Can sanctions deter wars? The Russia-Ukraine case *

Thierry Mayer† Isabelle Méjean ‡ Mathias Thoenig§

January 9, 2026

Abstract

We use the framework of Mayer et al. (2025) to study the geopolitical relationship between Russia and Ukraine. The model embeds diplomacy and war within a quantitative trade framework to estimate: (i) the model-implied probability of conflict over time, and (ii) the impact of different sanction regimes on this probability. We first calibrate the model under a war scenario based on data relevant to the post-February 2022 full-scale conflict, and then add counterfactual sanctions to this scenario. We find that the observed Ukraine's decoupling from Russia after the 2014 annexation of Crimea reduced its economic exposure to war but also increased the likelihood of a full-scale conflict by lowering its opportunity cost of war. Simulation results show that the 2024 sanction package, if credibly announced in 2021 and made contingent on further aggression, would have significantly raised Russia's cost of war and could have deterred the 2022 invasion.

1 Introduction

Economic sanctions have become a central instrument of international relations. Since the early 1990s, the number of active sanction regimes has increased sharply, affecting a growing share of global trade (Felbermayr et al., 2021). Historically, sanctions have been deployed in response to a wide range of geopolitical concerns, from South Africa's apartheid regime, Iran's nuclear program, Cuba's political regime to Russia's annexation of Crimea. While the economics literature documents the costs of sanctions, highlighting trade fragmentation and welfare losses, much less is known about their effectiveness as a geopolitical tool. Sanctions (or the threat of) aim at inducing changes in the behavior of foreign governments by harming their economies. They are designed to exchange economic losses for diplomatic leverage. Evaluating their success thus requires a framework that explicitly quantifies this economic–geopolitical trade-off.

In this paper, we build on the quantitative framework of Mayer et al. (2025) which embeds a diplomatic bargaining game into a standard quantitative trade model. Two countries are involved

*We acknowledge Vivan Sharma for splendid research assistance. We deeply thank Dzhamilya Nigmatulina for sharing with us the data of Egorov et al. (2025). Mathias Thoenig acknowledges financial support from the SNF grant "Quantitative Spatial Models of Violence and Migration" (204899).

†Department of Economics, Sciences Po, Paris; CEPII; and CEPR.

‡Department of Economics, Sciences Po, Paris; CEPII; and CEPR.

§Department of Economics, University of Lausanne; and CEPR.

in a geopolitical dispute that can either be resolved diplomatically via a negotiated transfer, or escalate into an armed conflict if bargaining fails. In equilibrium, the endogenous probability of conflict is a decreasing function of the countries' opportunity costs of war, defined as their real consumption losses incurred in war. In this setting, ex ante credible threats by third countries to impose sanctions on the potential belligerents in the event of war increase their opportunity costs of war, thereby reducing the probability of conflict.

We apply this framework to the geopolitical relationship between Russia and Ukraine by combining historical data from the 1995–2021 period with different sanction scenarios. The exercise is conducted from a pre-invasion perspective—prior to February 2022—and simulates the counterfactual geopolitical and deterrence effects that credible threats of sanctions, had they been announced in 2021, would have produced. These effects are measured in terms of welfare-relevant shifts in bargaining power and changes in the likelihood of preserving peace.

As a first step, we parameterize a war scenario using data from the actual conflict in Ukraine, which then allows us to compute, for both countries and year, the associated opportunity costs of war. A striking feature is the strong asymmetry in the costs. While Russian casualties are larger in absolute terms, they are comparable to Ukraine's once scaled by labor force size. In contrast, the economic toll is borne overwhelmingly by Ukraine, as all battlefields are located on its territory. This asymmetry results in consistently higher average opportunity costs of war for Ukraine over the sample period, making Russia comparatively less inclined to make diplomatic concessions to avoid conflict. In a second step, the model is calibrated to replicate a zero probability of conflict between Russia and Ukraine in 1995. This initial condition reflects the diplomatic context of the time: in 1994, both countries, together with the United Kingdom and the United States, signed the Budapest Memorandum, which guaranteed Ukraine's security and territorial integrity in exchange for its accession to the Treaty on the Non-Proliferation of Nuclear Weapons.

We then study how the historical evolution of the two countries' integration into world trade affected the conflictuality of their diplomatic relationship. From the early 2000s onward, Russia reduced its overall trade integration, while Ukraine increasingly opened up to trade with the European Union. Both trends lowered the opportunity costs of war between Ukraine and Russia, though not enough to increase the probability of conflict in a quantitatively significant way. That probability rises sharply, however, after the 2014 annexation of Crimea, in response to Ukraine halving its imports from Russia. In the model, such trade decoupling from its geopolitical rival improves Ukrainian welfare by reducing exposure to war-related trade disruptions. At the same time, it weakens the disciplining effect of prospective economic losses in diplomatic negotiations, thereby raising the likelihood of conflict and ultimately harming welfare. Quantitatively, the model predicts that this decoupling reduced Ukraine's wartime losses by nearly two percentage points (of real consumption), but increased the probability of war by more than five percentage points. This highlights the fundamental trade-off associated with economic interdependence in the context of rising geopolitical tensions.

What role can sanctions play in this context? In our framework, the post-2014 rise in conflict probability is primarily driven by Ukraine's declining opportunity cost of war due to trade decoupling. Sanctions can offset this mechanism if they succeed in raising Russia's opportunity cost of war. Specifically, third countries may preemptively threaten to impose trade sanctions on Russia in the event of an invasion of Ukraine. Such measures would curtail Russia's ability to mitigate wartime economic shocks through trade diversification, thereby amplifying the cost of war and reinforcing incentives for a peaceful diplomatic settlement. We use counterfactual sanction scenarios to evaluate the potential effectiveness of this strategy. Our simulation results suggest that, if credibly announced in 2021, the threat of the 2024 sanction package would have been sufficient to deter a full-blown conflict, restoring the pre-2014 probability of peace.

This paper contributes to several strands of the literature. First, it relates to the large body of work on economic sanctions. Despite their widespread use in diplomatic disputes, the international relations literature provides limited evidence on whether sanctions achieve their intended policy objectives (Pape, 1997; Hufbauer et al., 2009). In economics, most studies have focused on the economic consequences of sanctions—examining their effects on trade, production, and welfare—from historical episodes such as the Embargo Act of 1807 (O'Rourke, 2007) to the post–World War II era (Morgan et al., 2014; Haidar, 2017; Crozet et al., 2021; Morgan et al., 2023; Felbermayr et al., 2020). More recently, sanctions against Russia have been analyzed in Crozet and Hinz (2020); Syropoulos et al. (2024); Chowdhry et al. (2024); Flach et al. (2024); Nigmatulina (2022); Egorov et al. (2025). While these papers primarily look at their economic costs for the sanctioned and sanctioning countries, our paper shifts the focus to their quantitative implications for diplomatic outcomes and conflict risk. In this respect, our simulation-based approach complements narrative and empirical analyses of sanctions' effectiveness in the international relations literature.

Second, our paper contributes to the rapidly expanding field of geoeconomics, surveyed in Thoenig (2024), Mohr and Trebesch (2024), and Clayton et al. (2025). Building on Martin et al. (2008), Thoenig (2024), and Mayer et al. (2025), we employ a quantitative framework in which war arises as an on-path equilibrium outcome rather than as an off-equilibrium deviation. This feature allows us to study how economic integration and sanctions affect the equilibrium probability of conflict, which is particularly relevant in the context of the Russia–Ukraine relationship. Our modelling of sanctions shares similarities with Becko and O'Connor (2024), who also compare the effects of trade tools enacted in peacetime with credible threats to tax trade in the event of a geopolitical conflict.

The remainder of the paper is organized as follows. Section 2 presents the model and outlines its solution. Section 3 discusses the calibration of the model, with particular emphasis on the war scenario. Section 4 analyzes the evolution of trade between Russia and Ukraine and its implications for the cost of geopolitical disputes. Section 5 examines the role of sanctions in this setting. Section 6 concludes.

2 A model of trade and diplomacy

The first block of the quantitative framework consists in a diplomatic game involving two countries integrated into the global economy that face a geopolitical dispute. The second block models the trade equilibrium in a multi-country setting. The sequence of the game is as follows. At the beginning of the period, a geopolitical dispute arises between countries n and m. The dispute can be settled through diplomacy, and the countries are unconstrained in their choice of diplomatic protocol. The outcome of the diplomatic game is either a peaceful resolution of the dispute, in which case the countries agree on a transfer (expressed in consumption-equivalent), $\widetilde{T}_{nm} \gtrless 0$, with $\widetilde{T}_{nm} = -\widetilde{T}_{mn}$; or the outside option: a failure of diplomacy that leads to war. At the end of the game, production and trade happen, markets clear, and each country receives its state-contingent utility:

$$\widetilde{U}_n(\text{peace}) = C_n(\text{peace}) - \widetilde{T}_{nm} \qquad \text{and} \qquad \widetilde{U}_n(\text{war}) = C_n(\text{war}) - \tilde{u}_n, \tag{1}$$

where $C_n(\text{state})$ is the equilibrium state-contingent real consumption and $\tilde{u}_n$ represents a random shock to wartime consumption that is privately observed by the leader of country n. This informational asymmetry may lead to bargaining failure, resulting in war along the equilibrium path.

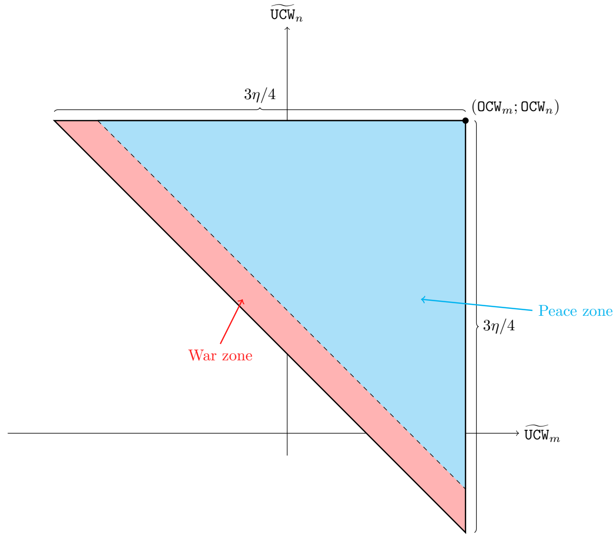
The ex ante utility cost of war—defined as the utility differential between peace and war—can be decomposed additively into a deterministic *Opportunity Cost of War* ($\texttt{OCW}_n$) and the war shock:

$$\widetilde{\texttt{UCW}}_n = \underbrace{C_n(\text{peace}) - C_n(\text{war})}_{\equiv\, \texttt{OCW}_n} + \tilde{u}_n. \tag{2}$$

The only departure from Mayer et al. (2025) is the definition of $\texttt{OCW}_n$, which is now based on the difference in real consumption—rather than the log difference—between peace and war.[1] All other elements of the diplomatic game remain unchanged. In particular, the diplomatic equilibrium retains a simple closed-form solution under the maintained assumption that the $\widetilde{\texttt{UCW}}$s are jointly uniformly distributed over a symmetric right triangle, as illustrated in Figure 1. The downward-sloping hypotenuse implies a negative correlation between the $\widetilde{\texttt{UCW}}$s, capturing the idea that, on average, gains for one country entails losses for the other; the parameter η (pre-multiplied by 3/4) measures the range of the support of the underlying random war shocks; and the maximum joint realization of the $\widetilde{\texttt{UCW}}$s is normalized to $(\texttt{OCW}_m, \texttt{OCW}_n)$. Moreover, peace is assumed to Pareto-dominate war, that is, $\widetilde{\texttt{UCW}}_n + \widetilde{\texttt{UCW}}_m \geq 0$ for all joint realizations, ensuring the existence of a peace-compatible transfer $\widetilde{T}_{nm}$ that can resolve the dispute diplomatically. However, this peaceful resolution may fail to materialize due to informational asymmetries regarding each country's utility cost of war. In such informational context, the second-best optimal protocol involves each leader announcing their own utility cost of war, $\widetilde{\texttt{UCW}}^a$. War occurs only when these announcements are not compatible with the resource constraint: $\widetilde{\texttt{UCW}}^a_n + \widetilde{\texttt{UCW}}^a_m < 0$. Otherwise, peace is preserved and the agreed transfer is proportional to the difference in announcements: $\widetilde{T}_{nm} = \left(\widetilde{\texttt{UCW}}^a_n - \widetilde{\texttt{UCW}}^a_m\right)/2$. Under this diplomatic protocol, one can show that each leader uses their private information strategically and optimally

[1] In Mayer et al. (2025), the leaders negotiate a transfer of geopolitical valence—i.e. an external good that enters additively in the utility—which is expressed in units of log real consumption. This modeling choice implies that country n must transfer an amount of geopolitical valence equal to $\widetilde{T}_{nm}$ percent of its own consumption and, simultaneously, $\widetilde{T}_{nm}$ percent of country m's consumption. Such a transfer of valence—comprising economic resources and geopolitical concessions—may be challenging to engineer in practice. In Mayer et al. (2025), this concern is minimal as they consider the US–China pair, for which GDPs are of reasonably comparable size. In this paper, we instead consider a dispute involving countries with large GDP differences (a tenfold GDP gap in 2019 between Ukraine and Russia). Given these GDP differences, we therefore assume that countries negotiate over transfers scaled in PPP-adjusted real consumption.

Figure 1: Joint distribution of the utility costs of war and the probability of wars



Note: The figure illustrates the joint distribution of the utility costs of war when $\tilde{u}_n$ and $\tilde{u}_m$ are jointly uniformly distributed over a right triangle of size $3\eta/4$. The blue (resp. red) area correspond to the peace zone (resp. the war zone) at the equilibrium of the diplomatic game.

announces

$$\widetilde{\texttt{UCW}}_n^a = \frac{2}{3}\widetilde{\texttt{UCW}}_n + \frac{1}{12}\texttt{OCW}_n - \frac{1}{4}\texttt{OCW}_m.$$

This relation shows how leaders systematically misreport their own utility cost of war.

With the solution of the diplomatic game in hand, it is now possible to characterize the utility cost of a geopolitical dispute using the following decomposition of expected utility:

$$\begin{aligned} \mathbb{E}[\tilde{U}_n] \equiv &\quad s_{nm}\left(U_n(\text{peace}) - \mathbb{E}\left[\widetilde{T}_{nm}|\text{peace}\right]\right) + (1-s_{nm}) \times \left(U_n(\text{peace}) - \mathbb{E}\left[\widetilde{\texttt{UCW}}_n|\text{war}\right]\right) \\ = &\quad U_n(\text{peace}) - C_n(\text{peace}) \times \mathcal{L}_n, \end{aligned} \tag{3}$$

where s_{nm} denotes the probability of appeasement, i.e. a peaceful diplomatic solution to the dispute, (and thus $1 - s_{nm}$ the probability of war), and $\mathcal{L}_n$ is the *geoeconomic loss*, defined as

$$\mathcal{L}_n \equiv s_{nm} \times \frac{\texttt{PKC}_n}{C_n(\text{peace})} + (1 - s_{nm}) \times \frac{\texttt{TCW}_n}{C_n(\text{peace})}, \tag{4}$$

where $\texttt{PKC}_n \equiv \mathbb{E}\left[\widetilde{T}_{nm}|\text{peace}\right]$ is the *Peace-Keeping Cost* and $\texttt{TCW}_n \equiv \mathbb{E}\left[\widetilde{\texttt{UCW}}_n|\text{war}\right]$ is the *True Cost of War*. The geoeconomic loss represents the percentage of consumption lost due to the geopolitical dispute. Importantly, all components of the geoeconomic loss can be expressed as functions of a single sufficient statistic, the opportunity cost of war:

$$s_{nm} = \min\left(\frac{(\texttt{OCW}_n + \texttt{OCW}_m)^2}{\eta^2}, 1\right) \tag{5}$$

$$\texttt{PKC}_n = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2} \tag{6}$$

$$\texttt{TCW}_n = \texttt{OCW}_n + \mathbb{E}\left[\tilde{u}_n\right] - \frac{1}{4}\frac{\left[\texttt{OCW}_n + \texttt{OCW}_m\right]^2}{\eta + \texttt{OCW}_n + \texttt{OCW}_m} \tag{7}$$

The opportunity cost of war can be quantified using standard quantitative trade methods, given a counterfactual war scenario. The next section details the approach.

3 A war scenario for Russia and Ukraine

Using the quantitative setup of Mayer et al. (2025), we estimate the opportunity cost of war as the difference in real consumption between a baseline peacetime equilibrium and a counterfactual wartime equilibrium. The approach relies on standard hat-algebra techniques developed in the quantitative trade literature.[2] The underlying trade model features nested CES structures in both consumption and production, leading to a rich pattern of input-output linkages. Producers and consumers first substitute across country-specific varieties within a sector and then across CES bundles of different sectors. Primary factors and intermediate inputs are also assumed to be imperfect substitutes. The supply of primary factors is taken to be exogenous and perfectly mobile across sectors.

The baseline equilibrium is simulated using trade flows and final demand data from the OECD–TiVA database for the years 1995–2021, given a set of calibrated elasticities summarized in Appendix Table A1. The counterfactual equilibrium is obtained by simulating a war scenario that aims to replicate key features of the Russo-Ukrainian war. To this end, we depart from the setup in Mayer et al. (2025), which implements a generic war scenario involving TFP losses and trade disruptions calibrated on a broad sample of historical conflicts. Instead, we tailor the war scenario to the specific characteristics of the Ukraine war. This refinement is crucial, given the salient asymmetries of the conflict: Russia and Ukraine differ markedly in economic size, and the battlefields are entirely located on Ukrainian territory, implying significantly higher economic costs for Ukraine relative to Russia.

The simulated war scenario involves a combination of human losses, economic losses, and trade disruptions:

(i) Human losses are calibrated using data from the Center for Strategic and International Studies,[3] which estimates casualties of around 400,000 Ukrainians and one million Russians in

[2] Because the baseline equilibrium is calibrated using nominal variables, comparisons over time are blurred by inflation dynamics. We correct for these nominal effects by using the level of nominal consumption observed in 1995 as a reference for both Russia and Ukraine. As a consequence, all quantitative results are interpreted in relative terms with respect to each country's consumption expressed in constant monetary units.

[3] https://www.csis.org/analysis/russias-battlefield-woes-ukraine

2025. Scaled by the size of the labor force (source: World Bank), these figures imply percentage losses in the labor supply of -1.95% and -1.38% for Ukraine and Russia, respectively.

(ii) Economic damages are highly concentrated geographically. As of early 2025, Russia occupies approximately 20% of Ukrainian territory (source: Institute for the Study of War, *Ukraine Fact Sheet*, February 2025). Between February 2022 and the end of 2024, Ukraine sustained direct damages estimated at USD 176 billion, according to the World Bank's *Fourth Rapid Damage and Needs Assessment*. In contrast, Russia experienced only limited direct economic damages, primarily in the form of equipment losses. We calibrate TFP losses, drawing on the estimates of GDP loss provided in Federle et al. (2024). They estimate the economic cost of the war to be equivalent to 31.02% of GDP for Ukraine and just 0.16% for Russia.[4]

(iii) The magnitude of trade disruptions is calibrated using the estimates from Glick and Taylor (2010), who document that, over the 1870-1997 period, bilateral trade between belligerents falls on average by 85% during wartime. Trade with third countries is also negatively affected, though to a lesser extent, with an average contraction of 15%. In the quantitative model, we replicate these disruptions by introducing sector-specific increases in iceberg trade costs, calibrated to match these averages while accounting for heterogeneity in trade elasticities across sectors.

Equipped with estimates of the opportunity costs of war, we can quantify the associated geoeconomic losses using the formulas presented in Section 2. To compute the endogenous probability of conflict, we must assign a value to the noise parameter η, which governs the degree of global safety. Intuitively, higher values of η imply more uncertainty in the diplomatic game, increasing the probability of conflict for any given level of opportunity cost. We now explain how the specific institutional context informs the calibration of this parameter.

In 1994, Ukraine, Russia, the United Kingdom, and the United States signed the *Budapest Memorandum*, under which the latter three countries committed to providing security assurances to Ukraine in exchange for its accession to the Treaty on the Non-Proliferation of Nuclear Weapons as a non-nuclear-weapon state. The memorandum explicitly reaffirmed their obligation to"*refrain from the threat or use of force against the territorial integrity or political independence of Ukraine, and that none of their weapons will ever be used against Ukraine except in self-defence or otherwise in accordance with the Charter of the United Nations.*" (Memorandum on Security Assurances in Connection with Ukraine's Accession to the Treaty on the Non-Proliferation of Nuclear Weapons).[5] While these commitments were eventually violated starting in 2014, we assume that, at the time of signing, all parties regarded them as credible. On this basis, using (5), we calibrate η such that the probability of appeasement in 1995 is exactly one.

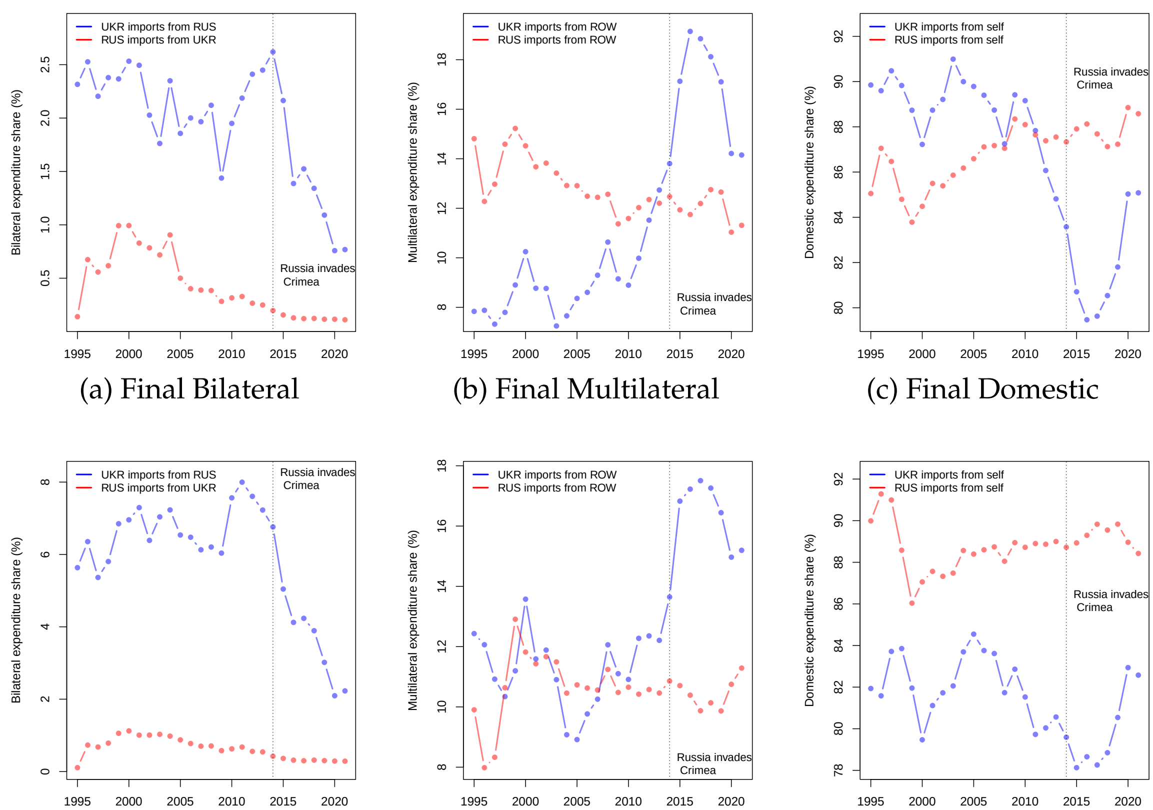
[4] We use the estimates reported on the companion website to the paper, available here.

[5] `https://treaties.un.org/doc/Publication/UNTS/Volume%203007/Part/volume-3007-I-52241.pdf`

4 Trade pattern, opportunity cost of war, and appeasement probability

Figure 2 illustrates the evolution of Russia's and Ukraine's trade patterns from 1995 to 2021, separately for final and intermediate goods, distinguishing between bilateral, multilateral and domestic trade shares in overall expenditures. Several salient features emerge. First, Russia has gradually reduced its exposure to global trade (particularly from Western Europe), starting in the early 2000s. This trend is evident for both final consumption and intermediates, and shows little response to the 2014 annexation of Crimea. The retreat from international trade is especially marked for imports from Ukraine but reflects a broader pattern of disengagement.

Figure 2: Evolution of the structure of trade: Russia and Ukraine



(a) Final Bilateral (b) Final Multilateral (c) Final Domestic

(d) Interm. Bilateral (e) Interm. Multilateral (f) Interm. Domestic

Source: TiVA, 2025 release

Ukraine presents a starkly different trajectory. Prior to 2014, imports from Russia remain relatively stable as a share of both final and intermediate consumption. At the same time, Ukraine steadily integrates into the global economy, particularly with the European Union. As a result, the share of domestic products in Ukrainian consumption declines between 2005 and 2014. A sharp regime shift occurs after 2014: imports from Russia collapse, especially for intermediates (falling by a factor of four over the following decade). This shift is mirrored in multilateral trade, with a significant increase in imports from the rest of the world—especially from EU countries—indicating a strong substitution away from Russia in Ukraine's sourcing of intermediates.

We now turn to the implications of these historical trade patterns for the opportunity costs of war and the resulting probability of conflict. Figure 3 displays these outcomes in panels (a) and (b), respectively. Panel (a) shows the evolution of $\texttt{OCW}$ (expressed in billions of 1995 USD). Due to the large asymmetry in economic size, Ukraine's opportunity costs of war are substantially higher than Russia's in absolute terms, as reflected by the different scales on the y-axes. While both series trend downward from the early 2000s, a marked break occurs for Ukraine in 2014. The sharp decline in its bilateral import dependence on Russian final and intermediate goods significantly reduces $\texttt{OCW}_{\text{ukr}}$. As a result, the sum $\texttt{OCW}_{\text{ukr}} + \texttt{OCW}_{\text{rus}}$ falls below its 1995 level, decreasing the incentives for peaceful settlement. This shift is captured in panel (b), where the model predicts a rise in the probability of war beginning in 2015. Between 2014 and 2021, this probability increases by more than five percentage points, reaching a local peak just prior to the full-scale invasion of Ukraine.

(a) Opp. Cost of War (b) Probability of appeasement

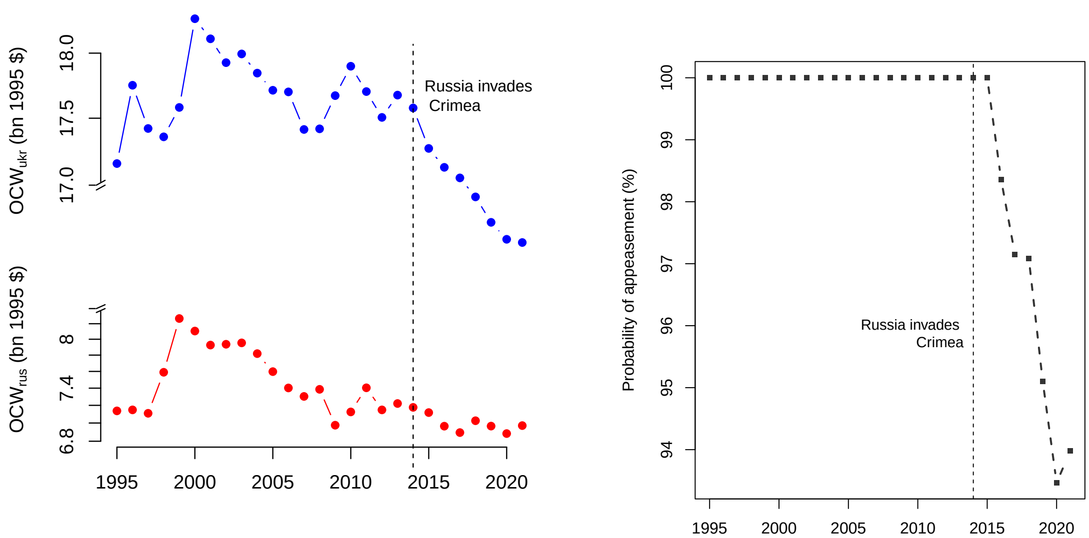


Figure 3: The historical evolution of conflictuality

Figure 4 uses the historical changes shown in Figure 3 to compute the evolution of geo-economic losses for the two countries over time. Panel (a) illustrates the Ukrainian side, where geopolitical uncertainty generates large expected losses, primarily through the transfers to Russia ($\texttt{PKC}$) needed to avoid very costly war outcomes ($\texttt{TCW}$). The fall in bilateral imports visible in Figure 2(a) reflects a process of decoupling, whereby Ukraine reduces its trade dependence on Russia.[6] This process has two beneficial effects: it lowers both the cost of war should it occur, and the diplomatic concessions required to deter it. However, decoupling also weakens the diplomatic incentives to avoid war and

[6]In unreported results, we simulate a decoupling episode by imposing a unilateral increase in the cost of Ukrainian imports from Russia, taking the 2014 trade structure as a reference. Replicating the observed decline in bilateral import flows requires a shadow iceberg trade cost of at least 15%.

consequently increases the likelihood of conflict: the resulting decline in overall expected conflict costs $\mathcal{L}$ is smaller than the reduction in PKC. From Russia's perspective (Panel (b)), all components of $\mathcal{L}$ are negative—indicating that geopolitical tensions are beneficial to Russia in expectation. The negative PKC reflects the large transfers extracted from Ukraine in exchange for peace. The negative TCW is driven by Russia's low opportunity cost of war, combined with a relatively high dispersion of war utility shocks $\tilde{u}_{\text{rus}}$. As Ukraine decouples after 2014, the magnitude of bilateral transfers declines, which constitutes a loss for Russia.

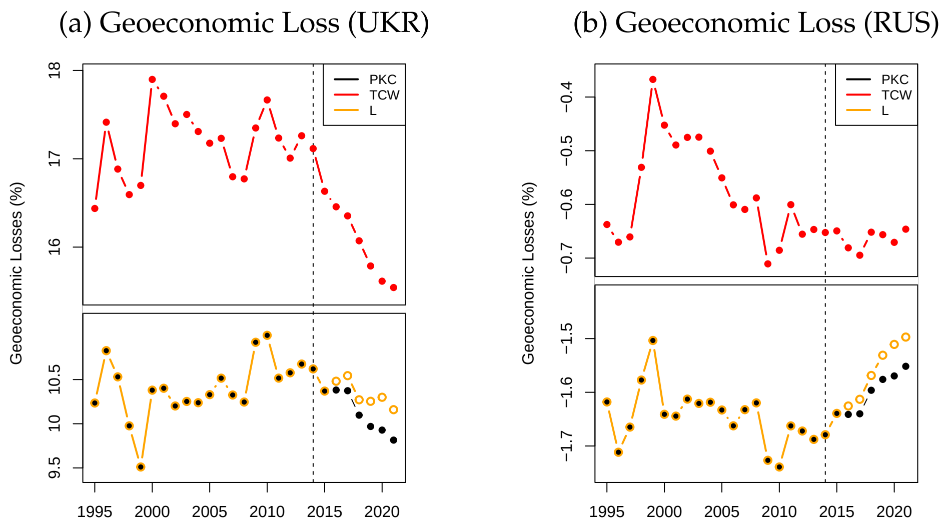


Figure 4: Ukraine vs Russia geoeconomic losses

Overall, our model predicts that Ukraine's effective decoupling from Russia following the 2014 annexation of Crimea lowered its opportunity costs of war, thereby raising the likelihood of conflict. During this period, however, Ukraine's security remained formally guaranteed by the Budapest Memorandum, which in principle should have acted as a deterrent. In the next section, we quantify the extent to which the credible threat of sanctions against Russia could have dissuaded it from invading Ukraine in 2022.

5 Trade sanctions and conflictuality

In this section, we conduct a set of counterfactual experiments to assess whether credible threats of sanctions, had they been announced in 2021, could have deterred Russia from invading Ukraine. Before turning to these experiments, it is important to note that the period between 2014 and 2021 already includes an initial package of sanctions, implemented in response to the annexation of Crimea. This 2014 package is already embedded in the quantification presented in Section 4. In both the model and reality, however, this package proved insufficient to deter conflict. The reason is that these sanctions were not state-contingent: they were imposed on Russia regardless of the outcome of its future diplomatic interactions with Ukraine. As a consequence, they had only a limited impact on Russia's opportunity cost of war and exerted little influence on the probability of further escalation to an armed conflict.

We compare the impact of non state-contingent sanctions with counterfactual scenarios implementing state-contingent sanctions—measures that are imposed only in the event of war.[7] By restricting Russia's ability to redirect trade in wartime, contingent sanctions amplify the economic costs associated with domestic and bilateral trade disruptions. This raises Russia's opportunity cost of war, thereby enhancing the disciplining effect of diplomacy and increasing the likelihood of a peaceful settlement.

5.1 The trade impact of trade sanctions

Our counterfactual sanction scenarios rely on the set of countries that effectively imposed sanctions following the 2022 invasion—namely, the European Union, the United Kingdom, Switzerland, the United States, Canada, Australia, Japan, and Korea. The list of targeted HS6 product categories, as well as the country-year mapping of implemented sanctions, is taken from Egorov et al. (2025). The trade impact of these sanctions is calibrated using a difference-in-differences strategy that compares trade dynamics before and after sanction imposition, between targeted and non-targeted product categories.

We first estimate trade frictions using the gravity residuals approach by Huang et al. (2025). Let s_{ijkt} be the share of country i in country j's imports of product k in year t, such that $s_{ijkt} = \exp(\eta_{ikt} + \mu_{jkt}) \times u_{ijkt}$.[8] The regression includes two high dimensional sets of fixed effects recovered from a structural gravity equation: η_{ikt} absorbs all exporter-specific determinants of trade, while μ_{jkt} captures all importer-specific determinants. The residual u_{ijkt} reflects bilateral frictions, and their impact through the trade elasticity θ_k. We estimate this equation using Poisson pseudo-maximum likelihood (PPML), balancing the dataset by assigning zeros whenever an exporter is observed at least once in the year on a given product for at least one destination country. This procedure results in approximately 80% zero trade flows. From this regression, we construct a measure of inverse bilateral trade frictions: $u_{ijkt} = s_{ijkt} / \exp(\hat{\eta}_{ikt} + \hat{\mu}_{jkt})$. We then estimate the trade impact of sanctions by running a staggered difference-in-difference on targeted versus non-targeted products exported by sanctioning countries to Russia:

$$\ln u_{ijkt} = \text{FE}_{ijt} + \text{FE}_{ijk} + \alpha \times \mathbb{1}(k \in T_i) \times \mathbb{1}(t \geq t_0) + \varepsilon_{ijkt}, \tag{8}$$

where $\mathbb{1}(k \in T_i)$ is a dummy equal to one if product k is sanctioned by country i and $\mathbb{1}(t \geq t_0)$ indicates post-treatment periods. The equation is estimated on the sample of sanctioning countries' exports to Russia, using data from 2017 to 2024. The fixed effects FE_{ijt} and FE_{ijk} control for time-varying bilateral factors and time-invariant product-level heterogeneity, respectively.

In this equation, the coefficient α captures the percentage change in trade frictions for targeted

[7] These two sets of instruments share similarities with those studied in Becko and O'Connor (2024). They consider a setting in which countries can develop peacetime industrial and trade policies, the equivalent of our non-contingent instruments, as well as credible threats to tax trade in the event of a geopolitical conflict, as in our contingent sanction scenario.

[8] Note that we do not observe domestic trade at this level of disaggregation, which is why we work with share of imports rather than expenditure.

products relative to non-targeted ones. Our preferred regression, focusing on the intensive margin of export values, yields $\hat{\alpha} = -0.636$. This effect is sizable compared to existing estimates in the literature. For example, Flach et al. (2024) estimate a 10.85% contraction in Russian imports following the 2014 sanctions, identified across products and across sanctioning versus non-sanctioning countries. In contrast, Crozet and Hinz (2020) find significantly larger effects when distinguishing embargoed from non-embargoed products, with trade in embargoed goods exported by sanctioning countries declining by up to 96% in the second half of 2014.

5.2 Integrating trade sanctions into the war scenario

Given the estimated trade impact of actual sanctions imposed by Western countries since 2022, we calibrate a war scenario augmented with sanctions. First, we map HS6-level products k into TiVA industries s in order to compute shr_{ijst}, the share of a given s-level trade flow from country i to country j that is covered by sanctions in a given year t. The tariff equivalent of trade sanctions is then defined as:

$$\text{SanctionsAVE}_{ijst} = (1 + \hat{\alpha} \times \text{shr}_{ijst})^{\frac{1}{-\theta_s}}.$$

where θ_s is the trade elasticity calibrated for sector s.

In practice, $\text{SanctionsAVE}_{ijs}$ is computed under four distinct scenarios, where Western sanctions are applied to exports of:

1. all HS products effectively targeted in 2022,
2. the same set extended to all HS products targeted in 2024,
3. all HS products exported to Russia by sanctioning countries,
4. the set in (3), augmented with a ban on oil imports from Russia.

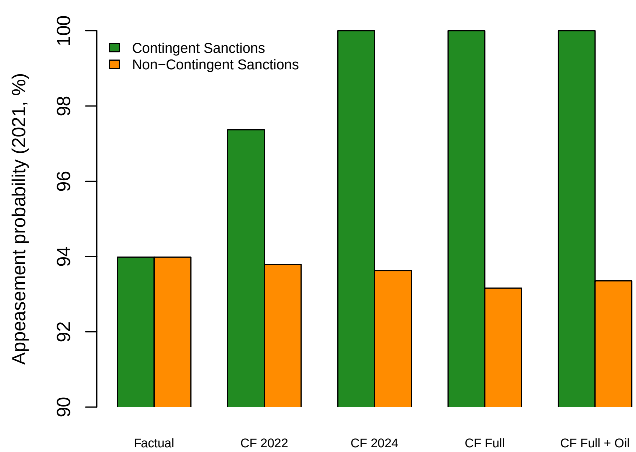


Figure 5: Counterfactual sanctions in 2021: impact on RUS-UKR appeasement probability

Using the 2021 equilibrium as the baseline, we first simulate the impact of adding sanctions to the war scenario described in Section 3 using the following formula: $\tilde{\tau}_{ijs} = \hat{\tau}_{ijs} \times \text{SanctionsAVE}_{ijs}$, where $\hat{\tau}_{ijs}$ denotes the baseline trade disruptions caused by war, as implied by the estimates in Glick and Taylor (2010), and $\tilde{\tau}_{ijs}$ is the counterfactual trade disruption integrating sanctions. This exercise allows us to compute the counterfactual opportunity costs of war under state-contingent sanctions, for both Ukraine and Russia. From this, we quantify the deterrent effect of state-contingent sanctions.

The impact of the state-contingent sanctions is compared with counterfactual scenarios in which sanctions are applied in wartime *and* in peacetime ("Non-Contingent Sanctions"). In that case, we first simulate a counterfactual peacetime equilibrium with sanctions such that $\check{\tau}_{ijs} = \text{SanctionsAVE}_{ijs}$, before simulating the impact of the war and compute the corresponding opportunity costs of war.

Figure 5 summarizes the results, focusing on the implied probability of appeasement (see Section 2 for the formula). Absent additional sanctions, the model predicts a 94% probability of appeasement in 2021. Augmenting the war scenario with the 2022 sanction package reduces the probability of war by more than half, raising the probability of appeasement to 97.5% (green bars in Figure 5). The 2024 package further increases this probability to nearly 100%. As expected, state-contingent sanctions reduce the ex ante probability of war by raising Russia's opportunity cost of conflict. Quantitatively, the 2024 sanction package is sufficient to fully offset the conflict-prone effects of Ukraine's effective decoupling from Russia in the aftermath of the 2014 annexation of Crimea.

In comparison, non-contingent sanctions slightly reduce the probability of appeasement (orange bars). By restricting Russia's access to Western products irrespective of the outcome of its diplomatic interactions with Ukraine, such sanctions induce a broader decoupling from the rest of the world and increase Russia's reliance on domestic goods in both peacetime and wartime. In a war scenario where Russian TFP is only marginally affected, this sanction-induced decoupling lowers Russia's opportunity cost of war, thereby weakening the disciplining force of diplomacy. As a result, the probability of appeasement declines.

6 Conclusion

This paper proposes a framework to assess how trade sanctions shape the likelihood of interstate conflict. By embedding a diplomatic bargaining model into a quantitative trade framework, we show that countries' opportunity costs of war—proxied by their real consumption losses under conflict—are central determinants of the probability of war. When geopolitical tensions rise, economic decoupling can reduce wartime exposure. However, it also weakens the disciplining role of interdependence in diplomatic negotiations, making peaceful outcomes less likely.

Applied to the Russia–Ukraine relationship, our quantitative model shows that Ukraine's post-2014 trade decoupling from Russia both reduced its war-related economic losses and increased the probability of war—highlighting a fundamental trade-off in geoeconomic strategy. We further explore whether this rise in conflict risk could have been mitigated by credible, war-contingent trade sanctions threatened in advance by third countries. Using detailed trade data and the structure of actual sanctions adopted post-2022, we simulate counterfactual sanction packages as if they had been announced in 2021. Our results suggest that a sufficiently strong and targeted set of sanctions—such as the 2024 package—would have increased Russia's opportunity cost of war enough to deter a full-blown conflict, restoring the pre-2014 probability of peace. Crucially, sanctions prove ineffective when imposed unconditionally (or engineered and announced ex post), as they fail to influence expectations at the bargaining stage. Overall, our analysis shows that sanctions can serve as a powerful tool for reducing conflict risk, although their success critically hinges on design: to act as a disciplinary force in diplomatic negotiations, sanctions must be credible, war-contingent, and sharply raise the opportunity cost of war for the targeted country.

References

Ahmad, S. and S. Schreiber (2024). *Estimating Elasticities for Tradable Services in Policy Simulations*. US International Trade Commission.

Baqaee, D. and E. Farhi (2024). Networks, Barriers, and Trade. *Econometrica*.

Becko, J. S. and D. O'Connor (2024). Strategic (dis) integration. Technical report, Working Paper.

Chowdhry, S., J. Hinz, K. Kamin, and J. Wanner (2024, None). Brothers in arms: the value of coalitions in sanctions regimes. *Economic Policy 39*(118), 471–512.

Clayton, C., M. Maggiori, and J. Schreger (2025). Putting economics back into geoeconomics. *NBER Macro Annual*.

Crozet, M. and J. Hinz (2020, None). Friendly fire: the trade impact of the russia sanctions and counter-sanctions. *Economic Policy 35*(101), 97–146.

Crozet, M., J. Hinz, A. Stammann, and J. Wanner (2021, May). Worth the pain? Firms' exporting behaviour to countries under sanctions. *European Economic Review 134*, 103683.

Egorov, K., V. Korovkin, A. Makarin, and D. Nigmatulina (2025, May). Trade sanctions against Russia: Stylized facts. *AEA Papers and Proceedings 115*, 578–82.

Federle, J., A. Meier, G. Muller, and M. Schularick (2024). The Price of War. Kiel Policy Brief 171, Kiel Institute for the World Econonomy.

Felbermayr, G., A. Kirilakha, C. Syropoulos, E. Yalcin, and Y. V. Yotov (2020, None). The global sanctions data base. *European Economic Review 129*(C), None.

Felbermayr, G., T. C. Morgan, C. Syropoulos, and Y. V. Yotov (2021). Understanding economic sanctions: Interdisciplinary perspectives on theory and evidence. *European Economic Review 135*, 103720.

Flach, L., I. Heiland, M. Larch, M. Steininger, and F. A. Teti (2024, February). Quantifying the partial and general equilibrium effects of sanctions on russia. *Review of International Economics 32*(1), 281–323.

Glick, R. and A. M. Taylor (2010, February). Collateral Damage: Trade Disruption and the Economic Impact of War. *The Review of Economics and Statistics 92*(1), 102–127.

Haidar, J. I. (2017, April). Sanctions and export deflection: evidence from Iran. *Economic Policy 32*(90), 319–355.

Hertel, T., D. Hummels, M. Ivanic, and R. Keeney (2007). How confident can we be of cge-based assessments of free trade agreements? *Economic Modelling 24*(4), 611–635.

Huang, Z., B. Kleinman, E. Liu, and S. J. Redding (2025, December). Accommodating emerging giants in the global economy. Working Paper 34530, National Bureau of Economic Research.

Hufbauer, G., J. Schott, and K. Elliott (2009). *Economic Sanctions Reconsidered, 3rd Edition (paper)*. Peterson Institute for International Economics.

Martin, P., T. Mayer, and M. Thoenig (2008, July). Make Trade Not War? *The Review of Economic Studies 75*(3), 865–900.

Mayer, T., I. Mejean, and M. Thoenig (2025). The fragmentation paradox: De-risking trade and global safety. Discussion Paper 20564, CEPR.

Mohr, C. and C. Trebesch (2024). Geoeconomics. Technical report, CESifo Working Paper.

Morgan, T. C., N. A. Bapat, and Y. Kobayashi (2014). Threat and imposition of economic sanctions, 1945–2005. *Journal of Conflict Resolution 58*(4), 541–570.

Morgan, T. C., C. Syropoulos, and Y. V. Yotov (2023, Winter). Economic sanctions: Evolution, consequences, and challenges. *Journal of Economic Perspectives 37*(1), 3–30.

Nigmatulina, D. (2022, Nov). Sanctions and misallocation. how sanctioned firms won and russia lost. LSE Research Online Documents on Economics 118037, London School of Economics and Political Science, LSE Library.

O'Rourke, K. H. (2007). War and Welfare: Britain, France, and the United States 1807-14. *Oxford Economic Papers 59*, i8–i30. Publisher: Oxford University Press.

Pape, R. A. (1997). Why economic sanctions do not work. *International Security 22*(2), 90–136.

Syropoulos, C., G. Felbermayr, A. Kirilakha, E. Yalcin, and Y. V. Yotov (2024, February). The global sanctions data baseâ€"release 3: Covid19, russia, and multilateral sanctions. *Review of International Economics 32*(1), 12–48.

Thoenig, M. (2024). Trade policy in the shadow of war: Quantitative tools for geoeconomics. In *Handbook of the Economics of Conflict*, Volume 1. Elsevier.

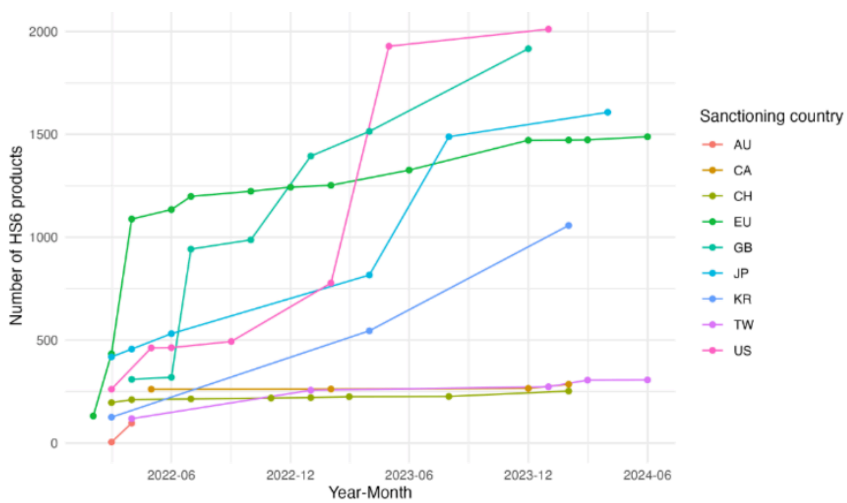
A Calibration Appendix

Table A1: Calibrated parameters

Parameter	Value	Source	Interpretation
ω	.35	Baqaee and Farhi (2024)	CES between sectors (inter. C)
θ	.5	Baqaee and Farhi (2024)	CES between sectors (final C)
λ	.1	Baqaee and Farhi (2024)	CES between VA and inputs
σ_j (Goods)		Hertel et al. (2007)	Armington elasticities
σ_j (Services)		Ahmad and Schreiber (2024)	Armington elasticities
$\pi^l_{m,j,0}$		TiVA data	Labor shares
$\pi^X_{m,ij,0}$		TiVA data	Intermediate shares
$\pi^X_{nm,ij,0}$		TiVA data	Intermediate trade shares
$\pi^c_{n,j,0}$		TiVA data	Final consumption shares
$\pi^c_{mn,j,0}$		TiVA data	Final trade shares
$y_{nm,j,0}$		TiVA data	Trade flows
$P_{n,0}C_{n,0}$		TiVA data	Final consumption

Note: The table summarizes the calibration of the model's key parameters. See details in Mayer et al. (2025).

Figure A1: Post 2022 sanctions



Source: Egorov et al. (2025). The figure summarizes the evolution of HS-6 product coverage under each country's sanction package since its initial implementation in 2022.