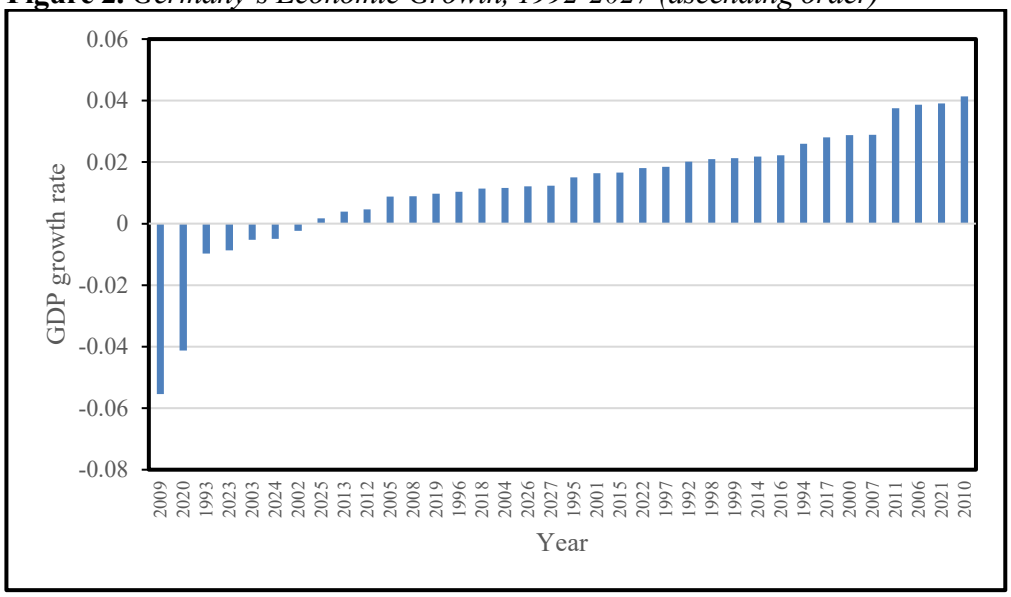
Source: European Commission (AMECO) and author's calculations

Figure 1 illustrates Germany's annual GDP growth from 1992 to 2027. The economy experienced notable fluctuations over this period, with sustained positive growth interrupted by sharp contractions during major crises. The most pronounced declines occurred in 2009, reflecting the Great Recession, and in 2020, corresponding to the COVID-19 pandemic. Peaks in growth, particularly in the late 2000s and early 2010s, reflect periods of rapid expansion and post-crisis recovery. The red horizontal line indicates the long-term average growth rate, approximately 1.2%, around which GDP growth typically oscillates. Projected growth from 2026 to 2027 suggests a return to modest positive growth, indicating stabilization following recent shocks, including the Russia–Ukraine war. Overall, the figure highlights the cyclicality of Germany's economic performance and its resilience in the face of global and domestic shocks.

Figure 2 shows Germany's economic growth, 1992–2027, in ascending order. The lowest growth rates occur in 2009 (-5.54%) and 2020 (-4.13%), corresponding

to the Great Recession and the COVID-19 pandemic, respectively. These two years clearly represent outliers, heavily influencing the distribution of growth rates. Their exclusion, as in Table 1, significantly raises the mean growth and reduces volatility.

Figure 2. *Germany's Economic Growth, 1992-2027 (ascending order)*



The majority of annual growth rates are positive, ranging from modest growth (e.g., 2002: 0.23%) to moderate growth (≈2–3% in 1994, 1997, 2000, and 2007). This demonstrates that Germany's economic performance has been predominantly expansionary over the past three decades, interrupted only by rare but severe contractions. Many observations cluster around 1–3% growth (e.g., 1996, 2001, 2015–2017, 2022), indicating a degree of economic stability during non-crisis years, which is consistent with Germany's mature and diversified economy.

The highest growth rates are observed in 2010 (4.13%), 2021 (3.91%), and 2006 (3.87%), reflecting strong recovery phases after recessions or periods of robust economic performance. This suggests that while the economy is vulnerable to shocks, it also exhibits significant resilience.

The extreme negative years create left skewness, while the positive outliers contribute to a leptokurtic distribution. This asymmetry and peakedness emphasize the importance of using robust statistical methods or trimming outliers when modeling German economic growth. The presence of severe but infrequent negative shocks highlights the need for policy buffers—fiscal or monetary—to stabilize growth during crises.[6] Meanwhile, the clustering of moderate positive growth suggests that Germany's long-term economic policy framework has generally maintained stability.

It is evident that negative extremes are sporadic rather than clustered in one era. This indicates that Germany's growth dynamics are influenced more by episodic

[6]The European Union implemented a large-scale recovery plan in response to the economic disruption caused by the COVID-19 pandemic, aimed at supporting growth, employment, and structural transformation across member states (Papanikos, 2021).

global or domestic shocks than by consistent long-term decline or acceleration. For econometric modeling, the extreme values in 2009 and 2020 necessitate careful consideration. Models assuming normality may be biased if these years are included, reinforcing the rationale for robustness checks or alternative modeling techniques.

Table 1 summarizes Germany's economic growth over the period 1992–2025, comparing the full dataset to a version that excludes 2009 and 2020 due to economic shocks in those years, e.g., the Great Recession and the COVID-19 pandemic. For the full period, the mean annual growth was 0.0119 (≈1.19%). Excluding the two crisis years increases the mean growth rate to 0.0156 (≈1.56%), indicating that these years had a significant negative impact on Germany's average growth. This is consistent with the fact that both years involved severe economic contractions.

Table 1. *Summary Statistics of Germany's Economic Growth*

Period **Statistic**	**Baseline 1992-2025**	**Trimmed 1992-2025** (2009 & 2020 are excluded)
Mean	0.0119	0.0156
Maximum	0.0413	0.0413
Minimum	-0.0554	-0.0097
Standard deviation	0.0205	0.014
Skewness	-1.369	0.007
Kurtosis	5.58	2.319
Jarque-Bera (probability)	20.12 (0.0000)	0.62 (0.7343)
Observations	34	32

The maximum growth is 4.13% in both cases, suggesting that the peak growth year is unaffected by excluding 2009 and 2020. The minimum growth is -5.54% for the full period versus -0.97% when excluding the crisis years. The large negative minimum in the full period is clearly driven by these crisis years. Removing these extreme negative values reduces the lowest point to a much milder contraction, highlighting the outlier effect of crises.

The standard deviation of growth is 0.0205 for the full period and 0.014 when excluding crises. Volatility is noticeably reduced when the two extreme years are removed, reinforcing that 2009 and 2020 were outliers that contributed to higher variability in growth rates.

The negative skew in the full period (-1.369, left-skewed) is consistent with large negative shocks. Once these years are removed, the distribution of growth rates becomes nearly symmetric (0.007). Similarly, high kurtosis in the full sample (5.58, leptokurtic) indicates extreme events affecting the distribution. Excluding the outlier years brings the kurtosis closer to 3 (2.319), reducing the impact of extreme growth deviations.

The full period significantly deviates from normality due to skewness and heavy tails, as confirmed by the Jarque-Bera test (20.12, $p = 0.0000$, reject normality). Excluding the crisis years makes the data statistically indistinguishable from a normal distribution (Jarque-Bera = 0.62, $p = 0.7343$, do not reject normality).

Summarizing the evidence reported in Table 1, Germany's economic growth over 1992–2025 is heavily influenced by extreme negative events, notably 2009 and 2020. Removing these crisis years smooths the data: the mean growth rises, volatility decreases, skewness and kurtosis normalize, and the distribution becomes approximately normal. Table 1 highlights the importance of accounting for outliers when analyzing economic growth, especially when using statistical models that assume normality.

In the next section, a simple economic growth model is used to assess the impact of the Russia-Ukraine war on Germany's economic growth.

Measuring the Impact of the Russia–Ukraine War on Germany's Economic Growth

The descriptive evidence presented in the previous section shows that, over the entire period from 1992 to 2027, the year of the war in Ukraine had the fourth most severe negative effect on Germany's economy, after the Great Recession in 2009, the COVID-19 pandemic in 2020, and the Exchange Rate Mechanism crisis of 1992–1993. The negative impact of the war persisted into 2024. Although the German economy appears to be recovering from this adverse shock, its growth rate remains below average.

This section examines the impact of the war on Germany's economic growth, incorporating eurozone growth excluding Germany as an additional explanatory variable. Both Germany's growth and eurozone growth (excluding Germany) are stationary across all specifications with a trend and a constant. The regression results, reported in Table 2, provide the basis for analysing the war's specific effects on Germany's economy.

The constant term is positive but not statistically different from zero. Its small magnitude is expected for growth rates, and its lack of significance suggests the absence of an underlying trend in growth.

The eurozone growth coefficient (0.671, significant at the 1% level) implies that a 1 percentage point increase in eurozone GDP growth (excluding Germany) is associated with an increase of approximately 0.67 percentage points in German GDP growth. This indicates that Germany is deeply integrated into the eurozone through trade and supply chains. A coefficient below unity suggests strong comovement, though not perfect lockstep. The high level of statistical significance reinforces the view that eurozone growth is a key external driver of German economic performance.

The coefficient on the war dummy variable is −0.0155 and is significant at the 1% level. This implies that, from 2022 onward, Germany's GDP growth has been, on average, 1.55 percentage points lower than it would have been in the absence of the war, conditional on eurozone growth. This represents a substantial negative shock in growth-rate terms and is consistent with (a) energy price shocks, (b) trade disruptions, and (c) heightened uncertainty and an associated slowdown in investment. The fact that the coefficient remains significant after controlling for eurozone growth suggests a Germany-specific effect rather than a generalized European slowdown. While the war dummy captures all post-2022 structural changes—not only the war itself (e.g., energy

transition policies or global monetary tightening)—the timing and magnitude of the effect make it reasonable to attribute it primarily to the war.

The adjusted R^2 of 0.6414 is relatively high for a growth regression, indicating that nearly two-thirds of the variation in German GDP growth is explained by eurozone growth and the war dummy. This supports the interpretation that Germany's growth is largely driven by European economic conditions combined with a discrete structural shock.

Table 2. *Regression Results*

Period/method **Variables**	**Baseline 1996-2025** Least Squares	**Baseline 1996-2025** Least Squares HAC Standard Errors	**Extended 1996-2027** Least Squares	**Extended 1996-2027** Least Squares HAC Standard Errors
Constant	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)
Eurozone Growth (excluding Germany)	0.671*** (0.094)	0.671*** (0.110)	0.662*** (0.0934)	0.662*** (0.1106)
War	-0.0155** (0.0069)	-0.0155*** (0.003)	-0.0102* (0.0058)	-0.0102** (0.0048)
R-squared	0.6661	0.6661	0.6407	0.6407
Adjusted R-squared	0.6414	0.6414	0.6160	0.6160
F-statistic (probability)	26.94 (0.0000)	26.94 (0.0000)	25.86 (0.0000)	25.86 (0.0000)
Durbin-Watson	1.64	1.64	1.55	1.55
Observations	30	30	32	32

Notes: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

The Durbin–Watson statistic of 1.65 is slightly below 2, suggesting mild positive serial correlation. However, inference is based on HAC (Newey–West) standard errors, which are robust to both heteroskedasticity and autocorrelation. The main results are unchanged across alternative specifications, and the remaining autocorrelation is limited and does not undermine the conclusions.

The results remain robust when the sample is extended to include the 2026 and 2027 forecast observations (final two columns of Table 2). Lagged Eurozone and German growth, a linear trend, and alternative definitions of the war dummy are not statistically significant (results not reported). The US growth rate was also considered, but its high correlation with Eurozone growth (+0.84) rendered it insignificant; when Eurozone growth is excluded, the US growth rate becomes significant. Using a weighted average of Eurozone and US growth produces a statistically significant coefficient. The findings in this case do not differ from those presented above. Energy price growth was not significant. Across all specifications, both the magnitude and significance of the war coefficient remain largely unchanged.

Overall, the results show a strong and statistically significant link between German GDP growth and eurozone growth excluding Germany, highlighting the role of regional economic conditions. The negative and highly significant war dummy implies that the war in Ukraine has lowered Germany's GDP growth by about 1.55 percentage points since 2022, even after accounting for eurozone-wide developments.

The model explains a substantial share of the variation in German growth, and diagnostic tests raise no serious econometric concerns.

Discussion and Conclusions

This paper has estimated the impact of the Russia–Ukraine war on Germany's economic growth using a time-series regression framework for the period 1996–2025, with robustness checks extending through 2027 using European Commission forecasts. The central finding is clear and consequential: the war has imposed a statistically significant and economically substantial drag on German GDP growth, lowering it by 1.55 percentage points annually since 2022, even after controlling for broader eurozone economic conditions. This result indicates that Germany has experienced war-related effects that go beyond the generalized slowdown affecting the European economy as a whole, reflecting the country's particular vulnerability to the conflict's disruptions.

The magnitude of this estimated effect is striking when placed in proper context. Germany's long-term average annual growth rate from 1992 to 2025 stands at approximately 1.2 percent. A reduction of 1.5 percentage points thus represents more than a complete elimination of Germany's typical growth, transforming what would have been modest expansion into near-stagnation or contraction. Indeed, the descriptive evidence presented in this study confirms that 2022 and the subsequent years represent the fourth most severe negative episode in Germany's post-reunification economic history, exceeded only by the 2009 Great Recession, the 2020 COVID-19 pandemic, and the 1992–1993 Exchange Rate Mechanism crisis. The persistence of weak growth through 2024, with only gradual recovery projected for 2025–2027, underscores that the war's economic consequences are not transitory but represent a sustained structural shock.

The econometric evidence strongly supports the interpretation that this growth reduction can be attributed primarily to the war rather than to coincidental factors. The regression model explains nearly two-thirds of the variation in German GDP growth through just two variables: eurozone growth excluding Germany and the war dummy variable. The war coefficient remains highly significant across multiple specifications, including when the sample is extended to incorporate forecast data, when heteroskedasticity and autocorrelation consistent standard errors are employed, and when various robustness checks are conducted. Alternative explanatory variables such as lagged growth rates and time trends fail to achieve statistical significance, while the war dummy's magnitude and significance remain stable. This robustness provides confidence that the estimated effect captures a genuine causal impact rather than spurious correlation.

The estimated eurozone growth coefficient of approximately 0.67 reinforces the well-established understanding that Germany's economy is deeply integrated into the broader European economic system through dense trade networks, supply chain linkages, and synchronized business cycles. However, the fact that this coefficient falls meaningfully below unity—and that the war dummy retains strong significance even after controlling for eurozone conditions—demonstrates that Germany faces

idiosyncratic vulnerabilities that amplify its exposure to this particular conflict. These vulnerabilities stem primarily from Germany's industrial structure and its pre-war energy policy choices. Germany's manufacturing sector, which accounts for a substantially larger share of GDP than in most other advanced economies, is notably energy-intensive. Chemicals, steel, automotive production, and machinery manufacturing —core pillars of the German economic model—all require abundant and affordable energy inputs. The country's decision to phase out nuclear power following the 2011 Fukushima disaster, combined with aggressive expansion of renewable energy capacity that nonetheless left substantial gaps during the transition, created heavy dependence on Russian natural gas as a bridging fuel.

The abrupt disruption of Russian energy supplies following the invasion, whether through deliberate supply cuts or through Germany's own policy decisions to reduce dependence, imposed a severe terms-of-trade shock. Energy prices surged to unprecedented levels, squeezing profit margins for energy-intensive industries and dampening both production and investment. Simultaneously, supply chain disruptions affecting components and materials sourced from Ukraine, Russia, and affected neighboring countries compounded production difficulties. The heightened geopolitical uncertainty and the rapid policy pivot toward energy security and increased defense spending further contributed to the challenging economic environment. These factors combined to create a multifaceted negative shock whose effects this study has successfully quantified.

From a policy perspective, these findings carry important implications. First, they validate the substantial economic costs that Germany has incurred as a consequence of the war and the associated energy crisis, costs that have necessitated large-scale government interventions including energy price subsidies for households and businesses, accelerated investments in renewable energy infrastructure and liquefied natural gas import terminals, and structural adjustments across energy-dependent industries. The magnitude of the estimated growth effect—approximately 1.55 percentage points annually—translates into substantial cumulative output losses over multiple years, losses that may total several percentage points of GDP by the time recovery is fully established. These figures underscore that the economic burden of the conflict extends far beyond the direct fiscal costs of supporting Ukraine and managing refugee flows.

Second, the results highlight the strategic importance of energy diversification and resilience for advanced industrial economies. Germany's particular vulnerability to this conflict stemmed directly from concentrated dependence on a single energy supplier whose reliability was subject to geopolitical risk. While the economic benefits of affordable Russian energy were real and substantial during the decades of relative geopolitical stability, the absence of adequate diversification left Germany exposed when that stability collapsed. The current accelerated pivot toward renewable energy, coupled with diversified import sources for fossil fuels during the transition, represents a necessary if costly adjustment. However, policymakers must remain attentive to ensuring that the speed of transition does not itself create new vulnerabilities or impose excessive adjustment costs on energy-intensive industries.

Third, the findings emphasize the broader challenge facing European economies as they navigate an increasingly fragmented and uncertain geopolitical landscape. The

post-Cold War era of globalization, characterized by deep economic integration and relatively stable geopolitical conditions, enabled specialized production networks and efficiency gains that supported growth across Europe. The Russia–Ukraine war, alongside other developments including US-China tensions and the weaponization of economic interdependence, signals a shift toward a more contested and potentially fragmented international system. Germany's experience offers a cautionary illustration of the economic costs such fragmentation can impose, particularly on economies whose industrial structures are predicated on open trade and reliable supply chains.

Looking forward, the modest recovery projected for 2025–2027 suggests that Germany's economy will gradually adapt to the new energy and geopolitical realities, though growth is expected to remain below historical averages for some time. The adjustment process will likely involve continued structural change, including further shifts in energy sourcing, potential relocation of some energy-intensive production, and ongoing investment in energy infrastructure. Whether Germany can return to its pre-war growth trajectory, or whether the war represents a permanent downward shift in potential output, remains an open question that will require continued monitoring and analysis.

Several limitations of this study should be acknowledged, suggesting directions for future research. The use of a binary war dummy variable, while straightforward and statistically powerful, does not capture potential time-varying effects or distinguish between different mechanisms through which the war affects growth. Future work could employ more granular approaches, examining specific channels such as energy prices, trade flows, investment uncertainty, and sectoral effects. Additionally, while this study controls for eurozone-wide conditions, a more comprehensive analysis might incorporate other control variables or employ synthetic control methods to construct more refined counterfactuals. Finally, as additional years of post-war data become available, researchers will be better positioned to assess whether the estimated effects represent primarily a temporary level shock or a more persistent change to Germany's growth trajectory.

In conclusion, this study provides robust quantitative evidence that the Russia–Ukraine war has imposed a significant structural shock on Germany's economy, reducing annual GDP growth by approximately 1.55 percentage points since 2022. This finding contributes to the growing literature on the macroeconomic consequences of contemporary conflicts and offers valuable insights for policymakers grappling with the economic fallout from geopolitical disruptions. As Europe continues to adjust to a more uncertain and contested international environment, understanding these economic costs and their distribution across countries will remain essential for designing effective policy responses and for building more resilient economic structures.

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