The Geopolitical Determinants of Economic Growth, 1960–2024

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This paper shows that geopolitical relations are a first-order determinant of economic growth. We construct a new event-based measure of bilateral geopolitical relations using large language models to compile and classify 373,020 geopolitical events across 193 countries from 1960 to 2024. This measure captures the timing and intensity of geopolitical interactions at a global scale. Exploiting within-country temporal variation with local projections, we find that a one-standard-deviation improvement in geopolitical relations increases GDP per capita by 10 percent over the subsequent 20 years. These effects operate through domestic stability, investment, trade, and productivity. Overall, geopolitical relations account for GDP variations ranging from −30 to +30 percent across countries and time periods.

Keywords. Geopolitical relations, Economic growth, Large language models, Local projections

JEL Classification. F50, F51, O11, O40, C82, P16

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1. Introduction

What determines the wealth of nations has long been a foundational question in economics and the social sciences. Early empirical contributions by Barro (1991) and Mankiw, Romer, and Weil (1992) identified physical and human capital accumulation as key drivers of cross-country income differences. Subsequent research identified technology, institutions, geography, culture, and financial systems as fundamental determinants, with Acemoglu et al. (2019) more recently providing causal evidence that democratization increases GDP per capita by approximately 20 percent in the long run. Yet despite decades of research on the determinants of economic growth, substantial cross-country growth and income differences remain unexplained (Kremer, Willis, and You 2022).

This paper shows that geopolitical alignment—the state of a country's diplomatic and strategic relationships with major nations—constitutes a first-order yet underexplored determinant of economic growth. While the growth literature has extensively studied domestic factors such as institutions and human capital, the role of international political relationships has received surprisingly little attention despite the evident importance of global integration for economic development. We find that geopolitical factors account for a substantial portion of growth and income variation, especially for developing economies where international relations can determine stability and access to markets, technology, and investment.

To systematically investigate this geopolitical growth determinant, we develop a novel event-based measure of bilateral geopolitical relations that captures both the timing and intensity of diplomatic dynamics. Employing large language models with web search capabilities, we compile and analyze 373,020 geopolitical events involving bilateral interactions between 193 United Nations member states and 24 major nations from 1960 to 2024. For each bilateral relationship and year, we identify significant geopolitical events—ranging from trade agreements and formal alliances to sanctions and wars—classify them using the Conflict and Mediation Event Observations (CAMEO) framework,[1] and assign Goldstein scores quantifying their cooperative or conflictual intensity.[2] This granular approach overcomes fundamental limitations of existing measures based on UN voting patterns or binary indicators, enabling us to exploit within-country variation in both the timing and magnitude of geopolitical changes. We aggregate bilateral scores using GDP-weighted averages to construct country-year indices that reflect each country's overall position in the global geopolitical landscape. The resulting measure captures the full arc of contem-

[1] CAMEO (Conflict and Mediation Event Observations) is a framework for systematically coding international political events into cooperation-conflict categories. See Schrodt and Yilmaz (2012) and Online Appendix C for implementation details.

[2] The Goldstein Scale assigns numerical values from −10 (maximum conflict) to +10 (maximum cooperation) to quantify the intensity of international political actions. See Goldstein (1992) and Online Appendix C for scoring guidelines.

porary international relations—from Cold War bipolarity through post-1990 globalization to the recent era of geopolitical fragmentation.

Our main empirical analysis employs local projection methods with country fixed effects to trace the dynamic effects of geopolitical alignment on economic growth. We find that the dynamic growth effects build gradually and persist for decades, with even transitory improvements generating persistent benefits. A one-standard-deviation permanent improvement in geopolitical relations increases GDP per capita by approximately 10 log points (10.5 percent) over 20 years. To illustrate the economic magnitude: moving from hostile relations to strong cooperation, comparable to South Africa's post-apartheid transformation, raises long-run GDP by 70 log points. These effects operate through multiple reinforcing channels, including immediate improvements in domestic stability and investment, followed by gradual expansions in trade openness, productivity growth, and human capital accumulation.

We support the causal interpretation of these results through multiple complementary approaches. First, our baseline estimates are robust across diverse sources of variation: from improvements to deteriorations in geopolitical relations across six decades, and whether alignment is with the United States, Russia (Soviet Union), China, Western democracies, or non-Western powers. This robustness across both directions of geopolitical change and ideologically different partners suggests that our estimates reflect the fundamental economic value of international cooperation rather than country-specific confounds. Second, extensive robustness tests controlling for alternative fixed effects specifications, time-varying covariates including trade openness and domestic unrest, and different lag structures yield consistent results. Third, we implement an instrumental variables strategy exploiting variation from non-economic verbal conflicts—diplomatic disputes, border tensions, and cultural disagreements that move bilateral relations but are plausibly less directly tied to contemporaneous economic conditions. The convergence of IV and OLS estimates suggests that the baseline relationship is unlikely to be driven solely by reverse causality or omitted economic confounders.

Our analysis reveals that geopolitical alignment drives growth through multiple reinforcing channels. Domestic political stability improves immediately, with investment shares of GDP rising by 7–8 percentage points within the first few years, driving capital accumulation that peaks at 15 log points after a decade. Total factor productivity shows substantial gains of 10–12 log points, while trade openness expands gradually by 10 percentage points of GDP as diplomatic alignment dismantles commercial barriers. Human capital accumulates slowly, with gains materializing toward the end of our 25-year horizon as international stability enables sustained educational investments. Additional evidence in the appendix confirms that both consumption and domestic absorption closely track GDP gains, suggesting that geopolitical alignment generates broad-based welfare improve-

ments rather than concentrated growth.

We then revisit the democracy-growth nexus by examining how it operates through the channel of political relations with major nations. Democracy and geopolitics operate as complementary but distinct growth drivers: democracy's short-run effect works primarily through improved Western relations, with bilateral relations rising by one standard deviation within five years of democratic transitions. However, democracy's long-run benefits persist even after controlling for geopolitical channels, reflecting additional gains from strengthened property rights and reduced expropriation risk. This decomposition reconciles the literature: short-run studies correctly emphasize international relations, while long-run analyses appropriately highlight institutional quality. Crucially, non-democratic countries can achieve substantial growth through geopolitical alignment alone, though they forgo democracy's additional long-run benefits—a key finding for development strategies in an increasingly multipolar world.

Having estimated these dynamic effects, we conduct growth accounting exercises to quantify geopolitical contributions to both temporal growth variations and persistent cross-country income differences. Geopolitical factors explain GDP variations ranging from −30% to +30% across countries and time periods. During the Cold War, bipolar competition created stark divisions with corresponding economic costs, while the 1990–2010 globalization era generated widespread gains through improved international relations. The period from 2010 to 2024, however, witnessed renewed fragmentation, with the median country experiencing negative contributions from geopolitical factors for the first time in our sample. Cross-sectionally, geopolitical alignment explains income differences comparable in magnitude to geography or institutions, with countries like Singapore benefiting from strategic positioning, while others, like Russia, pay severe economic penalties for international isolation.

Our findings are robust to alternative estimation methods and measurement approaches. Dynamic panel estimates exploiting the autoregressive structure yield similar dynamic effects, with permanent improvements generating long-run GDP gains close to our baseline. Alternative measures based on unsmoothed geopolitical events converge to similar long-run impacts once we account for their transitory nature. In contrast, measures based on UN voting patterns fail to generate any growth effects when subjected to the same empirical framework, highlighting the importance of our bilateral event-based approach. Even when compared to direct measures of economic coercion, such as sanctions, our comprehensive geopolitical index subsumes their explanatory power while capturing additional growth-relevant variation.

Recent geopolitical upheavals—from the U.S.-China trade war to the Russia-Ukraine conflict and pandemic-driven reshoring—underscore the urgency of understanding these dynamics. Our analysis quantifies the stakes: geopolitical misalignment can cost develop-

ing countries 20–30% of GDP, undermining gains from domestic reforms. Yet our finding that relations with different major nations generate similar economic benefits suggests that development need not become hostage to strategic rivalry.

Literature Review. This paper contributes to three strands of literature: the measurement of geopolitical relations, the determinants of economic growth, and the emerging field of geoeconomics.

Measuring Bilateral Geopolitical Relations. We develop a bilateral measure of geopolitical relations that addresses key limitations in existing approaches. The predominant method relies on UN General Assembly (UNGA) voting similarity (Bailey, Strezhnev, and Voeten 2017; Signorino and Ritter 1999), which captures multilateral positions rather than bilateral dynamics. Alternative categorical measures—including strategic rivalries (Aghion et al. 2019; Thompson 2001), sanctions (Ahn and Ludema 2020; Felbermayr et al. 2021), military alliances (Gibler 2008), and bilateral treaties (Broner et al. 2025)—provide discrete classifications but do not capture the continuous evolution of international relationships. Our event-based approach tracks both the timing and intensity of bilateral geopolitical dynamics at annual frequency. Drawing on textual analysis methods for measuring economic and political risks (Baker, Bloom, and Davis 2016; Caldara and Iacoviello 2022; Hassan et al. 2019, 2024) and the growing application of large language models for data construction in economics (Dell 2025; Lagakos, Michalopoulos, and Voth 2025; Asirvatham, Mokski, and Shleifer 2026; Clayton et al. 2025), we extract, classify, and score 373,020 bilateral political events across six decades using standardized frameworks (CAMEO/Goldstein).

Economic Growth Determinants. We contribute to the literature on cross-country growth determinants (Barro 1996; Levine and Renelt 1992; Durlauf, Johnson, and Temple 2005; Johnson and Papageorgiou 2020). While existing research has identified fundamental drivers including institutions (Acemoglu, Johnson, and Robinson 2001; Dell 2010), human capital (Barro 1991; Mankiw, Romer, and Weil 1992), culture (Nunn 2008; Tabellini 2010), geography (Dell, Jones, and Olken 2012; Sachs and Warner 1995), and trade (Alcala and Ciccone 2004; Frankel and Romer 1999), the role of geopolitical relationships remains underexplored. Building on Acemoglu et al. (2019)'s empirical framework, we employ local projection methods (Jordà 2005; Jordà and Taylor 2025) to estimate the dynamic growth effects of geopolitical shocks.

Geoeconomics. Our research bridges classical economic statecraft (Hirschman 1945) with contemporary geoeconomic analysis (Clayton, Maggiori, and Schreger 2024, 2026; Fernández-Villaverde, Mineyama, and Song 2024; Flynn et al. 2025; Gopinath et al. 2025; Kleinman, Liu, and Redding 2024; Liu and Yang 2025). While recent theoretical and empirical work has formalized the mechanisms, evidence on the growth consequences of geopolitical relations remains limited. In a companion paper, Fan, Wo, and Xiang

(2025) extend our measurement approach to study how geopolitical relations shape trade globalization; this paper focuses on the aggregate growth consequences. Our framework situates aid (Alesina and Dollar 2000; Nunn and Qian 2014), sanctions (Morgan, Syropoulos, and Yotov 2023), and conflicts (Federle et al. 2026; Martin, Mayer, and Thoenig 2008) within a unified spectrum of geopolitical relations.

Road Map. The remainder of the paper proceeds as follows. Section 2 introduces our event-based measure of geopolitical relations. Section 3 presents our main empirical results, estimating the dynamic effects of geopolitical alignment on long-run growth. Section 4 unpacks the channels through which geopolitics affects growth and disentangles the interplay between democracy and international alignment. Section 5 quantifies geopolitical contributions to cross-country growth and income differences. Section 6 provides additional robustness tests. Section 7 concludes.

2. Event-based Measure of Geopolitical Relations

To accurately measure the timing and intensity of geopolitical dynamics, we leverage a large language model augmented with search capabilities to compile and analyze 373,020 geopolitical events worldwide from 1960 to 2024. Our dataset covers bilateral interactions between all 193 UN member states, with particular focus on relationships involving 24 major economic and geopolitical nations (denoted as $\mathcal{N}$)[3]. Using these events, we construct a novel measure of bilateral geopolitical relations that varies by country pair and year, which we then aggregate to create country-year measures of average geopolitical relations. This section describes our data construction methodology.

2.1. LLM: Compile and Analyze Geopolitical Events

Bilateral geopolitical events—spanning diplomatic agreements, economic sanctions, military actions, and territorial disputes—constitute a salient component of human knowledge and form a core element of training corpora for large language models (LLMs). These events are extensively documented across global digital repositories, including news archives, official government publications, and scholarly databases. We employ Gemini 2.5 Pro, an LLM equipped with web search capabilities, to systematically collect, verify, and analyze bilateral geopolitical events through a structured prompt engineering framework. This approach leverages the LLM's capacity to process vast textual datasets while

[3]The 24 major nations are: Argentina, Australia, Belgium, Brazil, Canada, Switzerland, People's Republic of China, Germany, Denmark, Spain, France, United Kingdom, Indonesia, India, Italy, Japan, Republic of Korea, Mexico, Netherlands, Poland, Russian Federation (Soviet Union), Saudi Arabia, Turkey, and United States. Appendix A.1 discusses these choices. Collectively, these 24 nations account for 83–90 percent of global GDP over the study period, underscoring their dominant role in the world economy.

maintaining real-time access to credible online sources. Figure 1 illustrates our LLM-based analysis procedure, with complete analytical framework and prompt specifications provided in Appendix A.2.

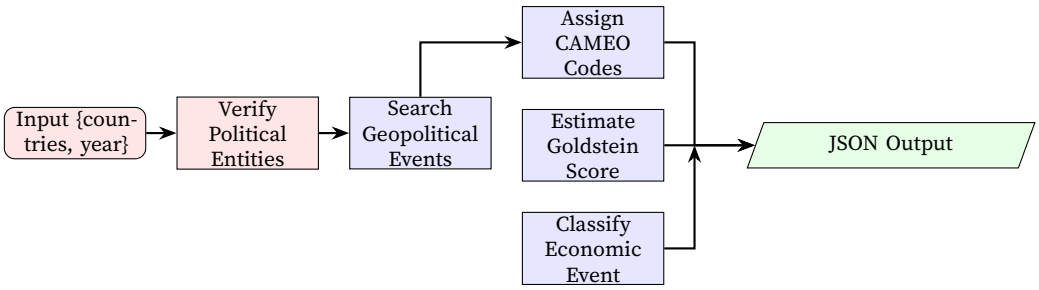


FIGURE 1. LLM Geopolitical Event Analysis Procedure

Our methodology instructs the LLM to perform five sequential tasks: (i) verify the historical political entities for each country pair and year, accounting for state succession (e.g., Soviet Union to Russian Federation); (ii) conduct systematic searches across its knowledge base and internet sources to identify bilateral geopolitical events from authoritative sources—spanning six dimensions: economic relations, diplomatic and political relations, security and defense, legal and territorial issues, multilateral governance, and other significant interactions (Table A1 in Appendix A.2; see Appendix C.2 for complete taxonomy); (iii) classify each event using the Conflict and Mediation Event Observations (CAMEO) framework into cooperation-conflict categories; (iv) assign Goldstein Scale scores ranging from −10 (maximum conflict) to +10 (maximum cooperation) based on event intensity;[4] and (v) categorize economic content when applicable.

Table 1 demonstrates our methodology using U.S.-Russia bilateral events from 2022, the year Russia launched its full-scale war on Ukraine. The analysis captures the dramatic deterioration in bilateral relations through systematic classification: five of the six geopolitical events represent conflict with Goldstein scores ranging from −4.5 to −8.0. The most severe event—U.S. military assistance to Ukraine—scores −8.0, reflecting direct material support to Russia's adversary in an active war. Comprehensive economic sanctions coordinated with G7 and EU partners score −7.5, while Russia's unprecedented suspension from the UN Human Rights Council scores −6.5. Verbal conflicts include President Biden's personal accusation labeling Putin a "war criminal" (−5.5) and the U.S.-led UN General Assembly resolution condemning the invasion (−4.5). The sole cooperative event—the Griner-Bout prisoner exchange in December—scores +7.0, illustrating how our framework captures rare instances of bilateral cooperation even amid otherwise hostile relations.

[4]Goldstein scores are assigned following the standard CAMEO-to-Goldstein mapping used by GDELT and ICEWS databases. While we maintain consistency with these established mappings, our LLM implementation allows for limited contextual adjustments based on the bilateral relationship's historical context and event severity. For the reference mapping between CAMEO codes and Goldstein scores, see `https://eventdata.parusanalytics.com/cameo.dir/CAMEO.SCALE.txt`.

TABLE 1. U.S.-Russia Bilateral Geopolitical Events in 2022: LLM Analysis Results

Event Name	Event Description	CAMEO Class.	Econ. Type	Goldstein Score
US Military Assistance to Ukraine	US committed billions in security assistance through Presidential Drawdown Authority and Ukraine Security Assistance Initiative, including Javelin missiles, Stingers, howitzers, and HIMARS	Material Conflict (17-170)	Not econ.	−8.0
Sweeping Sanctions on Russia	Following Russia's invasion of Ukraine, US coordinated with G7 and EU to impose extensive sanctions targeting major banks, state enterprises, and officials	Material Conflict (16-163)	Sanctions	−7.5
US Leads Russia's Suspension from UN Human Rights Council	Following reports of civilian deaths in Bucha, US led successful campaign to suspend Russia from UN Human Rights Council by 93–24 vote	Material Conflict (16-166)	Not econ.	−6.5
Biden Labels Putin a "War Criminal"	President Biden publicly called President Putin a "war criminal" for actions during the Ukraine invasion, a label the Kremlin called "unacceptable and unforgivable"	Verbal Conflict (11-112)	Not econ.	−5.5
US Leads Diplomatic Condemnation at UN	US led effort resulting in UN General Assembly Resolution ES-11/1, which passed 141–5 deploring Russia's aggression and demanding immediate withdrawal from Ukraine	Verbal Conflict (11-113)	Not econ.	−4.5
Griner-Bout Prisoner Exchange	US and Russia conducted prisoner swap in Abu Dhabi, exchanging Russian arms dealer Viktor Bout for American basketball player Brittney Griner after months of negotiations	Material Coop. (08-084)	Not econ.	+7.0

Table A2 in Appendix A.2 provides a contrasting example from the 1972 détente period, where all nine U.S.-Soviet geopolitical events represent cooperation with Goldstein scores ranging from +5.0 to +9.0—demonstrating our measure's ability to capture dramatic shifts in bilateral relations over time.

Table 2 synthesizes patterns across our complete dataset of 373,020 events spanning 1960–2024. The data reveal three distinct phases in international relations: Cold War tensions (1960–1989) with cooperation comprising 75–79% of interactions and mean Goldstein scores ranging from 2.86 to 3.28; the globalization era (1990–2010) witnessing cooperative events expand to 84–86% with scores peaking at 4.09; and the contemporary fragmentation period (2010–2024) where conflict events increase relatively faster than cooperation, with mean scores declining from 3.88 in the 2010s to 3.73 in the 2020s amid major geopolitical ruptures including the Russia-Ukraine war. The resulting measure captures the full arc of contemporary international relations—from Cold War bipolarity through post-1990

TABLE 2. Geopolitical Events Summary by Decade, 1960–2024

	1960s	1970s	1980s	1990s	2000s	2010s	2020s	Total
Cooperation Events	22,010	26,872	29,657	40,538	59,232	82,879	48,546	309,734
Conflict Events	7,279	7,353	9,390	7,988	9,647	13,296	8,333	63,286
Mean Goldstein Score	2.856	3.278	2.920	3.976	4.086	3.879	3.727	3.671

Notes: Cooperation events include verbal and material cooperation (CAMEO classes 1-2). Conflict events include verbal and material conflict (CAMEO classes 3-4). Goldstein Scale: −10 (most conflictual) to +10 (most cooperative).

globalization to the recent era of geopolitical fragmentation. Appendix A.2.2 provides detailed statistics on event classification and temporal patterns.

Comparison with Existing Event Databases. Our geopolitical events compilation differs from existing global event databases such as GDELT (Leetaru and Schrodt 2013) and ICEWS (Boschee et al. 2015) in two key dimensions. First, leveraging the LLM's contextual capabilities, we focus exclusively on geopolitical events that define bilateral geopolitical relations between country pairs, enabling more precise measurement of relationship intensity.[5] This targeted approach prioritizes events with clear bilateral significance rather than attempting to synthesize the full spectrum of international interactions. Second, our compilation provides extended temporal coverage from 1960, aligning with the availability of economic data necessary for comprehensive panel analysis.[6]

Model Robustness and Replicability. Our measurement approach is robust to the choice of LLM and replicable across runs. Appendix A.3 compares scores produced by Gemini 2.5 Pro, GPT 5.4, and Claude (Opus 4.6 and Sonnet 4.6): cross-model comparisons on random dyad-years (pooled $\rho = 0.88$) and within-model replicability (pooled $\rho = 0.93$). Bilateral geopolitical events are sufficiently well-documented that different LLMs converge on similar assessments.

2.2. Measuring Geopolitical Relations

Dynamic Bilateral Geopolitical Relations. We construct a measure of bilateral geopolitical relations based on geopolitical events between country pairs. Let $\left\{s_{ij,t}^{n}\right\}_{n=1}^{\tilde{N}_{ij,t}}$ denote the

[5] GDELT and ICEWS collect comprehensive global events across all actors and issue areas, making it challenging to aggregate these events into meaningful measures of bilateral relationship intensity between specific country pairs.

[6] GDELT provides daily event data only from 1979 onward, while ICEWS covers 1995 to present. Both databases have limited historical depth compared to the timespan required for comprehensive economic analysis of geopolitical relationships.

Goldstein scores for the set of events between countries i and j in year t, where $\tilde{N}_{ij,t}$ is the total number of events. The average event score is:

$$\tilde{S}_{ij,t} = \frac{1}{\tilde{N}_{ij,t}} \sum_{n=1}^{\tilde{N}_{ij,t}} s^n_{ij,t}/10$$

To balance both the immediate impact of political events and the institutional memory that characterizes international relationships, we then construct a dynamic geopolitical score for each country pair as a weighted moving average:

$$S_{ij,t} = \left(1 - \phi_{ij,t}\right) \cdot S_{ij,t-1} + \phi_{ij,t} \cdot \tilde{S}_{ij,t} \tag{1}$$
$$\phi_{ij,t} = \tilde{N}_{ij,t}/N_{ij,t}, \quad N_{ij,t} = (1-\delta)\, N_{ij,t-1} + \tilde{N}_{ij,t}$$

where $\phi_{ij,t}$ represents the updating weight, $N_{ij,t}$ is the effective cumulative number of events, and δ is the depreciation rate for past observations. We set $\delta = 0.3$, which approximates a four-year moving average with greater weight on recent events.[7] The dynamic geopolitical score is normalized to range from –1 (maximum conflict) to +1 (maximum cooperation).

This event-based measure captures both the timing and intensity of bilateral geopolitical relations, enabling identification of economic responses to geopolitical changes within a panel structure with country fixed effects. As emphasized by Durlauf, Johnson, and Temple (2005) and Kremer, Willis, and You (2022), exploiting within-country variation presents challenges for identifying growth effects with precision, making accurate measurement particularly important.

Figure 2 plots our dynamic geopolitical score (blue line) between the United States and Russia from 1960 to 2024. The measure accurately captures major historical episodes: the Cuban Missile Crisis marking peak Cold War tensions, the Détente period (1968–1979), deterioration following the Soviet invasion of Afghanistan, improvement beginning with Gorbachev's reforms in the mid-1980s, the post-Soviet peak in 1992, and subsequent decline culminating in the Crimean Crisis. The 2014–2024 period represents a historical low, exceeded only by the peak Cold War years. In contrast, the Ideal Point Distance measure from UN voting data (green line) captures neither the Détente period nor the sharp deterioration following the Crimean Crisis. Additional validation is provided in Appendix A.4 and A.5.

[7] The four-year window corresponds to a typical electoral cycle. Our results are robust to alternative depreciation rates. In Section 6.2, we examine the case where $\delta = 1$, which corresponds to using unsmoothed event-based scores. While these event scores show rapid mean reversion and generate smaller immediate GDP effects, the cumulative long-run impact of permanent changes in event flows converges to our baseline estimates. This confirms that our smoothing procedure captures economically meaningful variation without biasing the fundamental relationship between geopolitics and growth.

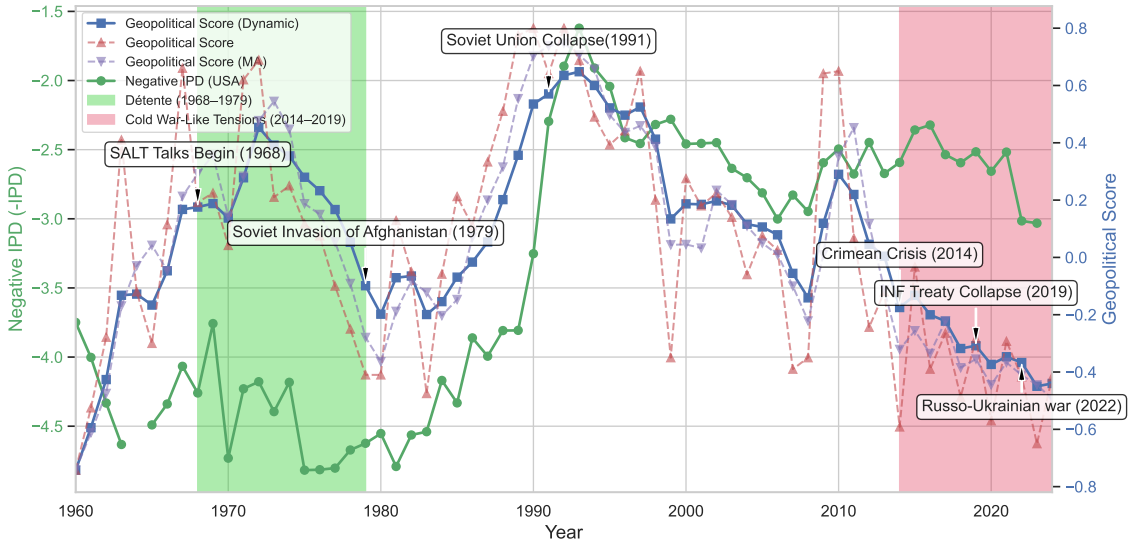


FIGURE 2. Geopolitical Scores Between United States and Russia (Soviet Union)

Time series comparison of geopolitical relationship measures between the United States and Russia, 1960–2024. The blue line shows our dynamic geopolitical score, the orange dashed line shows the yearly geopolitical score, the purple dashed line shows the four-year moving average, while the green line displays the negative Ideal Point Distance (–IPD) from UN voting data. Shaded regions highlight the Détente period (1968–1979, green) and recent Cold War-like tensions (2014–2024, red). Key geopolitical events are annotated on the dynamic score series.

Advantages over Existing Measures. Our event-based approach offers three key advantages over existing measures of bilateral geopolitical relations: universal coverage across countries and time, precision in capturing the timing and intensity of bilateral dynamics, and a comprehensive scale from conflict to cooperation.

Existing literature predominantly relies on UN voting similarity to achieve broad coverage (Signorino and Ritter 1999; Bailey, Strezhnev, and Voeten 2017; Kleinman, Liu, and Redding 2024). However, UNGA voting primarily reflects positions on multilateral issues rather than bilateral dynamics, resulting in measures that are more stable and less responsive to bilateral relationship changes (Broner et al. 2025). Figure 2 illustrates this limitation: while the negative Ideal Point Distance (Bailey, Strezhnev, and Voeten 2017) broadly tracks our measure's trajectory, it misses critical inflection points including the Détente period and the post-Crimean deterioration.

Our measure also complements categorical approaches that classify relationships using discrete indicators such as *Strategic Rivalry* (Thompson 2001; Aghion et al. 2019), *Sanctions* (Ahn and Ludema 2020; Felbermayr et al. 2021), *Formal Alliance* (Gibler 2008), and *Treaties* (Broner et al. 2025). While these binary classifications capture important institutional milestones, they necessarily focus on specific relationship thresholds rather than continuous evolution. Our framework incorporates these same landmark events—military rivalries, alliance formations, treaty signings—while situating them within a

broader spectrum of bilateral interactions. Appendix A.4 provides additional comparisons, and Section 6.2 presents empirical tests.

Country-Level Geopolitical Relations. To capture a country's overall geopolitical stance, we aggregate bilateral geopolitical scores $S_{ij,t}$ into a country-level measure using a GDP-weighted average:

$$p_{ct} = \sum_{j \in \mathcal{N}} S_{cj,t} \times \text{GDP share}_{jt} \tag{2}$$

Here, GDP share_{jt} denotes country j's share of world nominal GDP.[8] We interpret nominal GDP as a proxy for geopolitical influence, as it reflects both economic strength and military capacity. The resulting index p_{ct} serves as our primary measure of a country's geopolitical position in subsequent analyses of growth outcomes. Values of p_{ct} approaching -1 indicate strong global conflict, while values near $+1$ indicate strong alignment with the global order.

2.3. Landscape of Geopolitical Relations: 1960–2024

This section analyzes the evolution of global geopolitics from 1960 to 2024 using our dynamic measure of geopolitical relations. We illustrate key shifts in the geopolitical landscape through network visualizations and distributional analysis, further validating our measure's ability to capture major historical transformations.

Figure 3 illustrates the transformation from Cold War bipolarity to contemporary multipolarity. In 1980, the United States and Soviet Union anchor two distinct clusters, with extensive red dashed lines between blocs indicating widespread hostility. Notably, China appears positioned between the two superpowers but closer to the Western bloc, reflecting the Sino-American rapprochement following Nixon's opening and shared opposition to Soviet expansion.[9]

By 2024, the bipolar structure has transformed into a fragmented system shaped by Russia's invasion of Ukraine. The Western alliance—comprising the United States, United Kingdom, Germany, France, Japan, Australia, and South Korea—forms a tightly integrated cluster, while China and Russia occupy a separate pole connected by alliance ties and jointly isolated from the West. India maintains a strategically ambiguous position between these blocs, and "connector" states like Turkey, Brazil, and Mexico continue bridging

[8] Nominal GDP is measured in current U.S. dollars, sourced from the World Bank.

[9] The U.S.-China alignment in 1980 represented a dramatic reversal from the 1960s, demonstrating how quickly geopolitical relations can shift when strategic interests align. Non-aligned states like India, Brazil, and Mexico occupy intermediate positions, though their placement reveals varying degrees of practical tilt beyond stated non-alignment policies.

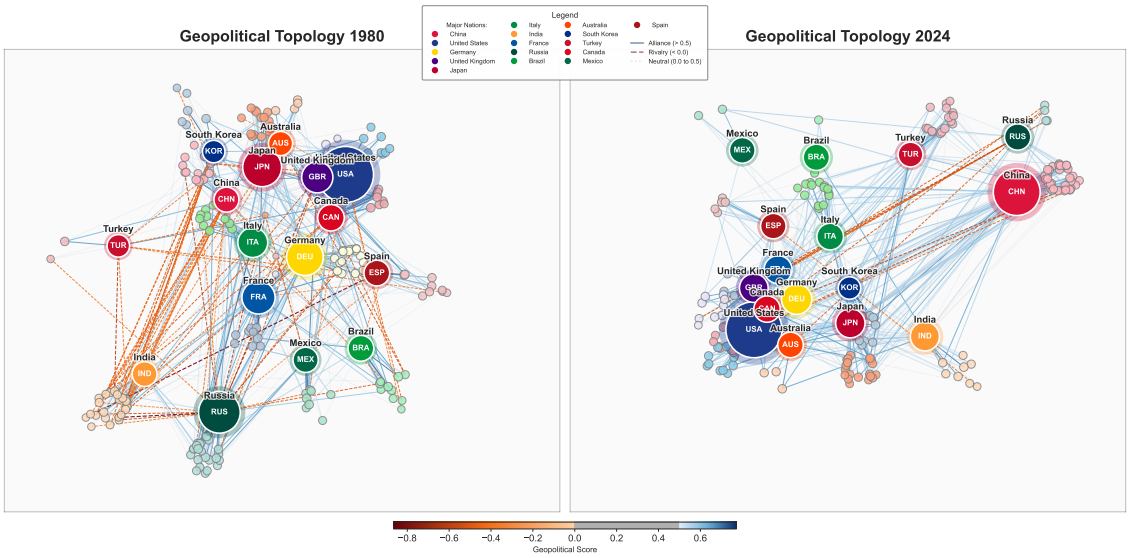


FIGURE 3. Geopolitical Relation Topology, 1980 and 2024

Geopolitical topology constructed using multidimensional scaling based on pairwise geopolitical scores between major nations. Distances between major nations reflect dissimilarity in their geopolitical relations with the rest of the world. Circle sizes indicate GDP shares. Smaller circles represent non-major countries, colored by strongest alignment and positioned near primary patron. Blue lines indicate alliances (scores > 0.5); red dashed lines indicate hostile relations (scores < 0.0).

different clusters amid intensifying competition.[10] Appendix A.6 provides additional geographic detail in maps.

Figure 4 reveals fundamental shifts in the global distribution of geopolitical relations across six decades. During the Cold War era (1960–1990), the 5th percentile fluctuated between −0.30 and −0.15, reflecting the volatile position of countries caught in superpower competition, while upper percentiles remained relatively stable. The 1970 and 1980 distributions exhibit clear bimodality—with a primary peak around 0.2 and substantial mass extending into negative territory—capturing the division into opposing geopolitical camps.

The post-Cold War transformation (1990–2010) brought dramatic convergence: the 5th percentile improved sharply from approximately −0.15 to nearly 0.0 and the median rose from 0.20 to above 0.30. By 2010, the distribution concentrated tightly around 0.25 with minimal mass below 0.0, reflecting the globalization era's widespread cooperation. The 2010–2024 period shows a notable reversal—the 5th percentile declined back toward 0.0, variance increased, and the 2020 distribution reveals renewed dispersion with a flattened peak and re-emerging left tail extending below 0.0.[11]

[10]These nonaligned "connector" countries are rapidly gaining importance and serving as bridges between blocs, potentially undermining the effectiveness of policies aimed at economic decoupling.

[11]The percentile spread narrowed from approximately 0.60 (ranging from −0.30 to 0.30) during peak Cold War to 0.35 (0.0 to 0.35) by 2010, before widening again to 0.40 by 2024. This compression and re-expansion of

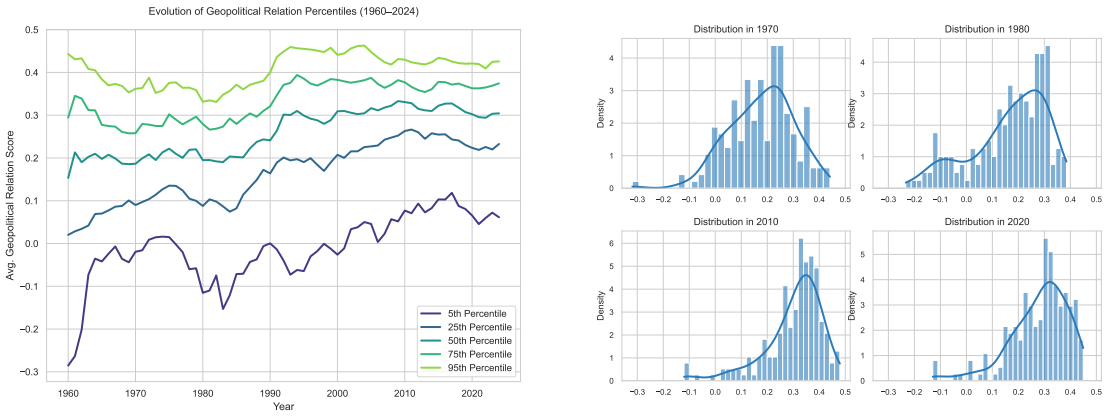


FIGURE 4. Evolution of Geopolitical Relation Distributions

Left panel shows the evolution of geopolitical relation percentiles from 1960–2024, with lines representing the 5th, 25th, 50th, 75th, and 95th percentiles. Right panels display kernel density estimates of the distribution of country-level average geopolitical relations for selected years (1970, 1980, 2010, 2020), highlighting the shift from Cold War bipolarity through post-Cold War convergence to contemporary re-polarization.

These distributional dynamics validate our measure's ability to capture macro-historical transformations through purely data-driven patterns that align with established historical narrative: Cold War tensions (wide percentile gaps and bimodal distributions through 1990), post-Cold War convergence (compression and rightward shift from 1990–2010), and contemporary fragmentation (renewed dispersion and re-emerging negative tail from 2010–2024).[12] Table A4 in Appendix A.6 provides additional summary statistics by decade.

3. Dynamic Growth Effects of Geopolitics

Having developed a novel event-based measure of geopolitical relations, we now examine its economic implications by estimating the dynamic causal effects of geopolitical relations on economic growth. This section presents our main empirical findings, demonstrating that improvements in international relations generate substantial and persistent economic gains.

3.1. Data and Preliminary Evidence

Economic Data. Our analysis employs a comprehensive panel dataset covering 193 countries from 1960 to 2024. The primary outcome variable is log GDP per capita in constant US dollars from the World Development Indicators, which provides broad country coverage

the distribution aligns with the rise and partial retreat of economic globalization.

[12] Mean geopolitical relations improved from 0.177 in the 1960s to 0.296 in the 2010s before declining to 0.281 in the 2020s; standard deviation fell from 0.141 to 0.108 over the same period before rising to 0.114 in the 2020s.

and facilitates cross-country comparisons.[13] We build upon the dataset constructed by Acemoglu et al. (2019), expanding coverage and incorporating additional variables from the Penn World Tables (Feenstra, Inklaar, and Timmer 2015) and Acemoglu et al. (2025).[14]

Beyond our main outcome, we examine key growth determinants spanning multiple categories: enhanced Solow fundamentals (physical capital, investment rates, population growth, education), institutional measures (democracy indices, governance quality), trade openness, and additional correlates identified in the growth literature. This comprehensive set of variables enables us to explore the channels through which geopolitical relations affect economic development.

Preliminary Evidence: Geopolitics and Growth across Decades. Before presenting our formal empirical analysis, we document the raw correlation between changes in geopolitical relations and subsequent economic growth. Figure 5 provides suggestive evidence by plotting decadal changes in geopolitical relations against future growth performance.

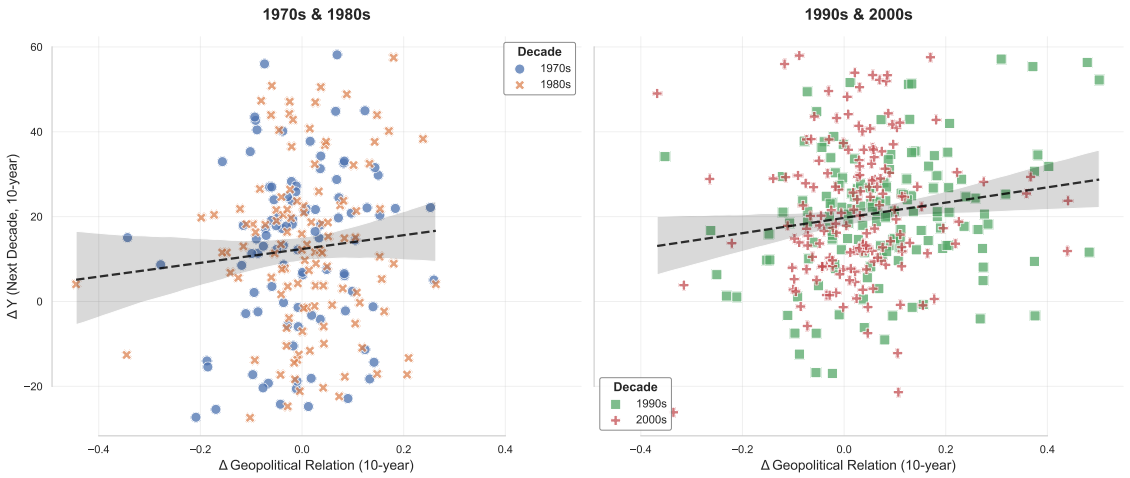


FIGURE 5. Geopolitical Relations and Subsequent Economic Growth by Decade

Each point represents a country-decade observation. The x-axis shows the average 10-year change in geopolitical relations during decade d, while the y-axis displays the average 10-year change in log GDP per capita during decade $d + 1$. To improve visualization, we exclude the top and bottom 2.5% of observations based on future growth rates. Dashed lines represent OLS regression fits with 95% confidence intervals shown in gray. The sample covers 1970–2010 for geopolitical changes, with growth outcomes measured through 2019.

Both panels reveal a positive association between improvements in geopolitical relations and subsequent economic performance. Countries experiencing diplomatic improvements in decade d tend to achieve higher growth rates in decade $d + 1$, with the relationship is stronger and more precise in the later period (1990s–2000s) compared to

[13] Section 3.4 presents robustness checks using alternative output measures from the Penn World Tables, confirming that our results are not sensitive to the choice of GDP measure.

[14] The panel is unbalanced, with coverage varying across countries and time periods. Table B1 in Appendix B.1 provides detailed information on country coverage and data availability for each variable.

the Cold War era (1970s–1980s). This tightening of the relationship coincides with the acceleration of globalization and the increasing importance of international economic integration.

While these correlations are suggestive, they cannot establish causality due to potential reverse causation and omitted variables. Countries with better growth prospects may attract more diplomatic attention, or unobserved factors might drive both geopolitical relations and economic performance. We therefore turn to a more rigorous empirical framework that addresses these identification challenges through panel methods with rich controls and instrumental variable strategies.

3.2. Empirical Specification

We denote our measure of country-level geopolitical relations as p_{ct}. Rather than examining the sources of geopolitical dynamics, we take geopolitical relations as given and identify their dynamic causal effects on economic outcomes. Specifically, we examine how a change in geopolitical relations at time t influences economic outcomes at future horizons relative to a baseline of no change. Formally, following Jordà and Taylor (2025), we define the impulse response function as:

$$\mathcal{R}_{p\to y}(h) \equiv E\left[y_{c,t+h} \mid p_{ct} = p_{c0} + 1; \mathbf{x}_{ct}\right] - E\left[y_{c,t+h} \mid p_{ct} = p_{c0}; \mathbf{x}_{ct}\right], \quad h = 0, 1, \ldots, H \tag{3}$$

where $y_{c,t+h}$ represents the economic outcome (log GDP per capita $\times$ 100) at horizon h, and $\mathbf{x}_{ct}$ is a vector of control variables.[15] The control vector includes:

$$\mathbf{x}_{ct} = \left\{ \{y_{c,t-\ell}, p_{c,t-\ell}\}_{\ell=1}^{J}, \delta_c, \delta_{r(c)t}, \boldsymbol{m}_{ct} \right\}$$

where $y_{c,t-\ell}$ and $p_{c,t-\ell}$ are lagged values of GDP and geopolitical relations, respectively, δ_c denotes country fixed effects, $\delta_{r(c)t}$ represents region-time fixed effects, and $\boldsymbol{m}_{ct}$ includes time-varying country-specific controls employed in robustness checks.

To estimate the impulse responses, we employ the local projection (LP) method proposed by Jordà (2005) and extended to panel settings by Jordà, Schularick, and Taylor (2020) and Bilal and Känzig (2024):

$$y_{c,t+h} = \alpha_h^{\text{LP}} p_{ct} + \gamma_h' \mathbf{x}_{ct} + \mu_{c,t+h}, \quad h = 0, 1, \ldots, H \tag{4}$$

where each horizon h is estimated via a separate regression, providing a semiparametric approximation of the conditional expectation in equation (3). In our baseline specification, we include four lags ($J = 4$) of both GDP and geopolitical relations, consistent with

[15] In our linear specification, this impulse response equals the marginal effect of geopolitical relations on GDP. The multiplication by 100 means coefficients are expressed in log points.

Acemoglu et al. (2019), to capture growth dynamics while ensuring robust inference in the presence of serial correlation (Montiel Olea and Plagborg-Møller 2021).

Country fixed effects δ_c account for time-invariant heterogeneity across countries, enabling identification from within-country variation—a stringent requirement in growth empirics (Durlauf, Johnson, and Temple 2005). Region-time fixed effects $\delta_{r(c)t}$ control for regional and global shocks, including shared temporal dynamics such as regional conflicts, financial crises, and globalization waves.[16] The accurate measurement of the timing and intensity of geopolitical relations is critical for empirical relevance in this demanding panel setting.

ASSUMPTION 1. *The structural shock to GDP satisfies* $\mathbb{E}\left[\mu_{c,t+h} \mid p_{ct}, \{\mathbf{x}_{c\tau}\}_{t_0 \le \tau \le t}\right] = 0$ *for all* $\{\mathbf{x}_{c\tau}\}_{t_0 \le \tau \le t}$*, all countries c, and all* $t \ge t_0$.

Assumption 1 ensures that, conditional on lagged GDP, lagged geopolitical relations, and other controls, geopolitical relations are orthogonal to contemporaneous and future shocks to GDP. This identification condition implies that $\mathcal{R}_{p \to y}(h) = \alpha_h^{\text{LP}}$ (Jordà 2005), allowing consistent estimation via ordinary least squares (OLS). Compared to vector autoregressions (VARs), local projections offer greater robustness to model misspecification, as they do not require a fully specified dynamic system to extrapolate responses across horizons (Montiel Olea and Plagborg-Møller 2021).

Economically, Assumption 1 requires that countries with different geopolitical relations exhibit similar potential GDP growth trends after conditioning on our controls. This is a strong assumption that warrants careful examination. We address potential concerns through three complementary approaches:

First, we argue that our rich set of controls—country fixed effects, lagged GDP, and lagged geopolitical relations—captures the primary determinants of both future growth and geopolitical dynamics. These include geographical endowments, historical legacies, institutional quality, and economic fundamentals. Supporting this identification assumption, Section 3.4.1 demonstrates broad robustness: countries experience virtually identical growth benefits whether improving relations with the United States or other major nations. This symmetry across ideologically and economically different partners, combined with stable linear effects across the entire distribution of geopolitical shocks, suggests our estimates reflect causal effects rather than country-specific time-varying confounds.

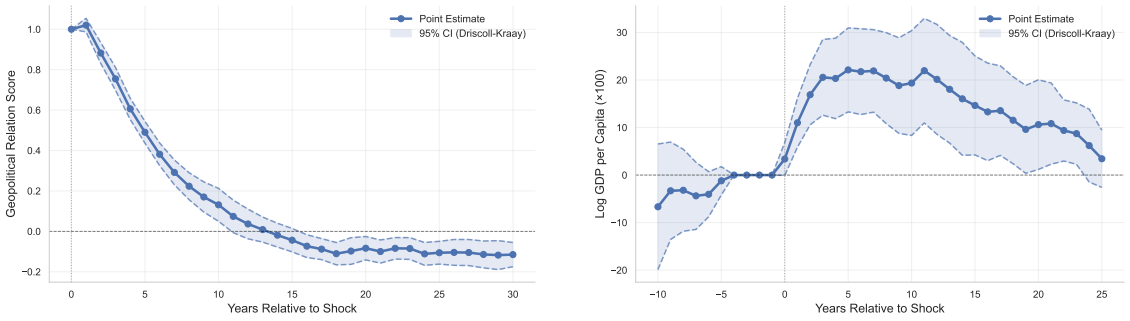
Second, we test the robustness of our identification assumption by incorporating additional time-varying controls in Section 3.4. These include lags of trade openness, domestic political stability, and other growth correlates. We also interact initial characteristics (political regime, development level) with year dummies to control for differential trends. The stability of our impulse response functions across these demanding specifications supports the validity of Assumption 1.

[16] Our estimates are robust to using only time fixed effects, as shown in Section 3.4.

Third, in Section 3.5, we implement an instrumental variables approach leveraging variation from non-economic verbal conflicts—diplomatic disputes, border tensions, and cultural disagreements that move bilateral relations but are plausibly less directly tied to contemporaneous economic conditions. The similarity between IV and OLS estimates provides additional support for the causal interpretation of our baseline results, though the exclusion restriction is not beyond dispute and we discuss its limitations.

3.3. Baseline Results

We present our main empirical findings on the dynamic effects of geopolitical relations on economic growth. Figure 6 displays two central results: the persistence of geopolitical shocks and their dynamic impact on GDP per capita.



A. IRF of Geopolitical Relations

B. IRF of GDP per Capita

FIGURE 6. Dynamic Responses to Geopolitical Relations Shock

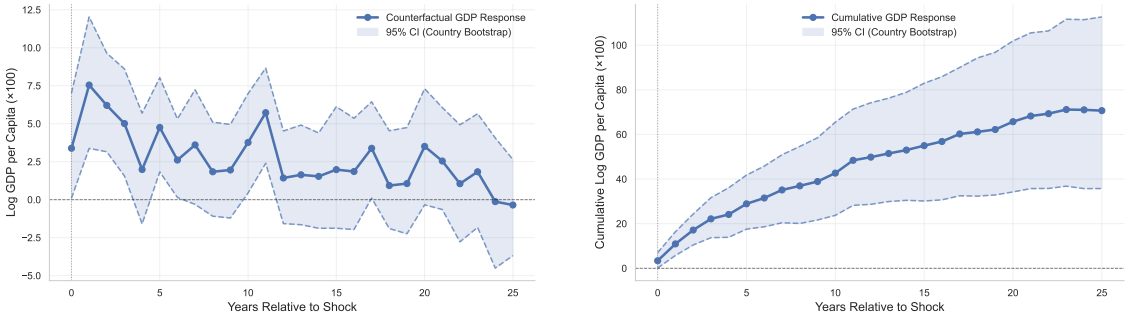
Panel (a) shows the impulse response of geopolitical relations to a unit shock. Panel (b) displays the impulse response of log GDP per capita (×100) to a unit improvement in geopolitical relations. Both panels estimate equation (4) with four lags of the dependent variable and geopolitical relations, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors. Horizons range from 0 to 30 years in panel (a) and −15 to 25 years in panel (b), where negative horizons test for pre-trends.

Dynamics of Geopolitical Relations and Economic Growth. Panel (a) of Figure 6 demonstrates that geopolitical relations exhibit substantial persistence following a shock. A unit improvement decays gradually—approximately 50% of the initial effect persists after five years, and 15% remains after ten years. Full dissipation occurs after approximately 15 years. This persistence drives the cumulative economic impact: the impulse response in panel (b) captures both the direct effect of the initial shock and the compounding influence of sustained improvements in geopolitical alignment.[17]

[17]The dynamics of geopolitical relations can be approximated by a mean-reverting AR(2) process with overshooting. Appendix A.7 provides additional analysis.

Panel (b) reveals three key patterns in the GDP response. First, the absence of pre-trends for horizons −10 to −1 is consistent with our identification assumption, indicating no systematic relationship between future geopolitical changes and current economic outcomes.[18] Second, GDP rises immediately following the geopolitical shock, increasing by approximately 10–20 log points over 20 years. Third, the response exhibits a hump shape, peaking between years 3 and 10 before declining as the underlying geopolitical impulse dissipates. Our inference employs Driscoll-Kraay standard errors to account for serial correlation and cross-sectional dependence (Driscoll and Kraay 1998; Montiel Olea and Plagborg-Møller 2021).[19]

Transitory versus Permanent Shocks. The impulse responses in Figure 6 capture the combined effect of an initial geopolitical shock and its subsequent dynamics. To isolate the impact of purely transitory changes, we follow Sims (1986) and Bilal and Känzig (2024) in constructing counterfactual impulse responses to shocks that increase by one unit on impact and immediately return to zero.[20]



A. Response to Transitory Shock

B. Cumulative Response to Permanent Shock

FIGURE 7. GDP Responses to Transitory and Permanent Geopolitical Shocks

Panel (a) shows the impulse response of log GDP per capita (×100) to a purely transitory unit shock in geopolitical relations (shock equals 1 at $h = 0$ and 0 thereafter). Panel (b) displays the cumulative response to a permanent unit shock. Both panels use the baseline specification with four lags of the dependent variable and geopolitical relations, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals based on 1,000 bootstrap iterations using country-block resampling.

Figure 7 decomposes the effects into responses to transitory and permanent shocks.

[18] Panel (b) of Figure 6 includes all 184 countries with GDP data available in any year. In Sections 3.4.2 and 4.1, estimates using countries with comprehensive data coverage show point estimates close to zero for horizons −10 to −5.

[19] Appendix B.2 presents three robustness checks: (i) restricting to 146 countries with complete data yields virtually identical impulse responses; (ii) bootstrap inference accounting for estimation uncertainty in the geopolitical measure produces only marginally wider confidence intervals; (iii) alternative lag specifications confirm the stability of our results.

[20] While local projections semiparametrically estimate the empirical impulse response, constructing counterfactual responses requires the structural assumption that effects of a series of unanticipated shocks equal those of an anticipated path announced at time zero. Appendix B.3 details our methodology.

Panel (a) reveals that even purely transitory improvements in geopolitical relations generate persistent economic gains. GDP per capita initially increases by approximately 7 log points and gradually fades away over 20 years. The wide confidence intervals reflect substantial uncertainty in medium-term dynamics, consistent with the challenges of estimating long-horizon effects in cross-country panels.

Panel (b) demonstrates the cumulative gains from permanent improvements: GDP per capita rises steadily, reaching approximately 70 log points after 20 years. The trajectory stabilizes after year 20, suggesting convergence to a new steady state. While local projections provide robust estimates, they sacrifice statistical efficiency at long horizons. Section 6.1 presents a complementary analysis using dynamic panel methods that exploit the autoregressive structure for more precise long-run estimates.

Economic Magnitude. The economic significance of our findings depends on the plausible range of geopolitical variation. The geopolitical relations index has a standard deviation of 0.143 and ranges from −0.43 (hostile relations) to 0.55 (strong cooperation), with a median of 0.26.[21] A one-standard-deviation improvement in geopolitical relations generates a long-run GDP gain of approximately 10 log points (0.143×70). Moving from the 25th to the 75th percentile—representing a shift from limited to moderate cooperation—increases GDP by 13 log points over 20 years.

More substantial improvements yield proportionally larger effects. Progressing from verbal tensions (index value of 0) to the cooperation level observed among allied nations (0.42) generates a 29 log point increase in GDP per capita. Distributed over 25 years, this represents an average annual growth contribution of 1.2 percentage points. For a country at the median geopolitical relations level (0.26), achieving the highest observed cooperation (0.55) results in a cumulative GDP increase of 20 log points. These gradual, compounding effects underscore the importance of long-horizon analysis.

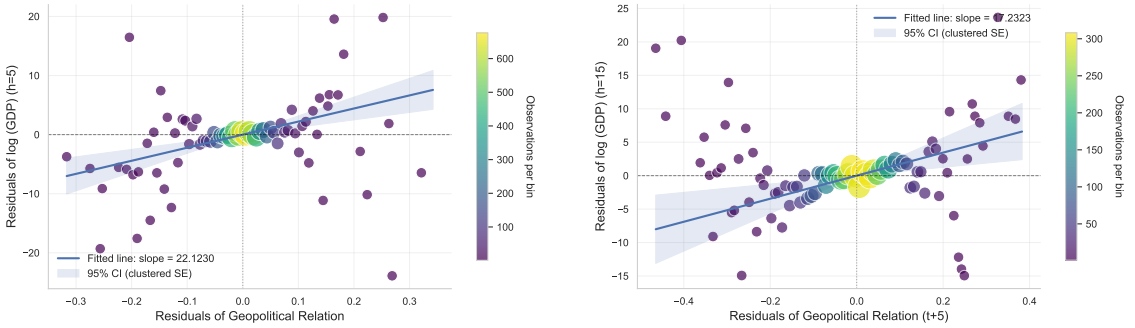
3.4. Robustness

In this section, we conduct a series of robustness checks to validate the causal interpretation of our main results. We examine two key dimensions: (i) whether the estimates are driven by outliers or specific sources of geopolitical variation, and (ii) whether results remain stable after controlling for additional sets of fixed effects and other time-varying country-level covariates.

[21] The 25th percentile is 0.155 and the 75th percentile is 0.342.

3.4.1. Sources of Variation

We first investigate whether our results are driven by outliers or depend critically on specific components of our geopolitical relations measure. The Frisch-Waugh-Lovell (FWL) theorem allows us to visualize the identifying variation by plotting the relationship between GDP and geopolitical relations after partialling out all controls and fixed effects.



A. GDP at $t + 5$ vs. Geo Relations at t

B. GDP at $t + 15$ vs. Geo Relations at $t + 5$

FIGURE 8. Binscatter Plots of Residualized GDP and Geopolitical Relations

Panel (a) displays the binscatter relationship between log GDP per capita at $t + 5$ and geopolitical relations at t after partialling out four lags of both variables, country fixed effects, and region-year fixed effects. Panel (b) shows the relationship between GDP at $t+15$ and forward geopolitical relations at $t+5$. Each dot represents the mean of approximately 100 observations within each bin, with size proportional to the number of observations. The fitted line and 95% confidence interval use Driscoll-Kraay standard errors.

Figure 8 reveals a robust positive relationship between geopolitical relations and future GDP growth. Panel (a) demonstrates that the relationship remains stable across the entire distribution of geopolitical shocks—from large negative changes (deteriorating relations) to large positive changes (improving relations). The approximately linear relationship indicates that both positive and negative changes in geopolitical relations generate symmetric economic responses, with no evidence of threshold effects or nonlinearities.

Panel (b) provides complementary evidence by examining GDP at $t + 15$ against cumulative geopolitical changes measured at $t + 5$. Using these forward geopolitical relations—which capture the accumulation of diplomatic changes over 5-year windows—yields a slope of 18, consistent with the baseline impulse response at comparable horizons. The stability of the relationship at this extended horizon, combined with consistency across different measures (contemporaneous versus cumulative changes), reinforces that our findings reflect a fundamental economic relationship rather than the influence of outliers or extreme events.[22]

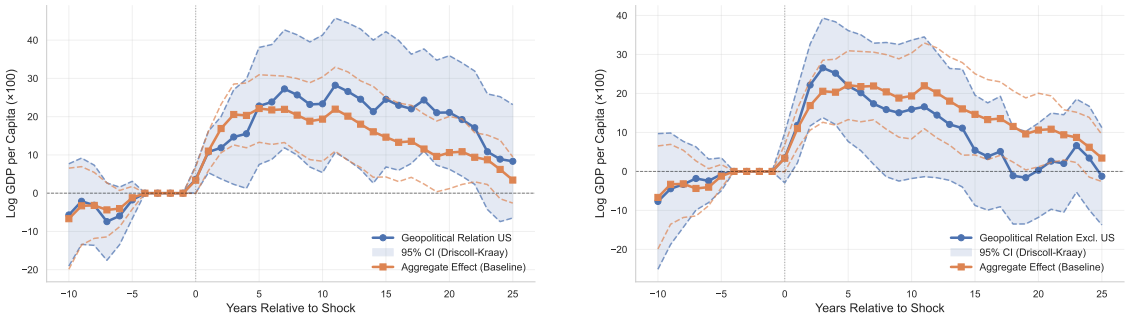
Next, we examine whether our results depend on geopolitical relations with the United States specifically or reflect broader patterns of international alignment. We decompose

[22]Appendix B.4 presents additional binscatter plots for the 10-year horizon, as well as raw scatter plots. The conditional covariance between GDP and geopolitical relations remains stable across all horizons.

our geopolitical relations measure into relations with the US (p_{ct}^{US}) and relations with all other major nations ($p_{ct}^{\text{Excl.US}}$), then jointly estimate their effects:

$$y_{c,t+h} = \alpha_h^{\text{US}} p_{ct}^{\text{US}} + \alpha_h^{\text{Excl.US}} p_{ct}^{\text{Excl.US}} + \boldsymbol{\gamma}_h' \mathbf{x}_{ct} + \delta_c + \delta_{r(c)t} + \varepsilon_{c,t+h}, \quad h = -10, \ldots, 25$$

where $\mathbf{x}_{ct}$ includes four lags of GDP, geopolitical relations with the US, and geopolitical relations excluding the US.



A. Geopolitical Relations with US

B. Geopolitical Relations Excluding US

FIGURE 9. Decomposing Geopolitical Relations: US versus Other Major Nations

This figure shows impulse responses of log GDP per capita (×100) to unit improvements in geopolitical relations with the US (panel a) and with other major nations excluding the US (panel b). Blue lines with shaded areas show the decomposed effects from joint estimation, while orange lines display the baseline aggregate effect for comparison. Both specifications include four lags of all variables, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

Figure 9 presents striking evidence that both components generate nearly identical dynamic responses. The impulse response to improved relations with the US (panel a) closely mirrors that from improved relations with other major nations (panel b), with both peaking around 20 log points after 5 years.[23] The overlapping confidence intervals and similar trajectory to our baseline aggregate measure (shown in orange) demonstrate that our results capture a general phenomenon rather than US-specific dynamics. This finding also validates our use of nominal GDP shares to aggregate bilateral geopolitical relations, suggesting that GDP weights capture the economic importance of different bilateral relationships. Appendix B.5 further demonstrates that decomposing relations into Western versus non-Western countries yields similarly robust results.

The stability of our estimates across distinct sources of variation strengthens the causal interpretation. As Section 4.3 documents, democratization improves relations with Western countries but not with Russia—and only modestly with China and India—yet both components generate virtually identical growth responses. This rules out ideology-

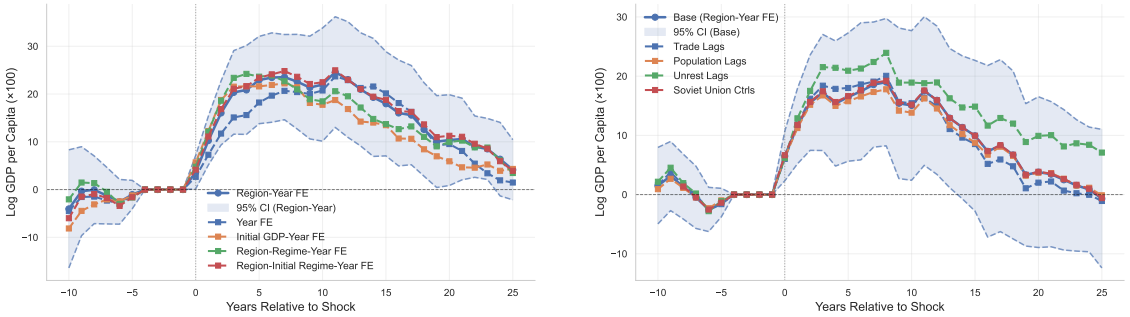
[23]The conditional correlation between US and non-US relations—after partialling out country fixed effects, region-year fixed effects, and lagged controls—is only 0.28, so that over 90% of the identifying variation in each component is independent of the other.

specific or country-specific confounds and points to the fundamental economic value of international cooperation. Combined with the absence of pre-trends and the linearity of effects across the distribution, these results support the interpretation that improvements in geopolitical alignment drive economic growth. Appendix B.6 further confirms that these effects are present in both the 1960–1989 and 1990–2019 sub-periods, ruling out the possibility that our results are driven exclusively by Cold War realignments.

3.4.2. Additional Controls

To further validate our main findings, we examine the robustness of our results to alternative fixed effects specifications and additional time-varying controls. These tests address potential concerns about omitted variables that might simultaneously affect geopolitical relations and economic growth. Following our approach in Appendix B.2, we focus on a balanced panel of countries with at least 30 years of GDP data to ensure consistent sample composition across specifications.

Alternative Fixed Effects Specifications. We first investigate whether our results are robust to different assumptions about unobserved heterogeneity. For these tests, we restrict our analysis to 146 countries with complete GDP coverage across all horizons, ensuring that compositional changes do not drive differences across specifications.



A. Alternative Fixed Effects

B. Additional Economic Controls

FIGURE 10. Robustness to Alternative Specifications

Panel (a) compares impulse responses under alternative fixed effects specifications. The baseline specification (solid blue line with 95% confidence interval) includes region-year fixed effects. Alternative specifications shown as dashed lines include: year fixed effects only, initial GDP quintile-year fixed effects, region-regime-year fixed effects, and region-initial regime-year fixed effects. Panel (b) presents robustness to additional economic controls, with the baseline specification compared to models including four lags of trade openness, population demographics, domestic unrest, and Soviet transition controls. All specifications include four lags of GDP and geopolitical relations with Driscoll-Kraay standard errors.

Panel (a) of Figure 10 demonstrates stability across alternative fixed effects specifications. First, replacing region-year fixed effects with only year fixed effects yields virtually

identical results, confirming that our findings are not driven by controlling for region-specific shocks. The impulse response peaks at approximately 20 log points after 3 years, close to our baseline specification.

Second, we control for initial development levels by interacting GDP per capita quintiles in 1960 with year fixed effects.[24] This specification identifies the effect of geopolitical relations by comparing countries with similar initial economic development. The results remain robust, with the peak effect reaching 20 log points.

Third, recognizing that both geopolitical relations and economic performance may be influenced by political institutions, we control for region-initial regime-year fixed effects. This specification compares countries within the same geographic region that shared similar political characteristics (democracy or non-democracy) at the start of our sample. The impulse response remains virtually unchanged, providing confidence that our results capture the effect of geopolitical alignment rather than correlated political transitions.

Finally, controlling for region-current regime-year fixed effects to account for contemporaneous democratization yields similar results, though with slightly attenuated long-run effects. This modest reduction suggests that while democratization and geopolitical alignment may be complementary, they represent distinct channels for economic development. Section 4.3 disentangles the dynamic effects of democracy and geopolitics.

Time-Varying Economic and Political Controls. We next examine robustness to additional time-varying controls that address specific historical events and potential confounding economic factors. For these specifications, we restrict our sample to 108 countries with complete data coverage for all control variables, ensuring comparability across estimates.

Panel (b) of Figure 10 presents these results. First, we address the possibility that geopolitical relations serve as a proxy for trade integration by including four lags of trade openness (imports plus exports over GDP). While the long-run effects are slightly attenuated—consistent with trade being one channel through which geopolitical relations affect growth—the impulse response remains economically and statistically significant, peaking at similar 20 log points.

Second, we verify that our results are not artifacts of the Soviet Union's collapse. We include interactions between indicators for Soviet and satellite countries with year dummies for 1989–1991 and post-1992. These controls have minimal impact, with the impulse response trajectory remaining virtually identical to our baseline specification. This stability is particularly noteworthy given the dramatic geopolitical realignments following the Cold War's end.

Third, recognizing that domestic political instability could simultaneously affect international relations and economic performance, we control for four lags of domestic

[24] Following Acemoglu et al. (2019), we rank countries using Angus Maddison's GDP estimates for 1960, which are available for 149 countries, to maximize sample coverage.

unrest.[25] The results remain robust, suggesting that our estimates capture the benefits of international cooperation beyond the costs of domestic conflict. Finally, we address potential demographic confounds by including four lags of log population, the share of population aged 0–14, and the share aged 15–65. These controls account for the possibility that demographic transitions might influence both diplomatic priorities and growth potential. The stability of our results indicates that geopolitical effects operate independently of demographic channels.

This robustness across different fixed effects structures, historical episodes, and potential confounding factors strengthens the causal interpretation of our results and underscores the first-order importance of geopolitical relations for economic development.

3.5. Instrumental Variables Estimates

The preceding analyses have established that geopolitical relations predict economic growth in a demanding panel setting with country and region-year fixed effects, extensive controls, and multiple lag structures. Two identification concerns nevertheless remain. First, reverse causality: countries experiencing rapid economic growth may attract greater diplomatic engagement from major nations. Second, omitted confounders: unobserved factors—such as leadership quality or shifting development strategies—might simultaneously drive both geopolitical alignment and economic performance. To help address these concerns, we implement an instrumental variables strategy that provides an additional source of identifying variation.

3.5.1. Instrument Description

Our instrument isolates variation from a specific subset of geopolitical events: non-economic verbal conflicts. These events—including diplomatic protests, public criticisms, formal demands, and symbolic political gestures—move bilateral relations but are plausibly less directly tied to contemporaneous macroeconomic conditions than economic agreements, sanctions, or material conflicts. They arise from political and institutional disputes, security and strategic concerns, social and cultural tensions, and legal disagreements over non-economic matters.[26] These conflicts generate substantial variation in bilateral relations through escalation patterns—from formal protests to public condemnations and threatened retaliation—that deteriorate relations (mean Goldstein score of

[25]The unrest measure captures strikes, demonstrations, and political violence from the Cross-National Time-Series Data Archive.

[26]The economic/non-economic classification is detailed in Appendix C.2. We focus on CAMEO root codes 9–14, which represent verbal conflicts ranging from diplomatic investigations to formal protests, excluding material conflicts (codes 15–16) that may have direct economic consequences through disrupted diplomatic channels or investment signaling, and severe conflicts (codes 17–20) that may directly interact with economic activity. Appendix A.8 provides a comprehensive analysis of these 37,519 events spanning 1960–2024.

–3.91) without involving material actions.[27]

Exclusion restriction. The key identifying assumption is that these verbal conflicts affect GDP only through their impact on overall geopolitical relations, conditional on our controls (stated formally as Assumption 2 below). This restriction is plausible but not unassailable.

The case for the restriction rests on the verbal and non-material nature of these events: they involve rhetoric, symbolic gestures, and diplomatic signaling rather than direct economic actions. We recognize, however, that "non-economic in form" does not guarantee "non-economic in intent." Some verbal conflicts—particularly those involving security posturing or territorial disputes—may be surface manifestations of deeper economic or strategic rivalries, and these events do have economic consequences, which is precisely what our results demonstrate. The identification question is whether they affect growth *only* through bilateral relations, or whether they also reflect underlying shocks that independently affect economic outcomes. Verbal conflicts may serve as early indicators of regime deterioration, strategic realignment, or escalation toward material conflict—shocks that could affect growth through channels not fully captured by our bilateral relations index.

We cannot definitively rule out these concerns, and we do not claim to do so. Several features of our design, however, limit their scope. First, we exclude material and severe conflicts (CAMEO codes 15–20), restricting the instrument to events least likely to carry direct economic meanings. Second, we control for four lags of the instrument, which absorb persistent confounders correlated with escalation dynamics. Third, our baseline specification already conditions on lagged GDP, lagged geopolitical relations, and region-year fixed effects, so the exclusion restriction requires only that verbal conflicts carry no *additional* information about future growth beyond what is already captured by these controls and the bilateral relations channel. This is a weaker condition than unconditional exogeneity, though it remains an assumption rather than a testable implication.

3.5.2. Empirical Implementation

We construct our instrument by isolating the component of geopolitical relations driven by non-economic verbal conflicts:

$$z_{ct} = \sum_{j \in \mathcal{N}} \left(\frac{1}{N^{\Omega}_{cj,t}} \sum_{n \in \Omega} s^{n}_{cj,t}/10 \right) \times \text{GDP share}_{jt}$$

[27]The substantial temporal variation, averaging 577 events annually with peaks exceeding 1,000 during periods of heightened geopolitical tension, provides rich identifying variation across both time and country pairs.

where $\mathcal{Q}$ denotes the set of non-economic verbal conflict events, $N^{\mathcal{Q}}_{cj,t}$ is the count of such events between countries c and j in year t, and $s^{n}_{cj,t}$ represents the Goldstein score of event n. This construction parallels our main geopolitical relations measure but restricts attention to verbal conflict events.

We estimate impulse responses using the local projection instrumental variables (LP-IV) method introduced by Jordà, Schularick, and Taylor (2015). Let $\tilde{\mathbf{x}}_{ct} = \left\{ \{z_{c,t-\ell}\}_{\ell=1}^{4}, \mathbf{x}_{ct} \right\}$ denote our extended control vector including four lags of the instrument. The LP-IV estimator proceeds in two stages. First, we estimate the reduced-form projection:

$$y_{c,t+h} = \alpha_h^{\text{RF}} z_{ct} + \gamma_h' \tilde{\mathbf{x}}_{ct} + \mu_{c,t+h}^{\text{RF}}$$

and the first-stage relationship:

$$p_{ct} = \alpha^{\text{FS}} z_{ct} + \gamma' \tilde{\mathbf{x}}_{ct} + \mu_{ct}^{\text{FS}}$$

The LP-IV estimate of the impulse response is then $\hat{\alpha}_h^{\text{LP-IV}} = \hat{\alpha}_h^{\text{RF}} / \hat{\alpha}^{\text{FS}}$. Following Plagborg-Møller and Wolf (2021), this approach requires the following exclusion restriction:

ASSUMPTION 2 (LP-IV Exclusion Restriction). $\mathbb{E}\left[\mu_{c,t+h} z_{ct} \mid \{\tilde{\mathbf{x}}_{c\tau}\}_{t_0 \le \tau \le t}\right] = 0$ *for all countries* c*, all* $t \ge t_0$*, and all horizons* h*.*

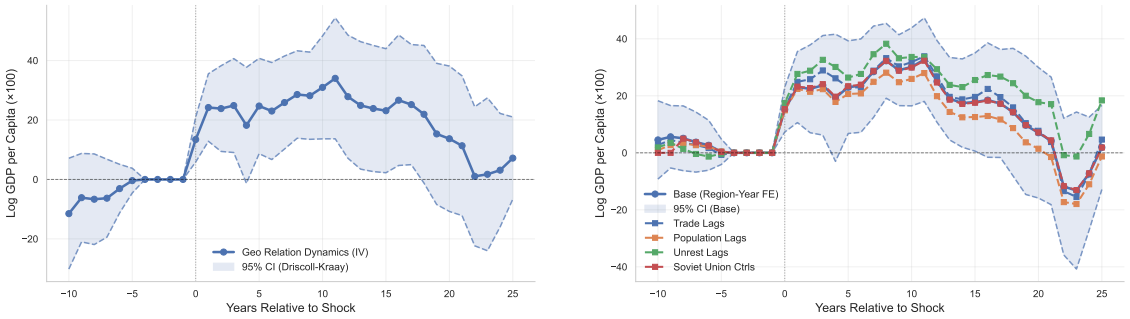
This assumption requires that non-economic verbal conflicts affect future GDP only through their impact on overall geopolitical relations, conditional on our controls.[28]

3.5.3. Results and Interpretation

Figure 11 presents our LP-IV estimates. Panel (a) shows that the IV impulse responses closely track our baseline OLS results: GDP per capita increases by approximately 20–30 log points within ten years after a geopolitical improvement, consistent with the baseline estimate. The IV confidence intervals are wider, reflecting the efficiency loss from instrumentation, but maintain statistical significance through horizon 15. The absence of significant pre-trends is consistent with the exclusion restriction, indicating that the instrument does not predict GDP at negative horizons—though we note that pre-trend tests are a necessary rather than sufficient condition for instrument validity.

Panel (b) shows that the alignment between IV and OLS estimates is stable across specifications with different time-varying controls, including trade openness, demographic transitions, domestic unrest, and Soviet-era dynamics. This pattern is informative: if the

[28]The assumption requires that, once we control for all lagged data, the instrument is not contaminated by other structural shocks or by lags of the shock of interest. It is equivalent to estimating a VAR with the instrument ordered first (Plagborg-Møller and Wolf 2021).



A. LP-IV Estimates

B. Robustness to Additional Controls

FIGURE 11. Instrumental Variables Estimates of Geopolitical Effects on Growth

Panel (a) shows the LP-IV impulse response of log GDP per capita (×100) to a unit improvement in geopolitical relations, instrumenting with non-economic verbal conflicts. The specification includes four lags of GDP, geopolitical relations, and the instrument, plus country and region-year fixed effects. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors. Panel (b) demonstrates robustness across specifications with additional controls: trade openness (4 lags), population demographics (log population and age distribution, 4 lags each), domestic unrest (4 lags), and Soviet transition indicators (contemporaneous). All alternative specifications maintain the same fixed effects structure and lag orders for core variables. The baseline specification is shown with confidence intervals; alternative specifications are presented as point estimates only for clarity.

baseline relationship were driven primarily by reverse causality or omitted variables correlated with economic conditions, we would expect the IV—which draws on a different source of variation—to yield substantively different estimates. The similarity across estimation strategies is consistent with, though not sufficient on its own to prove, a causal interpretation of our baseline results. Appendix B.7 provides detailed first-stage dynamics and demonstrates that our IV results remain stable across alternative fixed effects specifications.

Taken together, the convergence of OLS and IV point estimates, the stability across control specifications, and the absence of pre-trends are each individually imperfect but collectively informative. Combined with the robustness of the baseline design documented in Sections 3.4.1–3.4.2, the IV results strengthen the evidentiary basis for a causal interpretation.

4. Channels and Mechanisms

Having estimated the dynamic effects of geopolitical relations on GDP per capita, we now examine how these relationships influence the fundamental determinants of economic growth. Understanding these channels provides insights into the mechanisms through which international relations translate into economic prosperity.

4.1. Alternative Output Measures

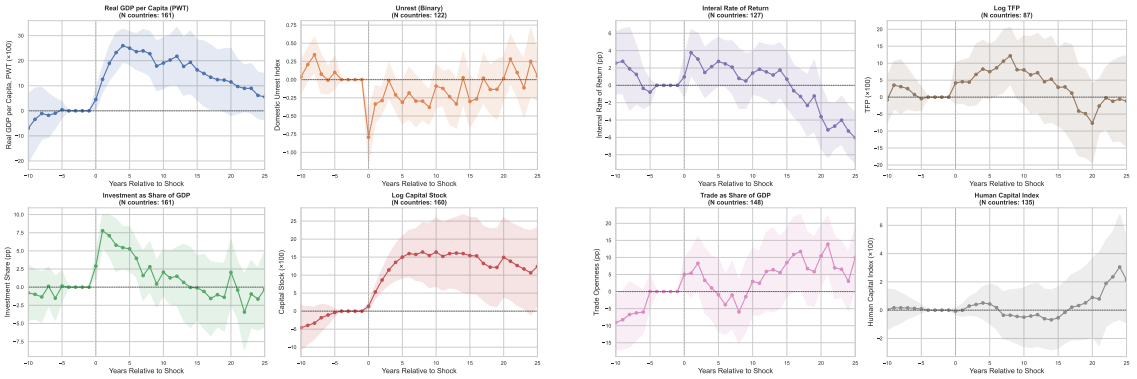
Our main analysis employs GDP per capita from the World Bank to maximize country and temporal coverage. To verify that our results are not sensitive to this choice, we first examine the response using real GDP per capita from the Penn World Table. Panel (a) of Figure 12 shows that the impulse response is virtually identical to our baseline estimates, with output increasing by approximately 20 log points within 15 years. This convergence across data sources reinforces the robustness of our core finding.

4.2. Mechanisms and Growth Fundamentals

To identify the channels through which geopolitical relations translate into economic prosperity, we examine its dynamic effects on key growth determinants:

$$m_{c,t+h} = \alpha_h^m p_{ct} + \sum_{\ell=1}^{4} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{4} \gamma_\ell p_{c,t-\ell} + \sum_{\ell=1}^{4} \lambda_\ell m_{c,t-\ell} + \delta_c + \delta_{r(c)t} + \mu_{c,t+h}^m$$

where $m_{c,t+h}$ represents various growth correlates at horizon h. We include four lags of the outcome variable alongside our standard controls.



A. Output and Stability B. Growth Fundamentals

FIGURE 12. Dynamic Effects of Geopolitical Relations on Growth Correlates

This figure displays impulse responses of various economic outcomes to a unit improvement in geopolitical relations. Panel (a) shows responses for real GDP per capita (Penn World Tables), domestic unrest, investment share, and capital stock. Panel (b) presents internal rate of return, total factor productivity, trade openness, and human capital. All specifications follow equation (4.2) with four lags of the dependent variable, GDP, and geopolitical relations, plus country and region-year fixed effects. The sample is restricted to countries with complete data for each variable across all horizons to ensure compositional stability. Numbers in parentheses indicate the country count for each balanced panel. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

Figure 12 reveals how geopolitical alignment triggers cascading effects across growth fundamentals. The responses exhibit distinct temporal patterns that illuminate the underlying mechanisms. Domestic political stability responds immediately and dramatically—

the unrest indicator drops sharply on impact before recovering toward baseline over the following years. This rapid pacification likely reflects both enhanced regime legitimacy from international recognition and concrete external support that helps manage internal tensions, consistent with Rodrik (1998)'s evidence on openness as a buffer against political volatility.

Physical capital also responds quickly. Investment rises by approximately 7–8 percentage points within the first few years, driving capital stock accumulation that peaks at 15–16 log points around year 5–10 and persists thereafter. The internal rate of return initially increases on impact—signaling improved investment opportunities—before declining as capital deepening proceeds, eventually turning negative after year 15, matching neoclassical predictions of diminishing returns. Total factor productivity shows substantial gains, rising to approximately 10–12 log points around year 5–10, suggesting that geopolitical alignment enables productivity improvements through technology transfer, better resource allocation, or institutional spillovers—though these gains attenuate at longer horizons.

The responses of trade and human capital unfold more gradually, reflecting inherent adjustment costs. Trade openness exhibits a volatile but generally positive trajectory, expanding to approximately 8–10 percentage points of GDP in the initial years and reaching peaks of 10–13 percentage points at longer horizons as diplomatic alignment dismantles both formal barriers and informal frictions to commerce. This pattern corroborates Frankel and Romer (1999)'s findings on the growth impact of trade integration. Human capital accumulation proceeds even more slowly, remaining near zero for most of the horizon before rising at the very end of our 25-year window—a trajectory reflecting the substantial time required for educational investments to mature and the sustained conditions for human development that international stability provides.

Appendix B.8 extends these findings across additional dimensions of economic development. Government expenditure responds positively, rising by 20–30 log points over the first decade as improved international relations enhance fiscal capacity. Primary school enrollment improves gradually by 10–15 log points over 25 years, reflecting the sustained conditions for human development that international stability provides. In contrast, market reforms, secondary school enrollment, employment rates, and labor share show no significant responses—suggesting that geopolitical alignment operates primarily through existing economic structures rather than through fundamental institutional transformation or labor market restructuring. Both consumption measures—real consumption and domestic absorption per capita—closely track GDP responses, confirming that growth translates into broad household welfare improvements.

This multi-channel propagation reveals why geopolitical relations exert such powerful growth effects. Alignment simultaneously relaxes constraints across multiple margins:

reducing political risk to unlock investment, facilitating technology transfer to boost productivity, expanding market access through trade, and enabling human capital investments that compound over generations. The temporal sequencing—from immediate stabilization effects through medium-term capital deepening to long-run human development—explains both the magnitude and persistence of our baseline results. Conversely, geopolitical misalignment likely triggers the reverse cascade: political instability deters investment, isolation blocks technology diffusion, trade barriers limit specialization gains, and uncertainty undermines educational investments.[29] For policymakers in developing countries, these findings underscore that international alignment operates as a catalyst enabling access to multiple growth channels simultaneously.

4.3. Democracy and Geopolitical Alignment

The relationship between political institutions and economic growth has been extensively studied, with Acemoglu, Johnson, and Robinson (2001) and Acemoglu et al. (2019) providing evidence for the causal effect of democratic institutions on development. Parallel literature examines how regime type shapes international relations, with democratic peace theory suggesting that democracies form more stable alliances (Maoz and Russett 1993; Leeds 2003). Democracy's growth effects may operate partly through international economic channels such as preferential foreign aid (Alesina and Dollar 2000) and reduced sanctions (Park 2024)—both manifestations of geopolitical relations.[30] This section examines how democracy and geopolitical alignment jointly influence economic growth, disentangling their relative contributions.

4.3.1. Democracy and Differential Geopolitical Associations

We first examine the conditional correlation between democratization and bilateral relations with different major nations. Using the democracy measure from Acemoglu et al. (2019) (henceforth ANRR), we estimate local projections of country-specific geopolitical scores following democratization episodes:

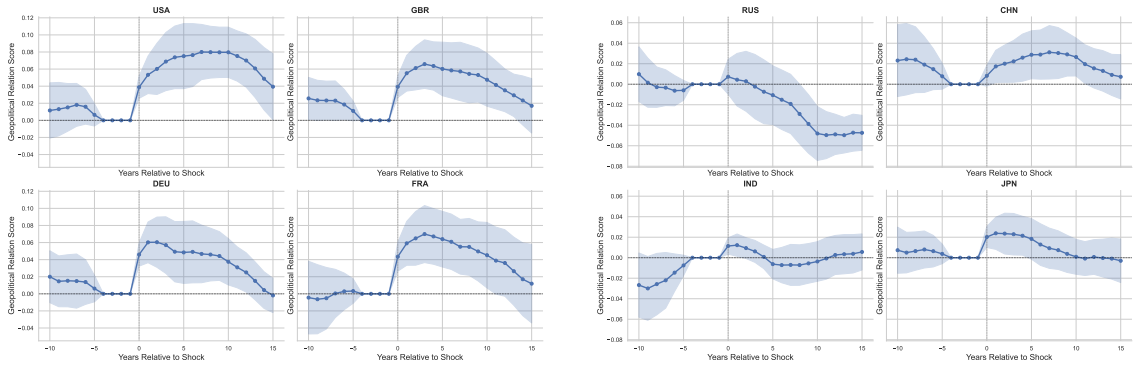
$$S_{cj,t+h} = \beta_h^j D_{ct}^{\text{ANRR}} + \sum_{\ell=1}^{4} \gamma_\ell S_{cj,t-\ell} + \delta_c + \delta_t + \varepsilon_{cjt+h} \tag{5}$$

where $S_{cj,t}$ represents the bilateral geopolitical score between country c and major power j, and D_{ct}^{ANRR} is the democracy indicator. These estimates quantify the dynamic association between democratic transitions and subsequent bilateral relations, conditional on past relationship dynamics and time-invariant country characteristics.

[29] Section 3.4.1 confirms symmetric effects for both positive and negative geopolitical changes.

[30] In our framework, sanctions constitute negative geopolitical events that lower bilateral Goldstein scores, directly contributing to our measure of geopolitical relations.

Figure 13 reveals striking heterogeneity in how bilateral relations with major nations evolve following democratization. Panel (a) shows that relations with Western democracies—the United States, United Kingdom, Germany, and France—improve substantially following democratic transitions. The association is strongest and most persistent for the United States, where bilateral scores increase by approximately 0.07 within five years of democratization and remain elevated through year 15. Germany and France display similar patterns, with bilateral scores rising by 0.05–0.06 points on impact and persisting for over a decade. The United Kingdom shows comparable initial gains, peaking at approximately 0.06 around year 5 before gradually declining. These improvements suggest sustained alignment between countries that share similar political institutions, consistent with democratic peace theory.



A. Western Democracies

B. Non-Western Powers

FIGURE 13. Bilateral Geopolitical Responses to Democratization

This figure shows impulse responses of bilateral geopolitical scores with major nations to a democratization shock. Panel (a) displays responses for Western democracies (USA, GBR, DEU, FRA), while panel (b) shows non-Western powers (RUS, CHN, IND, JPN). Specifications follow equation (5) with four lags of the bilateral score, country fixed effects, and year fixed effects. The horizons span −10 to +15 years, with negative values testing for pre-trends. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

In contrast, panel (b) demonstrates markedly different patterns for non-Western powers. Democratization is associated with significantly deteriorating relations with Russia, with bilateral scores declining by approximately 0.04 points over 10–15 years—consistent with geopolitical tensions that often accompany political realignment away from Russian influence. Interestingly, China shows a modest positive association, with bilateral scores rising by approximately 0.03 points over the medium term, possibly reflecting China's continued economic engagement with democratizing countries. India and Japan display smaller and more transitory responses: both show modest initial improvements of approximately 0.02 points on impact, but these gains dissipate over the following decade. These differential patterns indicate that democratization is primarily associated with a reorientation of international relations toward Western democracies, while generating divergent

responses among non-Western powers—deterioration with Russia, modest improvement with China, and minimal lasting effects with India and Japan.

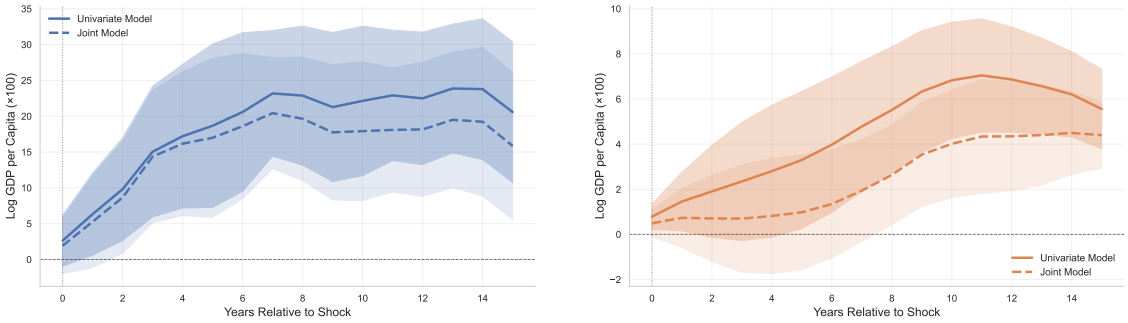
4.3.2. Disentangling Democracy and Geopolitical Channels

To assess the relative importance of democracy versus geopolitical alignment for growth, we estimate a horse-race specification:

$$y_{c,t+h} = \alpha_h^{\text{Geo}} p_{ct} + \alpha_h^{\text{Dem}} D_{ct}^{\text{ANRR}} + \boldsymbol{\gamma}_h' \mathbf{x}_{ct} + \delta_c + \delta_t + \mu_{c,t+h}$$

where both geopolitical relations (p_{ct}) and democracy enter jointly. Following ANRR, we use year fixed effects rather than region-year effects to avoid absorbing variation from regional democratization waves.[31]

Figure 14 presents the results. Panel (a) shows that geopolitical relations maintain strong growth effects even after controlling for democracy. The joint specification (dashed line) yields an impulse response only modestly attenuated relative to the univariate model (solid line), with GDP increasing by approximately 20 log points after 7–8 years—compared to approximately 23 log points without democracy controls. This modest reduction of about 15% suggests that while some of the benefits of geopolitical alignment operate through associated democratic transitions, the vast majority of geopolitical effects on growth are independent of regime type.



A. Geopolitical Relations

B. Democracy

FIGURE 14. Horse-Race: Democracy versus Geopolitical Channels

This figure compares univariate and joint specifications for geopolitical relations and democracy effects on GDP. Panel (a) shows the impulse response of geopolitical relations, comparing the univariate model (solid line) with the joint specification controlling for democracy (dashed line). Panel (b) presents democracy's effects, contrasting the univariate specification without geopolitical controls (solid line) against the joint model (dashed line). Both panels use year fixed effects following ANRR, with four lags of GDP. The geopolitical specifications include four lags of geopolitical relations; the democracy univariate model excludes these lags to match ANRR's approach. Coefficients represent log point changes in GDP per capita (×100).

[31] Regional democratization waves—such as those in Latin America (1980s), Eastern Europe (1990s), and the Arab Spring (2010s)—create strong regional correlation in democratic transitions. Region-year fixed effects would absorb this variation, potentially understating democracy's effects.

Panel (b) reveals how geopolitical relations mediate democracy's growth effects across the entire horizon. In the univariate specification, democracy generates steadily increasing GDP gains, rising from approximately 1 log point on impact to a peak of approximately 7 log points around year 10–11 before declining modestly. When controlling for geopolitical relations, democracy's effects are substantially attenuated throughout: the joint specification shows effects rising more gradually from near zero on impact to approximately 4–4.5 log points at year 10–12. This attenuation—reducing the peak effect by approximately 35–40%—indicates that a substantial portion of democracy's growth benefits operate through improved international relations, particularly enhanced access to Western markets and reduced economic restrictions, consistent with Park (2024)'s findings on sanctions.

However, the majority of democracy's growth impact persists even after accounting for geopolitical channels. By horizon 15, democracy continues to generate approximately 4.5 log points of additional GDP growth in the joint specification, representing roughly two-thirds of the univariate effect. The distinction between transitory and permanent democratization sharpens these findings: as shown in Appendix B.9, transitory democratic episodes generate growth almost exclusively through temporary geopolitical improvements. In contrast, permanent democratic transitions yield cumulative GDP gains of approximately 20 log points over 25 years, with geopolitical channels explaining only 30–40% of this effect. The remaining 60–70% operates through sustained domestic institutional improvements—enhanced property rights, political stability, reduced expropriation risk, and human capital accumulation—that materialize gradually but persist independently of international alignment.[32]

These results provide a nuanced decomposition of how political institutions and international relations jointly determine economic development. Democracy's growth effects operate partially through the geopolitical channel, as democratic transitions trigger improved relations with Western powers, reduced sanctions, and enhanced market access. Yet the persistence of substantial democracy effects even after controlling for geopolitics confirms that domestic institutional improvements provide independent growth benefits. This decomposition reconciles conflicting findings in the literature—studies emphasizing international relations and those highlighting institutional quality both capture real phenomena operating through distinct channels.

[32]Our estimate of 20 log points for permanent democratization aligns closely with Acemoglu et al. (2019)'s finding that democracy increases GDP per capita by approximately 20% in the long run. The decomposition reveals that while geopolitical improvements account for a substantial share of democracy's effects, domestic institutional channels remain quantitatively important. Appendix B.9 provides detailed impulse responses to transitory versus permanent democracy shocks using the methodology described in Appendix B.3.

5. Geopolitical Growth Accounting

Building on our empirical estimates of GDP impulse responses to geopolitical relations, we conduct three complementary growth accounting exercises to quantify the economic importance of international alignment. First, we measure the growth contributions arising from temporal changes in geopolitical relations—both improvements and deteriorations—across six decades. Then, we examine how cross-country differences in international political positioning explain growth and income differences. These analyses demonstrate that geopolitical factors account for GDP variations ranging from −30% to +30% across countries and time periods.

5.1. Growth Effects of Geopolitical Relation Changes

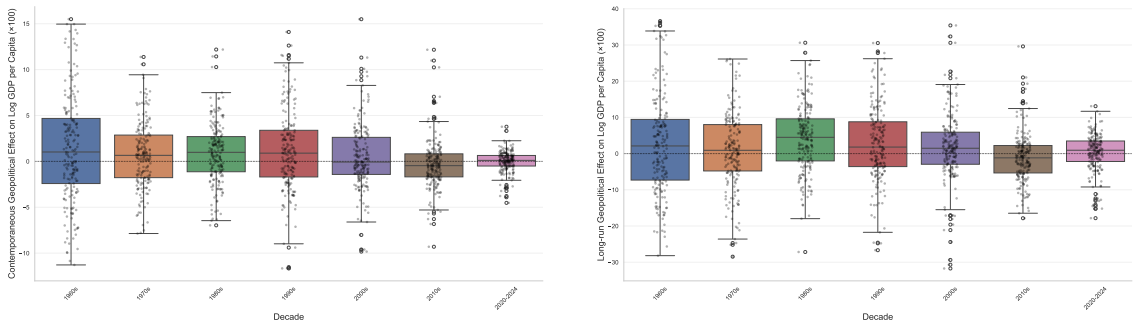
Section 2.3 documented fundamental shifts in the global distribution of geopolitical relations across six decades—from Cold War bipolarity through post-Cold War convergence to contemporary re-polarization. We now quantify the economic implications of these geopolitical transformations.

For each country-decade pair, we calculate the change in geopolitical relations from the beginning to the end of the decade and apply the relevant impulse response function to obtain growth effects.[33] This approach captures both the immediate economic impact within each decade (contemporaneous effect) and the projected long-term consequences (long-run effect).

Figure 15 presents the distribution of growth effects across countries for each decade from 1960 to 2024. Panel (a) displays contemporaneous effects—the cumulative GDP impact realized within each decade. The distributions reveal predominantly positive median effects from the 1970s through the 2000s, with median values ranging from approximately 0.5% to 1%. The 1960s show a median near zero, reflecting the volatile Cold War environment. The substantial dispersion, with interquartile ranges spanning approximately 3–5 percentage points, reflects heterogeneous country experiences. Individual countries experienced contemporaneous effects ranging from −15% to +15% across the sample period. The 2010s mark a notable shift, with the median turning negative for the first time, while the 2020–2024 period shows a return toward zero with a notably compressed distribution.

Panel (b) presents long-run effects—the projected 25-year GDP impact of within-decade geopolitical changes. The patterns reveal important temporal variation: the 1980s exhibit the highest median long-run gains at approximately 4–5%, followed by the 1990s and

[33] Specifically, for contemporaneous effects, we calculate $\sum_{t=0}^{9} \alpha_t^{\text{transitory}} \Delta p_{c,\tau+t}$, where $\alpha_t^{\text{transitory}}$ is the transitory IRF at horizon t and $\Delta p_{c,\tau+t}$ represents the year-on-year change in geopolitical relations, and τ denotes the first year of the decade. For long-run effects, we use $\alpha_{25}^{\text{permanent}} \times (p_{c,\tau+9} - p_{c,\tau})$, where $\alpha_{25}^{\text{permanent}}$ is the permanent IRF at the 25-year horizon.



A. Contemporaneous Effects B. Long-run Effects

FIGURE 15. Distribution of Growth Effects from Geopolitical Relation Changes by Decade

This figure displays the distribution of GDP effects from within-decade changes in geopolitical relations. Panel (a) shows contemporaneous effects—the cumulative GDP impact realized within each decade. Panel (b) presents long-run effects—the projected 25-year GDP impact of geopolitical changes. Each boxplot represents the distribution across countries, with boxes indicating interquartile ranges, whiskers extending to the 5th and 95th percentiles, and individual country observations shown as gray points. The horizontal dashed line marks zero effect. The sample includes all countries with complete geopolitical and GDP data for the respective decade.

2000s with median effects around 2%. The 1960s and 1970s show medians closer to zero, reflecting the constraints of Cold War bipolarity. Individual countries experienced effects ranging from −30% to +30% across the sample period. The 2010s stand out as the first decade with a negative median effect, consistent with the geopolitical fragmentation documented in Section 2.3. Interestingly, the 2020–2024 period shows a modest recovery in median effects, though with substantial dispersion reflecting the heterogeneous impacts of recent geopolitical upheavals including the Russia-Ukraine war.

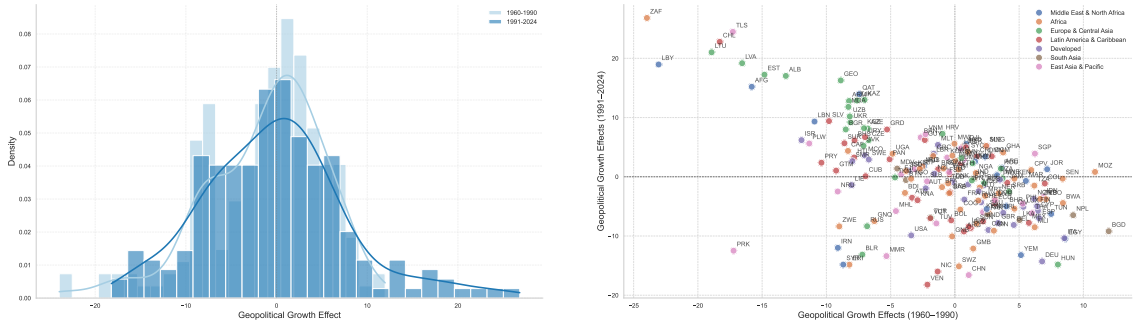
These results quantify the substantial economic stakes of geopolitical alignment. The 1980s–2000s period of improving international relations generated median long-run GDP gains of 2–5% per decade across countries, with cumulative effects over multiple decades comparable to major institutional reforms or technological revolutions. Conversely, the deterioration observed in the 2010s threatened to reverse decades of geopolitically driven growth, with particular implications for countries navigating between competing powers. The persistence of these effects, evidenced by the amplification from contemporaneous to long-run impacts, underscores that geopolitical choices cast long economic shadows.

5.2. Cross-Country Differences in Geopolitical Growth

Having examined temporal variation in geopolitical effects, we now investigate how cross-country differences in geopolitical relations shape growth disparities. While our empirical estimates leverage within-country variation for identification, we apply these estimates to

understand cross-sectional patterns in economic development.[34]

To quantify the contribution of geopolitical relations to cross-country income differences, we construct counterfactual GDP paths. For each year t, we calculate the median geopolitical relation across countries, p_t^{median}, and compute a counterfactual scenario where each country maintains this median level. The difference between actual and counterfactual GDP paths reveals how geopolitical positioning contributes to relative economic performance.[35]



A. Distribution of Geopolitical Growth Effects

B. Period Comparison by Country

FIGURE 16. Geopolitical Growth Effects: Cold War versus Post-Cold War Periods

Panel (a) shows kernel density estimates of geopolitical contributions to growth for 1960–1990 and 1991–2024. Panel (b) plots country-specific effects across both periods, with colors indicating regions. Countries above the diagonal experienced more positive geopolitical effects in the recent period.

The end of the Cold War represents a structural break in the global geopolitical landscape, warranting a separate analysis of different eras. Figure 16 examines how geopolitical factors shaped growth during 1960–1990 (Cold War) versus 1991–2024 (post-Cold War). Panel (a) reveals that both periods exhibit broadly similar distributions of geopolitical growth effects, centered near zero with substantial dispersion. Both the Cold War (1960–1990) and post-Cold War (1991–2024) distributions span approximately −25% to +30%, reflecting the heterogeneous geopolitical fortunes of countries in each era. The distributions show comparable dispersion, suggesting that while the nature of geopolitical competition has changed, the magnitude of its economic consequences has remained substantial across both periods.

Panel (b) provides country-level detail on the transition between periods, revealing dramatic reallocations in geopolitical fortunes. Countries in the upper-left quadrant—including South Africa, the Baltic states (Lithuania, Latvia, Estonia), Chile, Timor-Leste,

[34]This extrapolation assumes that the within-country effects we identify apply across countries. This assumption is reasonable given the stability of our estimates across diverse specifications and country subsamples.

[35]Formally, the geopolitical contribution to country i's GDP in year t is: $\Delta y_{i,t}^{\text{geo}} = \sum_{s=\max(1960,t-25)}^{t} \alpha_{t-s}^{\text{transitory}} \times (p_{i,s} - p_s^{\text{median}})$, where $\alpha_h^{\text{transitory}}$ is the transitory IRF at horizon h.

Albania, and Georgia—experienced the most striking reversals, suffering negative geopolitical effects during the Cold War but benefiting substantially in the post-Cold War era. South Africa's transformation stands out, moving from severe isolation under apartheid (approximately −28%) to strong positive effects (approximately +25%) following democratic transition. The Baltic states and other former Soviet bloc countries show similar patterns, with Cold War-era constraints giving way to post-Cold War integration with Western institutions.

Conversely, countries in the lower-right quadrant experienced deterioration. Venezuela, Nicaragua, and China show pronounced negative effects in the post-Cold War period despite neutral or positive Cold War positions, reflecting either confrontation with the Western-led order or, in China's case, rising geopolitical tensions in recent years. Several developed economies, including Germany, Italy, and Hungary, appear in the lower portion of the scatter, reflecting the relatively smaller gains (or modest losses) from geopolitical factors in the recent period compared to their Cold War positioning. Notable outliers facing severe post-Cold War isolation include North Korea, Iran, Belarus, Syria, and Myanmar, which experienced substantial negative effects in both or primarily the recent period. The wide dispersion of countries across the plot—rather than clustering along the diagonal—underscores that geopolitical fortunes are not persistent, and that the transition between eras created both winners and losers across all regions.

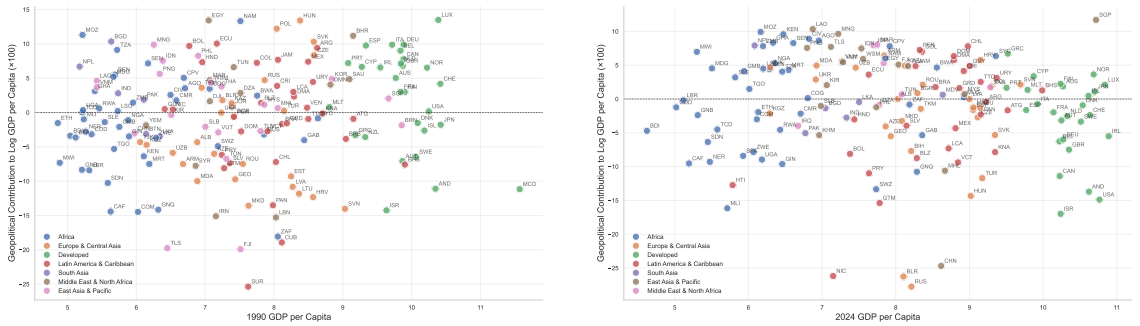
5.3. Geopolitics and Cross-Country Income Differences

To assess how geopolitical relations contribute to global inequality, Figure 17 examines the relationship between GDP per capita and geopolitical contributions for 1990 and 2024.[36]

The comparison between 1990 and 2024 reveals a dramatic transformation in the global distribution of geopolitical benefits. In 1990, at the end of the Cold War, the range of geopolitical effects spanned approximately −25% to +13%, with the largest positive contributions concentrated among Western European economies (Luxembourg, Germany, Italy, Belgium) and reforming Eastern European states (Hungary, Poland, Czechoslovakia). The most severe negative effects appeared among countries isolated from the Western-led order: South Africa under apartheid, Cuba under embargo, and Iran following the Islamic Revolution. Notably, the Baltic states and other Soviet republics showed substantial negative contributions reflecting their position within the declining Soviet bloc, while the United States and Singapore registered effects near zero.

By 2024, the landscape has fundamentally shifted. The range of effects now spans approximately −27% to +12%, but the composition of winners and losers has changed dramatically. Singapore emerges as the clearest beneficiary, deriving approximately 12%

[36]The geopolitical contribution is calculated as the percentage difference between actual GDP and the counterfactual GDP under median geopolitical relations: $100 \times \left[\exp(\Delta y_{i,t}^{\text{geo}}) - 1\right]$.



A. 1990 Cross-Section B. 2024 Cross-Section

FIGURE 17. Geopolitical Contributions to Cross-Country Income Differences

These scatter plots show the relationship between GDP per capita (log scale) and the percentage contribution of geopolitical relations to GDP. Each point represents a country, colored by region. The horizontal dashed line marks zero contribution. Countries above (below) the line have above-median (below-median) geopolitical relations that increase (decrease) their GDP relative to the counterfactual.

of GDP from favorable geopolitical positioning—a marked improvement from its near-zero contribution in 1990. Other notable gainers include small open economies and developing nations with broad international engagement: Laos, Mongolia, Mozambique, Kenya, and Croatia all show positive contributions of 7–10%. The transformation of the Baltic states is particularly striking: Estonia, Latvia, and Lithuania moved from negative contributions of 10–12% in 1990 to positive territory in 2024, reflecting their successful integration into Western institutions.

Conversely, the 2024 cross-section reveals the economic toll of recent geopolitical ruptures. Russia's contribution collapsed to approximately −27% following the Ukraine invasion, while Belarus shows similarly severe effects at approximately −25%. China's contribution deteriorated to approximately −23%, reflecting intensifying great power competition. Most strikingly, several major developed economies now show substantial negative contributions: the United States at approximately −15%, Canada at −11%, Israel at −17%, and Hungary at −14%. This represents a dramatic reversal from 1990, when most developed economies showed positive or neutral effects.

These patterns underscore that geopolitical contributions show no systematic correlation with income levels—rich countries are as likely as poor countries to experience geopolitical headwinds. The magnitude of effects, ranging from −27% to +12% of GDP, establishes geopolitical alignment as a first-order determinant of economic outcomes, comparable in magnitude to other fundamental growth determinants.[37]

[37] For comparison, Acemoglu et al. (2019) estimate that democratization increases GDP per capita by approximately 20% in the long run. Our geopolitical effects span a similar range: a one-standard-deviation improvement generates 10 log points over 20 years, while cross-country variation ranges from −27% to +12% of GDP.

6. Additional Robustness Results

6.1. Dynamic Panel Estimates

The local projection estimates in Section 3.3 provide robust inference but sacrifice statistical efficiency, particularly at long horizons. We complement our analysis with a dynamic panel model that exploits the autoregressive structure to extrapolate long-run effects more precisely (Olea et al. 2024):

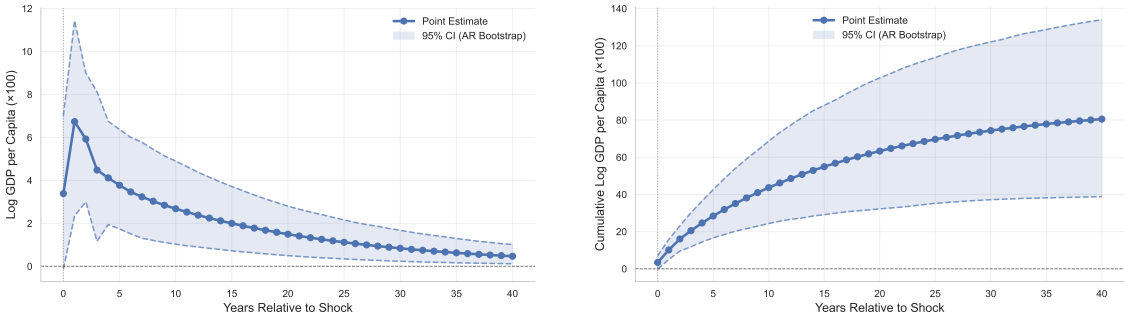
$$y_{ct} = \alpha p_{ct} + \sum_{\ell=1}^{J} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{J} \gamma_\ell p_{c,t-\ell} + \delta_c + \delta_{r(c)t} + \mu_{ct}$$

where y_{ct} denotes log GDP per capita, p_{ct} represents geopolitical relations, and δ_c and $\delta_{r(c)t}$ capture country and region-year fixed effects. We set $J = 4$ to match our baseline specification.

Under Assumption 1, the impulse response function is:

$$\phi_0 = \alpha, \quad \phi_k = \sum_{j=1}^{\min(k,J)} \beta_j \phi_{k-j} + \sum_{j=1}^{\min(k,J)} \gamma_j \text{ for } k \geq 1, \quad \phi_\infty = \frac{\alpha + \sum_{\ell=1}^{J} \gamma_\ell}{1 - \sum_{\ell=1}^{J} \beta_\ell}$$

This formulation yields identical population impulse responses to our local projection approach (Plagborg-Møller and Wolf 2021) while offering improved small-sample precision through parametric structure.



A. Response to Transitory Shock

B. Cumulative Response to Permanent Shock

FIGURE 18. Dynamic Panel Estimates: GDP Responses to Transitory and Permanent Geopolitical Shocks

Panel (a) shows the impulse response of log GDP per capita (×100) to a purely transitory unit shock in geopolitical relations. Panel (b) displays the cumulative response to a permanent unit shock. Specifications include four lags of both variables, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals from 1,000 bootstrap iterations using country-block resampling.

Figure 18 presents the dynamic panel estimates. Panel (a) shows the response to a

purely transitory shock: the initial impact of approximately 3.5 log points rises to a peak of nearly 7 log points at year 1 before declining monotonically thereafter. The response remains positive and statistically significant for approximately 25–30 years, demonstrating that even temporary diplomatic improvements generate long-lasting economic benefits. The gradual decay—reaching approximately 2 log points by year 15 and 1 log point by year 25—reflects the persistence of growth effects as improved geopolitical relations trigger sustained investment and productivity gains.

Panel (b) reveals cumulative gains from permanent improvements in geopolitical relations. GDP per capita rises steadily, reaching approximately 25 log points after 5 years, 60 log points after 15 years, and stabilizing around 80 log points by year 40.[38] The steady-state multiplier of approximately 80 log points implies that a one-standard-deviation improvement in geopolitical relations (0.143 units) generates a long-run GDP gain of approximately 11.4 log points.

These complementary methods—robust local projections and efficient dynamic panels—deliver consistent results. Despite different estimation approaches and robustness-efficiency trade-offs, both methods yield similar impulse response patterns, with transitory shocks generating persistent effects and permanent shocks producing large cumulative impacts.

6.2. Alternative Measures of Geopolitical Relations

Our event-based measure represents a methodological innovation, but its robustness requires examining alternative specifications and making comparisons with existing approaches. We conduct three tests: first, we analyze unsmoothed geopolitical events to verify that our smoothing procedure does not drive the results; second, we implement our framework using UN General Assembly voting patterns, the predominant measure in existing literature; third, we perform horse-race specifications against economic sanctions, the most direct observable form of economic statecraft.

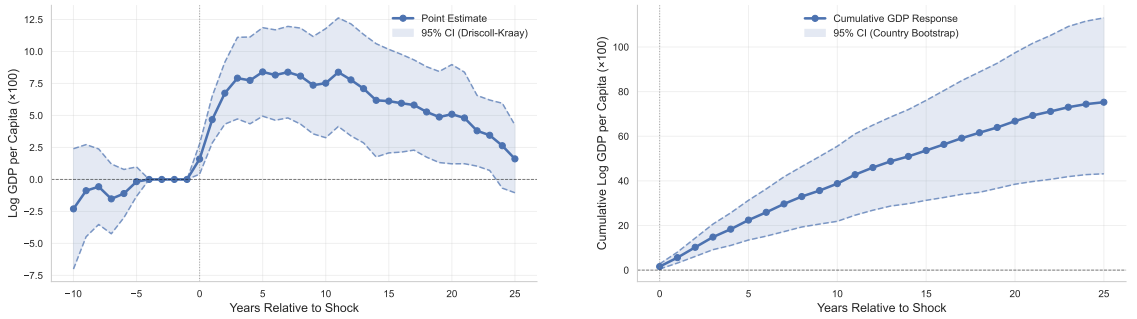
6.2.1. Impulse Responses to Average Events Scores

Our main analysis employs a dynamic geopolitical score that smooths volatile bilateral events to capture persistent trends. We examine robustness by estimating impulse responses to unsmoothed average event scores $\tilde{S}_{ct}$, which correspond to setting the depreciation rate $\delta = 1$ in equation (1).[39]

Figure 19 reveals that while GDP responds positively to average event scores, the magnitude is smaller than our baseline smoothed measure—peaking at approximately 8–9 log

[38]The parametric structure delivers narrower confidence intervals compared to local projections. At the 25-year horizon, the 95% confidence interval spans approximately 30 to 110 log points, improving precision about long-run effects.

[39]We estimate $y_{c,t+h} = \alpha_h^{\text{event}} \tilde{S}_{ct} + \gamma_h' \mathbf{x}_{ct} + \mu_{c,t+h}$, where $\tilde{S}_{ct} = \sum_{j \in \mathcal{N}} \tilde{S}_{ij,t} \times \text{GDP share}_{jt}$ represents the GDP-weighted average of bilateral event scores in year t without smoothing.



A. Response to Event-Based Scores

B. Cumulative Response to Permanent Shock

FIGURE 19. GDP Responses to Geopolitical Events

Panel (a) shows the impulse response of GDP per capita to a unit shock in event-based geopolitical scores. Panel (b) displays the cumulative response to a permanent unit shock in event scores. Shaded areas represent 95% confidence intervals.

points around years 5–10 versus 20–25 log points in our baseline. This attenuation reflects the rapid transitory nature of individual events.[40] However, panel (b) demonstrates that a permanent change in event flows yields a similar cumulative response of approximately 75 log points after 25 years. This convergence supports the interpretation that our geopolitical score captures economically meaningful variation: permanent changes in event flows mechanically generate permanent changes in the stock of geopolitical relations, yielding equivalent long-run effects, and our smoothing procedure retains the fundamental relationship between geopolitics and growth. Appendix B.10 provides additional discussion.

6.2.2. Measuring Geopolitical Relations Using UNGA Votes

Our event-based measure captures bilateral geopolitical relations with universal coverage. As an alternative approach, we examine whether voting patterns in the United Nations General Assembly—the predominant measure in existing literature (Signorino and Ritter 1999)—can generate similar results. We implement our empirical analysis using the negative Ideal Point Distance (IPD) from Bailey, Strezhnev, and Voeten (2017), which measures alignment based on UNGA voting behavior.

Figure B11 in Appendix B.11 reveals fundamental limitations of UNGA-based measures for capturing growth-relevant geopolitical dynamics. When we maintain our baseline specification with country fixed effects—essential for causal interpretation (Acemoglu et al. 2019; Kremer, Willis, and You 2022)—neither the aggregate GDP-weighted IPD nor bilateral alignment with the United States yields statistically significant effects on economic growth. The impulse responses hover near zero throughout the 25-year horizon, with confidence

[40] Appendix B.10 shows that event scores exhibit rapid mean reversion, with approximately 65% of the initial impact dissipating within one year.

intervals consistently spanning zero. This null result stands in stark contrast to our event-based measure, which produces robust and persistent growth effects.

The failure of UNGA measures reflects three fundamental limitations. First, Assembly votes primarily address multilateral issues—decolonization resolutions, human rights declarations, budget allocations—rather than the bilateral concerns that directly affect economic relationships. Countries with tense bilateral relations often vote similarly on global issues, while close allies may diverge on symbolic resolutions. Second, strategic voting behavior adds substantial noise: small states often vote with regional blocs or in exchange for aid commitments, while major nations use votes to signal positions to domestic audiences. Third, the temporal structure of UNGA voting—clustered in annual sessions—creates artificial spikes that poorly capture the continuous evolution of diplomatic relationships.[41]

This divergence from our baseline results has clear methodological implications. In Section 3.4.1, we demonstrated that geopolitical relations with the US and with other major nations generate nearly identical growth effects—evidence of a general phenomenon rather than US-specific dynamics. The failure of UNGA measures to replicate this pattern confirms that Assembly votes capture positioning within the US-led multilateral system rather than the broader bilateral relationships that drive economic outcomes.

6.2.3. Categorical Measures: Sanctions

Our event-based measure captures the full spectrum of geopolitical interactions, from diplomatic consultations to military conflicts. To illustrate its comprehensiveness relative to existing categorical approaches, we examine the relationship between our measure and economic sanctions—arguably the most direct and measurable form of economic statecraft. Using the Global Sanctions Database (Felbermayr et al. 2020; Yalcin et al. 2025), we construct a country-level sanctions exposure measure that parallels our geopolitical relations index: $p_{ct}^{\text{Sanction}} = \sum_{j \in \mathcal{N}} \mathbb{1}_{cjt} \times \text{GDP share}_{jt}$, where $\mathbb{1}_{cjt}$ indicates whether a major nation j imposed sanctions on country c in year t.

Figure B12 in Appendix B.12 presents horse-race results between our comprehensive measure and sanctions exposure. The findings are striking: when we control for sanctions, the dynamic effects of geopolitical relations remain virtually unchanged, with the impulse response maintaining its characteristic hump shape and peaking at approximately 26–27 log points around year 7–8. The univariate and joint specifications produce nearly identical trajectories, confirming that our event-based measure already incorporates the economically relevant variation associated with sanctions. In contrast, controlling for

[41] The positive cross-sectional correlation between US alignment and GDP (when country fixed effects are removed) likely reflects reverse causality and omitted variables: wealthier countries tend to share US positions on international law and market economics, rather than alignment causing prosperity.

geopolitical relations attenuates the sanctions effect—the trough impact shrinks from approximately −10 to −7 log points, a reduction of roughly 30%—and the effect recovers more quickly toward zero.

These patterns reveal that sanctions represent one manifestation of deteriorating geopolitical relations. While sanctions generate economic disruption through trade restrictions, asset freezes, and technology embargoes, a substantial portion of their measured effects operates through the broader degradation of bilateral relationships that our measure captures. Sanctions rarely emerge in isolation: they typically follow a cascade of negative events including diplomatic protests, recalled ambassadors, suspended agreements, and public condemnations. By incorporating this full spectrum of interactions, our event-based measure subsumes much of the information content in binary sanctions indicators while providing additional variation from the broader diplomatic dynamics.[42]

The robustness of our comprehensive measure when controlling for this most explicit form of economic coercion underscores its methodological advantages. Extending beyond the categorical indicators, including sanctions, alliances, rivalries, and trade agreements, our unified framework captures how the full complexity of international relations shapes economic outcomes. This comprehensiveness proves essential for understanding geopolitical dynamics in an era where economic and security concerns increasingly intertwine.

7. Conclusion

This paper has shown that geopolitical relations constitute a fundamental and quantitatively important determinant of economic growth. The effects we document are large, persistent, and robust across identification strategies, estimation methods, and measures of international relations.

Our results carry a broader message for the growth literature: the traditional separation between "domestic" and "international" determinants of growth is artificial. Geopolitical alignment shapes growth not through a single channel but by simultaneously relaxing political, technological, and financial constraints on development. Countries that improve their geopolitical alignment experience immediate gains in domestic stability and investment, followed by gradual expansions in productivity, trade, and human capital—a reinforcing dynamic that explains why even transitory diplomatic improvements generate lasting economic benefits. The democracy–geopolitics decomposition complements the institutions literature: democracy's short-run growth effect operates largely through improved geopolitical relations, while its long-run benefits persist independently through

[42]The timing difference between measures reinforces this interpretation: our event-based approach records sanctions when announced or lifted—capturing the geopolitical signal—while the sanctions database tracks their continuous enforcement. This explains why geopolitical relations better predict long-run outcomes despite sanctions' immediate economic bite.

strengthened property rights and reduced expropriation risk.

These findings are subject to important caveats. Our identification strategy exploits within-country variation and therefore speaks to the effects of changes in geopolitical alignment, not the level effects of sustained cooperation or isolation. The event-based measure, while more comprehensive than alternatives based on UN voting or binary indicators, relies on LLM-compiled data that may introduce measurement error. And while our IV estimates lend support to a causal interpretation, the exclusion restriction—that non-economic verbal conflicts affect growth only through bilateral relations—is plausible but not beyond dispute.

The policy implications extend beyond the usual prescription of "more openness." Our growth accounting reveals that the gains from international integration are neither automatic nor permanent: the post-2010 reversal toward fragmentation has already imposed measurable costs, with the median country experiencing negative geopolitical growth contributions for the first time in our sample. Yet the finding that relations with ideologically different major powers yield comparable economic benefits suggests that countries need not choose sides to prosper. The "connector" strategy—maintaining productive relations across geopolitical divides—offers a viable path, though one that great-power competition increasingly pressures.

As the post-Cold War order gives way to renewed strategic rivalry, the economic stakes of geopolitical choices will only grow. Our estimates provide a framework for quantifying those stakes and underscore a central tension of the current moment: the economic logic favoring broad engagement is colliding with the strategic logic driving fragmentation.

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Appendix A. Event-based Measure of Geopolitical Relations

This section describes additional results related to the event-based measure of geopolitical relations involving all 193 United Nations member states and 24 major nations.

A.1. Major Nations

Our event-based measure of geopolitical relations is designed to be flexible and applicable to any country over time. In this analysis, we examine geopolitical relations involving all 193 countries, with a particular focus on 24 major nations selected for their significant geopolitical, military, and, most critically, economic influence. These nations were chosen based on their substantial global economic impact, which underpins their relevance to our study of geopolitical dynamics and its influence on economic growth.

Figure A1 presents the time series of aggregate and individual GDP shares for these 24 major nations. [43] Panel (a) illustrates the combined GDP share of these nations relative to the global total, highlighting their collective economic dominance over time. Panel (b) displays the individual GDP share for each nation, revealing variations in economic influence across countries and over the study period.

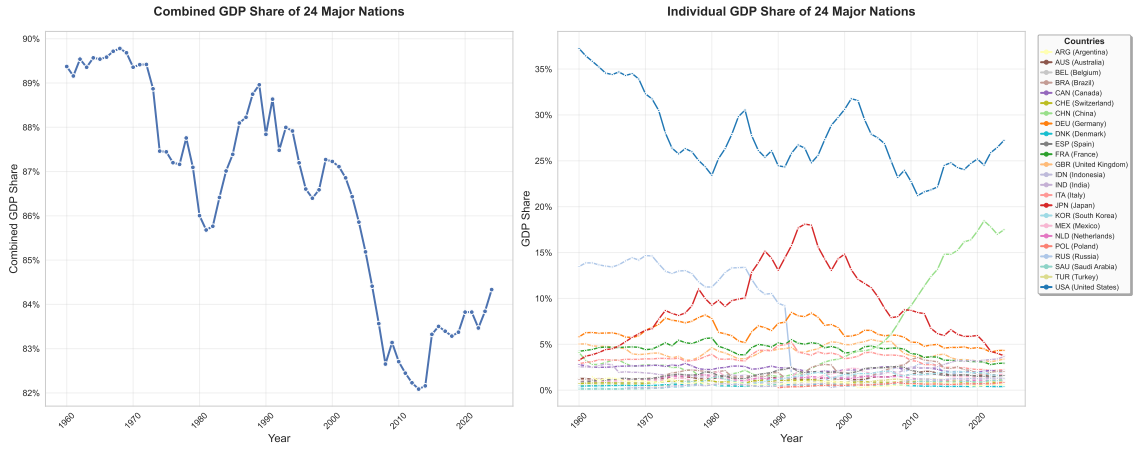


FIGURE A1. GDP Shares of Major Nations. Panel (a) shows the combined GDP share of 24 major nations (Argentina, Australia, Belgium, Brazil, Canada, Switzerland, People's Republic of China, Germany, Denmark, Spain, France, United Kingdom, Indonesia, India, Italy, Japan, Republic of Korea, Mexico, Netherlands, Poland, Russian Federation, Saudi Arabia, Turkey, and United States) relative to global GDP over time. Panel (b) presents the individual GDP share for each nation, illustrating cross-country variations and temporal trends. Data are sourced from the World Bank, with Soviet Union GDP calculated using relative GDP to the United States from the Maddison Project (Bolt and Van Zanden 2025).

[43] GDP data are nominal GDP in current USD and sourced from the World Bank. For the Soviet Union, GDP is calculated using relative GDP to the United States, obtained from the Maddison Project.

The GDP shares depicted in Figure A1 illustrate the economic power dynamics among major nations. The combined GDP share underscores the significant and sustained influence of these 24 nations, which collectively account for a substantial portion of global economic output. Individual GDP shares, however, reveal heterogeneity, with nations such as the United States maintaining large and relatively stable shares, while others, such as Russia (the Soviet Union) or China, experience fluctuations driven by economic growth, policy changes, or global events.

A.2. Geopolitical Event Data: Methodology and Descriptive Statistics

This section provides technical details on our LLM-based methodology for compiling bilateral geopolitical events and presents comprehensive descriptive statistics of the resulting dataset spanning 1960–2024. We first describe the systematic procedure for event identification and classification, then analyze temporal patterns across 373,020 events to validate our framework's ability to capture major shifts in international relations. Complete prompt specifications are provided in Appendix C.

A.2.1. Event Compilation and Analysis

Our analytical framework leverages a large language model (Gemini 2.5 Pro) with web search capabilities to systematically identify and classify geopolitical events between country pairs from 1960–2024. The complete prompt structure and technical implementation details are provided in Online Appendix C.

Entity Verification and Historical Accuracy. Our framework begins by verifying the political entities corresponding to each country pair for the target year. This step is crucial for maintaining historical accuracy, as it accounts for state succession events such as the dissolution of the Soviet Union and emergence of the Russian Federation on December 26, 1991. The LLM references authoritative sources including the Correlates of War State System Membership dataset when available. For years when specified entities did not exist, the framework identifies the primary political entities controlling the relevant territories or populations and applies them consistently throughout the analysis.

Systematic Event Identification. The LLM conducts comprehensive searches across multiple dimensions of bilateral relations to identify major geopolitical events that significantly affect or strongly indicate the state of the bilateral relationship. Table A1 summarizes the six dimensions and 22 subcategories that define the scope of geopolitical events in our analysis, with representative examples for each. Events are included only when verified through multiple credible sources to ensure authenticity. The framework prioritizes events

with demonstrable significant effects on the relationship's trajectory, with particular attention to political actions carried out through economic means and major developments concerning trade or security agreements. Detailed criteria for major geopolitical event identification are provided in Online Appendix C.2.

CAMEO Classification and Goldstein Scoring. Each identified event undergoes systematic classification using the Conflict and Mediation Event Observations (CAMEO) framework, which categorizes international political actions along two dimensions: cooperation versus conflict and verbal versus material. This creates four quadrant classes with hierarchical coding—root codes (two-digit) for general categories and event codes (three-digit) for specific actions. Following CAMEO classification, we assign Goldstein Scale scores ranging from −10.0 (maximum conflict) to +10.0 (maximum cooperation) based on the event code's typical intensity, with contextual adjustments for the bilateral relationship's historical context.

Additionally, we classify each event's economic content into five categories: Tariffs, Economic Sanctions, Trade Agreements and Treaties, Other Economic Policies, or Not an Economic Event. This classification enables targeted analysis of how different forms of economic diplomacy affect bilateral relations and economic outcomes. The detailed CAMEO codebook and Goldstein scoring guidelines are provided in Online Appendix C.3.

The stark contrast between Tables 1 and A2 demonstrates our methodology's ability to capture fundamental shifts in bilateral relations. While 2022 was dominated by conflicts with Goldstein scores ranging from −4.5 to −8.0—reflecting U.S. military assistance to Ukraine, sweeping sanctions, and diplomatic condemnation following Russia's invasion—the 1972 détente period exclusively features cooperative events with positive scores from +5.0 to +9.0. The concentration of high-scoring material cooperation events in 1972—including the SALT I accords (+9.0), the Incidents at Sea Agreement (+8.0), and agreements spanning trade, space exploration, and environmental protection—illustrates how our event-based approach quantifies both the intensity and multifaceted nature of diplomatic breakthroughs. This temporal variation within the same country pair validates our measure's sensitivity to geopolitical dynamics and its capacity to distinguish periods of cooperation from conflict.

A.2.2. Statistics of Geopolitical Events

Our comprehensive compilation of bilateral geopolitical events spans over six decades (1960–2024) and encompasses 373,020 individual events involving 24 major nations. Table A3 and Figure A2 provide detailed statistics revealing both the scale and evolution of international political interactions over this period.

TABLE A1. Categories of Bilateral Geopolitical Events

Subcategory	Representative Events	Subcategory	Representative Events
A. Economic Relations		*D. Legal, Territorial & Movement*	
A1. Trade Policy	Tariff imposition/removal; non-tariff barriers; FTA negotiations, signing, ratification, withdrawal	D1. Legal Actions	ICJ/WTO disputes; international arbitration; extradition; law enforcement cooperation
A2. Financial Relations	Asset freezes; SWIFT exclusions; capital market denial; currency swaps; FDI restrictions; investment treaties	D2. Territorial & Maritime	EEZ/continental shelf disputes; freedom of navigation operations; border demarcation; sovereignty claims
A3. Economic Coercion	Trade embargoes; sectoral sanctions; Entity List designations; export controls; foreign aid; debt relief	D3. Movement of People	Visa regime changes; travel bans; guest worker programs; refugee/asylum policies
A4. Strategic Sectors	Energy supply agreements; pipeline projects; nuclear cooperation; 5G bans; rare earth controls		
A5. Integration	BRI/B3W infrastructure; port concessions; friend-shoring; supply chain arrangements; customs unions	*E. Multilateral & Global Governance*	
A6. Other Economic	Regulatory harassment; boycott campaigns; government procurement restrictions; gray zone pressures	E1. Int'l Organizations	UNSC confrontations; GA coalition building; regional bloc membership changes
		E2. Global Issues	Climate cooperation; pandemic coordination; vaccine diplomacy; human rights
B. Diplomatic & Political Relations		*F. Other Significant Events*	
B1. Formal Diplomacy	Embassy/consulate openings and closures; ambassador recalls; staff expulsions; démarches	F1. Historical & Symbolic	Apologies for historical wrongs; memorial visits; monument disputes
B2. High-Level Interactions	Presidential visits; bilateral summits; summit boycotts; ministerial meetings; strategic dialogues	F2. Humanitarian	Disaster aid offers/rejections; joint rescue operations; evacuation cooperation
B3. Public Diplomacy	Policy speeches; parliamentary resolutions; propaganda campaigns	F3. Sports & Events	Olympic boycotts; joint hosting; World Expo participation
B4. Cultural & Educational	Cultural agreements/boycotts; scholarship programs; university partnerships; student visa policies	F4. Technology & Space	Joint space missions; tech theft accusations; research terminations
		F5. Environment	Transboundary river/pollution disputes; conservation conflicts
C. Security & Defense		F6. Communications	Journalist expulsions; broadcasting restrictions; information warfare
C1. Military Cooperation	Alliances; defense pacts; base arrangements; arms sales/embargoes; joint exercises; military aid	F7. Other	Emerging forms of bilateral interaction
C2. Security Incidents	Border skirmishes; airspace/maritime violations; naval encounters; hybrid warfare		
C3. Intelligence & Cyber	Espionage revelations; intel officer expulsions; intel-sharing pacts; state-sponsored cyber attacks		

TABLE A2. U.S.-Soviet Union Bilateral Geopolitical Events in 1972: LLM Analysis Results

Event Name	Event Description	CAMEO Class.	Econ. Type	Goldstein Score
Declaration of Basic Principles	Joint declaration of twelve principles guiding bilateral relations, including peaceful coexistence and renouncing unilateral advantage	Verbal Coop. (01-019)	Not econ.	+5.0
US-Soviet Grain Deal	Soviet purchase of 19 million metric tons of American grain, including nearly a quarter of the US wheat harvest	Material Coop. (06-061)	Trade Agree.	+6.0
Moscow Summit	President Nixon's historic visit to Moscow, the first official US presidential visit to the USSR	Verbal Coop. (04-042)	Not econ.	+6.0
Environmental Protection Agreement	Bilateral agreement establishing cooperation on 11 areas including air and water pollution and nature preservation	Material Coop. (05-057)	Not econ.	+6.5
Biological Weapons Convention	US and USSR signed the BWC prohibiting development and stockpiling of biological weapons	Material Coop. (05-057)	Not econ.	+7.0
US-Soviet Trade Agreement	Comprehensive agreement providing reciprocal MFN tariff treatment, official trade offices, and government credits	Material Coop. (05-057)	Trade Agree.	+7.0
Apollo-Soyuz Agreement	Agreement for joint US-Soviet space mission, leading to the 1975 orbital rendezvous of American astronauts and Soviet cosmonauts	Material Coop. (05-057)	Not econ.	+7.5
Incidents at Sea Agreement	Protocols to prevent accidents between US and Soviet navies, including rules against collisions and simulated attacks	Material Coop. (05-057)	Not econ.	+8.0
SALT I Accords	ABM Treaty limiting defensive systems and Interim Agreement freezing ICBM/SLBM launchers	Material Coop. (05-057)	Not econ.	+9.0

The data reveal a pronounced cooperative bias in international relations, with cooperative events (both verbal and material) comprising 83.0% of all recorded interactions (309,734 events) compared to 17.0% for conflictual events (63,286 events). Verbal cooperation represents the single largest category with 185,854 events (49.8%), followed by material cooperation with 123,880 events (33.2%). This distribution suggests that diplomatic statements and consultations provide the communicative framework for international relationships, while tangible cooperative actions—such as economic agreements, aid provision, and joint initiatives—constitute the substantive foundation of political interaction.

The temporal evolution demonstrates substantial growth in event documentation, with total events more than tripling from 29,289 in the 1960s to 96,175 in the 2010s. This expansion reflects both improved global communication and the increasing complexity of international interactions in an interconnected world. Notably, the growth is heavily

TABLE A3. Summary Statistics of Geopolitical Events by Decade, 1960–2024

	1960s	1970s	1980s	1990s	2000s	2010s	2020s	Total
CAMEO Event Classification								
Verbal Cooperation	13,276	16,532	17,433	23,001	34,330	51,142	30,140	185,854
Material Cooperation	8,734	10,340	12,224	17,537	24,902	31,737	18,406	123,880
Verbal Conflict	4,700	4,639	5,980	4,805	6,468	8,571	5,226	40,389
Material Conflict	2,579	2,714	3,410	3,183	3,179	4,725	3,107	22,897
Goldstein Scale Statistics								
Mean	2.86	3.28	2.92	3.98	4.09	3.88	3.73	3.67
Std. Dev.	4.87	4.62	4.74	4.27	3.87	3.78	3.88	4.18
Median	5.00	5.00	4.50	6.00	5.00	4.50	4.50	5.00
Economic Event Classification								
Trade Policy	1,873	2,722	2,125	3,570	4,938	6,164	3,362	24,754
Financial Relations	457	689	755	1,443	1,423	1,996	894	7,657
Economic Coercion	2,496	3,647	5,668	7,358	10,786	12,719	7,296	49,970
Other Economic (A4–A6)	1,470	1,987	1,740	1,696	3,217	5,487	3,295	18,892
Non-Economic	22,993	25,180	28,759	34,459	48,515	69,809	42,032	271,747
Summary								
Total Events	29,289	34,225	39,047	48,526	68,879	96,175	56,879	373,020

CAMEO classifications follow the Conflict and Mediation Event Observations framework. Goldstein Scale ranges from −10 (most conflictual) to +10 (most cooperative). Economic events are classified as: A1 (Trade Policy and Market Access), A2 (Financial and Monetary Relations), A3 (Economic Coercion and Incentives), Other Economic (A4–A6: investment, development, and resource issues), and Non-Economic events. All figures represent event counts except Goldstein Scale statistics.

concentrated in cooperative categories: verbal cooperation increases nearly fourfold (from 13,276 to 51,142), while material cooperation more than triples (from 8,734 to 31,737). Conflict events show more modest increases, with verbal conflict growing from 4,700 to 8,571 and material conflict from 2,579 to 4,725, reinforcing the overall cooperative trajectory of the international system. The 2020s data, though representing only half a decade, already show 56,879 events, suggesting continued high levels of international engagement amid geopolitical fragmentation.

The Goldstein Scale statistics illuminate important shifts in relationship intensity over time. The Cold War decades (1960s–1980s) exhibit relatively lower mean cooperation scores (2.86–3.28) and higher standard deviations (4.62–4.87), indicating more volatile and polarized international interactions. The globalization era (1990s–2000s) shows marked improvement, with mean scores reaching their peak at 4.09 in the 2000s and reduced volatility (standard deviation of 3.87). However, the 2010s and 2020s display a decline in mean cooperation to 3.88 and 3.73 respectively, suggesting emerging tensions in the contemporary international order while maintaining the reduced volatility characteristic of the post-Cold War period.

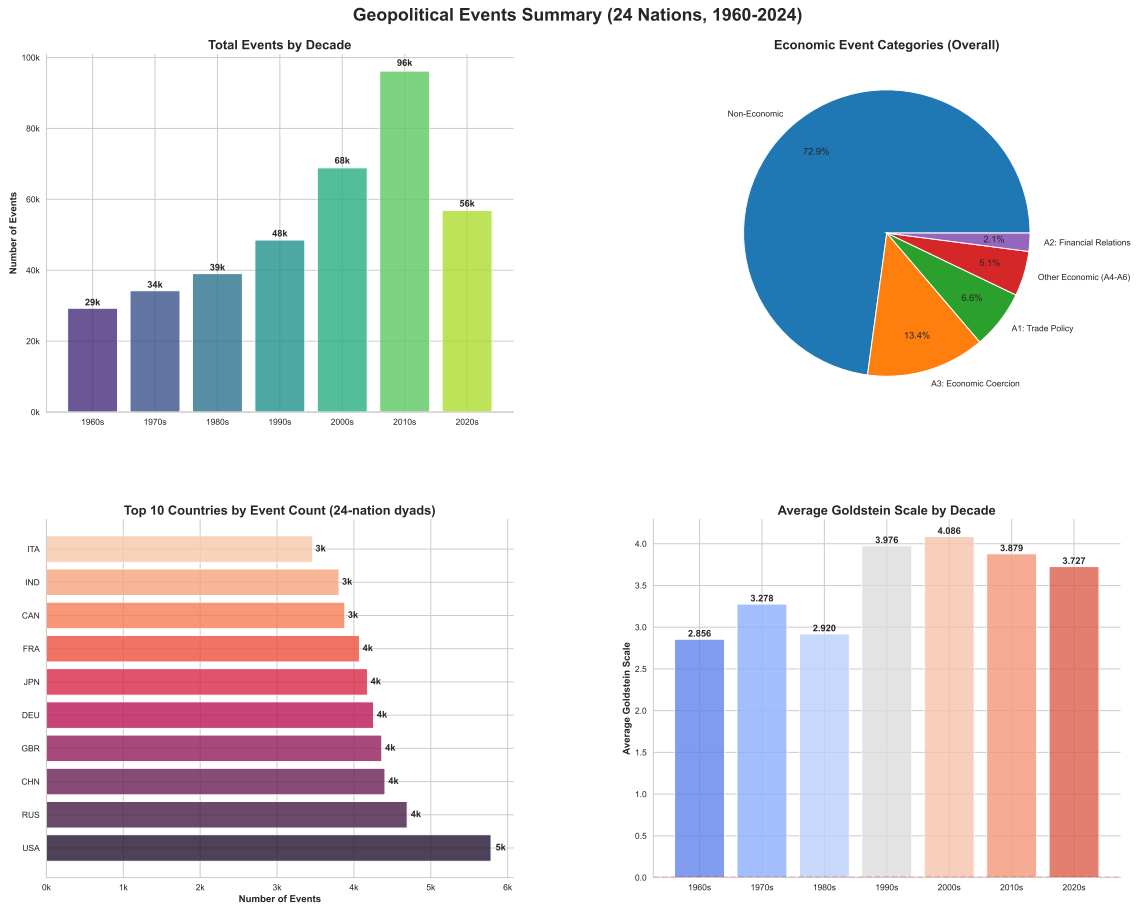


FIGURE A2. Geopolitical Events Summary (1960–2024)

Economic diplomacy represents a significant component of international political interaction, accounting for 27.2% of all events (101,273 events). Economic coercion (A3) dominates this category with 49,970 events (49.3% of economic events), followed by trade policy and market access (A1) with 24,754 events (24.4%), reflecting the diverse instruments of economic statecraft in modern international relations. Economic coercion events show notable temporal variation: increasing from 2,496 events in the 1960s to 5,668 in the 1980s, then surging through the globalization era to reach 12,719 in the 2010s, with 7,296 events already recorded in the 2020s. This pattern corresponds to the expansion of sanctions regimes and their recent intensification amid renewed strategic competition. Financial and monetary relations (A2), while less frequent with 7,657 events (7.6%), show steady growth particularly in the 1990s and 2010s, coinciding with financial globalization and its subsequent weaponization in geopolitical conflicts.

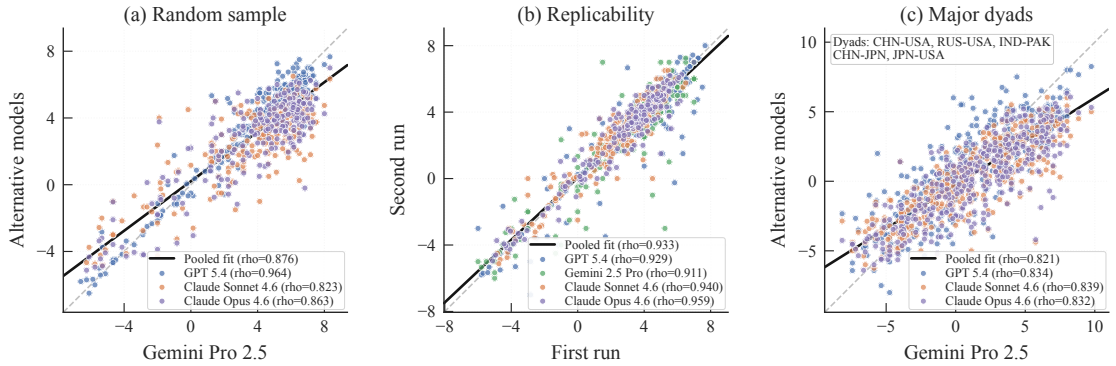
Online Appendix C provides additional visualizations of these temporal patterns through CAMEO quadrant distributions, root code evolution, and Goldstein Scale distributions by decade, which further illuminate the macro-historical shifts captured by

our methodology.

A.3. Model Robustness and Replicability

An important concern with LLM-based measurement is whether results depend on the specific model or vary across independent runs. We evaluate both dimensions using three frontier LLMs: Gemini 2.5 Pro (our baseline), GPT 5.4, and Claude (Opus 4.6 and Sonnet 4.6).

FIGURE A3. Model Robustness and Replicability of Geopolitical Scores



Notes: Each point represents the mean Goldstein score for a country-pair-year observation. Panel (a) compares scores from alternative models (vertical axis) against Gemini 2.5 Pro (horizontal axis) for 300 randomly selected dyad-years. Panel (b) tests within-model replicability by running each model twice on the same dyad-years. Panel (c) compares scores across models for five major bilateral relationships (CHN-USA, RUS-USA, IND-PAK, CHN-JPN, JPN-USA) across all years. All models are run with temperature = 0.1.

Figure A3 reports three complementary exercises. Panel (a) compares scores from alternative LLMs against our Gemini 2.5 Pro baseline for 300 randomly selected dyad-years. Scores cluster along the 45-degree line, with pairwise correlations exceeding 0.82 (pooled $\rho = 0.88$). Panel (b) tests within-model replicability by running each model twice on the same inputs.[44] Within-model correlations exceed cross-model correlations (pooled $\rho = 0.93$): the residual variation reflects only stochastic decoding, whereas cross-model differences additionally capture variation in training data and scoring conventions. Newer frontier models achieve higher stability, with Opus 4.6 reaching $\rho = 0.96$ and Sonnet 4.6 reaching $\rho = 0.94$, compared to $\rho = 0.93$ for GPT 5.4 and $\rho = 0.91$ for Gemini 2.5 Pro. Panel (c) compares scores for five major bilateral relationships across all available years—a more demanding test, since volatile major-power dyads require greater interpretive judgment. The pooled correlation ($\rho = 0.82$) is correspondingly lower but remains high. Across all exercises, correlations exceed 0.82, indicating that bilateral geopolitical events are

[44] All models are run with temperature = 0.1 to reduce stochastic variation while preserving some flexibility in event retrieval and summary.

sufficiently well-documented in public sources that different LLMs converge on similar assessments.

A.4. Additional Case Validation for Geopolitical Scores

This section provides detailed validation of our dynamic geopolitical scores through case studies of bilateral relationships that illustrate the measure's ability to capture the timing and intensity of major historical episodes. We compare our event-based scores with the negative Ideal Point Distance (IPD) from UN voting data to demonstrate the superior responsiveness of our measure to bilateral dynamics.

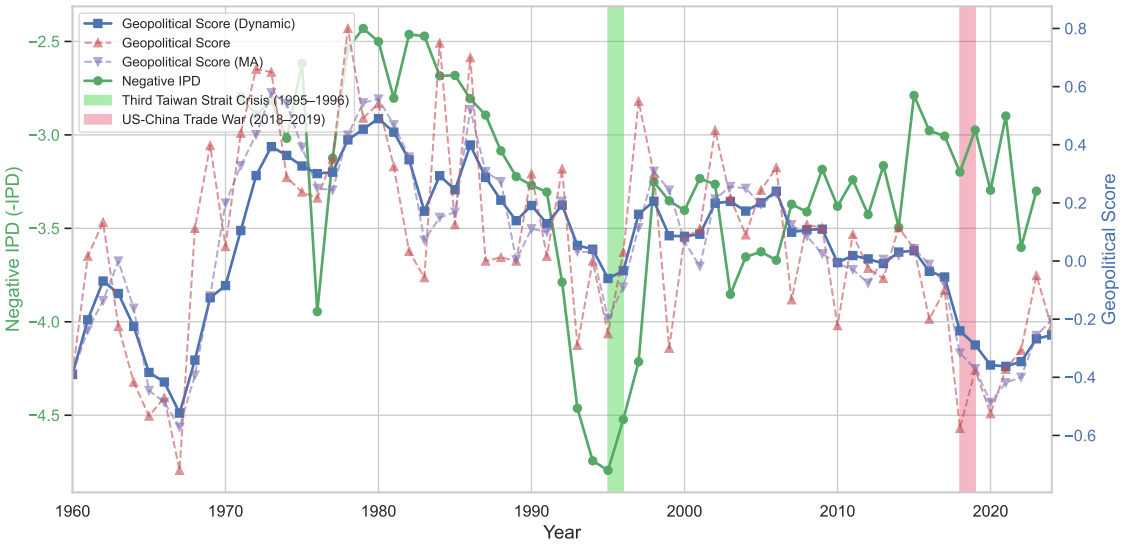


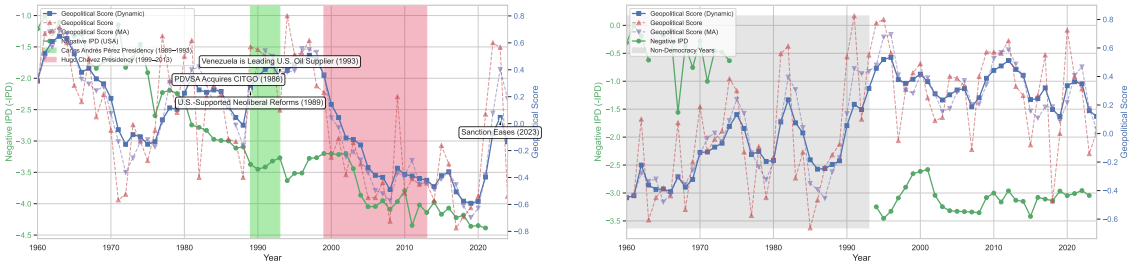
FIGURE A4. Geopolitical Scores Between United States and China

Time series comparison of geopolitical relationship measures between the United States and China, 1960–2024. The blue line shows our dynamic geopolitical score, the orange dashed line shows the yearly geopolitical score, the purple dashed line shows the four-year moving average, while the green line displays the negative Ideal Point Distance (−IPD) from UN voting data. Shaded regions highlight the Third Taiwan Strait Crisis (1995–1996, green) and the U.S.-China Trade War (2018–2019, red).

Figure A4 illustrates the U.S.-China relationship from 1960–2024, revealing dramatic shifts that our dynamic score captures with precision. The measure identifies the strategic rapprochement of the 1970s following Nixon's opening, with scores improving from around −0.4 to above 0.4 by the late 1970s. It then captures the sharp deterioration after 1989 following Tiananmen, with scores plummeting to approximately 0. The Third Taiwan Strait Crisis (1995–1996) appears as a significant negative spike, though less severe than the post-Tiananmen nadir. The subsequent recovery tracks China's WTO accession (2001) and economic integration, with scores returning to positive territory around 0.2 by the early 2000s, before gradually declining during the Obama administration's "pivot to Asia."

Most strikingly, our measure captures the precipitous decline during the U.S.-China

trade war (2018–2019), with scores plunging to approximately −0.4 and continuing to deteriorate into the 2020s, reaching historical lows below −0.5 by 2020—a magnitude comparable to the early Cold War hostility of the 1960s. Throughout these shifts, the IPD measure fails to capture both the diplomatic breakthrough that occurred before the PRC rejoined the UN and the deterioration caused by the trade war.



A. United States and Venezuela

B. United States and South Africa

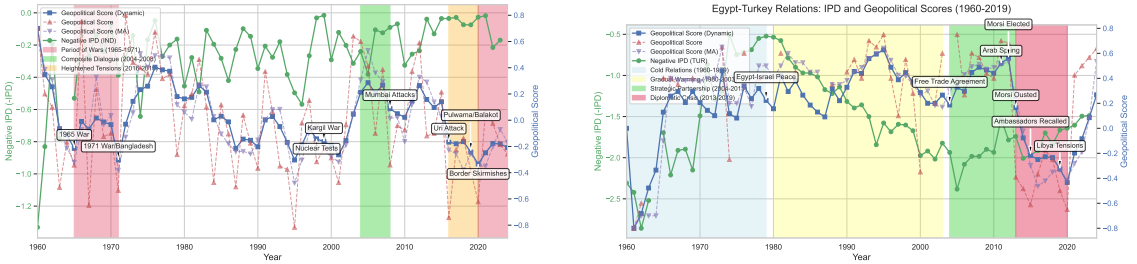
FIGURE A5. Geopolitical Scores: U.S. Relations with Venezuela and South Africa

Time series comparison of geopolitical relationship measures between the United States and Venezuela (panel a) and South Africa (panel b), 1960–2024. Blue lines show our dynamic geopolitical score, orange dashed lines show yearly scores, purple dashed lines show four-year moving averages, and green lines display the negative Ideal Point Distance (−IPD) from UN voting data. Shaded regions highlight key periods: Carlos Andrés Pérez presidency (1989–1993) and Hugo Chávez presidency (1999–2013) for Venezuela; gray shading indicates non-democracy years under apartheid for South Africa.

Figure A5 illustrates our measure's ability to capture how economic interdependence and domestic political transitions shape bilateral relations. Panel (a) traces U.S.-Venezuela relations, where scores improved substantially during the Carlos Andrés Pérez presidency (1989–1993) as PDVSA acquired CITGO and Venezuela became the leading U.S. oil supplier—a warming completely missed by the IPD measure. The dramatic deterioration under Hugo Chávez (1999–2013) and especially Nicolás Maduro is vividly captured, with scores declining to approximately −0.6 by 2020 as the Trump administration imposed sweeping sanctions. The recent partial recovery following sanction easing in 2023 demonstrates our measure's responsiveness to policy shifts.

Panel (b) reveals the complex dynamics of U.S.-South Africa relations during and after apartheid. The deterioration in the late 1970s and 1980s corresponds to increasing pressure following the Soweto uprising (1976), while Reagan's "constructive engagement" policy is reflected in less severe negativity than might be expected. The dramatic improvement beginning in 1990 precisely tracks F.W. de Klerk's reforms and Nelson Mandela's release, with scores reaching consistently positive territory by the late 1990s. Remarkably, the IPD measure shows virtually no variation throughout this entire period of dramatic change—from the height of apartheid through democratization—starkly illustrating the limitations of UN voting patterns for capturing bilateral dynamics.

Figure A6 exposes a critical limitation of UN voting-based measures: they systemat-



A. India and Pakistan

B. Egypt and Turkey

FIGURE A6. Geopolitical Scores: Regional Rivalries Misclassified by UN Voting Patterns

Time series comparison of geopolitical relationship measures between India and Pakistan (panel a) and Egypt and Turkey (panel b), 1960–2024. Blue lines show our dynamic geopolitical score, orange dashed lines show yearly scores, purple dashed lines show four-year moving averages, and green lines display the negative Ideal Point Distance (–IPD) from UN voting data. Shaded regions highlight key periods of conflict and cooperation. Note that higher IPD values (less negative) indicate greater UN voting similarity, which the IPD measure misinterprets as alliance.

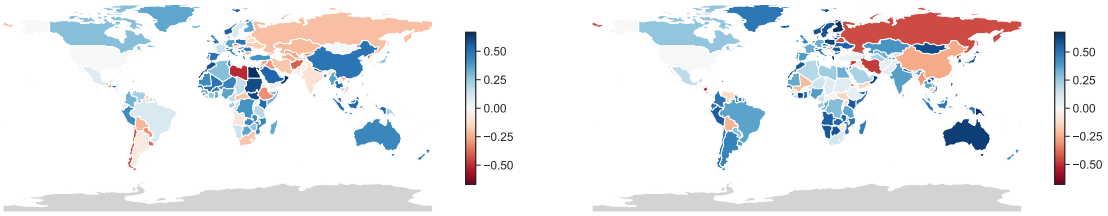
ically misclassify regional rivalries as alliances when countries share similar multilateral positions despite hostile bilateral relations. Panel (a) traces India-Pakistan relations through six decades of recurrent conflict. Our measure captures the wars of 1965 and 1971, the Kargil War (1999), nuclear tests (1998), and terrorist attacks (Mumbai 2008, Uri 2016, Pulwama 2019), with scores fluctuating between –0.2 and –0.8 throughout. The Composite Dialogue period (2004–2008) appears as a modest improvement before collapsing after the Mumbai attacks. Strikingly, the IPD measure shows these bitter rivals as increasingly aligned from the 1960s onward, with scores approaching zero by 2020—completely inverting the actual relationship because both countries often vote similarly on postcolonial and developing-world issues at the UN.

Panel (b) reveals similar dynamics in Egypt-Turkey relations. Our measure captures the cold relations of the Nasser era (1960–1979), gradual warming through the 1980s–1990s following Egypt's peace with Israel, the strategic partnership peak when Morsi was elected (2012), and the dramatic collapse after his ouster (2013) when ambassadors were recalled and relations plunged to historical lows around –0.5. The recent recovery beginning around 2020 is also visible. Yet the IPD measure again inverts reality: it shows Egypt and Turkey as close allies throughout the period of intense diplomatic crisis (2013–2019), because both Muslim-majority nations vote similarly on Middle Eastern issues at the UN despite their bilateral hostility over the Muslim Brotherhood, Libya, and regional influence.

A.5. Maps of Bilateral Geopolitical Relations with the US and Its Rivals

This section provides geographic visualization of geopolitical relations, comparing Cold War patterns (1980) with the contemporary landscape (2024) for both the United States

and its principal rivals.

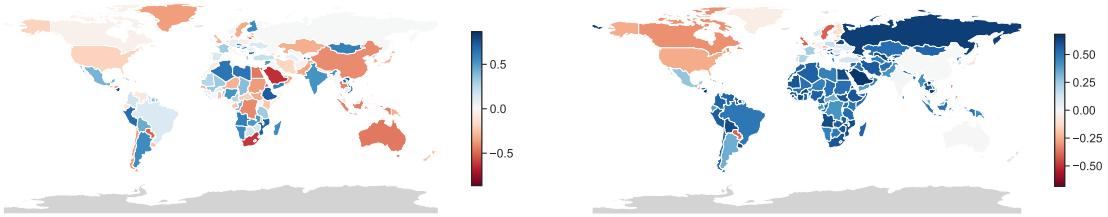


A. United States, 1980 B. United States, 2024

FIGURE A7. Map of Geopolitical Relations with the United States

World maps showing bilateral geopolitical scores with the United States in 1980 and 2024. Blue colors indicate positive relations; red colors indicate negative relations. The transformation from stark Cold War divisions to a more nuanced contemporary pattern is evident, though the re-emergence of great power rivalry with Russia and China is clearly visible in 2024.

Figure A7 reveals both continuity and change in U.S. geopolitical relations. The 1980 map displays classic Cold War geography: strong positive relations (blue) throughout NATO, Pacific allies (Japan, South Korea, Australia), and much of the Western Hemisphere, contrasted with hostile relations (red) across the Soviet Union, Eastern Europe, China, and apartheid-era South Africa. By 2024, while core alliances remain intact with Western Europe, Canada, Japan, and Australia showing deep blue, the map reveals intensified great power rivalry: Russia appears in dark red reflecting post-Ukraine war hostility, and China shows pronounced negative relations. Notably, much of Latin America, Africa, and Southeast Asia display lighter shades indicating more neutral or moderately positive relations compared to the stark Cold War divisions.



A. Soviet Union, 1980 B. China, 2024

FIGURE A8. Map of Geopolitical Relations: Soviet Union (1980) vs. China (2024)

Comparison of America's principal rival's geopolitical reach in 1980 (Soviet Union) and 2024 (China). While the Soviet Union's positive relations were concentrated in Eastern Europe and select developing countries, China's positive relations extend broadly across Asia, Africa, and Latin America through economic engagement.

Figure A8 contrasts the geographic reach of America's principal rivals across eras. The Soviet Union's 1980 influence concentrated in contiguous Eastern Europe (dark blue), Cuba, parts of Africa (Angola, Ethiopia, Libya), and allied states like Iraq and Syria—

largely maintained through military and ideological ties. Notably, China appears in red, reflecting Sino-Soviet tensions following the border conflicts of 1969. China's 2024 map reveals a fundamentally different pattern: positive relations (blue) extend across most of the developing world, particularly Sub-Saharan Africa, Central Asia, Pakistan, and much of Latin America, achieved primarily through trade and infrastructure investment rather than military alliances. However, China faces hostile relations (red) with the United States, Australia, and India, while maintaining strong ties with Russia.[45]

Several patterns validate our measure's ability to capture known geopolitical dynamics:

Cold War Bipolarity (1980): The near-mirror imaging between U.S. and Soviet maps confirms the era's zero-sum competition. Countries showing strong positive relations with one superpower typically display negative relations with the other. Notable exceptions like India (showing moderate relations with both) align with its non-aligned status, while China's hostile relations with both superpowers reflect its unique position following the Sino-Soviet split.

Contemporary Complexity (2024): The U.S. and China maps no longer display simple mirror-image qualities. Many countries in Africa, Latin America, and Southeast Asia maintain positive or neutral relations with both powers, creating the "connector" states identified in our network analysis. However, China's most negative relations concentrate among America's closest allies (Australia, Japan, India), while Russia's deep isolation from the West represents a sharper divide than even peak Cold War hostility.

Regional Variations: Different regions display distinct evolutionary patterns. Europe shows remarkable stability in U.S. alignment, now reinforced by the Ukraine war. Asia transformed from a Cold War battleground to an arena of complex economic interdependence alongside security competition. Africa shifted from proxy conflict to pragmatic multi-alignment, with most countries maintaining positive relations with both the U.S. and China. Latin America shows similar patterns of diversified partnerships.

These geographic patterns corroborate our distributional findings. The stark geographic blocs of 1980 produced the bimodal distribution observed in Figure 4, while the complex geometry of 2024—mixing continued alliances, new partnerships, and selective rivalries—generates the more continuous but increasingly dispersed contemporary distribution. The maps thus provide face validity for our measure by showing geographically coherent patterns that align with established historical narratives while revealing nuanced variations that aggregate measures miss.

[45]This shift from ideological-military to economic modes of influence expansion reflects broader changes in how great powers compete in the contemporary era.

A.6. Statistics of Country-level Geopolitical Relations

Table A4 presents summary statistics for country-level geopolitical relations across seven decades, revealing systematic patterns in the evolution of global geopolitical alignment.

TABLE A4. Summary Statistics of Geopolitical Relations by Decade, 1960–2024

	1960s	1970s	1980s	1990s	2000s	2010s	2020s
Summary Statistics							
Mean	0.177	0.193	0.182	0.260	0.287	0.296	0.281
Median	0.194	0.207	0.209	0.284	0.315	0.319	0.302
Std. Dev.	0.141	0.119	0.138	0.152	0.132	0.108	0.114
Min	−0.323	−0.315	−0.275	−0.430	−0.256	−0.335	−0.160
Max	0.499	0.531	0.466	0.550	0.548	0.479	0.482
5th Pct.	−0.055	−0.013	−0.103	−0.027	0.023	0.082	0.059
25th Pct.	0.069	0.111	0.111	0.188	0.226	0.251	0.223
75th Pct.	0.286	0.281	0.284	0.371	0.378	0.368	0.367
95th Pct.	0.379	0.368	0.359	0.451	0.446	0.425	0.422
N Country-Years	1,883	1,911	1,925	1,930	1,930	1,930	965
Countries with Lowest Geopolitical Relations (Bottom 5)							
1.	S. Africa	S. Africa	Afghanistan	Libya	Myanmar	N. Korea	N. Korea
2.	China	Albania	Libya	Iraq	Belarus	Eritrea	Nicaragua
3.	Zimbabwe	Zimbabwe	S. Africa	Myanmar	Zimbabwe	Syria	China
4.	Albania	Timor-L.	Latvia	Serbia	Iraq	Venezuela	Syria
5.	Timor-L.	Chile	Lithuania	Montenegro	Gambia	Iran	Russia
Countries with Highest Geopolitical Relations (Top 5)							
1.	Colombia	Colombia	Mali	Mongolia	Albania	Senegal	Laos
2.	Afghanistan	Belgium	Senegal	Kuwait	Vietnam	Liberia	Senegal
3.	Nepal	Bangladesh	Bangladesh	Mozambique	Ghana	Sierra Leone	Singapore
4.	Italy	Finland	Egypt	Poland	Romania	Singapore	Qatar
5.	Ethiopia	Romania	Mozambique	Hungary	Mozambique	Peru	Mozambique

Geopolitical Relation measures the GDP-weighted average of bilateral geopolitical scores for each country. Statistics are calculated using all available country-year observations within each decade. Countries are ranked by their decade average geopolitical relation scores.

The summary statistics reveal three key patterns. First, mean geopolitical relations improved substantially from 0.177 in the 1960s to 0.296 in the 2010s—a 67% increase—before declining modestly to 0.281 in the 2020s. This trajectory aligns with our distributional analysis showing post-Cold War convergence followed by recent fragmentation. Second, the standard deviation declined from 0.141 in the 1960s to 0.108 in the 2010s, indicating reduced heterogeneity as countries converged toward more cooperative average relations, though it has since risen slightly to 0.114 in the 2020s as geopolitical tensions resurface. Third, the 5th percentile improved dramatically from −0.055 in the 1960s to 0.082 in the 2010s, demonstrating that even the most isolated countries experienced substantial improvement in their average geopolitical relations during the globalization era, though this progress partially reversed to 0.059 in the 2020s.

The countries occupying extreme positions provide additional validation of our measure. During the Cold War decades, apartheid-era South Africa, China, and Albania consistently ranked among the most geopolitically isolated states, reflecting ideological divisions

and international ostracism. The contemporary period's most isolated countries—North Korea, Syria, and Iran in the 2010s, joined by China, Russia, and Nicaragua in the 2020s—are all subjects of extensive international sanctions or geopolitical confrontation with Western powers. Conversely, the highest-scoring countries often represent small states successfully maintaining positive relations across geopolitical divides (Singapore, Senegal, Qatar) or beneficiaries of particular historical moments (Poland and Hungary during post-Cold War democratization, Vietnam and Albania following market reforms, African states like Mozambique and Ghana engaging multiple development partners). These patterns confirm that our measure captures both systematic features of the international system and country-specific geopolitical strategies.

A.7. Dynamics of Geopolitical Relations

This section examines the dynamic properties of our geopolitical measures using local projection methods. We analyze both the persistence of bilateral geopolitical scores and country-level geopolitical relations to understand how these measures evolve over time.

Methodology. We estimate impulse response functions using local projections for two key measures. For country-level geopolitical relations, we estimate:

$$p_{c,t+h} = \alpha_h^{\text{Geo. Relation}} p_{ct} + \boldsymbol{\gamma}_h' \mathbf{x}_{ct} + \mu_{c,t+h}, \quad h = 0, 1, \ldots, 30$$

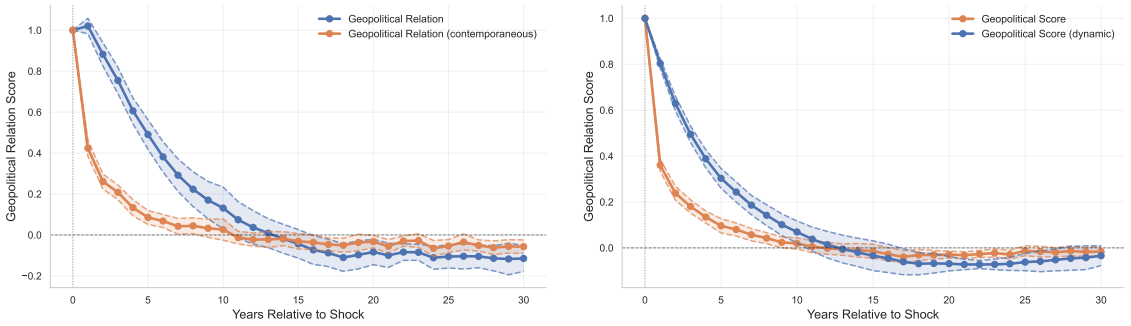
where p_{ct} denotes either our dynamic geopolitical relation measure or the contemporaneous average, $\mathbf{x}_{ct}$ includes four lags of GDP and the respective geopolitical measure, and we control for country and year fixed effects.

For bilateral geopolitical scores, we estimate:

$$S_{ij,t+h} = \alpha_h^{\text{Score}} S_{ij,t} + \boldsymbol{\gamma}_h' \mathbf{x}_{ij,t} + \mu_{ij,t+h}, \quad h = 0, 1, \ldots, 30$$

where $S_{ij,t}$ represents either the yearly average score or our dynamic score, $\mathbf{x}_{ij,t}$ contains four lags of the score variable, and we include country-pair and year fixed effects with Driscoll-Kraay standard errors.

Results. Figure A9 presents the impulse responses for both country-level relations and bilateral scores. Panel (a) shows that the dynamic geopolitical relation measure exhibits substantial persistence with a half-life of approximately 5 years, while the contemporaneous average displays rapid mean reversion, returning to baseline within 2–3 years. Notably, the dynamic measure shows slight overshooting between years 15–20 before converging to zero, consistent with cyclical patterns in international relations.



A. Country-Level Geopolitical Relations B. Bilateral Geopolitical Scores

FIGURE A9. Impulse Response Functions of Geopolitical Measures

Local projection impulse responses to own shocks. Panel (a): Country-level geopolitical relations with dynamic measure (blue) and contemporaneous average (orange). Panel (b): Bilateral geopolitical scores with dynamic score (blue) and yearly average (orange). Shaded areas represent 95% confidence intervals. Panel (a) includes four lags of GDP growth and the respective geopolitical measure, plus country and year fixed effects with Driscoll-Kraay standard errors. Panel (b) includes four lags of the respective score variable, plus country-pair and year fixed effects with Driscoll-Kraay standard errors.

Panel (b) reveals similar patterns at the bilateral level. The yearly average score exhibits strong mean reversion with a half-life under one year, reflecting the transitory nature of individual geopolitical events. In contrast, our dynamic score demonstrates markedly higher persistence, with effects remaining significant for over a decade. This enhanced persistence stems from our decay parameter $\delta = 0.3$, calibrated to capture the typical four-year political cycle while allowing past events to influence current relations. These findings validate our dynamic specification's ability to capture the inherent persistence in geopolitical relationships while filtering out short-term noise from individual events.

A.8. Instruments: Non-Economic Verbal Conflict Events

Our instrumental variable strategy exploits variation from non-economic verbal conflicts—diplomatic disputes and political tensions that affect bilateral relations without directly impacting economic activity. This section provides a detailed analysis of these events, which constitute our exclusion restriction for causal identification.

Figure A10 synthesizes patterns across 37,519 non-economic verbal conflict events from our dataset. These events exhibit three key characteristics that validate their use as instruments. First, they show substantial temporal variation, averaging 577 events annually with considerable year-to-year fluctuation and peaking at 1,044 events in 2022, providing rich identifying variation across time. Second, the distribution across CAMEO categories reveals that verbal disapproval (code 11) comprises 74.3% of events, followed by rejections (code 12) at 13.6%, demonstrating a spectrum of diplomatic intensity that generates heterogeneous effects on bilateral relations. Third, the negative mean Goldstein

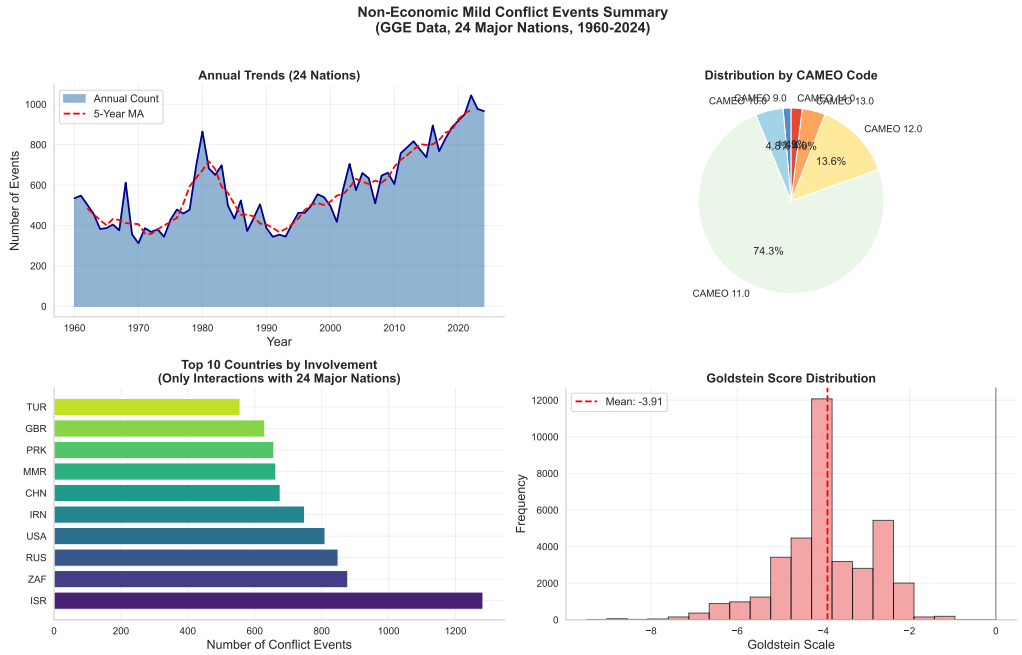


FIGURE A10. Non-Economic Verbal Conflict Events: Summary Statistics (1960–2024)

This figure presents four panels analyzing 37,519 non-economic verbal conflict events. Panel A shows annual trends with a 5-year moving average, revealing increasing frequency over time with a peak of 1,044 events in 2022. Panel B displays the distribution across CAMEO root codes, with "Disapprove" (74.3%) and "Reject" (13.6%) dominating. Panel C identifies the top 10 initiating countries, led by Israel, South Africa, and Russia. Panel D presents the Goldstein score distribution, with a mean of −3.91, confirming the conflictual nature of these events. Data include only events with Goldstein scores ≤ 0 and exclude economic events.

score of −3.91 (with a standard deviation of 1.16) confirms that these events consistently deteriorate geopolitical relations without involving economic content.

Table A5 details the taxonomy of non-economic verbal conflicts that constitute our instrumental variable. The predominance of "Disapprove" events (27,867 occurrences, 74.3%) and "Reject" events (5,093 occurrences, 13.6%) reflects the rhetorical nature of most bilateral tensions. These events—ranging from human rights criticisms to diplomatic protests and refusals of cooperation—generate substantial variation in our geopolitical relations measure while remaining orthogonal to economic fundamentals. We exclude CAMEO codes 15–16 (Exhibit Force and Reduce Relations) because these material conflict events may have direct economic consequences through disrupted diplomatic channels, expelled personnel, or signaling effects that influence investment decisions. We also exclude codes 17–20 (Coerce and Assault), as these severe conflict events may directly affect economic activity through disruption of commerce, destruction of property, or humanitarian crises.

The exclusion restriction requires that these non-economic verbal conflicts affect GDP only through their impact on overall geopolitical relations. This assumption is plausible

TABLE A5. Non-Economic Verbal Conflict Events: CAMEO Root Codes 09–14

Root Code & Category	Event Types	Primary Causes
09 INVESTIGATE	Investigations into crime, corruption, human rights abuses, military actions, and war crimes	Accountability demands, transparency requirements, moral obligations, violation of international norms
10 DEMAND	Diplomatic cooperation, political reform, compliance, meetings, negotiations, dispute settlement, mediation initiatives	Political disagreements, sovereignty disputes, governance failures, diplomatic tensions
11 DISAPPROVE	Criticism, accusations, opposition mobilization, official complaints, legal proceedings, guilt determinations	Ideological differences, policy disagreements, human rights concerns, norm violations
12 REJECT	Refusal of cooperation, political reform, negotiations, mediation; defiance of norms and laws	Political incompatibility, sovereignty protection, ideological resistance, strategic positioning
13 THREATEN	Diplomatic threats, administrative sanctions, political dissent support, negotiation suspension, military ultimatums	Deterrence strategies, power projection, diplomatic leverage, security concerns
14 PROTEST	Political dissent, demonstrations, hunger strikes, boycotts, obstructions	Political grievances, social justice issues, governance problems, rights violations

This table presents the classification scheme for geopolitical conflict events using the Conflict and Mediation Event Observations (CAMEO) framework, focusing on root codes 09–14 representing verbal conflict. These events involve rhetorical confrontation without material force or tangible demonstrations of power. Events are classified based on primary action type rather than underlying motivations, which may include multiple concurrent factors. Economic conflict events (e.g., trade disputes, sanctions), material conflict events (CAMEO codes 15–16 involving force exhibition and relation reduction), and severe conflict events (CAMEO codes 17–20 involving coercion and assault) are excluded from this classification to focus on purely verbal diplomatic tensions that satisfy our exclusion restriction.

for several reasons. First, by construction, we exclude all events with direct economic content (tariffs, sanctions, trade agreements). Second, the events consist exclusively of verbal actions—diplomatic protests, investigations into human rights violations, or ideological disagreements—that lack immediate economic consequences. Third, by restricting attention to verbal conflicts (codes 09–14), we exclude both material actions (force exhibitions, relation severance) and violent events that could directly affect economic activity through physical destruction or displacement. Fourth, the distribution of initiating countries spans diverse political systems and development levels, suggesting these conflicts arise from idiosyncratic political factors rather than systematic economic conditions.

Importantly, while these verbal conflicts generate negative Goldstein scores (mean = -3.91, median = -4.0), they create sufficient variation in bilateral relations to identify causal

effects. A typical diplomatic criticism scoring –4.0 on the Goldstein scale meaningfully deteriorates the bilateral relationship, affecting the country-level geopolitical measure through our GDP-weighted aggregation. The instrument's strength derives from both the frequency of these events (averaging 577 per year) and their cumulative impact on diplomatic relations.

The temporal trend reveals substantial variation in verbal diplomatic conflict over our sample period. Events exhibit considerable year-to-year fluctuation around a median of 524 per year, with notable peaks during periods of heightened geopolitical tension such as the early 1980s, mid-2010s, and early 2020s. The spike to 1,044 events in 2022 reflects intensified diplomatic disputes associated with contemporary great power competition. Crucially for identification, these temporal patterns exhibit quasi-random variation rather than smooth trends, providing the exogenous shocks necessary for our instrumental variables strategy.

Appendix B. Additional Empirical Results

B.1. Economic Data

This appendix documents the economic variables used in our analysis. Our dataset extends Acemoglu et al. (2019) to cover 193 countries over 1960–2024, incorporating updated democracy measures from Acemoglu et al. (2025) and economic indicators from the Penn World Tables (Feenstra, Inklaar, and Timmer 2015).

Table B1 organizes variables into four categories following the growth literature: enhanced Solow fundamentals (GDP, investment, capital, demographics), political institutions and governance (democracy, unrest, regime indicators), market institutions and reforms (liberalization indices, fiscal measures), and human capital and labor markets (education, employment, productivity measures). Coverage varies from 109 countries (TFP) to 195 countries (demographic variables), reflecting differences in data availability and statistical capacity across countries and time periods. All monetary variables are in constant prices for temporal comparability.

B.2. Additional Results for Baseline Estimates

This section provides supplementary evidence for our baseline results, including detailed coefficient estimates and robustness checks addressing potential concerns about sample composition, inference methods, and lag specifications.

Table B2 presents the complete local projection coefficients underlying our baseline impulse response function. The results reveal a clear dynamic pattern: insignificant pre-trends for negative horizons confirm the absence of reverse causality, while the contemporaneous effect of 3.3 log points grows to peak at 21.9 log points after 5 years before gradually declining. The coefficient remains statistically significant through horizon 20, demonstrating persistence. The within-R^2 values follow an inverse U-shape, reaching near-unity around horizons 0 and −5 where lagged dependent variables have maximum predictive power, then declining at longer horizons as prediction becomes more challenging.

Balanced versus Unbalanced Panel Estimates. Our baseline analysis employs an unbalanced panel where country coverage varies across horizons. To ensure compositional changes do not drive our results, we construct a balanced panel of 146 countries with complete data from $h = -10$ to $h = 25$. Panel (a) of Figure B1 shows stability: impulse responses from both panels closely track each other, with overlapping confidence intervals throughout most horizons. Both specifications exhibit the characteristic hump-shaped response, peaking around years 6–8 at approximately 20 log points. The absence of pre-trends in both samples reinforces our identification strategy.

TABLE B1. Data Description and Coverage

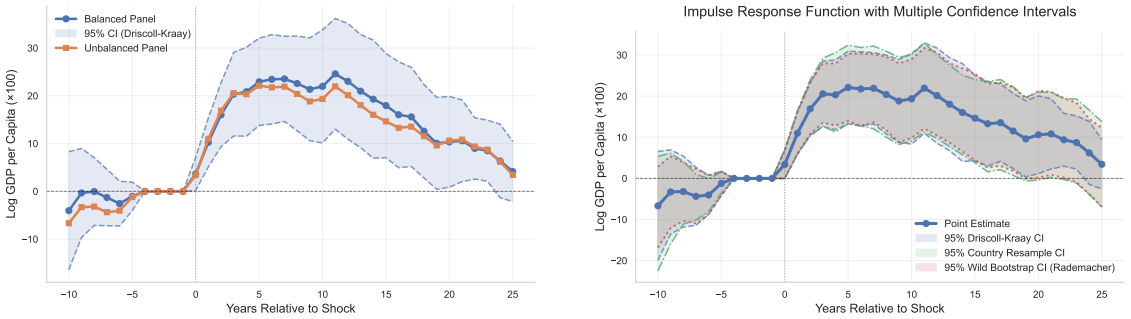
Variable	Data Source	Country Coverage	Data Period
Enhanced Solow Fundamentals			
GDP per capita (Constant US Dollar)	WDI	184 countries	1960–2024
Real GDP per capita	PWT	172 countries	1960–2023
Trade as Share of GDP	WDI	176 countries	1960–2024
Investment as Share of GDP	PWT	172 countries	1960–2023
Capital Stock	PWT	169 countries	1960–2023
Population	PWT	172 countries	1960–2023
0–14 Population Share	WDI	192 countries	1960–2023
15–65 Population Share	WDI	192 countries	1960–2023
Political Institutions and Governance			
Democracy (Acemoglu et al. 2019)	Acemoglu et al. (2019)	191 countries	1960–2019
Democracy (Acemoglu et al. 2025)	Acemoglu et al. (2025)	172 countries	1960–2019
Unrest	Acemoglu et al. (2019)	179 countries	1960–2010
Soviet Union	Acemoglu et al. (2019)	183 countries	1960–2024
Region	Acemoglu et al. (2025)	192 countries	1960–2024
Market Institutions and Reforms			
Market Reform Index	Acemoglu et al. (2019)	152 countries	1960–2005
Tax-to-GDP	Acemoglu et al. (2019)	136 countries	1960–2005
Human Capital and Labor Markets			
Human Capital Index	PWT	142 countries	1960–2023
Employment	PWT	172 countries	1960–2023
Labor Share	PWT	132 countries	1960–2023
Primary Enrollment	Acemoglu et al. (2019)	176 countries	1970–2010
Secondary Enrollment	Acemoglu et al. (2019)	176 countries	1970–2010
Productivity and Returns			
TFP	PWT	108 countries	1960–2010
Internal Rate of Return	PWT	132 countries	1960–2023
Real Consumption	PWT	172 countries	1960–2023
Real Domestic Absorption	PWT	172 countries	1960–2023

This table summarizes all variables used in the analysis, organized into four categories: enhanced Solow fundamentals, political institutions and governance, market institutions and reforms, and human capital measures. Country coverage represents the number of countries with at least one non-missing observation for each variable. Data sources: WDI = World Development Indicators; PWT = Penn World Tables.

TABLE B2. Local Projection Estimates: Effect of Geopolitical Relations on GDP per Capita

Horizon (years)	−15	−10	−5	+0	+5	+10	+15	+20	+25
Geopolitical Relations	−10.031	−6.688	−1.226	3.341*	21.914***	19.105***	14.412***	10.268**	3.134
	(8.040)	(6.745)	(1.527)	(1.779)	(4.536)	(5.607)	(5.265)	(4.773)	(2.927)
Within-R^2	0.525	0.767	0.980	0.981	0.775	0.538	0.353	0.221	0.127
Observations	6,997	7,899	8,813	8,971	8,057	7,155	6,260	5,373	4,493
Countries	179	182	183	183	182	179	179	177	172

This table presents local projection estimates from equation (4) for the effect of geopolitical relations on log GDP per capita (×100). Each column represents a separate regression for horizon h, where negative horizons test for pre-trends. All specifications include country fixed effects, region-year fixed effects, and four lags of both log GDP per capita and geopolitical relations. Driscoll-Kraay standard errors in parentheses account for cross-sectional and temporal dependence. The sample spans 1975–2024 with varying coverage across horizons due to lag requirements and data availability. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.



A. Balanced vs. Unbalanced Panel

B. Alternative Inference Methods

FIGURE B1. Robustness Checks for Baseline IRF Estimates

Panel (a) compares impulse responses using balanced (146 countries with complete data, blue) and unbalanced panels (all available observations, orange). Panel (b) displays the baseline IRF with three types of confidence intervals: Driscoll-Kraay standard errors (blue shaded), 1,000 country-block bootstrap iterations (green shaded), and 1,000 wild bootstrap iterations using Rademacher weights (red shaded). Both panels show the response of log GDP per capita (×100) to a unit shock in geopolitical relations. All specifications include four lags of the dependent variable and geopolitical relations, country fixed effects, and region-year fixed effects.

Bootstrap-Based Inference. Our baseline Driscoll-Kraay standard errors treat the geopolitical relations measure as fixed, potentially understating uncertainty. Panel (b) examines robustness using two alternative bootstrap procedures. First, we implement a block bootstrap that resamples entire countries with replacement, capturing both within-country serial correlation and measurement uncertainty in the geopolitical index. Second, we employ a wild bootstrap with Rademacher weights that preserves the panel structure while accounting for potential heteroskedasticity and within-cluster correlation.[46]

The confidence intervals from 1,000 iterations of each bootstrap method are marginally

[46]The wild bootstrap generates weights $w_i \in \{-1, +1\}$ with equal probability for each observation, then constructs bootstrap samples as $y^*_{it} = \hat{y}_{it} + w_i \hat{\epsilon}_{it}$, where $\hat{y}_{it}$ and $\hat{\epsilon}_{it}$ are fitted values and residuals from the baseline specification. This approach is particularly robust to heteroskedasticity of unknown form in panel settings (Cameron, Gelbach, and Miller 2008).

wider than the Driscoll-Kraay bands, particularly at medium horizons (5–15 years), but the differences are economically modest. The wild bootstrap intervals (red shaded area) are slightly narrower than the country-resampling bootstrap (green shaded area) at most horizons, suggesting that accounting for heteroskedasticity provides efficiency gains while maintaining valid inference. All three inference methods yield statistically significant positive effects throughout the key horizons, with the impulse response remaining well above zero even at the widest confidence bounds. The convergence of results across these diverse inference approaches—parametric clustered standard errors, block resampling, and wild bootstrap—confirms the robustness of our inference.

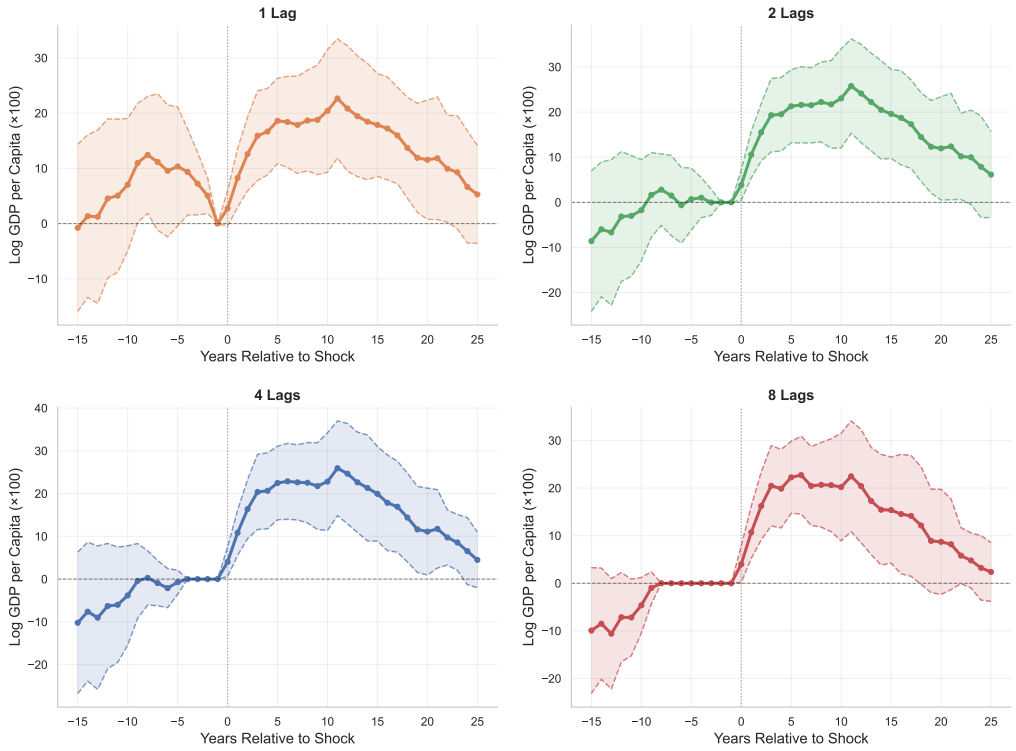


FIGURE B2. Impulse Response Functions Under Alternative Lag Specifications

IRF of log GDP per capita (×100) to a unit improvement in geopolitical relations. Each panel shows results with the indicated number of lags for both GDP and geopolitical relations. All specifications include country and region-year fixed effects. Shaded areas represent 95% confidence intervals with Driscoll-Kraay standard errors. The spurious pre-trends in one- and two-lag specifications highlight the importance of adequate lag structure for identification.

Alternative Lag Specifications. Figure B2 examines sensitivity to lag length selection. Parsimonious specifications with one lag exhibit problematic pre-trends—GDP declines before geopolitical improvements—indicating inadequate control for growth dynamics. Our baseline four-lag specification eliminates these pre-trends while maintaining precision. The eight-lag specification yields nearly identical point estimates with moderately wider

confidence intervals due to additional parameters. The convergence between four- and eight-lag results validates our baseline choice, confirming adequate capture of relevant dynamics without overfitting.

These robustness checks collectively reinforce our main findings. The stability of impulse responses across different samples, inference methods, and lag structures supports our conclusion that geopolitical alignment generates substantial and persistent economic returns. The consistency of results is particularly noteworthy given the stringent demands of within-country identification in growth empirics.

B.3. Impulse Responses to Transitory and Persistent Shocks

The impulse responses presented in Section 3.3 reflect both the direct impact of initial geopolitical shocks and the subsequent effects of geopolitical persistence. To isolate the direct effects, we construct responses to a counterfactual scenario where geopolitical improvements are purely transitory—increasing by one unit on impact and returning to zero immediately thereafter. Following Sims (1986) and Bilal and Känzig (2024), we combine the impulse responses of geopolitical relations and GDP to construct this counterfactual transitory response.

We begin by estimating the dynamics of geopolitical relations using local projections:

$$p_{c,t+h} = \phi_h^p p_{ct} + \gamma_h' \mathbf{x}_{ct} + \mu_{c,t+h}, \quad h = 0, 1, \ldots, H \tag{B1}$$

where $\{\phi_h^p\}_{h=0,\ldots,H}$ represents the impulse response of geopolitical relations to its own shock. To construct the purely transitory shock, we introduce a series of auxiliary shocks $\{p_h^{\text{shock}}\}_{h=0}^{H}$ at each horizon that impose the desired transitory response pattern $\widetilde{\boldsymbol{\phi}}^p = (1, 0, \ldots, 0)'$. The required shock series $\boldsymbol{p}^{\text{shock}}$ is obtained by solving:

$$\underbrace{\begin{pmatrix} p_0^{\text{shock}} \\ p_1^{\text{shock}} \\ \vdots \\ p_H^{\text{shock}} \end{pmatrix}}_{\boldsymbol{p}^{\text{shock}}} = \underbrace{\begin{pmatrix} 1 & 0 & \cdots & 0 \\ \phi_1^p & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ \phi_H^p & \phi_{H-1}^p & \cdots & 1 \end{pmatrix}^{-1}}_{\left(\boldsymbol{\Phi}^p\right)^{-1}} \underbrace{\begin{pmatrix} 1 \\ 0 \\ \vdots \\ 0 \end{pmatrix}}_{\widetilde{\boldsymbol{\phi}}^p} \tag{B2}$$

Given this shock series, the corresponding GDP impulse responses $\widetilde{\boldsymbol{\alpha}}$ to the purely

transitory geopolitical shock are:

$$\underbrace{\begin{pmatrix} \tilde{\alpha}_0 \\ \tilde{\alpha}_1 \\ \vdots \\ \tilde{\alpha}_H \end{pmatrix}}_{\tilde{\boldsymbol{\alpha}}} = \underbrace{\begin{pmatrix} p_0^{\text{shock}} & 0 & \cdots & 0 \\ p_1^{\text{shock}} & p_0^{\text{shock}} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ p_H^{\text{shock}} & p_{H-1}^{\text{shock}} & \cdots & p_0^{\text{shock}} \end{pmatrix}}_{\mathbf{P}^{\text{shock}}} \underbrace{\begin{pmatrix} \alpha_0 \\ \alpha_1 \\ \vdots \\ \alpha_H \end{pmatrix}}_{\boldsymbol{\alpha}} \tag{B3}$$

The resulting impulse responses $\tilde{\boldsymbol{\alpha}}$ represent the GDP effects following a one-time, purely transitory improvement in geopolitical relations. This decomposition enables computation of responses to geopolitical shocks with arbitrary persistence patterns. For the permanent shock response shown in Figure 7, we compute the cumulative effect as $\sum_{s=0}^{h} \tilde{\alpha}_s$, which represents the total GDP impact when geopolitical relations permanently increase by one unit. Statistical inference employs block bootstrap resampling across countries to account for estimation uncertainty in both stages.

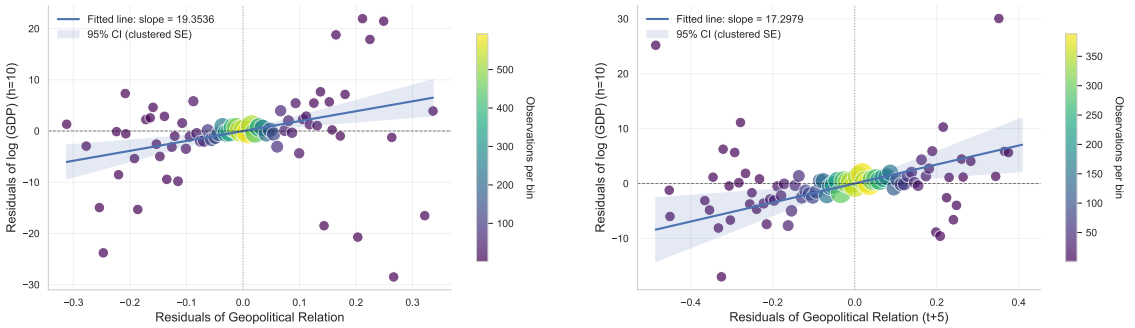
Methodological Caveat. This approach assumes that the economic effects of a sequence of unanticipated geopolitical shocks equal those of an anticipated path announced at time zero. While this assumption facilitates decomposition analysis and is standard in the impulse response literature, it abstracts from forward-looking behavior that might differ under anticipation of future geopolitical changes. The assumption is most plausible for transitory shocks where agents have limited ability to anticipate persistence. We employ this decomposition primarily to illustrate the economic importance of geopolitical persistence rather than for structural policy analysis.

B.4. Additional Robustness Results

This section provides additional evidence supporting the robustness of our main findings through extended visualizations and decomposition analyses.

Binscatter at Different Horizons. We present binscatter plots at various horizons to demonstrate that the positive relationship between geopolitical relations and economic growth is not driven by outliers or specific subsamples.

Figure B3 examines the relationship at the 10-year horizon from two perspectives. Panel (a) shows that geopolitical relations continue to predict GDP growth 10 years later, with a slope coefficient of 19.4 log points. This modest decline from the 5-year coefficient aligns with the hump-shaped impulse response in our main results. Panel (b) examines a shorter prediction window by relating GDP at $t+10$ to geopolitical relations at $t+5$, yielding a slope of 17.3. The similarity of these coefficients—whether using a 10-year or 5-year prediction



A. Binscatter: GDP at $t + 10$ vs. Geo at t

B. Binscatter: GDP at $t + 10$ vs. Geo at $t + 5$

FIGURE B3. Binscatter Plots at Extended Horizons

This figure extends the binscatter analysis to the 10-year horizon. Panel (a) relates log GDP per capita at $t + 10$ to geopolitical relations at t, while panel (b) examines GDP at $t + 10$ against forward geopolitical relations at $t + 5$. Each dot represents the mean of approximately 100 observations within each bin, with size proportional to the number of observations. The specification includes four lags of both variables, country fixed effects, and region-year fixed effects. Fitted lines use Driscoll-Kraay standard errors.

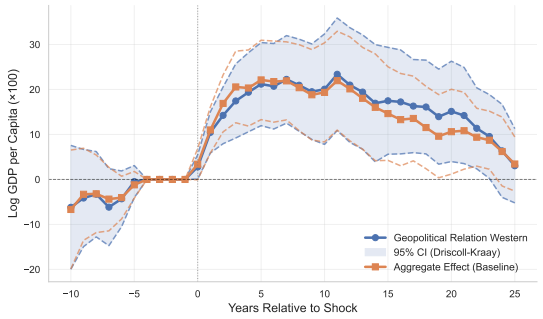
horizon—reinforces our interpretation that geopolitical alignment generates persistent economic benefits.

The binscatter visualization reveals a smooth, approximately linear relationship across the entire distribution. Using forward geopolitical relations—which capture cumulative changes over 5-year windows—yields consistent results across all horizons. The slopes remain stable whether examining GDP at $t + 5$, $t + 10$, or $t + 15$, ranging from 17 to 22 log points. This consistency across different shock sizes and time windows confirms that our results reflect a genuine economic relationship rather than the influence of extreme events or specific subsamples.

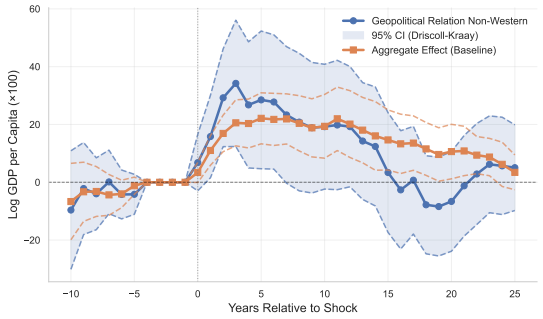
B.5. Geopolitical Relations with Western and Non-Western Countries

Building on our decomposition of geopolitical effects, we examine whether growth impacts differ between alignment with Western democracies versus non-Western powers. We partition our geopolitical relations measure into two components: relations with Western countries (United States, United Kingdom, Germany, France, Canada, Australia, Belgium, Denmark, Italy, Netherlands, Spain, Switzerland, and Poland) and relations with non-Western countries (China, Russia, India, Japan, South Korea, Brazil, Mexico, Argentina, Indonesia, Turkey, and Saudi Arabia). This classification captures the traditional West/non-West divide in international relations while accounting for the economic weight of each group.

Figure B4 presents impulse responses from joint estimation of both components. Panel (a) reveals that improved relations with Western countries generate substantial growth effects, with GDP per capita increasing by approximately 21–23 log points at the peak



A. Geopolitical Relations with Western Countries



B. Geopolitical Relations with Non-Western Countries

FIGURE B4. Decomposing Geopolitical Relations: Western versus Non-Western Countries

This figure shows impulse responses of log GDP per capita (×100) to unit improvements in geopolitical relations with Western countries (panel a) and non-Western countries (panel b). Blue lines with shaded areas show the decomposed effects from joint estimation, while orange lines display the baseline aggregate effect for comparison. Both specifications include four lags of all variables, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

around years 5–10. The response exhibits our characteristic hump shape, with effects persisting significantly through year 20 before gradually declining. Panel (b) demonstrates similar dynamics for relations with non-Western countries, though with higher peak effects: the impulse response reaches approximately 28–35 log points around years 3–5 before declining more rapidly, with wider confidence intervals reflecting greater volatility in non-Western diplomatic relationships. Both components track closely with the baseline aggregate measure (shown in orange), confirming that each contributes meaningfully to overall geopolitical effects.

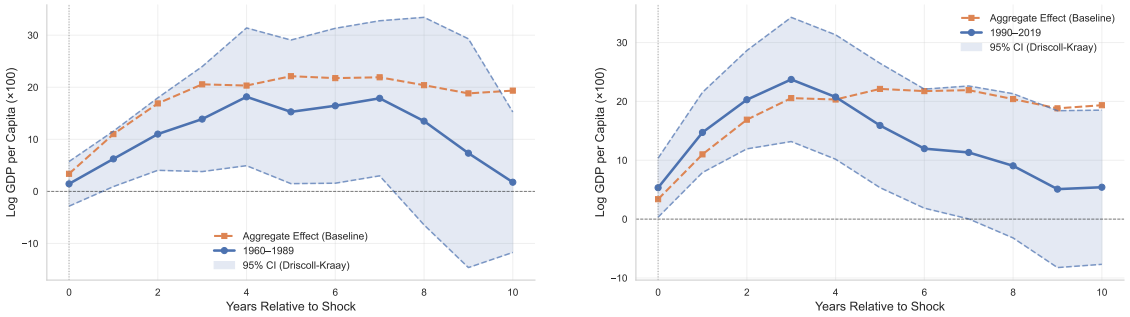
This symmetry extends our main finding that geopolitical benefits transcend ideological boundaries.[47] Whether countries improve relations with traditional Western democracies or emerging non-Western powers, the growth dividends are economically substantial. The Western component shows more persistent effects with tighter confidence intervals, while the non-Western component exhibits higher but more volatile peak effects. These patterns likely reflect differences in the nature of diplomatic engagement: Western relationships tend to be anchored in institutional frameworks (trade agreements, alliance structures) that generate sustained benefits, while non-Western relationships may depend more on bilateral political dynamics that fluctuate with leadership changes. For developing countries navigating an increasingly multipolar world, this finding suggests that diversified diplomatic engagement across both Western and non-Western powers can yield substantial economic returns without requiring exclusive alignment with either

[47]The conditional correlation between Western and non-Western relations—after partialling out country fixed effects, region-year fixed effects, and lagged controls—is only 0.27, confirming that the identifying variation across these groups is largely independent.

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B.6. Sub-Period Stability

We assess whether the growth effects of geopolitical relations are stable across historical periods by estimating our baseline specification separately for 1960–1989 and 1990–2019. Each sub-period spans 30 years, and we restrict the horizon to $h = 0, \ldots, 10$ to preserve adequate sample size within each window.



A. 1960–1989 B. 1990–2019

FIGURE B5. Sub-Period Stability of Geopolitical Growth Effects

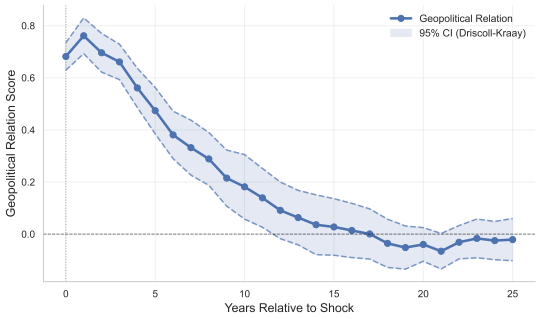
This figure shows impulse responses of log GDP per capita (×100) to a unit improvement in geopolitical relations, estimated separately for 1960–1989 (panel a) and 1990–2019 (panel b). Blue lines with shaded areas show sub-period estimates; orange dashed lines display the full-sample baseline for comparison. Both specifications include four lags of all variables, country fixed effects, and region-year fixed effects. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors. Horizons are restricted to $h = 0, \ldots, 10$ due to reduced sample size in each sub-period.

Figure B5 shows that the effect is present in both periods. Point estimates track the full-sample baseline through year 5, with both sub-periods generating peak effects of 15–24 log points. The full-sample estimate lies within the 95% confidence interval throughout. Estimates attenuate at longer horizons, reflecting reduced statistical power as the forward projection consumes a larger share of the 30-year window rather than a genuine decline in persistence.

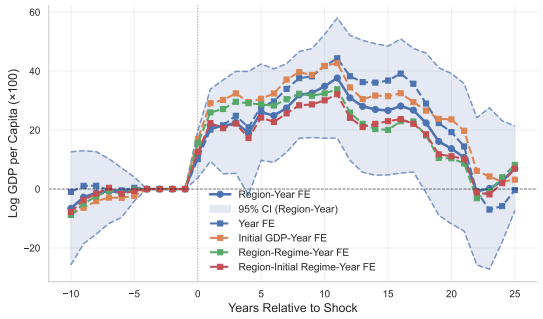
B.7. Additional Results for IV Estimates

This appendix provides supplementary results for our instrumental variables analysis, including the first-stage relationship between non-economic verbal conflicts and overall geopolitical relations, as well as LP-IV estimates under alternative fixed effects specifications.

First-Stage Dynamics. Panel (a) of Figure B6 demonstrates the strength and persistence of our first-stage relationship. The instrument generates a strong positive response in



A. First-Stage: Instrument → Geopolitical Relations



B. LP-IV Estimates with Alternative Fixed Effects

FIGURE B6. First-Stage Relationship and LP-IV Robustness

Panel (a) displays the first-stage impulse response of overall geopolitical relations to a unit shock in the instrument (non-economic verbal conflicts). The specification includes four lags of geopolitical relations, GDP, and the instrument, plus country and region-year fixed effects. Panel (b) presents LP-IV estimates of GDP responses under alternative fixed effects specifications. All specifications include four lags of core variables and the instrument with Driscoll-Kraay standard errors. Shaded areas represent 95% confidence intervals.

geopolitical relations: a one-unit increase in the instrument raises overall geopolitical relations by approximately 0.69 units on impact. This effect peaks at horizon 1 (reaching approximately 0.76) before gradually decaying—falling to approximately 0.48 by year 4, 0.22 by year 8, and crossing zero around year 16. The persistence of the first-stage relationship—remaining statistically significant for approximately 15–16 years—reflects how initial verbal diplomatic conflicts cascade through bilateral relationships. The effect eventually dissipates, with modest negative values at longer horizons (approximately −0.05 by year 21), consistent with the transitory nature of many diplomatic developments.

LP-IV Robustness Across Fixed Effects. Panel (b) of Figure B6 examines the sensitivity of our IV estimates to different assumptions about unobserved heterogeneity. The stability across specifications supports our causal interpretation. All specifications show insignificant pre-trends and generate similar impulse response patterns.

The baseline region-year specification shows GDP increasing by approximately 14 log points on impact, rising to approximately 25 log points by year 5, and reaching a peak of approximately 38 log points around year 10, before declining to approximately 10 log points by year 20. When we replace region-year fixed effects with only year effects—allowing for global shocks but not regional ones—the IV estimates follow a similar trajectory with slightly higher point estimates, peaking around 42 log points at year 10, suggesting our results are not driven by regional confounders. The initial GDP quintile-year specification, which compares countries at similar development stages, yields point estimates that track closely with the baseline, with effects reaching approximately 32–35 log points

around years 8–10 before declining. The region-regime-year and region-initial regime-year specifications—our most demanding tests that account for political institutions—produce similar patterns, with peak effects of approximately 32–35 log points around years 8–10, though both show somewhat earlier attenuation compared to the baseline.

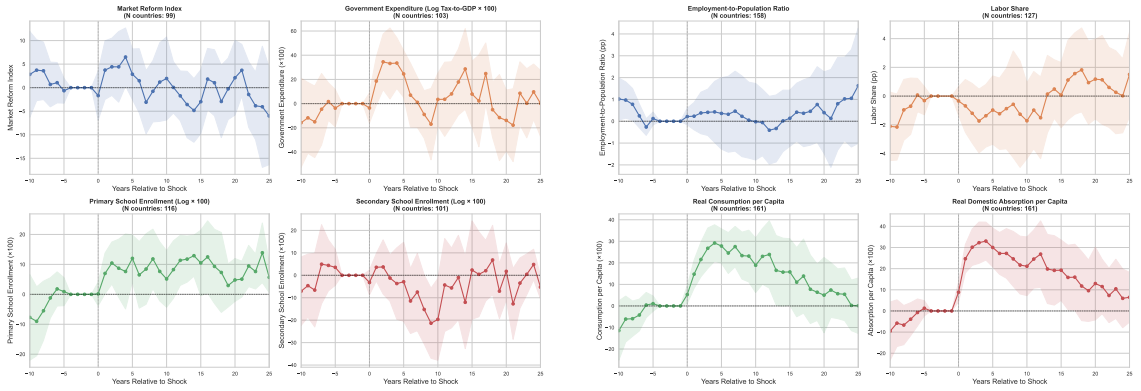
The consistency of LP-IV estimates across these diverse fixed effects structures is noteworthy. Despite varying assumptions about relevant comparison groups and sources of unobserved heterogeneity, all specifications yield effects between 20 and 42 log points at the 10-year horizon, with substantial effects persisting (5–15 log points) even at the 20-year horizon. This stability, combined with the strong first-stage relationship and absence of significant pre-trends, suggests that the instrument provides an informative source of identifying variation. The similarity between IV and OLS estimates across these specifications is consistent with a causal interpretation of the baseline relationship and indicates that the results are not driven by regional patterns or dependent on specific institutional contexts.

B.8. Other Correlates of Growth

This section extends our analysis by examining additional growth correlates beyond those presented in the main text. We investigate two sets of outcomes: (i) institutional and human capital variables emphasized by Acemoglu et al. (2019) in their study of democracy's economic effects, and (ii) labor market and absorption measures from the Penn World Tables that capture alternative dimensions of economic development.

Market Reforms and Human Capital Formation. Panel (a) of Figure B7 reveals heterogeneous institutional and educational responses to geopolitical alignment. The market reform index shows no statistically significant response, with point estimates fluctuating around zero throughout the horizon and confidence intervals consistently spanning zero. Government expenditure exhibits a positive response, rising by approximately 20–30 log points over the first decade, though wide confidence intervals reflect substantial cross-country heterogeneity in fiscal responses to improved international relations. Education outcomes display contrasting patterns: primary school enrollment shows a gradual and persistent improvement, rising by approximately 10–15 log points over 25 years as sustained international stability enables educational investments. In contrast, secondary school enrollment exhibits no significant effect, with point estimates remaining statistically indistinguishable from zero throughout the horizon.

Labor Markets and Domestic Absorption. Panel (b) demonstrates that growth from geopolitical alignment translates into broad-based welfare improvements, though labor market structure remains largely unchanged. The employment-to-population ratio exhibits a mod-



A. Market Reforms and Education

B. Employment and Consumption

FIGURE B7. Dynamic Effects of Geopolitical Relations on Additional Growth Correlates

Panel (a) displays impulse responses of market reform index, government expenditure (log tax-to-GDP × 100), primary and secondary school enrollment (log × 100) to a unit improvement in geopolitical relations. Panel (b) shows responses for employment-to-population ratio, labor share, real consumption and domestic absorption per capita (log × 100). All specifications follow equation (4.2) with four lags of the dependent variable, GDP, and geopolitical relations, plus country and region-year fixed effects. Sample restricted to countries with complete data (N in parentheses). Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

est upward trend but remains statistically insignificant throughout the horizon, suggesting that geopolitical alignment does not generate substantial extensive-margin employment effects. Similarly, the labor share shows no significant response, fluctuating around zero with confidence intervals consistently spanning zero—indicating that the functional distribution of income remains stable following geopolitical improvements. In contrast, both consumption measures display robust positive responses that closely track GDP dynamics documented in our main analysis: real consumption per capita rises sharply, peaking at approximately 30 log points around year 5 before gradually declining, while domestic absorption per capita follows a similar pattern with comparable magnitude. These results confirm that growth translates into household welfare improvements and validate the investment boom documented in Section 4.

Synthesis. These results reinforce our main findings while revealing important heterogeneity across outcomes. The positive responses in government expenditure, primary education, consumption, and domestic absorption confirm that geopolitical alignment generates tangible benefits across multiple dimensions of economic development. Notably, the absence of significant effects on market reforms, secondary education, employment rates, and labor share suggests that geopolitical improvements operate primarily through existing economic structures rather than through fundamental institutional transformation or labor market restructuring. The strong consumption and absorption responses, combined with stable labor market indicators, indicate that geopolitical alignment en-

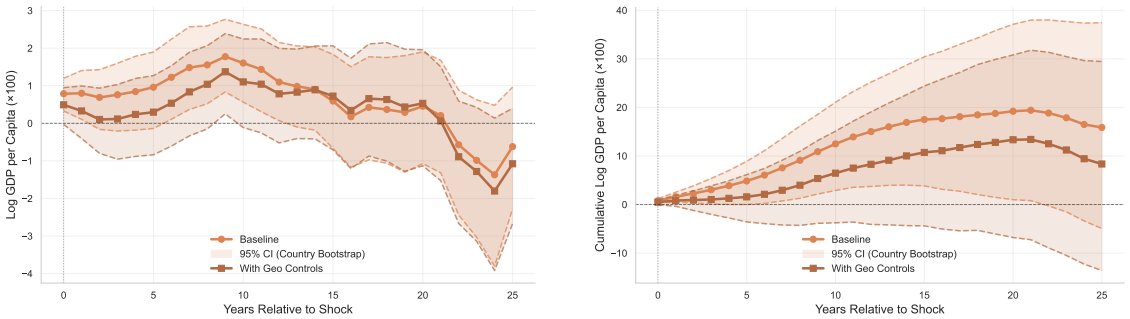
hances economic efficiency and resource availability without necessarily altering the underlying distribution of economic activity or income.

B.9. Additional Results for Democracy and Geopolitics

This appendix provides supplementary results for our analysis of democracy and geopolitical relations, including decompositions of transitory versus permanent democratization effects and the conditional correlation between these variables.

B.9.1. Transitory versus Permanent Democratization Shocks

To disentangle the dynamic effects of democratization, we decompose democracy's growth impact into responses to transitory versus permanent institutional changes. Following the methodology in Appendix B.3, we construct counterfactual impulse responses that isolate the effects of purely transitory democratization (a one-time shock that immediately reverts) from permanent democratic transitions.



A. Response to Transitory Democratization

B. Response to Permanent Democratization

FIGURE B8. GDP Responses to Transitory and Permanent Democracy Shocks

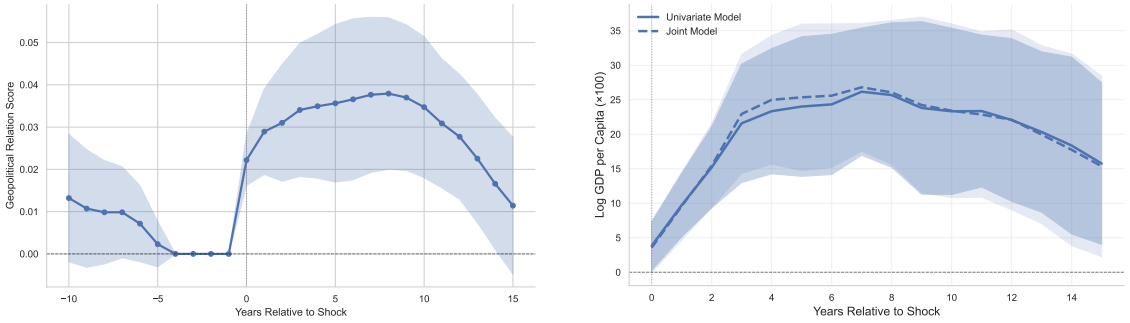
Panel (a) shows the impulse response of log GDP per capita (×100) to a purely transitory democratization shock. Panel (b) displays the cumulative response to a permanent democratic transition. Both panels compare the baseline specification (controlling for 4 lags of GDP) with the specification controlling for geopolitical relations. Shaded areas represent 95% confidence intervals from 1,000 bootstrap iterations using country-block resampling.

Figure B8 reveals striking patterns in how geopolitical relations mediate democracy's growth effects. Panel (a) demonstrates that even transitory democratization generates persistent economic gains in the baseline specification, with GDP remaining 1–2 log points higher for several years. However, when we control for geopolitical relations, the short-run effect virtually disappears—the point estimates hover near zero. This stark attenuation suggests that temporary democratic episodes generate immediate growth primarily through improved international relations rather than domestic institutional changes.

Panel (b) presents the cumulative effects of permanent democratization. The baseline specification shows GDP rising steadily to approximately 20 log points after 25 years. Controlling for geopolitical relations reduces but does not eliminate these gains: the long-run effect remains economically significant at 10–15 log points. This persistence indicates that while geopolitical improvements explain roughly 30% of democracy's growth impact, sustained democratic institutions generate additional benefits through domestic channels—improved property rights, reduced expropriation risk, and enhanced contract enforcement—that operate independently of international alignment.

B.9.2. Democracy and Geopolitical Relations: Conditional Correlation

While our main analysis examines how democracy and geopolitics jointly affect growth, understanding their mutual relationship provides additional insights. Figure B9 presents two complementary perspectives.



A. Geopolitical Relations and Democracy

B. Geopolitical Effects with Region-Year FE

FIGURE B9. Democracy-Geopolitics Nexus: Additional Evidence

Panel (a) shows the impulse response of overall geopolitical relations to a democratization shock, estimated using local projections with four lags of geopolitical relations, country fixed effects, and year fixed effects. Panel (b) compares the growth effects of geopolitical relations with and without controlling for democracy, using our baseline region-year fixed effects specification. Both panels use Driscoll-Kraay standard errors with 95% confidence intervals.

Panel (a) reveals that democratization generates sustained improvements in geopolitical relations, with alignment increasing gradually to peak at 0.035 units (approximately 0.3 standard deviations) after 8 years—roughly half the difference between neutral relations and moderate cooperation. The absence of pre-trends confirms that international improvements follow rather than precede democratization, with effects persisting through year 15. This complements our bilateral analysis: while democratization primarily improves Western relations, these gains are sufficient to raise the GDP-weighted aggregate measure.

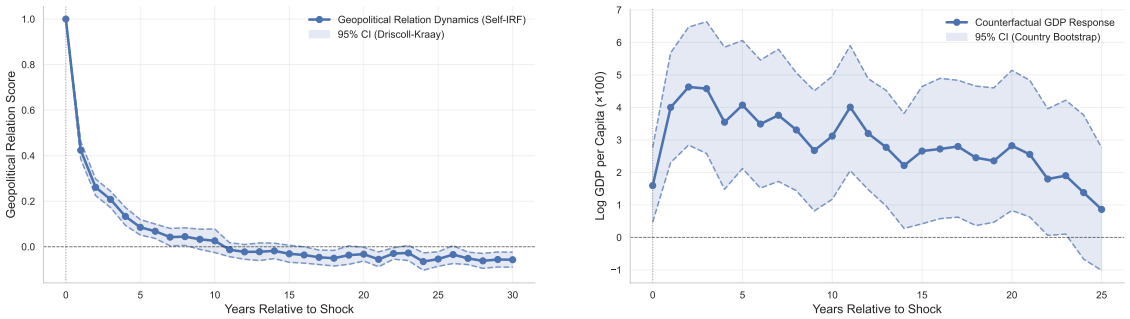
Our main democracy analysis follows ANRR using year fixed effects to preserve variation from regional democratization waves, while our baseline employs region-year fixed

effects. Panel (b) demonstrates that geopolitical relations drive growth regardless of specification choice. The growth effects remain virtually identical whether controlling for democracy or not, with both specifications peaking around 25 log points. This stability confirms that geopolitical relations capture distinct variation from democratic institutions within region-year cells. Geopolitical alignment generates substantial growth differences unexplained by shared democratization waves.

These results clarify the complex interplay between democratic institutions and international relations. The transitory shock analysis reveals that temporary democratic episodes operate almost exclusively through geopolitical channels, while permanent democratization generates additional domestic benefits. Combined with our evidence on bilateral heterogeneity and robustness across specifications, these findings support both the complementarity and independence of political institutions and geopolitical alignment as drivers of economic development.

B.10. Dynamics of Average Event Scores

This appendix provides a detailed analysis of the average event scores $\tilde{S}_{ct}$ examined in Section 6.2.1. We document the persistence properties of these unsmoothed scores and demonstrate how transitory event shocks aggregate into permanent effects on GDP, providing insight into the dynamic relationship between diplomatic events and economic outcomes.



A. Persistence of Event Scores

B. Response to Transitory Event Shock

FIGURE B10. Event Score Dynamics and Transitory Shock Responses

Panel (a) displays the impulse response of event-based geopolitical scores to their own shock, revealing rapid mean reversion. Panel (b) shows the GDP response to a purely transitory event shock (1 at $h = 0$, 0 thereafter), constructed using auxiliary shock methodology. Shaded areas represent 95% confidence intervals from 1,000 bootstrap iterations.

Panel (a) of Figure B10 reveals the fundamental difference between event scores and our smoothed geopolitical relations measure. Following a unit shock, event scores exhibit strong mean reversion: approximately 63% of the initial impact dissipates within one year, falling to roughly 0.37, and the effect continues declining to approximately 0.10 by

year 5. The effect becomes statistically indistinguishable from zero after approximately 7–8 years and turns slightly negative thereafter, suggesting mild overshooting before full dissipation. This rapid decay reflects the inherently episodic nature of diplomatic events. The mean reversion pattern suggests that individual geopolitical events, while impactful in the moment, lack the institutional persistence that characterizes broader bilateral relationships. In contrast, our baseline geopolitical relations measure (Figure 6A) shows substantially greater persistence, capturing the institutional memory and path dependence in international relations.

Panel (b) isolates the GDP response to a purely transitory event shock—a single-period improvement that immediately reverts to baseline. Even this fleeting diplomatic success generates persistent economic gains. GDP rises from approximately 1.5 log points on impact to a peak of approximately 4–5 log points around years 2–3, then gradually declines while remaining positive throughout the 25-year horizon, settling around 1–2 log points by year 25. This persistence suggests that even temporary diplomatic breakthroughs can catalyze economic relationships—through investment decisions, trade agreements, and confidence effects—that outlast the initial political impetus.

Combining panels (a) and (b) illuminates our estimand. The impulse response to event scores shown in Section 6.2.1 combines two effects: the direct impact of the initial event and the indirect effects through subsequent event persistence. Formally:

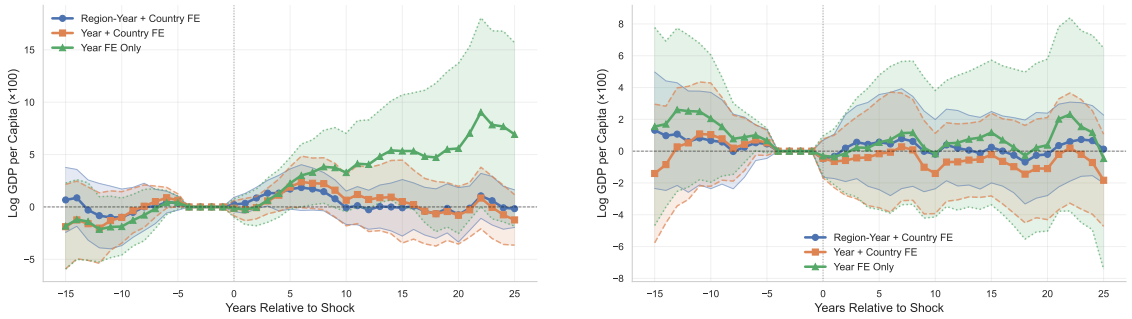
$$\text{IRF}_{event \to GDP}(h) = \sum_{s=0}^{h} \text{IRF}_{event \to event}(s) \times \text{IRF}_{transitory \to GDP}(h - s)$$

The rapid decay in event persistence explains why the direct response to $\tilde{S}_{ct}$ appears muted relative to our baseline specification. However, when we construct the response to a permanent change in event flows—effectively summing the transitory responses—we recover comparable long-run effects to our smoothed measure. This equivalence confirms that our baseline approach captures the economically relevant variation in geopolitical relations while filtering out noise from isolated diplomatic incidents.

B.11. UNGA Voting and Economic Growth: Detailed Results

This appendix presents comprehensive results using UNGA voting alignment as an alternative measure of geopolitical relations. We employ the negative Ideal Point Distance (IPD) from Bailey, Strezhnev, and Voeten (2017), which ranges from −5 (complete disagreement) to 0 (perfect alignment). Higher values thus indicate closer alignment in voting behavior. The IPD measure has been widely used in the international relations literature as a proxy for foreign policy similarity, making it a natural benchmark for our event-based approach.

Figure B11 reveals why UNGA voting patterns fail to capture the economic effects of geopolitical relations. Panel (a) examines alignment with US voting positions. With our



A. Alignment with United States

B. GDP-Weighted Alignment

FIGURE B11. Impulse Responses Using UNGA Voting Alignment

This figure displays impulse responses of log GDP per capita to improvements in UNGA voting alignment. Panel (a) shows responses to closer alignment with US positions (negative IPD with USA). Panel (b) presents responses to improved GDP-weighted alignment with all major powers. Three specifications are shown: region-year plus country fixed effects (blue, our baseline), year plus country fixed effects (orange), and year fixed effects only (green). All specifications include four lags of GDP and the IPD measure. Shaded areas represent 95% confidence intervals with Driscoll-Kraay standard errors.

baseline specification including country fixed effects (blue line), the impulse response hovers near zero throughout the horizon, with confidence intervals consistently spanning zero. This null result persists when we relax to year plus country fixed effects (orange line). Only when we remove country fixed effects entirely (green line) does a positive relationship emerge, reaching approximately 6 log points after 20 years. However, this cross-sectional correlation likely reflects omitted variables rather than a causal effect of voting alignment on growth.

Panel (b) presents results for GDP-weighted alignment with all major powers, constructed analogously to our main geopolitical measure but using IPD rather than bilateral events. The pattern is even more striking: all three specifications yield economically small and statistically insignificant effects. Even without country fixed effects, which should maximize the chance of finding a relationship, the impulse response remains indistinguishable from zero. This complete absence of growth effects for the aggregate measure suggests that UNGA voting patterns fail to capture the economically relevant aspects of international relations.

These null results contrast sharply with our event-based measure for three fundamental reasons:

Limited Bilateral Content. UNGA votes primarily address multilateral issues—decolonization, human rights declarations, nuclear disarmament, budget allocations—rather than bilateral economic or security concerns. The voting agenda is dominated by symbolic resolutions that have little direct bearing on trade, investment, or technology transfer. Countries with tense bilateral relations (e.g., India and Pakistan) often vote similarly on global issues,

while close allies (e.g., US and Israel) may diverge on symbolic resolutions. Our event-based measure, by focusing on direct bilateral interactions, captures the economically relevant variation that UNGA votes miss.

Strategic Voting Behavior. UNGA votes reflect complex strategic calculations beyond bilateral relationships. Small states often vote with regional blocs (e.g., African Union positions) or in exchange for aid commitments, while major powers use votes to signal positions to domestic audiences or third parties. Vote trading is common, with countries supporting each other's pet resolutions regardless of substantive agreement. This strategic behavior adds noise that obscures the underlying bilateral relationships driving economic outcomes. Moreover, the one-country-one-vote structure gives equal weight to all nations regardless of economic importance, further diluting the signal about economically meaningful relationships.

Temporal Misalignment. UNGA votes cluster in annual sessions running from September to December, creating artificial spikes in measured alignment changes. Important bilateral developments occurring outside this window are poorly captured. Our event-based measure, drawing from the continuous flow of diplomatic interactions throughout the year, better captures the full picture of geopolitical shifts and their economic consequences.

The positive cross-sectional relationship between US alignment and GDP (green line, panel a) likely reflects reverse causality and omitted variables. Wealthier countries tend to share US positions on international law, human rights, and market economics—preferences that correlate with but do not cause their prosperity. The absence of any relationship for the GDP-weighted measure (panel b) suggests that even this cross-sectional variation fails to capture meaningful geopolitical alignment.

These findings reinforce our methodological contribution. By developing an event-based measure that directly captures bilateral interactions, we overcome the fundamental limitations of existing approaches and reveal the true economic importance of geopolitical relations.

B.12. Sanctions and Geopolitical Relations: A Horse-Race Analysis

This appendix examines the relationship between our comprehensive geopolitical relations measure and economic sanctions—a categorical measure that captures the most explicit form of economic statecraft. We implement horse-race specifications to disentangle their respective contributions to economic growth and assess whether sanctions provide additional explanatory power beyond our event-based measure.

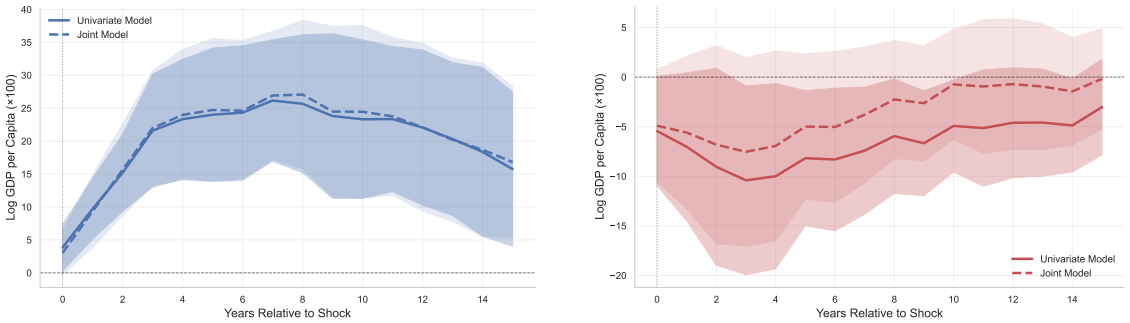
Empirical Specification. We estimate both univariate and joint specifications to assess how sanctions and geopolitical relations interact:

$$\text{(B4)} \qquad \text{Univariate:} \quad y_{c,t+h} = \alpha_h^k p_{ct}^k + \sum_{\ell=1}^{4} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{4} \gamma_\ell^k p_{c,t-\ell}^k + \delta_c + \delta_{rt} + \varepsilon_{c,t+h}$$

$$\text{Joint:} \quad y_{c,t+h} = \alpha_h^{\text{Geo}} p_{ct} + \alpha_h^{\text{Sanc}} p_{ct}^{\text{Sanction}} + \sum_{\ell=1}^{4} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{4} \gamma_\ell^{\text{Geo}} p_{c,t-\ell}$$

$$\text{(B5)} \qquad + \sum_{\ell=1}^{4} \gamma_\ell^{\text{Sanc}} p_{c,t-\ell}^{\text{Sanction}} + \delta_c + \delta_{rt} + \varepsilon_{c,t+h}$$

where $k \in \{\text{Geo}, \text{Sanction}\}$ indexes the measure type. The univariate specifications include four lags of GDP and the respective geopolitical measure, while the joint specification controls for both measures and their lags simultaneously. This approach follows our baseline methodology while accounting for the potential interdependence between sanctions and broader geopolitical relations.



A. Geopolitical Relations B. Sanctions

FIGURE B12. Horse-Race: Geopolitical Relations versus Sanctions

This figure compares univariate and joint specifications for geopolitical relations and sanctions. Panel (a) shows impulse responses for our geopolitical relations measure, comparing the univariate model (solid line) with the joint specification controlling for sanctions (dashed line). Panel (b) presents analogous results for sanctions exposure. Both panels include 95% confidence intervals based on Driscoll-Kraay standard errors.

Results and Interpretation. Figure B12 presents striking evidence for the primacy of comprehensive geopolitical relations over categorical sanctions measures. Panel (a) demonstrates stability in the geopolitical relations effect: the impulse response peaks at approximately 26–27 log points around year 7–8 in both specifications, with nearly identical trajectories throughout the 15-year horizon. The univariate and joint model lines virtually overlap, indicating that controlling for sanctions has minimal impact on the estimated effect of geopolitical relations. This stability suggests that our event-based approach already captures the economically relevant variation associated with sanctions through the

diplomatic deterioration that precedes, accompanies, and follows their imposition.

Panel (b) reveals important patterns for sanctions. The univariate specification (solid line) shows sanctions reducing GDP by approximately 10 log points at the trough around year 3, with effects gradually attenuating toward −5 log points by year 10 and −3 log points by year 15. The joint specification (dashed line) shows attenuated effects: the trough is shallower at approximately −7 log points, and the effect recovers more quickly, approaching zero by year 10. Both specifications show sanctions effects that remain negative but diminish over time, with the joint model consistently closer to zero. The attenuation when controlling for geopolitical relations—reducing the peak negative effect by approximately 30%—indicates that part of the sanctions effect operates through the broader deterioration of bilateral relationships that our comprehensive measure captures.

Comprehensiveness of Event-Based Measures. Our event-based approach captures not only formal sanctions announcements but also the entire diplomatic ecosystem surrounding them. Sanctions rarely emerge suddenly; they typically follow an escalating pattern of diplomatic tensions, failed negotiations, and deteriorating bilateral trust. Our measure incorporates diplomatic protests, recalled ambassadors, suspended cooperation agreements, cancelled summits, hostile rhetoric, and other negative events that precede formal economic restrictions. Similarly, it captures the diplomatic efforts at sanctions relief, negotiated settlements, and gradual normalization that may follow. By incorporating this full spectrum of interactions, our measure subsumes much of the information content in binary sanctions indicators while providing additional variation from the broader relationship context.

The robustness of our geopolitical relations measure to controlling for sanctions—the most explicit and measurable form of economic coercion—validates our comprehensive approach. Rather than requiring researchers to choose among multiple categorical indicators or construct indices combining different relationship types, our event-based methodology captures the full complexity of international relations and their economic consequences. This comprehensiveness proves essential for understanding how geopolitical dynamics shape national prosperity in an interconnected world where economic, diplomatic, and security concerns increasingly intertwine.

Appendix C. LLM Prompt: Event Category, CAMEO, and Goldstein Score

C.1. Prompt Structure

This subsection describes the LLM prompt structure for compiling and analyzing major political events shaping the bilateral relationship between two countries, {country_1} (code: {country_1_code}) and {country_2} (code: {country_2_code}), or their historical predecessors, during {target_year}. The analysis employs the Conflict and Mediation Event Observations (CAMEO) framework, detailed in Section C.3, and the Goldstein scale, described in Section C.3, to classify events and assess their intensity. If no major events are identified, a historical context-based relationship assessment is provided. The output is a single JSON object for computational integration.

Relationship Assessment Framework. The bilateral relationship for {target_year} is classified into one mutually exclusive category, reflecting interaction intensity and nature:

- **State of War / Active Conflict**: Sustained, large-scale armed conflict.
- **Crisis / Intense Confrontation**: High tension with disputes or limited clashes, short of war.
- **Hostile / Antagonistic Relationship**: Animosity marked by sanctions or diplomatic friction.
- **Competitive / Rivalrous Relationship**: Strategic competition with limited cooperation.
- **Limited Contact / Cool Relationship**: Minimal, neutral interaction.
- **Selective Cooperation / Transactional Relationship**: Cooperation on specific interests amid competition.
- **Broad Cooperation / Partnership**: Extensive sectoral cooperation with regular dialogue.
- **Strategic Partnership**: Deep coordination on strategic issues with high trust.
- **Alliance**: Formal treaty-based mutual support, often military.

Analytical Steps. The analysis follows five steps for rigorous event identification, classification, and assessment:

a. **Verify Political Entities**: Confirm {country_1} (code: {country_1_code}) and {country_2} (code: {country_2_code}) existed in {target_year}. If not, identify the primary political entity controlling the relevant territory (e.g., Soviet Union for Russia before December 26, 1991; Russian Federation thereafter). Ambiguities are noted in the evaluation summary, with analysis using the best-identified entities, reflected in JSON fields `country1` and `country2`.

b. **Data Collection**: Use search tools to compile interactions between verified entities during {target_year}.

c. **Identify Major Political Events**: Identify events in {target_year} significantly influencing the bilateral relationship, verified by reliable sources. Events include economic diplomacy, diplomatic actions, high-level interactions, and security measures, with details in Section C.2.
d. **Event Analysis**: For each event:
    i. Assign `country1` and `country2` as initiator/target or participants.
    ii. Provide `event_name` and `event_description`.
    iii. Classify using CAMEO (see Section C.3): `CAMEO_quad_class` (Verbal/Material Cooperation/Conflict), `CAMEO_root_code` (e.g., 04), `CAMEO_event_code` (e.g., 043), emphasizing economic actions (e.g., 163 for sanctions) and mediation (e.g., 045).
    iv. Assign `Goldstein_Scale` (–10.0 to +10.0; see Section C.3), reflecting intensity, adjusted for bilateral context but consistent with CAMEO.
    v. Classify `economic_event`: Tariffs, Economic Sanctions, Trade Agreements and Treaties, Other Economic Policies, or Not an economic event.
    vi. Provide `evaluation_summary` justifying classifications and scores.
e. **Overall Relationship Assessment**: Select one `relationship` category for {target_year}, integrating event patterns (via CAMEO/Goldstein) and historical context. If no events are found, assess based on interaction absence and historical trends.

JSON Output. The output is a JSON object with key `historical_political_events`:

- If events found: List of objects with fields:
    - `year`, `country1`, `country2`, `event_name`,
    - `event_description`, `CAMEO_quad_class`, `CAMEO_root_code`,
    - `CAMEO_event_code`, `economic_event`, `Goldstein_Scale`,
    - `relationship`, `evaluation_summary`.
- If no events found: Single object with `event_name` = "No Major Bilateral Events Found," null CAMEO/Goldstein fields, and context-based `relationship`.

Implementation Notes.

- Entity verification ensures historical accuracy using country codes.
- "Major" events have significant political impact.
- The `relationship` assessment is uniform for {target_year} and historically contextualized.
- JSON output adheres to the specified structure for automation.

C.2. Event Identification Details

This subsection elaborates on the criteria for identifying major political events that significantly influence the bilateral relationship between {country_1} (code: {country_1_code}) and {country_2} (code: {country_2_code}), or their historical predecessors, during {target_year}, as referenced in Section C.1. Events are selected for their demonstrable impact on the relationship's trajectory.

Event Verification. Potential events are critically evaluated using reliable sources to confirm authenticity. Unverified or fabricated events are excluded to ensure analytical rigor. When events span multiple categories, the primary classification reflects the dominant mechanism or domain of impact, with secondary dimensions noted in the event description.

Event Dimensions. Events are identified across six major dimensions of bilateral relations, ensuring comprehensive coverage of politically consequential interactions.

Economic Relations. This dimension encompasses the full spectrum of economically mediated bilateral interactions, including both cooperative arrangements and coercive measures.

- *Trade Policy and Market Access*: Imposition, adjustment, or removal of tariffs; non-tariff barriers such as technical standards, sanitary measures, and import licensing; trade agreement negotiations, signings, ratifications, withdrawals, or dispute settlement proceedings.
- *Financial and Monetary Relations*: Financial sanctions including asset freezes, transaction bans, and SWIFT exclusions; currency swap agreements and bilateral payment arrangements; foreign investment restrictions or liberalizations; bilateral investment treaty developments.
- *Economic Coercion and Inducements*: Comprehensive trade embargoes and sectoral sanctions; export controls and entity list designations; technology transfer restrictions; foreign aid packages, development finance, and debt relief programs.
- *Strategic Economic Sectors*: Energy supply agreements and pipeline projects; telecommunications and digital economy restrictions (e.g., 5G bans); critical resource arrangements covering rare earth elements, strategic minerals, and food security.
- *Economic Integration and Infrastructure*: Bilateral infrastructure initiatives; supply chain arrangements including friend-shoring and critical supply agreements; regional economic arrangement participation.

Diplomatic and Political Relations. This dimension captures formal state-to-state interactions and official communications that shape the bilateral relationship.

- *Formal Diplomatic Engagement*: Embassy or consulate openings and closures; ambassador appointments and recalls; diplomatic staff expulsions; formal protests, démarches, and official condemnations or commendations.
- *High-Level Political Interactions*: Presidential or prime ministerial visits and bilateral summits; ministerial meetings across foreign affairs, defense, and trade portfolios; joint commission sessions and strategic dialogues.
- *Public Diplomacy and Rhetoric*: Major policy speeches affecting bilateral relations; parliamentary resolutions; government white papers on the bilateral relationship; significant public campaigns or propaganda efforts.

Security and Defense. This dimension encompasses military cooperation, competition, and security-related incidents between the two countries.

- *Military Cooperation and Competition*: Defense cooperation agreements and military alliances; status of forces agreements; major weapons sales or cancellations; arms embargoes; joint military exercises and military-to-military exchanges.
- *Security Incidents*: Border skirmishes and territorial claim assertions; airspace or maritime violations; naval encounters and air intercepts; demarcation agreements.
- *Intelligence and Cyber Operations*: Publicly revealed espionage scandals; intelligence officer expulsions; intelligence sharing agreements or suspensions; state-sponsored cyber attacks and cyber security cooperation.

Legal, Territorial, and Movement. This dimension covers international legal proceedings, sovereignty disputes, and policies governing the movement of people.

- *International Legal Actions*: Bilateral disputes before international courts such as the International Court of Justice or International Tribunal for the Law of the Sea; WTO disputes with significant political dimensions; contentious extradition cases.
- *Territorial and Maritime Issues*: Exclusive economic zone disputes; continental shelf claims; fisheries agreements or conflicts; freedom of navigation operations; border demarcation and sovereignty recognition.
- *Movement of People*: Visa regime changes and travel bans; visa-free agreements; guest worker programs; readmission agreements; refugee and asylum policy changes.

Multilateral and Global Governance. This dimension captures bilateral dynamics manifested through international organizations and global issue areas.

- *International Organizations*: United Nations Security Council confrontations; General Assembly coalition building; specialized agency disputes; regional organization mem-

bership changes.

- *Global Issues*: Climate agreement positions and environmental cooperation; pandemic response coordination and vaccine diplomacy; human rights criticism or defense in international fora.

Other Significant Events. This residual category encompasses additional politically consequential interactions.

- *Historical and Symbolic*: Apologies for historical wrongs; memorial visits; monument disputes; anniversary commemorations with bilateral significance.
- *Humanitarian and Disaster Response*: Aid offers or rejections following natural disasters; joint rescue operations; humanitarian access disputes.
- *Technology and Space*: Joint space missions; satellite cooperation; technology theft accusations; research collaboration terminations.
- *Communications and Media*: Journalist expulsions; broadcasting restrictions; undersea cable disputes.

Selection Criteria. Events are prioritized based on their significant effect on, or strong indication of, the bilateral relationship's trajectory. When economic tools are employed for political purposes, events are classified under economic categories. Only key interactions meeting these significance thresholds are included, ensuring analytical focus on politically consequential events that characterize the bilateral relationship.

C.3. Conflict and Mediation Event Observations and Goldstein Score

Our analysis employs the Conflict and Mediation Event Observations (CAMEO) framework (Schrodt and Yilmaz 2012) to systematically classify and quantify bilateral political events. CAMEO provides a comprehensive coding scheme that categorizes international political actions along two primary dimensions: the nature of the interaction (cooperation versus conflict) and the form of action (verbal versus material). This framework enables consistent, objective classification of diverse political events while preserving crucial information about their intensity and character.

CAMEO Classification Structure. The CAMEO framework organizes events into four quadrant classes based on the intersection of cooperation-conflict and verbal-material dimensions:

- **Verbal Cooperation**: Diplomatic statements, consultations, expressions of intent to cooperate, and formal diplomatic cooperation including treaty signing and public endorsements.

- **Material Cooperation**: Tangible cooperative actions such as economic aid provision, military cooperation, intelligence sharing, and policy concessions.
- **Verbal Conflict**: Critical statements, accusations, demands, rejections, threats, and public protests that express disagreement or hostility.
- **Material Conflict**: Concrete hostile actions including economic sanctions, military demonstrations, coercive measures, and various forms of violence.

Within each quadrant, CAMEO provides a hierarchical coding system with root codes (two-digit) representing general action categories and event codes (three-digit) specifying precise actions. For example, root code 16 (REDUCE RELATIONS) includes event codes 163 (impose economic sanctions) and 161 (reduce diplomatic relations), allowing for nuanced differentiation within broader conflict categories.

Implementation in Our Analysis. Our LLM-based analysis applies CAMEO classification through structured prompt engineering that guides the model through systematic event categorization. The process begins with identifying the core bilateral action in each event description, determining its cooperative or conflictual nature, and assessing whether the action is primarily verbal or material. The LLM then selects the most appropriate root code within the identified quadrant class and chooses the specific event code that best captures the action's essence.

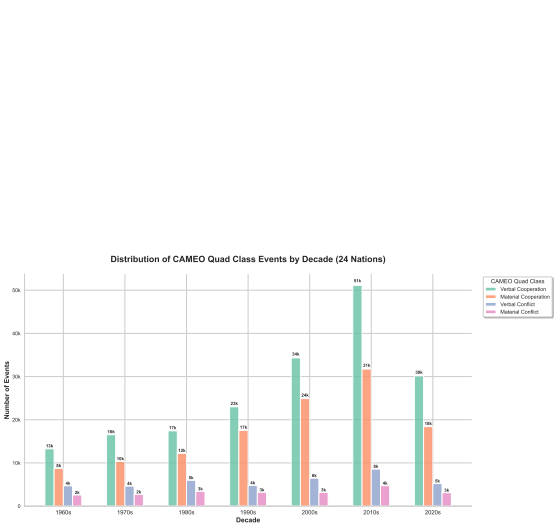
We pay particular attention to economic diplomacy events, ensuring that economic tools of statecraft receive appropriate classification. For instance, we distinguish between broad economic sanctions (code 163) and targeted administrative sanctions (code 172), recognizing their different mechanisms and intensities. Similarly, we differentiate between various forms of diplomatic cooperation, from routine consultations (code 040) to formal agreement signing (code 057), capturing the spectrum of cooperative engagement.

Integration with Goldstein Scale Scoring. CAMEO classifications inform our Goldstein Scale scoring (Goldstein 1992), which assigns numerical values from −10.0 (maximum conflict) to +10.0 (maximum cooperation) to each event. The LLM uses the CAMEO event code as the primary reference point for determining baseline intensity, then applies contextual adjustments based on the specific circumstances described in the event. This approach ensures consistency with established conflict-cooperation measurement while allowing for nuanced assessment of event significance within particular bilateral contexts.

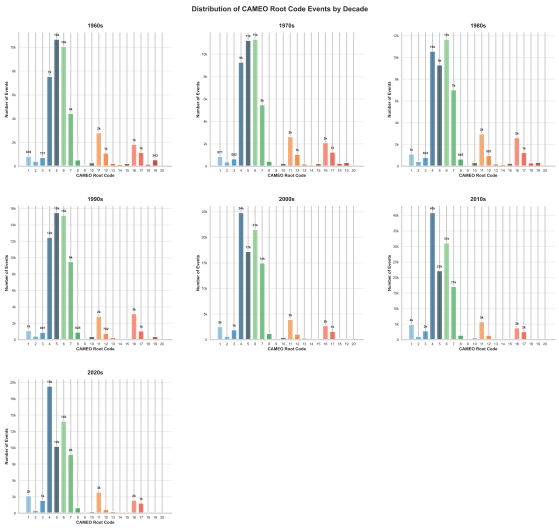
The combination of CAMEO's systematic classification with Goldstein Scale quantification enables our methodology to capture both the categorical nature of political actions and their relative intensity, providing a foundation for empirical analysis of how different types of geopolitical events affect economic outcomes. This dual-coding approach addresses the limitations of purely categorical measures while maintaining the

interpretability necessary for economic research applications.

Empirical Patterns in Event Classification. Figures C1 and C2 illustrate the distribution and evolution of our compiled geopolitical events across the CAMEO classification system and Goldstein Scale from the 1960s through the 2020s, revealing distinct patterns that align with major shifts in the international order.



A. Distribution of CAMEO Quad Class Events by Decade



B. Distribution of CAMEO Root Code Events by Decade

FIGURE C1. Evolution of CAMEO Event Classification Patterns

The temporal patterns reveal striking correspondence with major historical periods in international relations. During the Cold War decades (1960s–1980s), Figure C1A shows relatively balanced distributions across event types, with verbal and material cooperation dominating but conflict events maintaining a consistent presence. Total events grow modestly from approximately 27,000 in the 1960s to 37,000 in the 1980s, reflecting the structured but adversarial nature of superpower rivalry.

A dramatic transformation occurs during the globalization period (1990s–2000s), coinciding with the end of the Cold War and the expansion of liberal international institutions. Figure C1A demonstrates a marked acceleration in cooperative activities: verbal cooperation rises from 17,000 events in the 1980s to 34,000 in the 2000s, while material cooperation doubles from 12,000 to 24,000. This cooperative surge, coupled with relatively stable conflict levels, reflects the era's emphasis on economic integration and multilateral diplomacy during the "unipolar moment."

The 2010s represent the peak of recorded bilateral interactions, with total events exceeding 94,000—more than triple the 1980s level. While cooperation continues to expand in absolute terms (51,000 verbal and 31,000 material cooperation events), conflict events

also increase notably, with verbal conflict rising to 8,000 and material conflict to 4,000. This simultaneous intensification of both cooperative and conflictual interactions suggests not a simple return to Cold War dynamics, but rather a new pattern of competitive interdependence characteristic of emerging multipolarity.

The 2020s data, though representing only a partial decade, already reveals important continuities and shifts. Total events reach approximately 56,000, suggesting continued high-frequency bilateral engagement. Verbal cooperation (30,000) and material cooperation (18,000) remain the dominant categories, but conflict events persist at elevated levels inherited from the 2010s (5,000 verbal and 3,000 material conflict). Notably, the 2020s maintain the 2010s pattern of increased conflict share relative to the cooperative globalization era, consistent with the consolidation of great power competition as a structural feature of contemporary international relations.

Figure C1B provides additional granularity on these historical transitions. The Cold War period shows relatively balanced distributions across root codes, with consultation (code 04), diplomatic cooperation (code 05), and material cooperation (code 06) predominating. The globalization era witnesses a pronounced expansion of consultation activities, which reach 24,000 events in the 2000s and 40,000 in the 2010s. The 2020s show consultation (code 04) at 19,000 events and material cooperation (code 06) at 14,000, maintaining the pattern of institutionalized diplomatic engagement. Simultaneously, economic restrictions and sanctions (root codes 11 and 16) show persistent presence across recent decades, reflecting the growing use of economic statecraft as a tool of strategic competition in the contemporary multipolar environment.

The Goldstein Scale evolution particularly illuminates these macro-historical shifts. The Cold War decades display relatively wide distributions (standard deviations of 4.87, 4.62, and 4.74 for the 1960s, 1970s, and 1980s, respectively) with mean cooperation scores between 2.86 and 3.28, reflecting the mixture of confrontation and routine diplomacy that characterized superpower rivalry. A marked transition occurs in the 1990s and 2000s, which exhibit the highest mean cooperation scores in our sample (3.98 and 4.09, respectively) alongside reduced dispersion (standard deviations declining to 4.27 and 3.87). This compression toward positive values, with median scores of 6.0 in the 1990s and 5.0 in the 2000s, captures the cooperative orientation of the post-Cold War liberal order.

The 2010s and 2020s reveal a partial retreat from this cooperative peak. Mean cooperation declines modestly to 3.88 in the 2010s and 3.73 in the 2020s, while standard deviations stabilize at approximately 3.8. Median scores settle at 4.5 for both decades—lower than the globalization-era highs but still firmly in cooperative territory. Notably, the distributions for recent decades show increased mass in the negative tail compared to the 1990s and 2000s, consistent with the rising incidence of sanctions, diplomatic tensions, and strategic competition. Yet the overall distributions remain right-skewed, indicating that cooperative

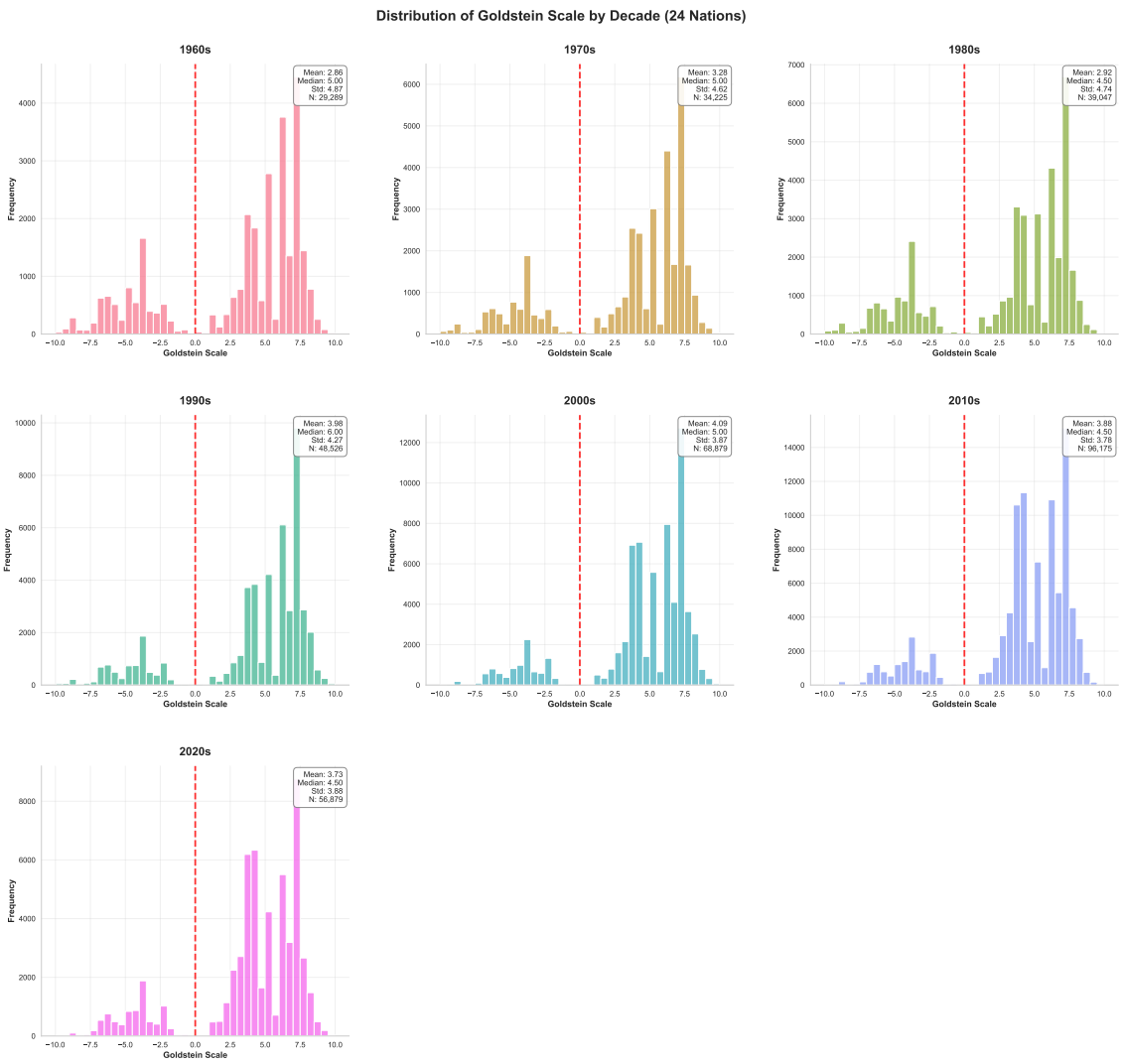


FIGURE C2. Distribution of Goldstein Scale Scores by Decade

interactions continue to dominate bilateral relations even as conflictual events become more frequent.

These empirical patterns validate our framework's sensitivity to major historical transformations while demonstrating how contemporary geopolitical dynamics manifest in measurably different event patterns compared to the cooperative globalization era. The data suggest that the 2010s and 2020s represent not a return to Cold War-style confrontation, but rather a new configuration of competitive interdependence—one characterized by persistently high levels of cooperative engagement coexisting with intensified strategic rivalry. This duality, reflected in both the CAMEO classifications and Goldstein Scale distributions, underscores the complex nature of contemporary international relations in an era of great power competition.