Measuring Geopolitical Alignment and Economic Growth

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This paper introduces a new event-based measure of bilateral geopolitical alignment and provides evidence that it shapes economic growth. The measure is built from 373,020 geopolitical events across 193 countries over 1960–2024, compiled using large language models. With local projections exploiting within-country temporal variation, we find that a one-standard-deviation permanent improvement in geopolitical alignment increases GDP per capita by approximately 10 percent over 25 years. These effects are associated with improvements in domestic stability, investment, productivity, trade, and human capital. In illustrative accounting exercises, observed geopolitical changes correspond to GDP differences ranging from about −30 to +30 percent across countries and time periods. (*JEL*: F50, F51, O11, O40, C80, P16)

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

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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 has examined technology, institutions, geography, culture, and financial systems as fundamental determinants, with Acemoglu et al. (2019) 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, large cross-country growth and income differences remain unexplained (Kremer, Willis, and You 2022).

Countries develop not only through these domestic factors, but also within an external environment. This paper provides evidence that geopolitical alignment—the state of a country's diplomatic and strategic relationships with major nations—is an important yet underexplored dimension of this environment, shaping economic growth. We find that geopolitical factors account for substantial growth and income differences across countries, as geopolitical alignment affects stability, access to markets, investment, and technology. The accelerating fragmentation of international relations makes quantifying these dynamics especially pressing.

To characterize this dimension of the external environment, we introduce a novel event-based measure of bilateral geopolitical alignment that captures both the timing and intensity of diplomatic dynamics. Using large language models with web search capabilities, we compile 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 approach captures within-country variation in both the timing and magnitude of geopolitical changes, which measures based on UN voting patterns or binary indicators cannot provide. We aggregate bilateral scores using

[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 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 Appendix C for scoring guidelines.

GDP-weighted averages to construct country-year indices that reflect each country's geopolitical alignment. The resulting measure spans six decades of 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. Growth effects of geopolitical alignment changes build gradually and persist for decades, with even transitory improvements generating lasting benefits. A one-standard-deviation permanent improvement in the geopolitical alignment index increases GDP per capita by approximately 10 log points (about 10 percent) over 25 years.

We support the causal interpretation through complementary approaches. Decomposing the index into economic, diplomatic, and security components shows that all three contribute independently. The effects hold when we decompose alignment into relations with the United States versus other major nations, and are present in both the Cold War and post-Cold War periods, consistent with broad-based international cooperation rather than country-specific confounders. Results survive placebo tests, alternative fixed effects, and progressive controls for trade, domestic unrest, war exposure, and institutional quality. Two instrumental variables strategies address distinct threats. A verbal-conflict IV isolates variation from non-economic diplomatic events, addressing economic-content endogeneity. A leadership-change IV exploits bilateral shifts induced by major-nation successions, addressing the concern that within-country geopolitical changes may reflect broader domestic trajectories. Both yield responses consistent with the baseline.

The growth effects are associated with multiple reinforcing channels (domestic stability, physical capital accumulation, productivity gains, and trade expansion) with distinct temporal patterns ranging from immediate stabilization to gradual human capital gains. We then revisit the democracy-growth nexus by examining how it operates through the channel of geopolitical alignment. Democracy and geopolitics operate as complementary but distinct growth drivers: democracy's short-run growth effect works largely through improved Western relations, while its long-run benefits persist independently of geopolitical alignment.

Applying the estimated impulse responses to observed geopolitical changes, we find that improving international relations from the 1980s to 2000s generated median GDP gains of 2–5% per decade, while post-2010 fragmentation reversed this pattern. Under maintained assumptions,

differences in geopolitical alignment can account for GDP variations ranging from about −30% to +30% across countries. Beyond the baseline identification, our findings are robust to dynamic panel estimation and unsmoothed event-based measures. Notably, UN voting patterns produce null growth effects in our empirical framework, while our event-based measure subsumes much of the explanatory power of sanctions and formal alliances (Section 6).

Literature Review. We study geopolitical alignment as a measurable dimension of the external environment of economic development, and contribute to three literatures: the measurement of geopolitical alignment, the determinants of economic growth, and the emerging field of geoeconomics.

Measuring Bilateral Geopolitical Alignment. Our primary contribution is to provide a continuous, time-varying representation of bilateral geopolitical relations that addresses key limitations in existing approaches. The predominant method relies on UN General Assembly (UNGA) voting similarity (Signorino and Ritter 1999; Bailey, Strezhnev, and Voeten 2017), which captures multilateral positions rather than bilateral dynamics. Alternative categorical measures (strategic rivalries (Thompson 2001; Aghion et al. 2019), 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 track the continuous evolution of international relationships. Our event-based approach fills this gap, providing continuous bilateral coverage at annual frequency across six decades. Drawing on the text-as-data framework (Gentzkow, Kelly, and Taddy 2019) and its applications to economic and political risks (Baker, Bloom, and Davis 2016; Hassan et al. 2019; Caldara and Iacoviello 2022; Hassan et al. 2024), as well as the growing applications of large language models for data construction in economics (Clayton et al. 2025; Dell 2025; Lagakos, Michalopoulos, and Voth 2025; Asirvatham, Mokski, and Shleifer 2026), we extract, classify, and score 373,020 bilateral political events spanning 1960–2024 using standardized frameworks (CAMEO/Goldstein).

Economic Growth Determinants. We contribute to the literature on cross-country growth determinants (Levine and Renelt 1992; Barro 1996; Durlauf, Johnson, and Temple 2005). Existing research has identified fundamental drivers internal to countries—institutions (Acemoglu, Johnson, and Robinson 2001; Dell 2010), human capital (Barro 1991; Mankiw, Romer, and Weil 1992), culture (Nunn 2008; Tabellini 2010), and geography (Sachs and Warner 1995; Dell, Jones, and Olken

2012)—as well as external economic integration through trade (Frankel and Romer 1999; Alcalá and Ciccone 2004) and cross-border technology diffusion (Parente and Prescott 1994; Coe and Helpman 1995). Yet the role of countries' external political environment remains underexplored. Building on Acemoglu et al. (2019)'s empirical framework, we employ local projection methods (Jordà 2005; Ramey 2016; Jordà and Taylor 2025) to estimate the dynamic growth effects of geopolitical shocks.

Geoeconomics. Our research bridges classical economic statecraft (Hirschman 1945; Baldwin 1985; Kirshner 1995) with contemporary geoeconomic analysis (Clayton, Maggiori, and Schreger 2024, 2026; Fernández-Villaverde, Mineyama, and Song 2024; Kleinman, Liu, and Redding 2024; Gopinath et al. 2025; Liu and Yang 2025). While recent theoretical and empirical work has studied specific channels, evidence on the aggregate growth consequences of geopolitical relations remains limited. A related paper, Fan, Wo, and Xiang (2025), extends the event-based measurement framework introduced here to study how geopolitical relations shape trade globalization. Our framework situates aid (Alesina and Dollar 2000; Nunn and Qian 2014), sanctions (Morgan, Syropoulos, and Yotov 2023), and conflicts (Martin, Mayer, and Thoenig 2008; Federle et al. 2026) 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 alignment. 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 applies these estimates to conduct growth accounting exercises. Section 6 provides additional robustness tests. Section 7 concludes.

2. Event-based Measure of Geopolitical Alignment

Characterizing this dimension of the external environment requires a measure of geopolitical alignment that captures bilateral relationship intensity (not merely multilateral voting positions or discrete institutional thresholds) at annual frequency and over long historical horizons. Existing approaches fall short on at least one of these dimensions: UN voting similarity reflects multilateral preferences rather than bilateral relationship intensity, while categorical indicators of sanctions, alliances, or strategic rivalries mark specific relationship thresholds but not the continuous evolution

between them.

To construct such a measure, 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 bilateral geopolitical alignment scores that vary by country pair and year, then aggregate them into a country-level geopolitical alignment index. This section describes the construction, validates the measure against historical episodes and alternative pipelines, and documents the evolution of global geopolitical relations over six decades.

2.1. LLM: Compile and Analyze Geopolitical Events

Bilateral geopolitical events—diplomatic agreements, economic sanctions, military actions, and territorial disputes—are prominent features of the historical record, extensively documented across news archives, diplomatic records, government publications, and scholarly databases. Unlike granular economic transactions or social interactions that may leave limited historical traces, these events are salient and widely corroborated across independent sources, making them well-suited for systematic extraction by large language models (LLMs) trained on such corpora. We employ Gemini 2.5 Pro, an LLM equipped with web search capabilities, to collect, verify, and analyze bilateral geopolitical events through a structured prompt engineering framework. Figure 1 illustrates our LLM-based analysis procedure, with complete analytical framework and prompt specifications provided in Appendices A.2 and C.



FIGURE 1. LLM Geopolitical Event Analysis Procedure

Our methodology instructs the LLM to perform four sequential tasks: (i) verify the historical political entities for each country pair and year, accounting for state succession (e.g., Soviet Union

[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.

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 A.1 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]

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	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	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

[4]Goldstein scores are assigned following the standard CAMEO-to-Goldstein mapping used by the Global Database of Events, Language, and Tone (GDELT) and Integrated Crisis Early Warning System (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 demonstrates our methodology using U.S.-Russia bilateral events from 2022, the year Russia launched its full-scale war on Ukraine. Five of the six events represent conflict, with Goldstein scores ranging from −4.5 (UN General Assembly condemnation) to −8.0 (U.S. military assistance to Ukraine), spanning material and verbal dimensions. The sole cooperative event—the Griner-Bout prisoner exchange—scores +7.0, illustrating how the framework captures rare bilateral cooperation even amid otherwise hostile relations. Table A.2 in Appendix A.2 provides a contrasting example from the 1972 détente period, where all nine U.S.-Soviet events represent cooperation with scores ranging from +5.0 to +9.0.

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).

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 (1960–1991) with cooperation comprising 75–79% of interactions and mean Goldstein scores ranging from 2.86 to 3.28; the globalization era (1992–2010) with cooperation rising to 83–86% of interactions and mean 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. 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 events that shape bilateral 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

[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.

compilation provides extended temporal coverage from 1960, aligning with the availability of economic data necessary for comprehensive panel analysis.[6]

2.2. Measuring Geopolitical Alignment

Dynamic Bilateral Geopolitical Alignment. We construct a measure of bilateral geopolitical alignment based on geopolitical events between country pairs. Let $\left\{s_{ij,t}^{n}\right\}_{n=1}^{\tilde{N}_{ij,t}}$ denote the 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, normalized to the $[-1, +1]$ interval, is:

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

To capture both the immediate impact of political events and the institutional memory that characterizes international relationships, we then construct a dynamic geopolitical alignment 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 yields a half-life of about two years and captures dynamics at the frequency of a typical four-year electoral cycle.[7] The resulting dynamic score exhibits a half-life of roughly three years (versus under one year for raw event scores), suggesting that it reflects the persistent bilateral relationship stock rather than transitory event noise (Appendix A.6). The dynamic geopolitical alignment score is normalized to range from -1 (maximum conflict) to $+1$ (maximum cooperation). Throughout the paper, we refer to $S_{ij,t}$ as the

[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.

[7]When no events are observed ($\tilde{N}_{ij,t} = 0$), equation (1) does not apply; instead, both the effective event count and the score decay: $N_{ij,t} = (1-\delta)N_{ij,t-1}$ and $S_{ij,t} = (1-\delta)S_{ij,t-1}$. For the initial year of each bilateral pair, $S_{ij,t_0} = \tilde{S}_{ij,t_0}$ and $N_{ij,t_0} = \tilde{N}_{ij,t_0}$. Our results are robust to alternative depreciation rates. Section 6.2 examines the case $\delta = 1$ (unsmoothed event scores): while raw event scores show rapid mean reversion and smaller immediate GDP effects, the cumulative long-run impact of permanent changes converges to our baseline estimates, because the local projection controls for lags of geopolitical alignment and thus identifies off innovations rather than the accumulated stock.

bilateral geopolitical alignment score and to the GDP-weighted aggregate p_{ct} (defined below) as the *geopolitical alignment index*.

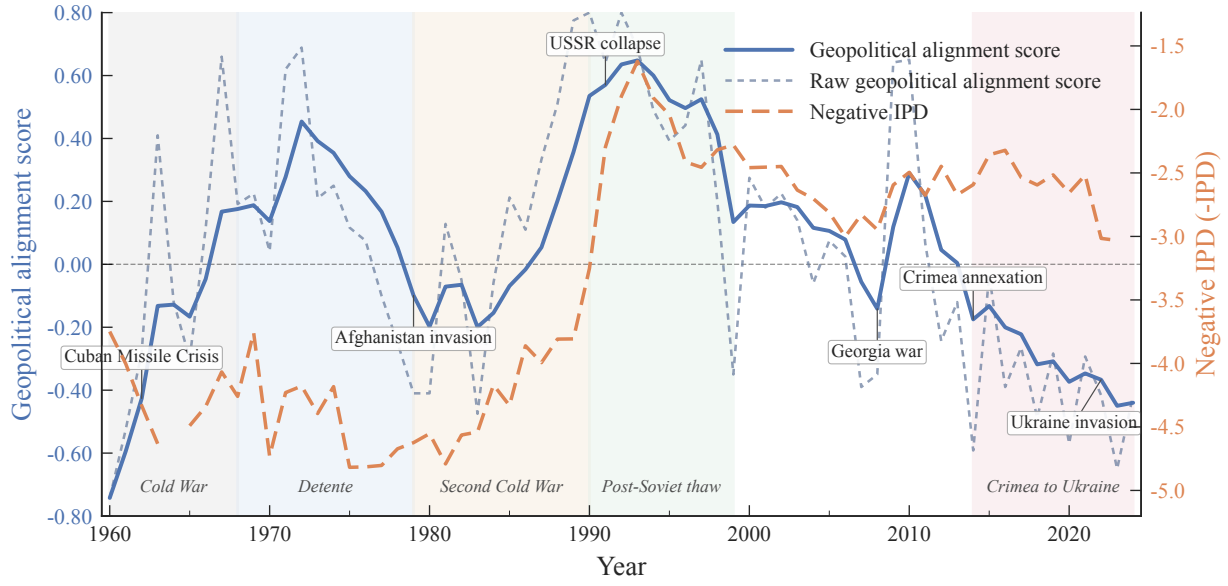
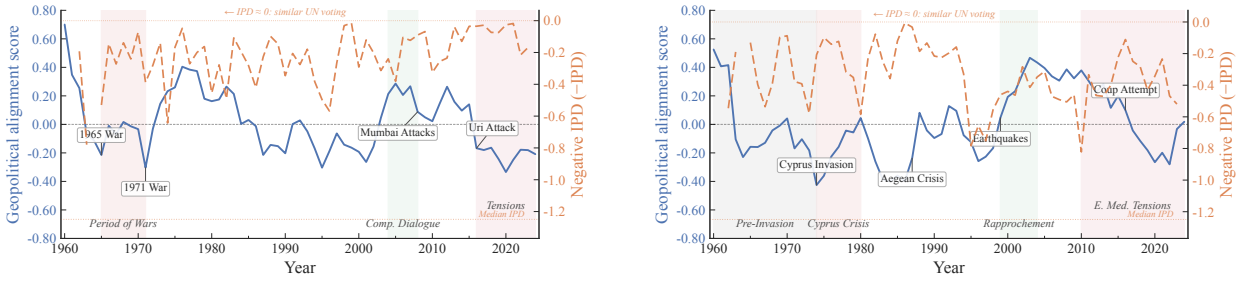


FIGURE 2. Geopolitical Alignment Scores Between United States and Russia (Soviet Union)

Time series comparison of bilateral geopolitical alignment measures between the United States and Russia, 1960–2024. The blue solid line shows our dynamic geopolitical alignment score (left axis), the light blue dashed line shows the raw (unsmoothed) geopolitical alignment score, and the orange dashed line displays the negative Ideal Point Distance (−IPD) from UN voting data (right axis). Shaded regions indicate five geopolitical eras: Cold War (1960–1968), Détente (1968–1979), Second Cold War (1979–1990), Post-Soviet thaw (1990–1999), and Crimea to Ukraine (2014–2024). Key geopolitical events are annotated.

We validate the resulting measure against known bilateral dynamics and compare it with existing alternatives. Figure 2 plots our dynamic geopolitical score (blue line) between the United States and Russia from 1960 to 2024. The measure tracks 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 (orange dashed line) fails to capture the Détente period and shows little movement after the Crimean Crisis despite the sustained bilateral deterioration. Figure 3 extends this validation to two non-superpower relationships that expose a critical limitation of UN voting-based measures.

Panel (a) of Figure 3 traces India-Pakistan relations through six decades of recurrent conflict. Our



A. India and Pakistan

B. Greece and Turkey

FIGURE 3. Geopolitical Alignment Scores: India-Pakistan and Greece-Turkey

Time series comparison of bilateral geopolitical alignment measures for India-Pakistan (panel a) and Greece-Turkey (panel b), 1960–2024. Blue solid lines show our dynamic geopolitical alignment score (left axis); orange dashed lines display the negative Ideal Point Distance (−IPD) from UN voting data (right axis). The dotted horizontal line marks the cross-country median IPD. Shaded regions highlight key periods of conflict and cooperation; boxed labels mark major bilateral events.

measure tracks the wars of 1965 and 1971, the Mumbai terrorist attacks (2008), and the Uri attack and subsequent surgical strikes (2016), with scores ranging from +0.70 in the early 1960s to −0.45 at the 1971 war nadir. The measure captures repeated cycles of conflict and cautious engagement: scores recover to +0.40 in the late 1970s, rise again during the Composite Dialogue period (2004–2008) to approximately +0.30, and collapse after the Mumbai attacks. The IPD measure, by contrast, shows these persistent rivals as increasingly aligned—because both countries vote similarly on postcolonial issues at the UN—completely inverting the actual bilateral relationship.

Panel (b) reveals a similar pattern in Greece-Turkey relations: our measure registers the sharp deterioration following the 1974 Cyprus invasion, the 1987 Aegean crisis, the brief rapprochement following the 1999 earthquakes, and the sustained decline during Eastern Mediterranean tensions (2010–2024). The IPD measure shows these NATO allies as consistently close throughout—because both vote with the Western bloc at the UN—despite decades of bilateral hostility over Cyprus, the Aegean, and maritime boundaries. In both cases, the entire IPD series remains well below the cross-country median (dotted line), confirming that UN voting similarity reflects bloc affiliation rather than bilateral dynamics.[8] Appendix A.3 provides additional case validation across eight bilateral relationships spanning major power dynamics (Figure A.3) and regional rivalries (Figure A.4); geopolitical maps appear in Appendix A.4. Consistent with capturing meaningful bilateral ties, the

[8]Fan, Wo, and Xiang (2025) show formally that UNGA voting similarity correlates with the low-dimensional bloc structure of our bilateral alignment scores—the distance over the first three principal components—but misses the higher-dimensional bilateral variation that drives economic outcomes.

dyadic measure is also systematically associated with trade, sanctions, migration, and foreign aid in standard gravity frameworks (Appendix A.8).

Robustness and Replicability. Beyond historical face validity, our measure shows high cross-model agreement. Cross-model agreement tests using four frontier model configurations across three model families (Gemini 2.5 Pro, GPT 5.4, Claude Opus 4.6, and Claude Sonnet 4.6) on 300 randomly sampled dyad-years yield a pooled correlation of 0.88, with within-model replicability reaching 0.93. The residual cross-model variation is consistent with differences in training data and scoring conventions rather than measurement instability (Appendix A.5).

A more demanding test varies the entire measurement pipeline—both the LLM and the prompt structure—simultaneously. An independent pipeline using Gemini 2.5 Flash with an earlier prompt design produces a country-year index correlated at 0.87 (Pearson) with our baseline, and nearly identical growth impulse responses with a horizon-by-horizon correlation of 0.97 (Figure A.8). Because bilateral geopolitical events are extensively documented in public sources, different models and prompt architectures converge on similar assessments.[9]

Advantages over Existing Measures. The preceding case studies illustrate the broader point: our event-based approach captures bilateral variation that UN voting similarity and categorical indicators miss or invert.[10] Section 6.2 presents formal empirical comparisons. At the aggregate level, the conflict component of our bilateral events co-moves with the Geopolitical Risk Index of Caldara and Iacoviello (2022), while providing coverage for all 193 countries (Appendix A.9).

Country-Level Geopolitical Alignment Index. To construct the country-level summary, we aggregate bilateral geopolitical alignment scores $S_{ij,t}$ into a country-level measure using a GDP-weighted aggregate:

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

[9] Cross-model convergence establishes measurement reliability. Whether it also reflects accuracy—given that frontier LLMs share overlapping training corpora—is discussed in Appendix A.5.

[10] UN voting-based measures include Signorino and Ritter (1999), Bailey, Strezhnev, and Voeten (2017), and Kleinman, Liu, and Redding (2024); see Broner et al. (2025) for limitations. Categorical alternatives include 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).

Here, GDP share$_{jt}$ denotes country j's share of world nominal GDP in current U.S. dollars.[11] 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 alignment in subsequent analyses of growth outcomes. Higher values of p_{ct} indicate stronger alignment with major nations; lower values indicate more conflictual relations.

2.3. Landscape of Geopolitical Alignment: 1960–2024

The country-level index reveals three macro-historical transformations in the global geopolitical landscape (Cold War bipolarity, post-Cold War convergence, and contemporary fragmentation) that also establish the within-country temporal variation exploited in Section 3.

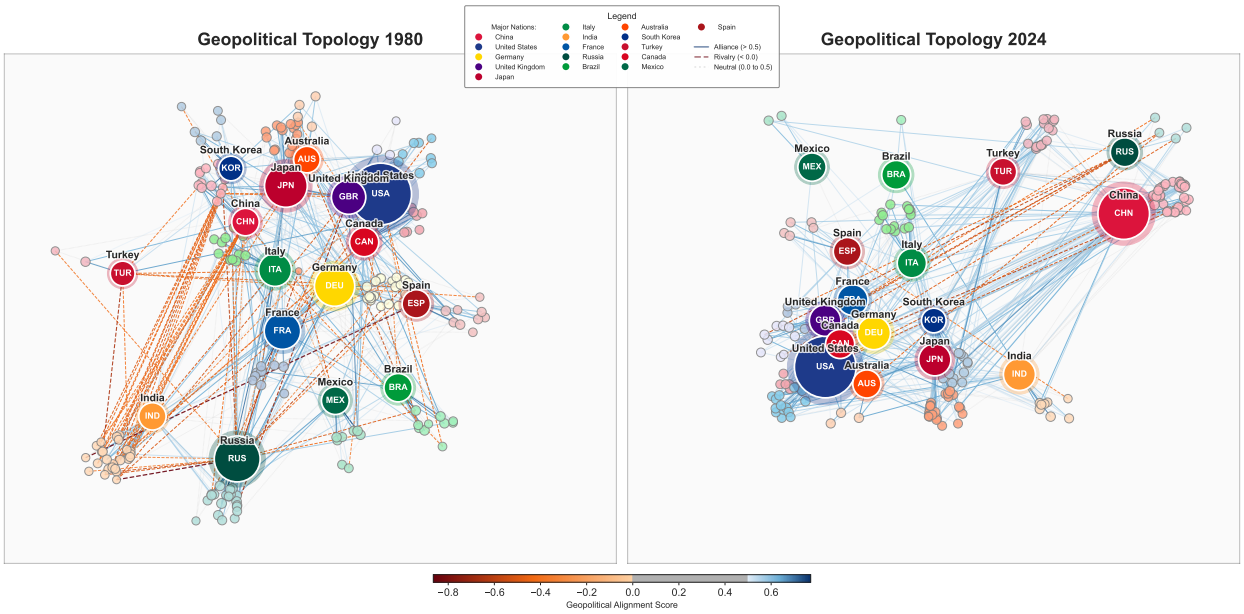


FIGURE 4. Geopolitical Alignment Topology, 1980 and 2024

Geopolitical topology constructed using multidimensional scaling based on pairwise geopolitical alignment scores between major nations. Distances between major nations reflect dissimilarity in their geopolitical alignment 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).

Figure 4 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

[11] Since the 24 major nations account for 83–90 percent of world GDP over the sample period, the weights approximately but do not exactly sum to one. The identifying variation in p_{ct} comes from changes in bilateral scores $S_{cj,t}$ rather than from movements in GDP shares. Figure B.1(b) in Appendix B.3 confirms that replacing time-varying weights with fixed average or regime-fixed GDP shares yields nearly identical impulse responses.

lines between blocs indicating widespread hostility. 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.[12]

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 different clusters amid intensifying competition.[13]

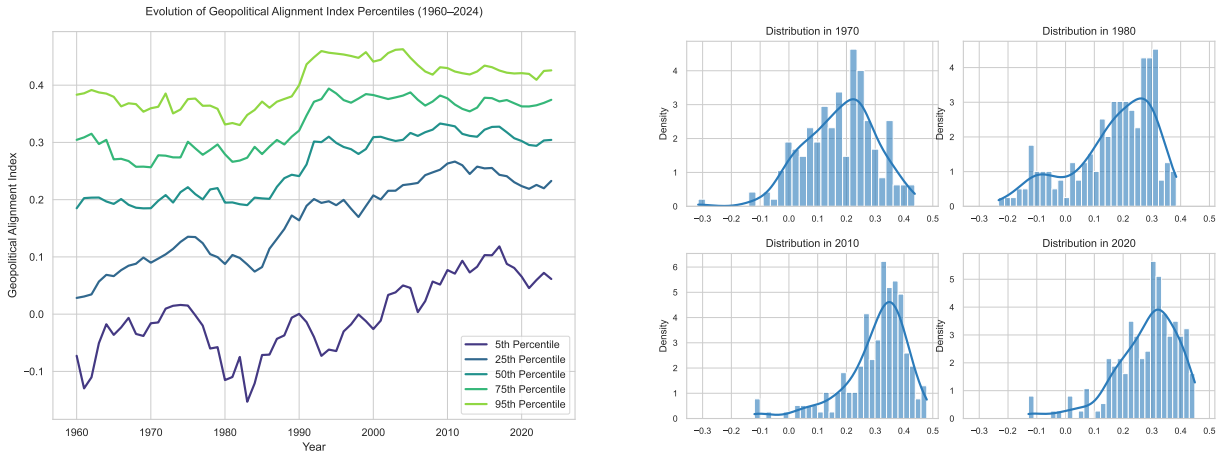


FIGURE 5. Evolution of the Distribution of the Geopolitical Alignment Index

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

Figure 5 documents shifts in the global distribution of geopolitical alignment across six decades. During the Cold War era (1960–1991), 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 are left-skewed—with a primary peak around 0.2 and considerable mass extending into negative territory—capturing the division into opposing geopolitical camps.

[12]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.

[13]These nonaligned states maintain positive relations across blocs, complicating strategies aimed at economic decoupling.

The post-Cold War transformation (1992–2010) brought broad convergence: the 5th percentile improved sharply from −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 reversal: the 5th percentile declined back toward 0.0, variance increased, and the 2020 distribution shows renewed dispersion with a flattened peak and re-emerging left tail extending below 0.0.[14] The measure recovers these historical phases without imposing them ex ante.[15]

3. Dynamic Growth Effects of Geopolitics

This section estimates the dynamic effects of geopolitical alignment on economic growth using local projections with country fixed effects. We present baseline impulse responses, extensive robustness analysis, and two instrumental variables checks.

3.1. Economic Data

Our analysis employs a panel dataset covering 193 countries from 1960 to 2024, of which 184 have GDP data from the World Development Indicators. The primary outcome variable is log GDP per capita in constant US dollars from the World Development Indicators, which provides broad country coverage and facilitates cross-country comparisons.[16] 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).[17]

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. These variables enable us to explore the channels through which the geopolitical alignment index affects economic development.

[14]The percentile spread narrowed from roughly 0.75 (ranging from −0.30 to 0.45) 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 the distribution aligns with the rise and partial retreat of economic globalization.

[15]Summary statistics by decade, including means and standard deviations, appear in Table A.4 (Appendix A.7).

[16]Section 4.1 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.

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

Distinctiveness from Economic Fundamentals. Table B.2 in Appendix B.2 reports within-year cross-sectional correlations between the geopolitical alignment index and standard economic fundamentals. These correlations are small and unstable across decades, typically below 0.2 in absolute value. In contrast, the same fundamentals exhibit strong and stable correlations with GDP per capita.

3.2. Empirical Specification

Rather than examining the sources of geopolitical dynamics, we treat p_{ct} as given and estimate its dynamic effects on economic outcomes. Specifically, we examine how a change in the index at time t influences GDP at future horizons relative to a baseline of no change. Formally, following Jordà and Taylor (2025), we define the impulse response function (IRF) 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.[18] 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 alignment, respectively, δ_c denotes country fixed effects, $\delta_{r(c)t}$ represents region-year 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):

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

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 alignment, consistent with Acemoglu et al. (2019),

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

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, so that identification relies on within-country variation—a standard requirement in modern growth empirics (Durlauf, Johnson, and Temple 2005). Region-year 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.[19]

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, the lagged geopolitical alignment index, and other controls, the geopolitical alignment index is orthogonal to contemporaneous and future shocks to GDP. This identification condition implies that $\mathcal{R}_{p \to y}(h) = \alpha_h^{\mathrm{LP}}$ (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 alignment exhibit similar potential GDP growth trends after conditioning on our controls. This is a strong assumption that warrants careful examination. Country fixed effects absorb time-invariant heterogeneity (geographical endowments and historical legacies) while lagged GDP and lagged geopolitical alignment capture the dynamic components of growth and diplomatic trajectories. We probe the credibility of this identification through four complementary exercises.

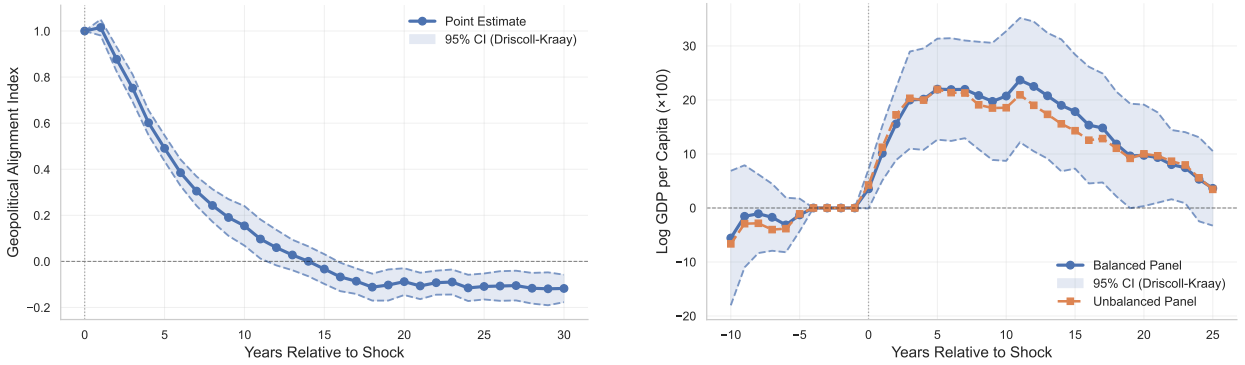
First, Section 3.4.1 decomposes the geopolitical alignment index into economic, diplomatic, and security components, showing that the growth effects are not driven by economic content embedded in the index. Second, Section 3.4.2 examines the identifying variation by decomposing our geopolitical alignment index into relations with the United States versus other major nations, testing stability across Cold War and post-Cold War sub-periods, and inspecting the distribution of effects across the shock distribution. Third, Section 3.4.3 tests sensitivity to alternative fixed effects structures

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

and additional time-varying controls, including lags of trade openness, domestic political stability, casualty-based war exposure, and institutional quality. Fourth, Section 3.4.4 conducts placebo exercises that test whether the estimated GDP response depends on the realized country-specific assignment and timing of geopolitical shocks. Section 3.5 then implements two complementary instrumental variables strategies: a verbal-conflict IV addressing economic-content endogeneity, and a leadership-change IV exploiting bilateral shifts induced by major-nation succession events.

3.3. Baseline Results

Figure 6 displays two central results: the persistence of geopolitical shocks and their dynamic impact on GDP per capita.



A. IRF of Geopolitical Alignment Index

B. IRF of GDP per Capita

FIGURE 6. Dynamic Responses to Geopolitical Alignment Shock

Panel (a) shows the impulse response of the geopolitical alignment index to a unit shock. Panel (b) displays the impulse response of log GDP per capita (×100) to a unit improvement in geopolitical alignment, comparing the balanced panel of 148 countries with at least 40 years of GDP data (solid blue with 95% Driscoll-Kraay confidence interval) and the unbalanced panel using all available countries (dashed orange). Both panels estimate equation (4) with four lags of the dependent variable and geopolitical alignment, country fixed effects, and region-year fixed effects. Horizons range from 0 to 30 years in panel (a) and −10 to 25 years in panel (b), where negative horizons test for pre-trends.

Dynamics of Geopolitical Alignment and Economic Growth. Panel (a) of Figure 6 shows that geopolitical alignment exhibits substantial persistence following a shock. A unit improvement decays gradually—about 50% of the initial effect persists after four years, and 15% remains after ten years. The effect is largely dissipated 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 relations.[20]

Panel (b) shows three key patterns in the GDP response. The solid blue line restricts the sample to 148 countries with at least 40 years of GDP data, while the dashed orange line uses the full unbalanced panel; the close overlap confirms that compositional changes do not drive the results.[21] First, the absence of pre-trends for horizons -10 to -1 supports our identification assumption. Second, GDP rises on impact, peaking at 22 log points over years 5–11. Third, the response follows a hump-shaped path, gradually declining to roughly 10 log points by year 20 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).[22]

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 (2026) in constructing counterfactual impulse responses to shocks that increase by one unit on impact and immediately return to zero.[23]

Figure 7 decomposes the effects into responses to transitory and permanent shocks. Panel (a) shows that even purely transitory improvements in geopolitical relations generate persistent economic gains. GDP per capita increases by 3.5 log points on impact, rises to a peak of 6.5 log points after one year, and gradually fades 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.

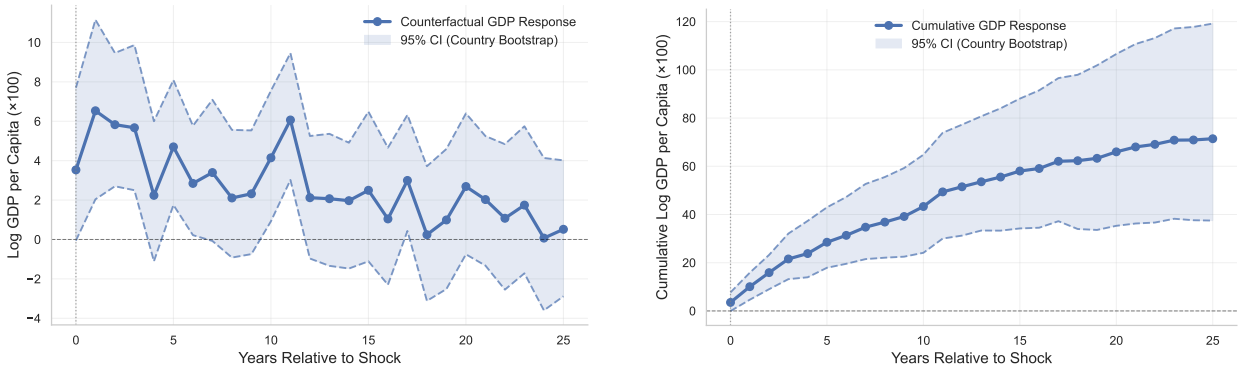
Panel (b) demonstrates the cumulative gains from permanent improvements: GDP per capita rises steadily, reaching approximately 70 log points after 25 years. The trajectory continues to rise after year 20, though at a diminishing rate. While local projections provide robust estimates, they sacrifice statistical efficiency at long horizons. Section 6.1 presents a complementary analysis

[20] The dynamics of geopolitical relations can be approximated by a mean-reverting AR(2) process with overshooting. Appendix A.6 provides additional analysis.

[21] All subsequent impulse response estimates use the 148-country balanced sample unless otherwise noted.

[22] Appendix B.3 presents three additional robustness checks: (i) bootstrap inference using country-block resampling produces only marginally wider confidence intervals; (ii) replacing time-varying GDP weights with fixed or regime-fixed weights yields nearly identical responses; (iii) alternative lag specifications confirm the stability of our results.

[23] 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.4 details our methodology.



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 response to a purely transitory unit shock (shock equals 1 at $h = 0$ and 0 thereafter). Panel (b) displays the cumulative response to a permanent unit shock. Baseline specification as in Figure 6. Shaded areas represent 95% confidence intervals from 500 country-block bootstrap iterations.

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 alignment index has a standard deviation of 0.140 and ranges from −0.43 (hostile relations) to 0.55 (strong cooperation), with a median of 0.26.[24] A one-standard-deviation improvement in the geopolitical alignment index generates a long-run GDP gain of approximately 10 log points (0.140×70). Moving from the 25th to the 75th percentile (a shift from limited to moderate cooperation) increases GDP by 13 log points over 25 years. For context, South Africa's post-apartheid geopolitical transformation, one of the largest observed shifts at 0.78 units, implies gains of about 55 log points over 25 years.

While the absence of pre-trends supports our identification assumption, pre-trend tests have limited power against confounders that accumulate gradually. We next evaluate the credibility of these estimates through a series of robustness exercises.

[24]The 25th percentile is 0.156 and the 75th percentile is 0.340.

3.4. Robustness and Identifying Variation

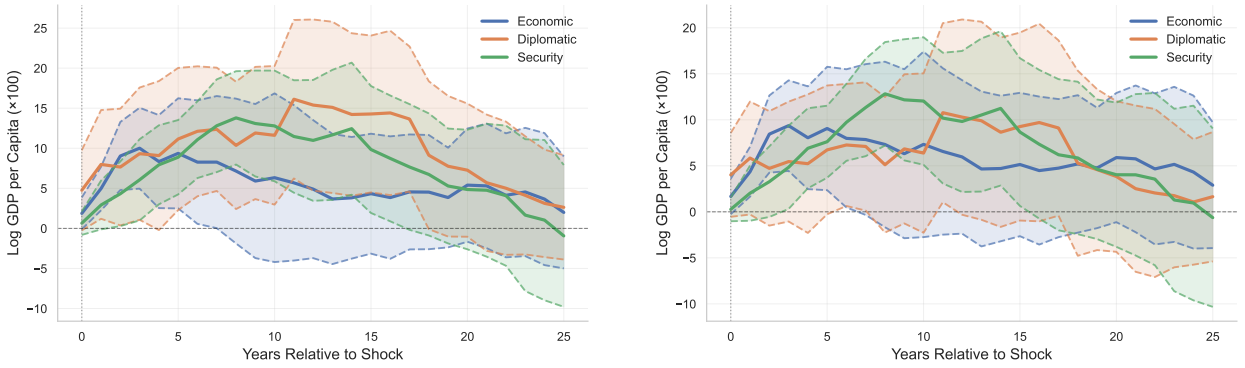
3.4.1. Decomposing the Geopolitical Alignment Index

A natural concern is whether the growth effects are driven by economic content embedded in the index—trade agreements, sanctions, or investment treaties that may be endogenous to growth conditions. Our event classification system (Section 2.1) assigns each bilateral event to one of six major categories. We construct three components of the geopolitical alignment index from these categories: *economic relations* (category A), *diplomatic and political relations* (category B), and *security, defense, and territorial relations* (categories C and D).[25] This classification is defined ex ante in the LLM prompt and held fixed across the entire sample. Each component is aggregated to the country-year level using the same GDP-weighted procedure as the baseline index (equation (2)). The three components correlate with the full index at 0.74, 0.78, and 0.67, with pairwise cross-correlations between 0.36 and 0.53, sufficiently distinct to support a meaningful decomposition.

Horse Race. Figure 8 reports local projection estimates from two specifications that assess the independent contribution of each component. Panel (a) includes all three components simultaneously, each with four lags, in a multivariate extension of equation (4). All three generate positive and statistically significant growth responses. Economic relations peak early, at approximately 10 log points within the first few years, before gradually attenuating. Diplomatic relations exhibit the largest and most persistent effect, reaching 10–15 log points between horizons 5 and 12. Security and territorial relations produce a sustained response of approximately 12 log points around horizon 10. The joint significance of all three components shows that the growth effects of geopolitical relations are not reducible to economic content alone.

Orthogonal Variation. Panel (b) isolates variation unique to each component by regressing each on the other two with country and year fixed effects, then using the residuals as shocks in the baseline local projection. Security and territorial relations show the strongest independent signal, significant from horizon 5 through 15 and peaking at approximately 12 log points. Economic

[25] Category A covers trade policy, financial relations, economic coercion, strategic sectors, and economic integration. Category B covers formal diplomacy, high-level interactions, public diplomacy, and cultural exchanges. Categories C and D cover military cooperation, security incidents, intelligence, territorial disputes, and maritime issues. The remaining categories (multilateral governance (E) and other events (F)) account for 20% of events and are omitted; including them as a fourth component does not affect the results. See Table A.1 for subcategory details.



A. Joint Specification

B. Orthogonal Components

FIGURE 8. Decomposing Geopolitical Alignment: Component-Level Growth Effects

Panel (a) estimates a multivariate extension of equation (4) with all three geopolitical components entered simultaneously, each with four lags. Panel (b) uses orthogonal components obtained by regressing each component on the other two with country and year fixed effects and using the residuals as shocks. Both panels show the impulse response of log GDP per capita (×100) with baseline fixed effects and Driscoll-Kraay standard errors as in Figure 6. Shaded areas represent 95% confidence intervals. Components: Economic (category A), Diplomatic (category B), Security (categories C and D).

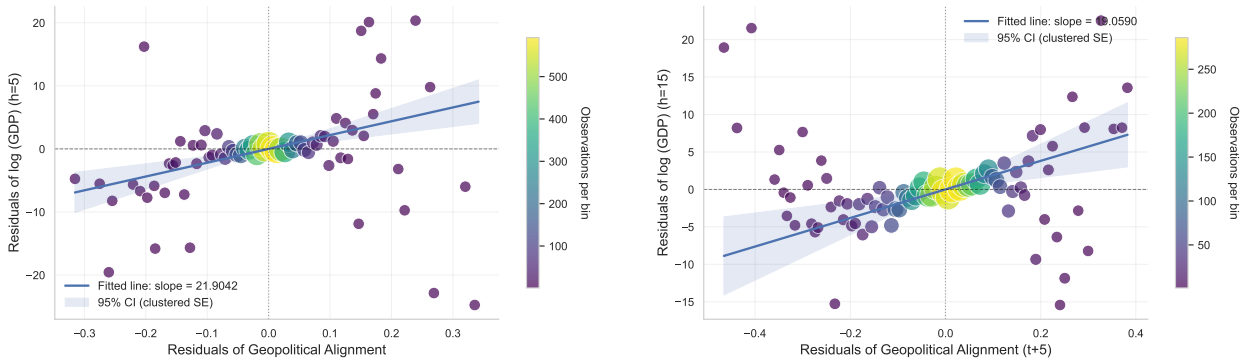
relations retain significance at short horizons, while diplomatic relations show a positive but less precisely estimated response. This contrast with panel (a)—where diplomacy exhibits the largest joint effect—reflects shared variation: much of diplomatic variation is correlated with economic and security conditions, so its joint predictive content is high but its unique orthogonal content is more limited.

The security component (military cooperation, defense agreements, territorial arrangements, and conflict dynamics) generates the most robust independent growth response.

3.4.2. Identifying Variation and Symmetry

A separate concern is whether the results depend on outliers, alignment with specific partners, or specific historical periods. The Frisch-Waugh-Lovell (FWL) theorem allows us to visualize the identifying variation by plotting the relationship between GDP and geopolitical alignment after partialling out all controls and fixed effects.

Figure 9 shows a robust positive relationship between geopolitical alignment and future GDP growth. Panel (a) confirms 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



A. GDP at $t + 5$ vs. Geopolitical Alignment at t B. GDP at $t + 15$ vs. Geopolitical Alignment at $t + 5$

FIGURE 9. Binscatter Plots of Residualized GDP and Geopolitical Alignment

Binscatter of residualized log GDP per capita against residualized geopolitical alignment after partialling out all baseline controls (as in Figure 6). Panel (a): GDP at $t + 5$ vs. geopolitical alignment at t. Panel (b): GDP at $t + 15$ vs. forward geopolitical alignment at $t + 5$. Each dot represents approximately 100 observations; fitted lines use clustered standard errors.

negative changes in geopolitical relations are associated with symmetric economic responses over the observed range.

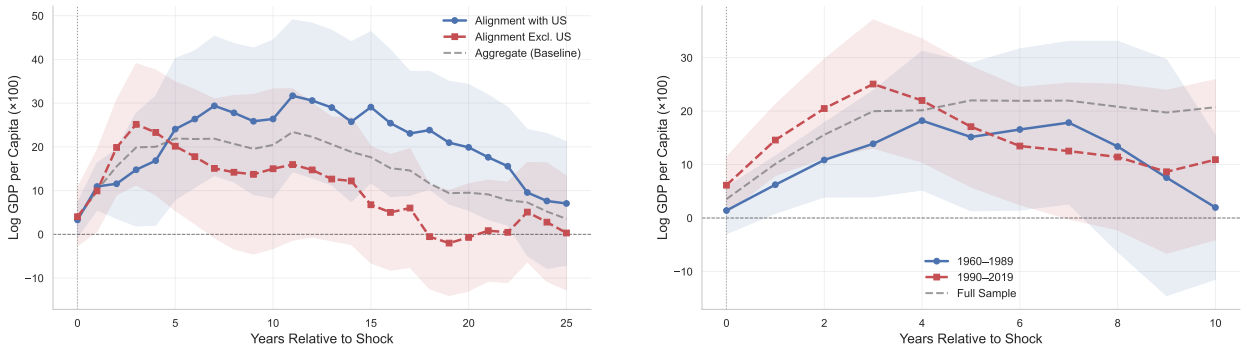
Panel (b) provides complementary evidence by examining GDP at $t + 15$ against cumulative geopolitical changes measured at $t + 5$. Using forward geopolitical alignment, which captures the accumulation of diplomatic changes over 5-year windows, yields a slope of 19, consistent with the baseline impulse response at comparable horizons.

We decompose the geopolitical alignment index 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 alignment with the US, and geopolitical alignment excluding the US. We also estimate the baseline specification separately for the 1960–1989 and 1990–2019 sub-periods, restricting the horizon to $h = 0, \ldots, 10$ to preserve adequate sample size within each window.

Figure 10 shows that our estimates are stable across both dimensions. Panel (a) demonstrates that both components generate substantial growth responses: alignment with the US peaks at approximately 32 log points around year 11, while alignment with other major nations peaks at approximately 25 log points around year 3, with both generating qualitatively similar dynamic



A. Partner Symmetry: US vs. Non-US

B. Temporal Stability: 1960–1989 vs. 1990–2019

FIGURE 10. Stability of Geopolitical Growth Effects across Partners and Time Periods

Panel (a): impulse responses from joint estimation of US and non-US geopolitical alignment. Blue solid: alignment with the US; red dashed: alignment excluding the US; gray dashed: baseline aggregate for comparison. Panel (b): impulse responses estimated separately for the 1960–1989 and 1990–2019 sub-periods. Blue solid: 1960–1989; red dashed: 1990–2019; gray dashed: full-sample baseline. Shaded bands show 95% confidence intervals based on Driscoll-Kraay standard errors. Baseline specification as in Figure 6.

patterns. The conditional correlation between US and non-US alignment—after partialling out country fixed effects, region-year fixed effects, and lagged controls—is only 0.28 (shared $R^2 \approx 0.08$). Despite this largely independent variation, both components produce similar growth responses. This suggests that our results reflect a general phenomenon rather than dependence on relations with a single dominant power or geopolitical bloc, and supports our use of GDP weights to aggregate bilateral relations.[26] Appendix B.6 shows that decomposing relations into Western versus non-Western countries yields similarly robust results, with both components generating sizable growth effects.

Panel (b) shows that the growth effects are present in both the Cold War and post-Cold War eras. Point estimates track the full-sample baseline through year 5, with both sub-periods generating peak effects of 18–25 log points. Estimates attenuate at longer horizons, likely reflecting reduced statistical power as the forward projection consumes a larger share of the 30-year window.

Beyond identification, these results speak to measurement quality: the consistency of estimated effects across nearly independent sources of variation, historical periods, and index components indicates that the geopolitical alignment index captures a substantive and well-measured feature of

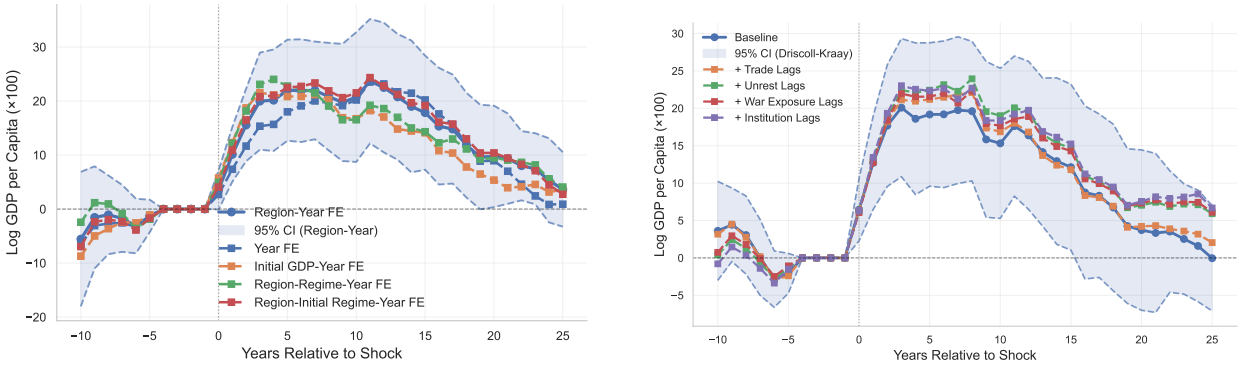
[26] As Section 4.3 documents, democratization improves relations with Western countries but not with Russia—and only modestly with China and India—yet both components generate similar growth responses. Replacing GDP weights with equal weights across the 24 major nations yields an index correlated at 0.86 with the baseline, and the IRF closely tracks the GDP-weighted version (Figure B.1C), confirming that the identifying variation comes from changes in bilateral geopolitical scores rather than from the aggregation weights.

countries' international position.

3.4.3. Additional Controls and Fixed Effects

The preceding exercises hold the control set fixed. We now vary the fixed effects structure and add time-varying controls.

Alternative Fixed Effects Specifications. We examine sensitivity to different assumptions about unobserved heterogeneity. Panel (a) of Figure 11 confirms that results are insensitive to four alternative fixed effects structures: year fixed effects only, initial GDP quintile-year effects,[27] region-initial regime-year effects (where regime indicates a country's democracy status), and region-current regime-year effects. All specifications yield impulse responses closely tracking the baseline, with peaks between 20 and 23 log points. The modest attenuation under region-current regime-year effects, which absorb contemporaneous democratization, points to an interplay that Section 4.3 explores in detail.



A. Alternative Fixed Effects B. Additional Controls

FIGURE 11. Robustness to Alternative Specifications

Panel (a) compares impulse responses under alternative fixed effects specifications. The baseline (solid blue with 95% Driscoll-Kraay confidence interval) uses region-year fixed effects. Dashed overlays show: year fixed effects only, initial GDP quintile-year, region-initial regime-year, and region-current regime-year fixed effects (regime = democracy status). Panel (b) shows robustness to progressively adding time-varying controls (all entering as lags only). Each overlay cumulatively includes all controls from the previous specification: four lags of trade openness; four lags of domestic unrest; four lags of five casualty-based war exposure measures from Federle et al. (2026); and four lags of five V-Dem institutional quality indices (Coppedge et al. 2025). All specifications in panel (b) use a common sample of 109 countries. Both panels use the baseline lag structure as in Figure 6.

[27] 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.

Time-Varying Economic and Political Controls. Time-varying confounders—trade shocks, domestic instability, wars, institutional change—may bias the estimates if they correlate with geopolitical changes. We address this by progressively adding controls, all entering as lags only to avoid conditioning on contemporaneous outcomes of the geopolitical shock. To ensure that differences across specifications reflect only the added controls, we restrict all estimates to a common sample of 109 countries with complete data for every control variable.

Figure 11, panel (b), shows that the impulse response is robust to cumulatively adding controls. Trade openness is a plausible channel through which geopolitical alignment affects growth; including four lags slightly attenuates long-run effects, but the peak response remains above 20 log points. Four lags of domestic unrest[28] leave the response essentially unchanged, ruling out the concern that geopolitical deterioration proxies for domestic political instability. Lagged casualty-based war exposure[29] has a similarly small effect, indicating that geopolitical alignment affects growth through channels beyond wartime destruction. Even after adding four lags of five V-Dem institutional quality indices—electoral, liberal, participatory, deliberative, and egalitarian democracy (Coppedge et al. 2025), following Acemoglu et al. (2025)—the response attenuates negligibly.

Appendix B.5 shows that results are also robust to controlling for a broad set of economic fundamentals from the Penn World Tables, including investment, capital, human capital, and labor market variables.

3.4.4. Placebo and Timing Validation

We conduct two placebo exercises that test whether the estimated GDP response depends on the realized country-specific assignment and timing of geopolitical shocks. Both exercises re-estimate the full baseline local projection from scratch in each placebo draw, preserving the specification's dynamics and fixed effects structure.

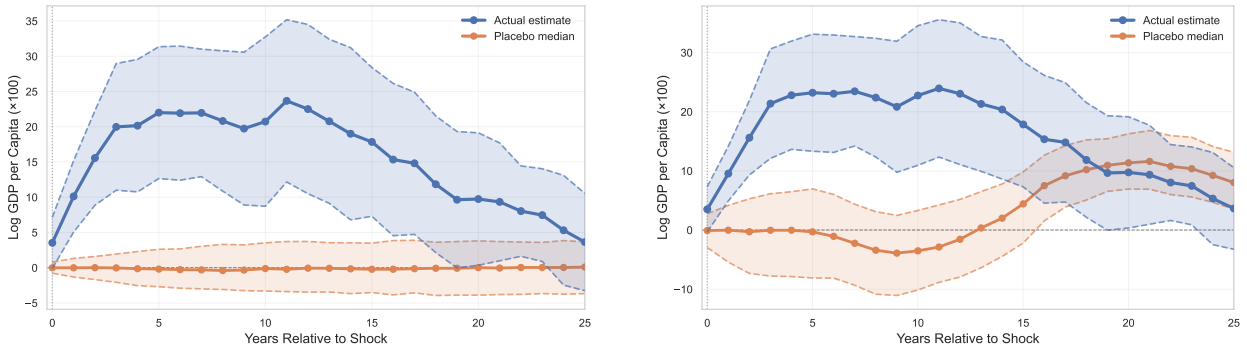
Within-Region-Year Reassignment. The first exercise randomly reassigns geopolitical shocks across countries within each region-year cell, preserving common regional shocks and the cross-sectional

[28]The unrest indicator equals one if any domestic conflict event (assassinations, strikes, guerrilla warfare, government crises, purges, riots, revolutions, or anti-government demonstrations) is recorded in the Cross-National Time-Series Data Archive. See Appendix B.1 for details.

[29]We include four lags of five war variables from Federle et al. (2026): domestic war-site onset, domestic casualty intensity (scaled by prewar population), trade-weighted foreign war exposure, proximity-weighted foreign war exposure, and the count of active foreign war sites.

distribution of the shock variable while breaking the link between each country's outcome path and its own realized geopolitical shock. Since our baseline already includes region-year fixed effects, this placebo does not test for common regional dynamics—those are absorbed in the main specification. Instead, it asks whether, conditional on the regional-time environment, the estimated GDP response depends on the realized country-specific assignment of shocks within a region-year cell.

Panel (a) of Figure 12 shows that the placebo median remains flat near zero across all horizons and the placebo band stays tight, while the realized response lies well outside the placebo envelope throughout. This provides evidence against a specific class of threats: mechanical artifacts from GDP persistence, incidental within-cell correlations, and estimator-specific biases that could generate spurious positive responses to any persistent regressor. Because the random reassignment preserves country-specific confounders alongside the true treatment assignment, it does not address time-varying omitted variables—a concern targeted by the robustness checks in Sections 3.4.1–3.4.3 and the IV strategies in Section 3.5.



A. Within-Region-Year Reassignment

B. Future-Year Timing Placebo

FIGURE 12. Placebo Tests for the Dynamic GDP Response to Geopolitical Shocks

Blue: actual estimates with 95% Driscoll-Kraay CIs. Orange: placebo median and 5th–95th percentile range across 500 draws. Panel (a): within-region-year reassignment of geopolitical shocks. Panel (b): replacement with future shocks drawn 8–15 years ahead. Both re-estimate the full baseline specification (Figure 6) in each draw.

Future-Year Timing Placebo. The second exercise replaces each country's contemporaneous shock with a randomly drawn future shock (8 to 15 years ahead), preserving each country's own shock distribution while breaking the contemporaneous timing. Unlike the cross-country reassignment, this placebo preserves country identity and therefore tests whether the baseline result depends on the actual temporal alignment between geopolitical changes and subsequent GDP dynamics.

Panel (b) of Figure 12 reveals a pattern consistent with the timing structure of the design. The placebo median remains near zero until approximately horizon 8, then begins rising as the local projection window reaches horizons where the shifted shocks have actually occurred. By horizons 15–18, the placebo response reaches magnitudes comparable to the actual response over its peak horizons 0–10. This delayed emergence serves as a positive control for timing: the LP recovers the expected response once the outcome window overlaps with the actual occurrence of the reassigned shocks, but produces null results at horizons where the shifted shocks have not yet materialized.

This pattern supports the interpretation that the baseline estimates depend on the temporal location of geopolitical shocks rather than on slow-moving country trajectories. At the same time, because the shift is long, the exercise is less informative about more proximate time-varying confounders that may jointly influence current growth and contemporaneous geopolitical changes.

Appendix B.7 reports complementary randomization-inference results based on the average response over horizons 0 to 10, which place the realized estimate in the extreme right tail of the placebo distribution (randomization $p \leq 0.002$ in both exercises).

3.5. Instrumental Variables Credibility Checks

The baseline design exploits within-country changes in geopolitical alignment, but two concerns remain. First, some components of the index, such as trade agreements or sanctions, may respond to economic prospects. Second, observed changes in geopolitical alignment may coincide with broader national reorientation episodes that independently affect growth. To probe these concerns, we implement two complementary IV strategies. The first isolates variation from non-economic verbal conflicts, addressing economic-content endogeneity. The second exploits bilateral shifts induced by leadership changes in major nations, addressing the concern that within-country geopolitical changes reflect country-specific trajectories. We interpret both exercises as targeted credibility checks rather than as stand-alone substitutes for the baseline design.

3.5.1. Non-Economic Verbal Conflicts

Our first instrument isolates variation from a specific subset of geopolitical events: non-economic verbal conflicts. These events—diplomatic protests, public criticisms, formal demands, and symbolic political gestures—shape bilateral relations without direct links to contemporaneous macroeconomic

conditions, unlike economic agreements, sanctions, or material conflicts.[30]

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

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

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

We estimate impulse responses using the local projection instrumental variables (LP-IV) method (Jordà 2005; Plagborg-Møller and Wolf 2021). 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:

$$\underbrace{y_{c,t+h} = \alpha_h^{\text{RF}} z_{ct} + \gamma_h' \tilde{\mathbf{x}}_{ct} + \mu_{c,t+h}^{\text{RF}}}_{\text{reduced form}}, \qquad \underbrace{p_{ct} = \alpha^{\text{FS}} z_{ct} + \gamma' \tilde{\mathbf{x}}_{ct} + \mu_{ct}^{\text{FS}}}_{\text{first stage}}$$

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 alignment, conditional on our controls.[31] We do not claim this restriction is beyond dispute. Verbal diplomatic conflicts may reflect underlying shocks—leadership changes, strategic realignments, regime deterioration—that independently affect growth. The

[30] 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.10 provides a comprehensive analysis of these 37,519 events spanning 1960–2024.

[31] 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).

verbal-conflicts IV should therefore be interpreted as a check on whether the baseline results are driven by economic-channel confounders, not as a resolution of all identification concerns.

3.5.2. Leadership Changes in Major Nations

Our second instrument exploits a distinct source of variation: bilateral shifts induced by leadership changes in major nations. When a head of state dies unexpectedly in office or is replaced through a close election, the bilateral relationships between that major nation and partner countries shift in directions determined by the successor's foreign policy orientation. These shifts vary across partner countries, providing cross-sectional identifying variation that is plausibly exogenous to any individual partner country's growth trajectory.

We combine two types of events: 25 unexpected deaths in office among major-nation leaders (from the Archigos database, 1950–2015) and 42 close election turnovers with vote margins below 10 percentage points (from Marx, Pons, and Rollet (2024), 1960–2018).[32] For each leadership-change event in major nation j at time t, we measure the bilateral shift for every country c:

$$z_{ct}^{\text{LC}} = \left(S_{cj,t+1} - S_{cj,t-1}\right) \times \text{GDP share}_{j,t-1}$$

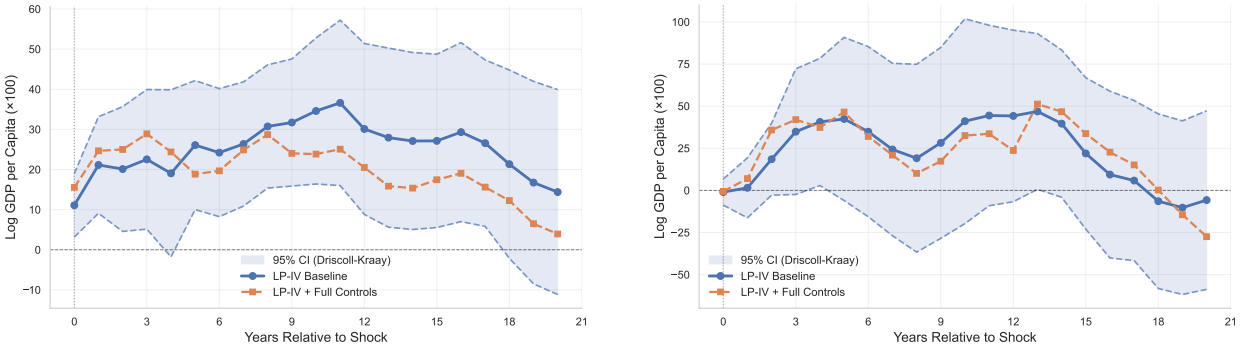
where $S_{cj,t+1} - S_{cj,t-1}$ captures the realized change in the bilateral geopolitical score one year after versus one year before the leadership change. The instrument thus uses the post-event bilateral shift as a measure of treatment intensity, rather than a simple event indicator; this provides richer cross-sectional variation but means the instrument reflects bilateral developments in a short window around the transition, not solely the leadership change itself. The GDP weight ensures comparability with the baseline index. When multiple leadership changes occur in the same year, the instrument sums across events.

The exclusion restriction requires that leadership changes in major nation j affect country c's GDP only through the resulting shift in bilateral geopolitical alignment. The design is most compelling for unexpected deaths, where the timing is fully exogenous; the close-election component provides a complementary source of variation that is less likely to be driven by partner-country growth

[32] Close election turnovers include 12 presidential elections (e.g., Bush 2000, margin +0.9%; Kim Dae-jung 1997, +1.6%; Macri 2015, +2.7%) and 31 parliamentary turnovers where the largest party's seat-share margin was below 10pp. Switzerland is excluded (rotating presidency); France enters through presidential turnovers only. See Appendix B.9 for the full event list.

trajectories, though it does not constitute a sharp regression-discontinuity design. The main threat is that major-nation leadership transitions transmit global policy spillovers (e.g., shifts in trade policy, monetary signaling) beyond the bilateral channel; region-year fixed effects absorb common global shocks, but country-specific spillovers remain a concern. The first stage is strong at short horizons (F = 17–36 for h = 0–3), declining as expected as the leadership-induced bilateral shift dissipates.[33]

3.5.3. Results



A. Non-Economic Verbal Conflicts B. Leadership Changes in Major Nations

FIGURE 13. Two Instrumental Variables Estimates of Geopolitical Effects on Growth

LP-IV impulse responses of log GDP per capita (×100) to a unit improvement in geopolitical alignment under two IV strategies. Panel (a): instrumenting with non-economic verbal conflicts (h = 0–20). Panel (b): instrumenting with bilateral shifts induced by leadership changes in major nations (25 deaths in office + 42 close election turnovers, h = 0–20). Blue solid: baseline specification as in Figure 6, augmented with four lags of the instrument. Orange dashed: adding progressive controls for trade openness, domestic unrest, war exposure, and institutional quality. Shaded bands show 95% confidence intervals based on Driscoll-Kraay standard errors.

Figure 13 presents LP-IV estimates from both strategies. The two instruments exploit fundamentally different sources of variation—diplomatic rhetoric in one case, major-nation succession dynamics in the other—yet produce convergent results. Panel (a) shows that the verbal-conflicts IV generates positive, hump-shaped growth responses of 20–30 log points over the first decade, closely tracking the baseline OLS.[34] Panel (b) shows that the leadership-change IV produces a similar

[33]Results are robust across six alternative bilateral-shift windows. Appendix B.9 reports the full window robustness analysis.

[34]The first-stage Wald F-statistic for the verbal-conflicts instrument at h = 0 is 520. This reflects the mechanical correlation between non-economic verbal conflicts—a component of the aggregate index—and overall geopolitical alignment. Standard critical values for weak-instrument inference are not directly applicable when the instrument is a component of the endogenous variable, so this statistic should be interpreted as confirming mechanical relevance rather than instrument strength in the conventional sense.

pattern, peaking at 25–45 log points within the first decade. The wider confidence intervals reflect the smaller number of identifying events (67 leadership changes versus continuous verbal-conflict variation), but the point estimates are positive and significant at the 90% level through horizon 15.

Both IV estimates are stable when progressively adding controls, and the convergence of two conceptually distinct strategies—one addressing economic-content endogeneity, the other addressing country-trajectory confounding—strengthens the credibility of the baseline relationship.[35] More broadly, the exercises in Sections 3.4–3.5 collectively narrow the class of confounders that could generate the baseline results: the component decomposition argues against economic-content confounding; partner and sub-period stability argue against dependence on any single power or era; progressive controls for trade, instability, war exposure, and institutional quality leave the response largely unchanged; placebo exercises reject mechanical artifacts and confirm that the response tracks the actual timing of shocks; and the two IV strategies address economic-channel and country-trajectory endogeneity. The class of threats that survives this battery consists of bundled transformation episodes—geopolitical reorientation coinciding with domestic regime change or economic reform whose non-geopolitical components affect growth through channels our controls capture imperfectly. The bulk of identifying variation comes from incremental diplomatic shifts rather than wholesale regime transformations, and the approximately linear relationship across the full shock distribution (Figure 9) suggests that the estimated effects are not driven by large outlier episodes where bundled confounding is most plausible.

4. Channels and Mechanisms

This section examines how geopolitical alignment influences the fundamental determinants of economic growth. We first verify robustness to alternative output measures, then trace the dynamic effects through key growth channels: stability, investment, productivity, trade, and human capital. We also revisit the democracy-growth nexus, showing that geopolitical relations mediate a substantial share of democracy's short-run growth effects while democracy retains independent long-run benefits.

[35] Appendix B.8 provides detailed first-stage dynamics for the verbal-conflicts IV and stability across alternative fixed effects specifications. Appendix B.9 reports the leadership-change event list, bilateral-shift window robustness, and a split by event type.

4.1. Alternative Output Measures

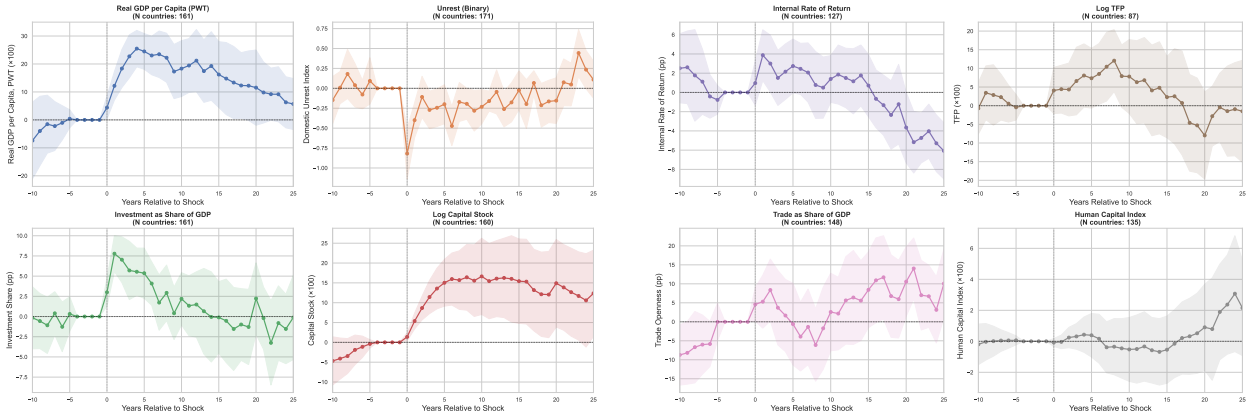
Our main analysis employs GDP per capita from the World Bank to maximize country and temporal coverage. To verify that our results are not sensitive to this choice, we first examine the response using real GDP per capita from the Penn World Table. Panel (a) of Figure 14 shows that the impulse response closely matches our baseline estimates, with output increasing by approximately 20 log points within 15 years.

4.2. Mechanisms and Growth Fundamentals

To trace the channels through which the geopolitical alignment index may affect growth, we estimate reduced-form responses of key growth determinants to the same geopolitical shock:

$$m_{c,t+h} = \alpha_h^m p_{ct} + \sum_{\ell=1}^{4} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{4} \gamma_\ell p_{c,t-\ell} + \sum_{\ell=1}^{4} \lambda_\ell m_{c,t-\ell} + \delta_c + \delta_{r(c)t} + \mu_{c,t+h}^m \tag{5}$$

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 14. Dynamic Effects of the Geopolitical Alignment Index on Growth Correlates

This figure displays impulse responses of various economic outcomes to a unit improvement in geopolitical alignment. 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 (5) with baseline fixed effects and lag structure as in Figure 6, adding four lags of the dependent variable. 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 14 traces the reduced-form responses of growth fundamentals to geopolitical alignment changes, revealing a pattern of reinforcing dynamics. The responses exhibit distinct temporal patterns that illuminate the underlying mechanisms. Domestic political stability responds immediately and substantially—the unrest indicator drops sharply on impact before recovering toward baseline over the following years. This rapid stabilization likely reflects enhanced regime legitimacy from international recognition and external support that helps manage internal tensions.

Physical capital also responds quickly. Investment rises by 7–8 percentage points within the first few years, driving capital stock accumulation that peaks at 15–16 log points around years 8–12. The internal rate of return increases on impact, signaling improved investment opportunities, before declining as capital deepening proceeds. Total factor productivity rises to 8–10 log points around years 5–8 before gradually declining. As with all channels, these responses eventually dissipate as the transitory geopolitical improvement fades, but the timing varies: stability gains are immediate and short-lived, investment and TFP peak within a decade, while trade and human capital respond more gradually.

Trade openness expands to about 5 percentage points of GDP in the initial years, reaching 10–13 percentage points at longer horizons as diplomatic alignment reduces formal and informal barriers to commerce. The magnitude echoes Frankel and Romer (1999)'s findings on trade and growth. Human capital accumulation proceeds even more slowly, remaining near zero for most of the horizon before rising at the end of the 25-year window, reflecting the time required for educational investments to mature.

Appendix B.10 extends these findings across additional dimensions of economic development. The tax-to-GDP ratio 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 slow accumulation of educational gains under sustained stability. In contrast, market reforms, secondary school enrollment, employment rates, and labor share show no significant responses, consistent with geopolitical alignment operating primarily through existing economic structures, though limited statistical power may partly explain the null results. Both consumption measures—real consumption and domestic absorption per capita—closely track GDP responses, confirming that growth translates into broad household welfare improvements.

The compounding dynamics across these channels, from immediate stabilization through capital deepening to gradual human capital gains, help account for both the magnitude and persistence of the baseline growth effects.[36]

4.3. Democracy and Geopolitical Alignment

Democracy's growth effects may operate partly through international channels such as preferential foreign aid (Alesina and Dollar 2000) and reduced sanctions (Park 2024), both manifestations of geopolitical relations.[37] The causal effect of democratic institutions on development is extensively documented (Acemoglu, Johnson, and Robinson 2001; Acemoglu et al. 2019), and democratic peace theory suggests that democracies form more stable alliances (Maoz and Russett 1993; Leeds 2003). 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:

$$S_{cj,t+h} = \beta_h^j D_{ct}^{\text{ANRR}} + \sum_{\ell=1}^{4} \gamma_\ell S_{cj,t-\ell} + \delta_c + \delta_t + \varepsilon_{cjt+h} \tag{6}$$

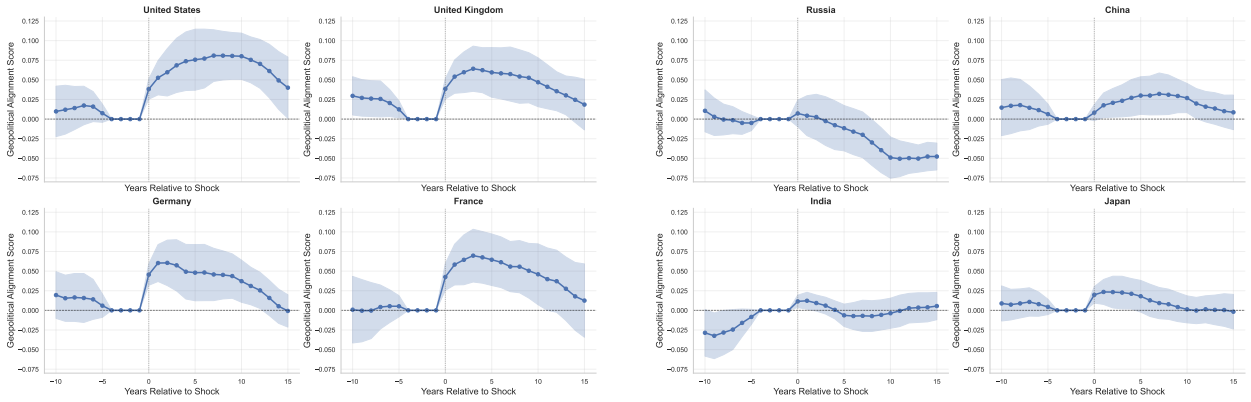
where $S_{cj,t}$ represents the bilateral geopolitical alignment score between country c and major nation j, and D_{ct}^{ANRR} is the democracy indicator. These estimates quantify the dynamic association between democratic transitions and subsequent bilateral relations, conditional on past relationship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

Figure 15 reveals marked heterogeneity in how bilateral relations with major nations evolve following democratization. Panel (a) shows that relations with Western democracies—the United

[36] While the temporal sequencing is suggestive, each channel is estimated in a separate reduced-form regression; we do not establish a causal ordering among mediators.

[37] In our framework, sanctions constitute negative geopolitical events that lower bilateral Goldstein scores, directly contributing to our geopolitical alignment index.

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 within the first few years 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 15. Bilateral Geopolitical Responses to Democratization

This figure shows impulse responses of bilateral geopolitical alignment 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 (6) 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) shows markedly different patterns for non-Western powers. Democratization is associated with significantly deteriorating relations with Russia, with bilateral scores declining by approximately 0.05 points over 10–15 years, consistent with geopolitical tensions that often accompany political realignment away from Russian influence. China shows a modest positive association, with bilateral scores rising by approximately 0.02–0.03 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:

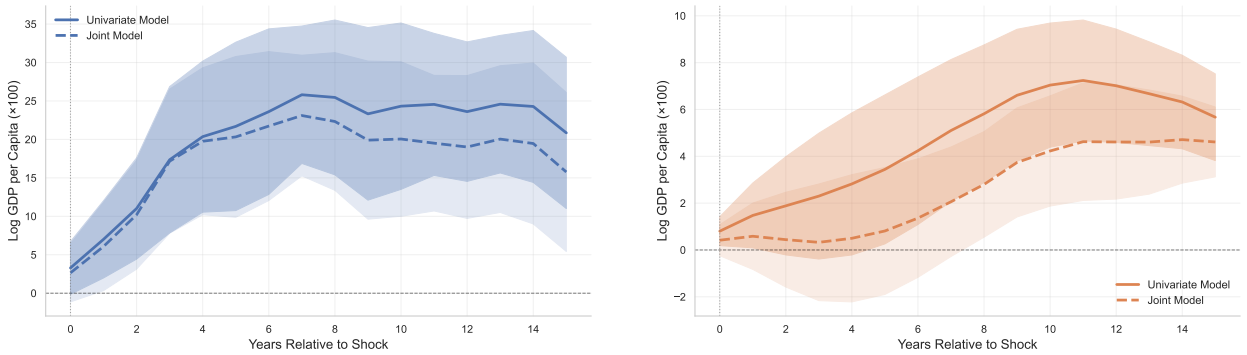
$$y_{c,t+h} = \alpha_h^{\text{Geo}} p_{ct} + \alpha_h^{\text{Dem}} D_{ct}^{\text{ANRR}} + \boldsymbol{\gamma}_h' \mathbf{x}_{ct} + \delta_c + \delta_t + \mu_{c,t+h}$$

where both the geopolitical alignment index (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.[38]

Figure 16 presents the results. Panel (a) shows that the geopolitical alignment index maintains 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 about 23 log points after 7–8 years, compared to about 26 log points without democracy controls. This modest reduction of about 10–15% suggests that while some of the benefits of geopolitical alignment operate through associated democratic transitions, most of the estimated effect remains after controlling for democracy.

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

[38] 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.



A. Geopolitical Alignment Index

B. Democracy

FIGURE 16. Horse-Race: Democracy versus Geopolitical Channels

This figure compares univariate and joint specifications for geopolitical alignment and democracy effects on GDP. Panel (a) shows the impulse response of geopolitical alignment, 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 alignment; the democracy univariate model excludes these lags to match ANRR's approach. Coefficients represent log point changes in GDP per capita (×100).

economic restrictions, as documented by Park (2024) for sanctions.

However, the majority of democracy's long-run growth impact persists even after accounting for geopolitical channels. By horizon 15, democracy continues to generate about 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.11, transitory democratic episodes generate growth almost exclusively through temporary geopolitical improvements. In contrast, permanent democratic transitions yield cumulative GDP gains of roughly 20 log points over 25 years, with geopolitical channels explaining only 30–40% of this effect. The remaining 60–70% is consistent with domestic institutional channels, including enhanced property rights, political stability, reduced expropriation risk, and human capital accumulation—that materialize gradually but persist independently of international alignment.[39]

These results reveal how domestic institutions and the external political environment jointly shape economic development. Democracy's short-run growth effects operate largely through improved geopolitical relations, while its long-run benefits persist through domestic institutional

[39]Our estimate of 20 log points for permanent democratization aligns closely with Acemoglu et al. (2019)'s finding of approximately 20% in the long run; see Appendix B.11 for the full transitory-versus-permanent decomposition.

channels. This helps reconcile conflicting findings in the literature—studies emphasizing international relations and those highlighting institutional quality both capture real phenomena operating through distinct mechanisms.

5. Geopolitical Growth Accounting

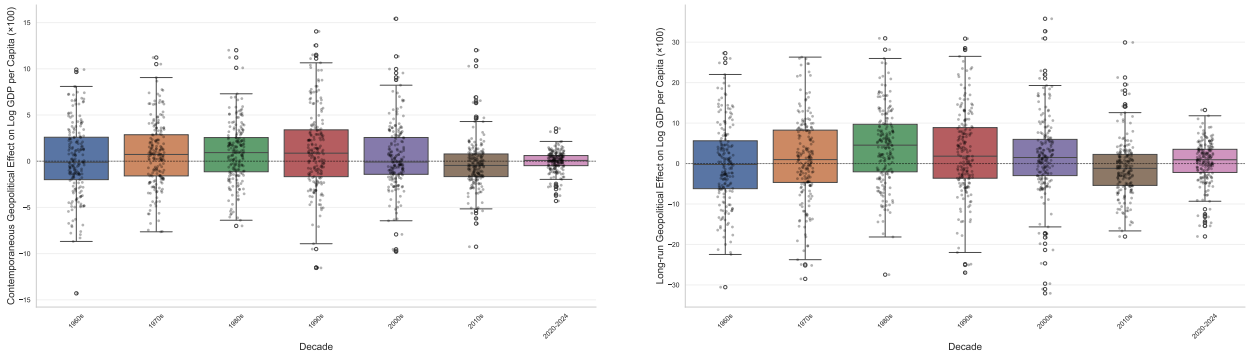
Section 3 estimates the dynamic GDP response to within-country changes in the geopolitical alignment index. In this section, we use those estimated impulse responses as an accounting tool to quantify the implied contributions of observed geopolitical changes over time and to illustrate how persistent cross-country differences in geopolitical alignment may translate into growth and income differences. The first exercise applies the estimated IRFs directly to observed within-country changes; the second extrapolates these estimates to cross-country differences under a maintained homogeneity assumption. These cross-country results should be interpreted as illustrative rather than separately identified.

5.1. Growth Effects of Changes in Geopolitical Alignment

For each country-decade pair, we calculate the change in the geopolitical alignment index from the beginning to the end of the decade and apply the relevant impulse response function to obtain growth effects.[40] This approach captures both the immediate economic impact within each decade (contemporaneous effect) and the projected long-term consequences (long-run effect).

Figure 17 presents the distribution of growth effects across countries for each decade from 1960 to 2024. Contemporaneous effects (panel a) show predominantly positive medians from the 1970s through the 2000s, ranging from 0.5% to 1%, with wide dispersion reflecting heterogeneous country experiences. Long-run effects (panel b) are correspondingly larger: the 1980s exhibit the highest median gains at 4–5%, followed by the 1990s and 2000s at around 2%. The 2010s mark a turning point, with median effects turning negative for the first time in both panels, consistent with the geopolitical fragmentation documented in Section 2.3. The 2020–2024 period shows a partial recovery, though with substantial dispersion reflecting the heterogeneous impacts of recent

[40] Specifically, for contemporaneous effects, we calculate $\sum_{t=0}^{9} \alpha_{9-t}^{\text{transitory}} (p_{c,\tau+t} - p_{c,\tau})$, where $\alpha_h^{\text{transitory}}$ is the transitory IRF at horizon h, $p_{c,\tau+t} - p_{c,\tau}$ is the cumulative change in the geopolitical alignment index from the start of the decade, 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 17. Distribution of Growth Effects from Changes in Geopolitical Alignment by Decade

This figure displays the distribution of GDP effects from within-decade changes in geopolitical alignment. 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 1.5 times the interquartile range, and outliers shown as individual points. The horizontal dashed line marks zero effect. The sample includes all countries with complete geopolitical and GDP data for the respective decade.

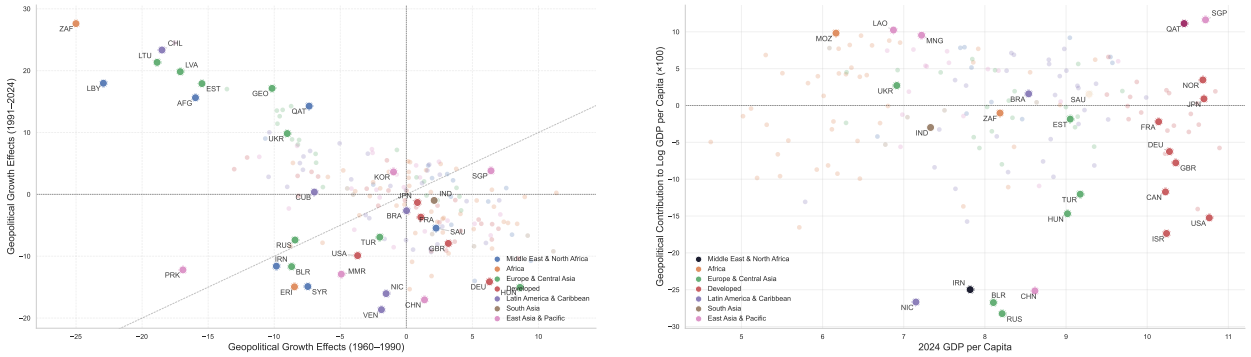
geopolitical upheavals including the Russia-Ukraine war.

5.2. Cross-Country Growth and Income Differences

While the empirical design in Section 3 identifies responses to within-country changes in geopolitical relations, it is useful to ask what these estimates imply for broader cross-country differences. We apply the estimated impulse responses to persistent differences in countries' geopolitical alignment index relative to a common benchmark—the median level of the geopolitical alignment index across countries in each year.[41]

Figure 18 presents the implied cross-country effects under the maintained homogeneity assumption. Panel (a) compares implied geopolitical growth effects during the Cold War (1960–1991) and post-Cold War (1992–2024) periods, using the dissolution of the Soviet Union as the breakpoint. Both periods show wide dispersion, with implied effects spanning −25% to +28%, but the composition of beneficiaries and adversely affected countries shifted substantially. Countries in the

[41] Formally, the geopolitical contribution to country c's GDP in year t is: $\Delta y^{\text{geo}}_{c,t} = \sum_{s=\max(1960,t-25)}^{t} \alpha^{\text{transitory}}_{t-s} \times (p_{c,s} - p^{\text{median}}_{s})$, where $\alpha^{\text{transitory}}_{h}$ is the transitory IRF at horizon h and p^{median}_{s} is the cross-country median of the geopolitical alignment index in year s. Panel (a) plots the within-era change $\Delta y^{\text{geo}}_{c,\text{end}} - \Delta y^{\text{geo}}_{c,\text{start}}$ for each period. Panel (b) applies the long-run permanent IRF to cross-country differences in 2024: $(p_{c,2024} - p^{\text{median}}_{2024}) \times \alpha^{\text{permanent}}_{25}$. Both exercises assume that the within-country dynamic response generalizes across countries—an assumption supported by the stability of our estimates across diverse specifications and country subsamples, but one that should be kept in mind when interpreting the results.



A. Implied Growth Differences

B. Implied Income Differences, 2024

FIGURE 18. Cross-Country Growth and Income Implications of Geopolitical Alignment

Both panels apply the estimated impulse responses from Section 3 to cross-country differences in geopolitical alignment relative to the sample median. Panel (a) plots the within-era change in implied geopolitical contributions ($\Delta y^{\text{geo}}_{c,\text{end}} - \Delta y^{\text{geo}}_{c,\text{start}}$) during 1960–1990 (x-axis) versus 1991–2024 (y-axis); countries in the upper-left quadrant experienced the largest positive reversals. Panel (b) shows the implied contribution to GDP in 2024, plotted against GDP per capita (log scale). Colors indicate regions; dashed lines mark zero.

upper-left quadrant—including South Africa, the Baltic states, Chile, and Georgia—experienced the largest reversals, moving from negative implied effects during the Cold War to positive effects afterward. South Africa's trajectory is the largest reversal, shifting from approximately −25% under apartheid-era isolation to +27% following democratic transition. Conversely, Venezuela, Nicaragua, and China show deteriorating implied effects in the post-Cold War period. The wide dispersion of countries across all four quadrants—rather than clustering along the 45-degree line—indicates that geopolitical fortunes are not persistent across eras.

Panel (b) translates these cumulative growth effects into implied income differences for 2024. The distribution is strikingly asymmetric: implied contributions range from approximately −29% to +12% of GDP, with the costs of geopolitical misalignment substantially exceeding the benefits of favorable alignment. The largest negative contributions fall on countries whose relations with major Western economies have deteriorated most sharply: Russia at approximately −29% following the Ukraine invasion, Belarus at −27%, and China at −25%. Several major developed economies also bear substantial costs: the United States at approximately −15%, Israel at −18%, and Canada at −12%. At the other end, the largest beneficiaries are small open economies with broad international engagement: Singapore at approximately +12%, followed by Laos, Mongolia, and Mozambique at approximately +10%.

These implied contributions show no systematic correlation with income levels—rich countries

are as likely as poor countries to experience geopolitical headwinds. The magnitude of implied effects, ranging from approximately −29% to +12% of GDP, suggests that geopolitical alignment is a quantitatively important dimension of cross-country income variation.[42]

6. Additional Robustness Results

6.1. Dynamic Panel Estimates

We complement the local projection estimates with a dynamic panel model that exploits autoregressive structure for more precise long-run inference (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 the geopolitical alignment index, 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:

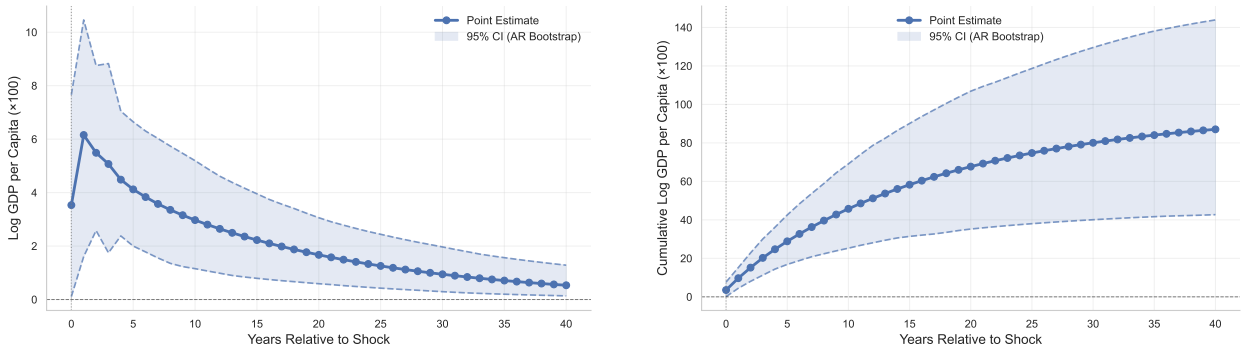
$$\phi_0 = \alpha, \quad \phi_k = \sum_{j=1}^{\min(k,J)} \beta_j \phi_{k-j} + \gamma_k \cdot \mathbf{1}[k \le J] \text{ for } k \ge 1, \quad \phi_\infty = \frac{\alpha + \sum_{\ell=1}^{J} \gamma_\ell}{1 - \sum_{\ell=1}^{J} \beta_\ell}$$

This formulation yields identical population impulse responses to those from our local projection approach (Plagborg-Møller and Wolf 2021) while offering improved small-sample precision through parametric structure.[43]

Figure 19 presents the dynamic panel estimates. Panel (a) shows the response to a purely transitory shock: the initial impact of 3.5 log points rises to a peak of approximately 6 log points at year 1 before declining monotonically thereafter. The response remains positive and statistically significant for approximately 25–30 years, confirming the persistence documented in Section 3.3. The gradual decay, reaching approximately 2 log points by year 15 and 1 log point by year 25, reflects

[42] For comparison, Acemoglu et al. (2019) estimate that democratization increases GDP per capita by approximately 20% in the long run. Our within-country estimates imply effects of similar magnitude (Section 3.3).

[43] With $T \approx 65$ years and $J = 4$, the Nickell bias in the autoregressive coefficients is of order $J/T \approx 6\%$, which modestly attenuates the estimated long-run multiplier ϕ_∞.



A. Response to Transitory Shock

B. Cumulative Response to Permanent Shock

FIGURE 19. 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 alignment. Panel (b) displays the cumulative response to a permanent unit shock. Baseline fixed effects and lag structure as in Figure 6. Shaded areas represent 95% confidence intervals from 500 bootstrap iterations using country-block resampling.

the persistence of growth effects as improved geopolitical relations trigger sustained investment and productivity gains.

Panel (b) shows cumulative gains from permanent improvements in geopolitical relations. GDP per capita rises steadily, reaching approximately 25 log points after 5 years, 55 after 15, and converging to approximately 87 log points by year 40.[44] The steady-state multiplier of approximately 87 log points implies that a one-standard-deviation improvement in the geopolitical alignment index (0.140 units) generates a long-run GDP gain of approximately 12.2 log points—slightly larger than the 10 log points implied by local projections, reflecting the parametric model's ability to extrapolate dynamics beyond the 25-year LP horizon.

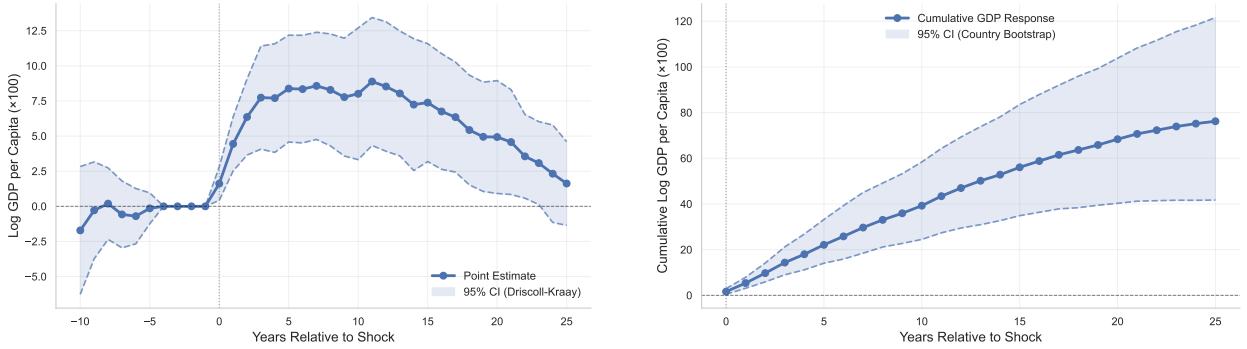
6.2. Alternative Measures of Geopolitical Alignment

We compare the event-based measure against three alternatives: unsmoothed event scores, UN General Assembly voting patterns, and horse-race specifications with economic sanctions and formal military alliances.

[44]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.

6.2.1. Impulse Responses to Average Event Scores

Our main analysis employs a dynamic geopolitical alignment 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).[45]



A. Response to Event-Based Scores

B. Cumulative Response to Permanent Shock

FIGURE 20. GDP Responses to Geopolitical Events

Baseline specification as in Figure 6, with event-based geopolitical alignment scores ($\tilde{S}_{ct}$) replacing the dynamic index. Panel (a) shows the impulse response of GDP per capita to a unit shock with 95% Driscoll-Kraay confidence intervals. Panel (b) displays the cumulative response to a permanent unit shock with 95% confidence intervals from 500 country-block bootstrap iterations.

Figure 20 shows that while GDP responds positively to average event scores, the magnitude is smaller than our baseline smoothed measure—peaking at 8–9 log points around years 5–10 versus 22 log points in our baseline. This attenuation reflects the transitory nature of individual events.[46] However, panel (b) shows that a permanent change in event flows yields a similar cumulative response of about 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 geopolitical alignment score, yielding equivalent long-run effects, and our smoothing procedure retains the fundamental relationship between geopolitics and growth. Appendix B.12 provides additional discussion.

[45] 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.

[46] Appendix B.12 shows that event scores exhibit rapid mean reversion, with approximately 58% of the initial impact dissipating within one year.

6.2.2. Measuring Geopolitical Alignment Using UNGA Votes

Our event-based measure covers bilateral geopolitical relations with universal scope. 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 B.12 in Appendix B.13 exposes fundamental limitations of UNGA-based measures for capturing growth-relevant geopolitical dynamics. When we maintain our baseline specification with country fixed effects, 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 intervals consistently spanning zero. This null result contrasts with our event-based measure, which produces robust and persistent growth effects.

This null result is consistent with the case evidence in Section 2.2: UNGA voting tracks bloc affiliation rather than bilateral dynamics, so within-country variation in UNGA alignment does not predict growth. Appendix B.13 develops these limitations in detail.

6.2.3. Sanctions and Formal Alliances

Sanctions and formal alliances provide informative bilateral benchmarks because they represent salient but narrow margins of interstate relations. Sanctions reflect explicit episodes of bilateral coercion; formal alliances reflect institutionalized security cooperation. Both are discrete and partial relative to a continuous measure of overall bilateral geopolitical relations. A natural horse-race test asks whether these standard bilateral proxies retain independent explanatory power once our broader event-based measure is included.

Using the Global Sanctions Database (Felbermayr et al. 2020; Yalcin et al. 2025), we construct a country-level sanctions exposure measure: $p_{ct}^{\text{Sanction}} = \sum_{j \in \mathcal{N}} \mathbb{1}_{cjt} \times \text{GDP share}_{jt}$, where $\mathbb{1}_{cjt}$ indicates whether a major nation j imposed sanctions on country c in year t. Figure B.13 in Appendix B.14 presents the results. When we control for sanctions, the geopolitical alignment index impulse response is essentially unchanged, peaking at 26–27 log points around year 7–8. In contrast,

controlling for geopolitical alignment attenuates the sanctions effect—the trough impact shrinks from approximately −10 to −7 log points, a reduction of roughly 30% at the peak—and the sanctions coefficient in the joint specification approaches zero by year 10, indicating that the broader geopolitical alignment index captures most of the longer-run sanctions signal. Sanctions represent one manifestation of deteriorating bilateral relations: they typically follow diplomatic protests, recalled ambassadors, and suspended agreements, all of which our event-based measure already incorporates.[47]

Formal alliances display a parallel pattern on the cooperative side. Using the Alliance Treaty Obligations and Provisions dataset (Leeds et al. 2002), we construct an analogous GDP-weighted alliance exposure measure: $p_{ct}^{\text{Alliance}} = \sum_{j \in \mathcal{N}} \mathbb{1}_{cjt}^{A} \times \text{GDP share}_{jt}$, where $\mathbb{1}_{cjt}^{A}$ indicates whether country c maintains an active formal alliance with major nation j in year t. Figure B.14 in Appendix B.15 shows that alliance exposure predicts higher GDP per capita in univariate specifications. Once the bilateral geopolitical score is included, the alliance coefficient falls by roughly one-half, while the coefficient on geopolitical alignment remains stable. The timing pattern is informative: the short-run alliance coefficient largely disappears once geopolitical alignment is controlled for, consistent with the event-based measure absorbing the diplomatic cooperation surrounding alliance formation, while a modest positive residual persists at longer horizons, suggesting that durable treaty commitments may contain institutional information beyond what annual event flow fully summarizes.

In both horse races, the event-based measure remains stable when the narrower proxy is included, while absorbing most of the proxy's explanatory power.

7. Conclusion

With the new event-based measure of bilateral geopolitical alignment, this paper provides evidence that improvements in geopolitical alignment have large, persistent effects on economic growth, with multiple complementary designs supporting a causal interpretation. Our results carry a broader message for the growth literature: the traditional separation between "domestic" and "international"

[47] 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.

determinants of growth obscures important interactions between domestic factors and the external political environment. Improvements in geopolitical alignment are associated with reinforcing gains across stability, investment, productivity, trade, and human capital, with distinct temporal patterns that explain why even transitory improvements generate lasting economic benefits. The democracy–geopolitics decomposition shows that geopolitical and institutional channels are complementary but operate at different horizons.

These findings are subject to important caveats. Our identification strategy exploits within-country variation and therefore speaks to the effects of changes in geopolitical relations, 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. While our two IV strategies lend support to a causal interpretation, neither exclusion restriction is beyond dispute: verbal conflicts may reflect regime deterioration that independently affects growth, and major-nation leadership transitions may transmit policy spillovers beyond the bilateral channel.

The implications go beyond the general case for openness. Our growth accounting suggests that the benefits of cooperative geopolitical alignment are neither automatic nor permanent: the post-2010 reversal toward fragmentation implies measurable costs, with median geopolitical growth contributions turning negative for the first time in six decades of data. Yet the finding that relations with ideologically different major powers yield comparable economic benefits suggests that countries need not choose sides to prosper.

As the post-Cold War order gives way to renewed strategic competition, the external political environment is an increasingly consequential dimension of economic development; the framework developed here provides a basis for quantifying its stakes—from the costs of bilateral deterioration to the benefits of diversified engagement.

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Online Appendix A. Event-based Measure of Geopolitical Alignment

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

A.1. Major Nations

Our event-based measure of geopolitical alignment is designed to be flexible and applicable to any country over time. In this analysis, we examine geopolitical alignment 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 how geopolitical dynamics influence economic growth.

Figure A.1 presents the time series of aggregate and individual GDP shares for these 24 major nations.[48] 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.

[48]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.

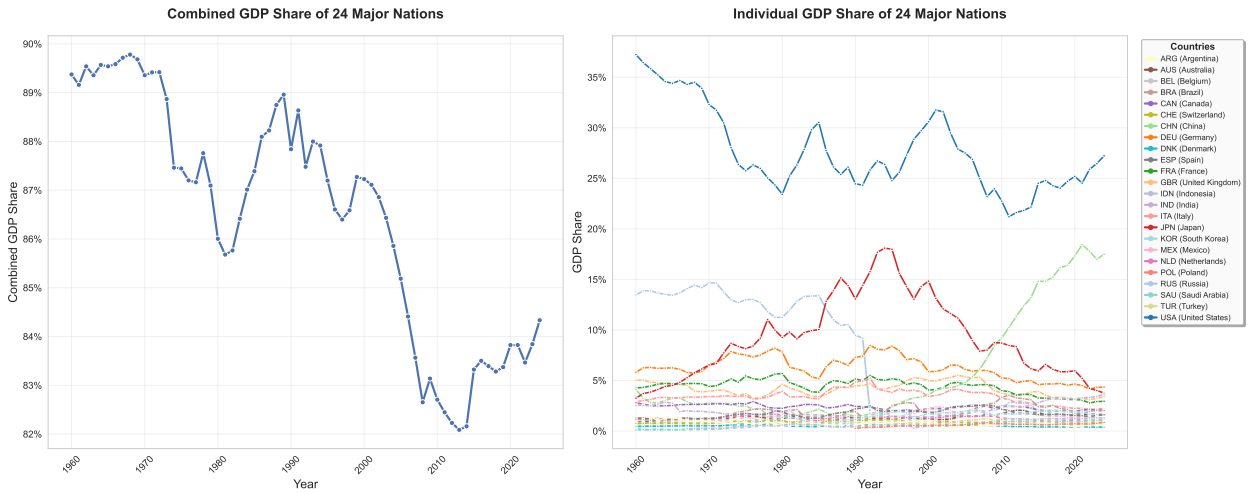


FIGURE A.1. GDP Shares of Major Nations. Panel (a) shows the combined GDP share of 24 major nations (Argentina, Australia, Belgium, Brazil, Canada, Switzerland, People's Republic of China, Germany, Denmark, Spain, France, United Kingdom, Indonesia, India, Italy, Japan, Republic of Korea, Mexico, Netherlands, 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).

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

This subsection provides additional detail on the event compilation and analysis procedure described in Section 2.1. The complete prompt structure is in 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 A.1 summarizes the six dimensions and 25 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. 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 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 Appendix C.3.

Tables 1 and A.2 illustrate the range of the methodology: 2022 U.S.-Russia events are dominated

TABLE A.1. 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 A.2. 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

by conflict scores (−4.5 to −8.0), while the 1972 détente period features exclusively cooperative events (+5.0 to +9.0).

A.2.2. Statistics of Geopolitical Events

Table A.3 and Figure A.2 provide detailed statistics on the 373,020 events compiled across six decades.

Table A.3 and Figure A.2 reveal three patterns. First, international interactions are overwhelmingly cooperative: 83% of events fall in cooperative categories (verbal and material), with conflict events comprising only 17%. Second, total event volume more than tripled from 29,289 in the 1960s to

TABLE A.3. 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
Event Category Classification								
Economic Relations (A)	6,296	9,045	10,288	14,067	20,365	26,366	14,847	101,274
Diplomatic & Political (B)	11,559	12,516	14,082	16,058	25,591	41,086	23,529	144,421
Security & Defense (C)	3,635	3,205	3,879	4,361	5,507	8,343	5,175	34,105
Legal & Territorial (D)	1,588	1,889	1,614	2,226	3,565	4,736	2,443	18,061
Multilateral & Governance (E)	5,239	6,212	6,624	9,765	10,780	11,268	7,459	57,347
Other Significant Events (F)	974	1,362	2,561	2,052	3,073	4,377	3,426	17,825
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). Event categories follow the six-category classification embedded in the LLM prompt: (A) Economic Relations, (B) Diplomatic & Political Relations, (C) Security & Defense, (D) Legal, Territorial & Movement, (E) Multilateral & Global Governance, and (F) Other Significant Events. See Table A.1 for subcategory details. All entries represent event counts except Goldstein Scale statistics. Event categories are not mutually exclusive; 13 events fall into multiple categories, so category totals slightly exceed the overall total.

96,175 in the 2010s, driven primarily by expanding cooperative interactions. Third, mean Goldstein scores rose from Cold War levels (2.86–3.28) to a post-Cold War peak (3.98–4.09) before declining modestly from 3.88 in the 2010s to 3.73 in the 2020s, consistent with the distributional dynamics in Section 2.3. Across the six event categories, diplomatic and political interactions (category B) account for 39% of all events, followed by economic relations (A, 27%) and multilateral governance (E, 15%). Security and defense events (C) constitute 9%, while legal/territorial (D) and other events (F) account for 5% each. Appendix C provides additional visualizations of these temporal patterns.

Temporal Coverage and Event Counts. The rising event counts over time reflect two reinforcing factors: the genuine intensification of bilateral interactions—the proliferation of international institutions, trade agreements, and diplomatic channels documented in the international relations literature—and the greater availability of digitized source material for more recent decades in LLM training

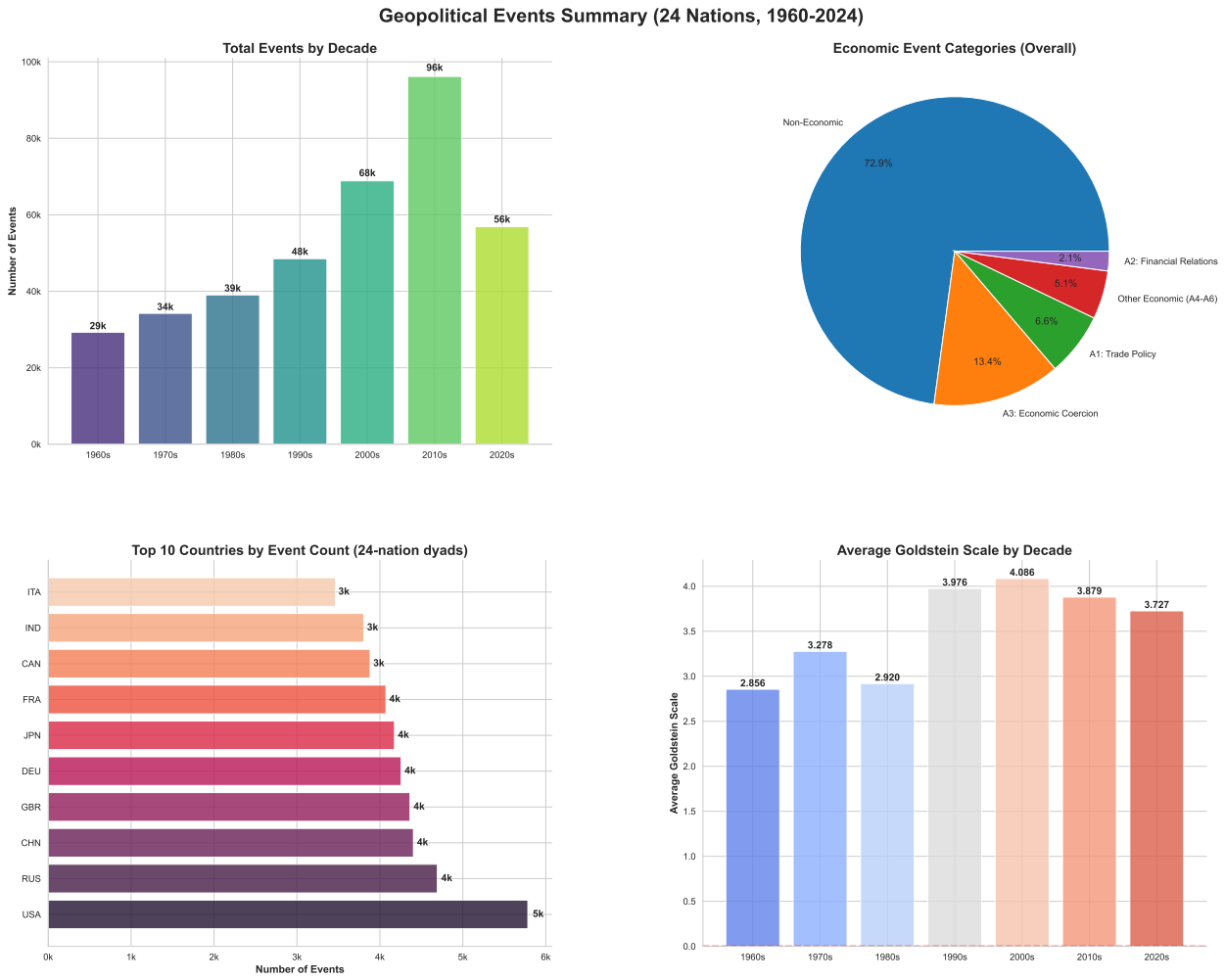


FIGURE A.2. Geopolitical Events Summary (1960–2024)

corpora. Three features of our measurement design mitigate the concern that this trend distorts the geopolitical alignment scores. First, the scores are constructed from Goldstein-weighted averages of events within each country-pair-year, so they capture the intensity composition of interactions rather than raw event volume. Second, as discussed in Section 2.1, major geopolitical events appear in multiple independent sources (diplomatic archives, news coverage, academic histories, and policy analyses), supporting reliable extraction even for earlier decades. Third, estimating the baseline specification separately for 1960–1989 and 1990–2019 yields comparable growth effects in both sub-periods (Section 3.4.2), indicating that the lower event counts in earlier decades do not attenuate the estimated relationship.

A.3. Additional Case Validation for Geopolitical Alignment Scores

This section provides additional validation of our dynamic geopolitical scores beyond the cases presented in the main text (Figures 2 and 3). We examine eight bilateral relationships spanning different regions and relationship types: great power rivalries, ideological revolutions, war-to-normalization transitions, sectarian conflicts, and diplomatic reversals. In each panel, the blue solid line shows the dynamic geopolitical score while the gray dashed line shows the raw (unsmoothed) yearly score. Shaded regions highlight key historical periods and boxed labels mark major bilateral events.

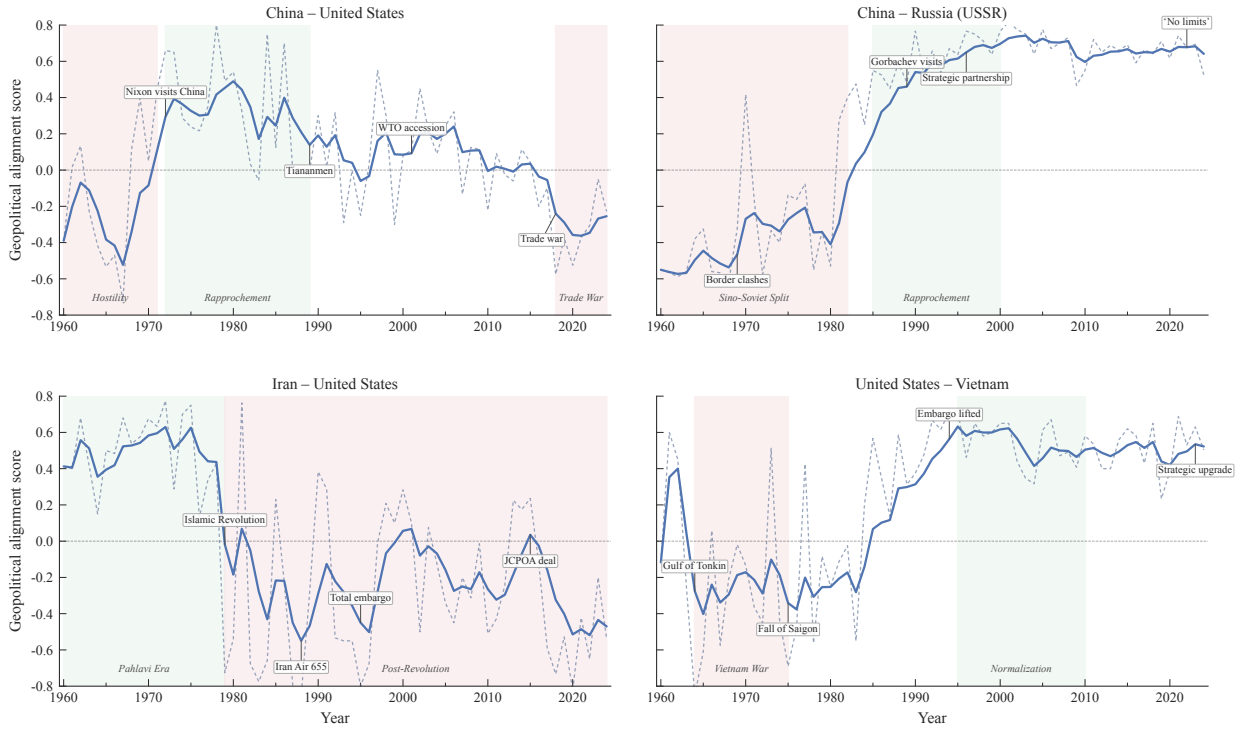


FIGURE A.3. Geopolitical Alignment Scores: Major Power Dynamics

Dynamic geopolitical alignment scores for four major-power bilateral relationships, 1960–2024. Panel (a): China–United States, from Cold War hostility through Nixon's rapprochement and WTO-era cooperation to the recent trade war. Panel (b): China–Russia, capturing the Sino-Soviet split, border clashes, Gorbachev-era rapprochement, and the contemporary "no limits" partnership. Panel (c): Iran–United States, showing the sharp discontinuity at the 1979 Islamic Revolution and sustained hostility interrupted briefly by the JCPOA. Panel (d): United States–Vietnam, tracing the arc from war through normalization to the 2023 strategic upgrade.

Figure A.3 presents four major-power relationships. The China–U.S. trajectory (panel a) traces five distinct phases: Cold War-era hostility in the 1960s with scores near −0.4, Nixon's 1972 opening, which lifted scores above +0.4, a post-Tiananmen deterioration around 1989, a period of WTO-era

cooperation in the early 2000s, and the sharp trade-war decline after 2018 that returns scores to levels comparable to the 1960s. The China–Russia case (panel b) traces one of the largest shifts in Cold War geopolitics—from alliance through the Sino-Soviet split and 1969 border clashes (scores near −0.5) to Gorbachev's 1989 visit, the strategic partnership of the late 1990s, and the contemporary "no limits" partnership with scores exceeding +0.7. Iran–U.S. relations (panel c) exhibit a clean regime-change discontinuity at the 1979 Islamic Revolution, with scores collapsing from approximately +0.5 during the Pahlavi era to sustained hostility below −0.4, punctuated by the Iran Air 655 incident (1988), the total embargo (1995), and the brief JCPOA-related recovery around 2015. The U.S.–Vietnam case (panel d) demonstrates a complete war-to-normalization transition: scores fall from moderate levels in the early 1960s through the Gulf of Tonkin escalation and the Fall of Saigon to deep hostility, before recovering steadily after the 1994 embargo removal and reaching cooperative levels with the 2023 strategic upgrade.

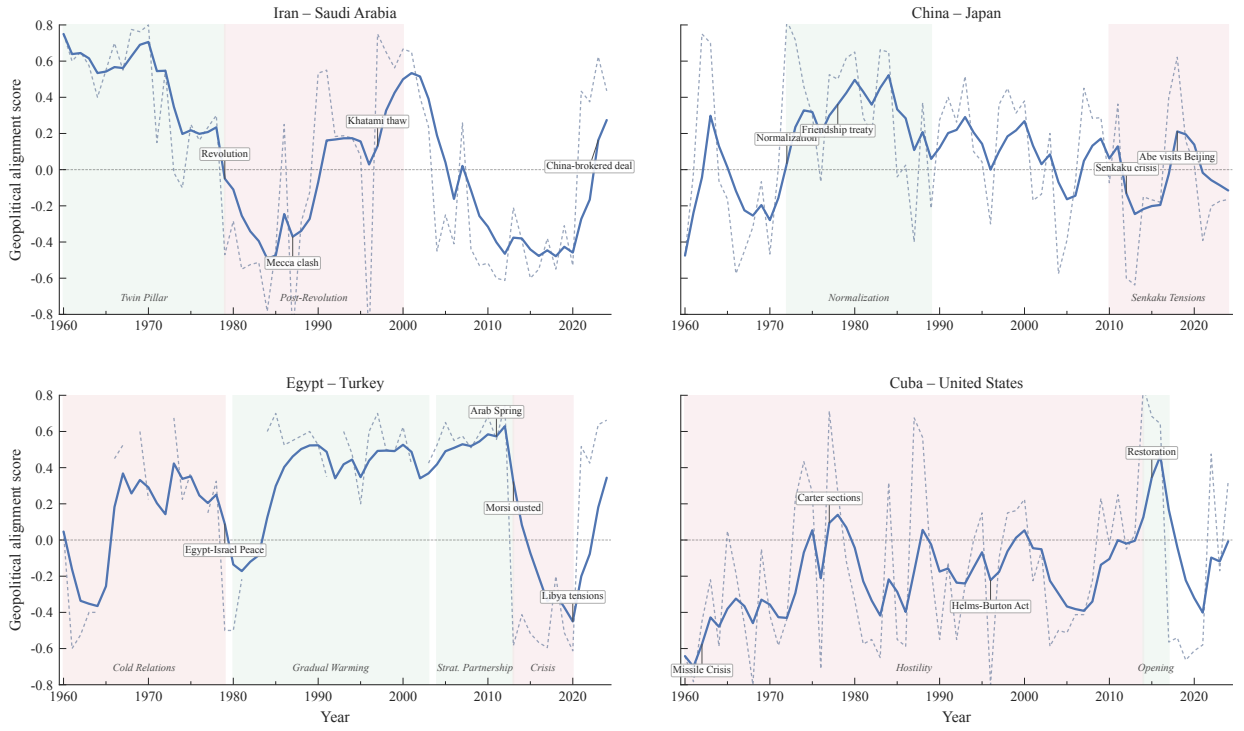


FIGURE A.4. Geopolitical Alignment Scores: Regional Rivalries and Bilateral Dynamics

Dynamic geopolitical alignment scores for four regional bilateral relationships, 1960–2024. Panel (a): Iran–Saudi Arabia, from the Twin Pillar era through post-revolutionary rivalry to the 2023 China-brokered rapprochement. Panel (b): China–Japan, capturing post-war normalization, the friendship treaty era, and the Senkaku/Diaoyu crisis. Panel (c): Egypt–Turkey, showing cold relations during the Nasser era, gradual warming, the strategic partnership peak under Morsi, and the dramatic post-2013 collapse. Panel (d): Cuba–United States, illustrating persistent hostility following the Castro revolution with the brief Obama-era opening.

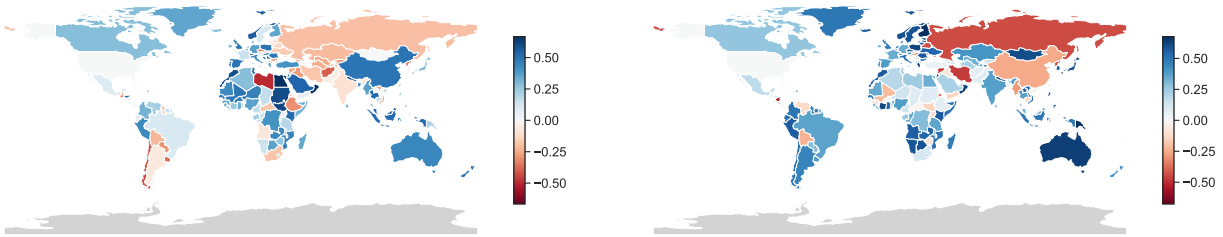
Figure A.4 presents four regional relationships. The Iran–Saudi Arabia case (panel a) tracks the Twin Pillar era of cooperation under the Shah (scores near +0.7), the sharp post-revolutionary deterioration including the 1987 Mecca clash (scores dropping to approximately −0.3), the Khatami-era thaw in the late 1990s that temporarily restored scores above +0.5, and the subsequent deterioration followed by the 2023 China-brokered rapprochement. China–Japan relations (panel b) show the post-war normalization around 1972 and the friendship treaty period of the late 1970s (scores reaching +0.8), followed by gradual erosion and the sharp deterioration after the 2012 Senkaku/Diaoyu crisis, with a modest recovery around Abe's 2018 visit to Beijing. The Egypt–Turkey case (panel c) reflects cold relations during the Nasser era in the 1960s (scores near −0.2), gradual warming after Egypt's 1979 peace with Israel, a strategic partnership peak during the Arab Spring and Morsi presidency in 2011–2012 (scores reaching approximately +0.6), and the collapse after Morsi's ouster in 2013 with continuing tensions over Libya. Finally, Cuba–U.S. relations (panel d) show persistent hostility following the 1962 Missile Crisis and the Castro revolution, interrupted briefly by the Carter-era interest sections in the late 1970s, tightened further by the 1996 Helms-Burton Act, and punctuated by the sharp Obama-era restoration around 2015 before subsequent reversal.

A.4. Maps of Bilateral Geopolitical Alignment with the US and Its Rivals

This section provides geographic visualization of geopolitical alignment, comparing Cold War patterns (1980) with the contemporary landscape (2024) for both the United States and its principal rivals.

Figure A.5 shows the transformation from Cold War bipolarity (1980: strong NATO/Pacific alliance bloc vs. hostile Soviet/Eastern European bloc) to a more complex 2024 landscape where core Western alliances remain intact but Russia and China appear in deep red, while much of Latin America, Africa, and Southeast Asia maintain moderate or neutral relations.

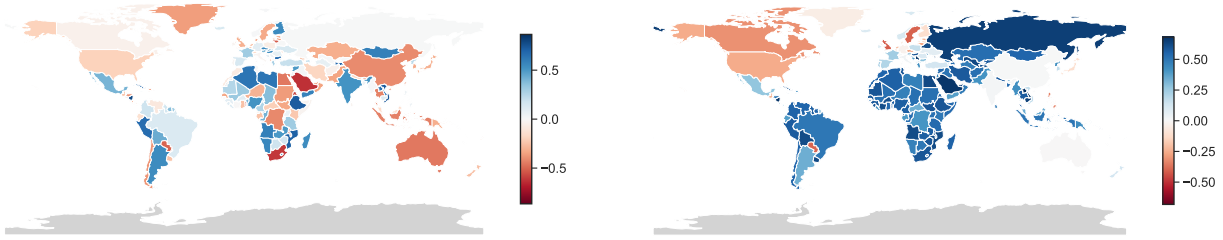
Figure A.6 contrasts the geographic reach of America's principal rivals. The Soviet Union's 1980 positive relations concentrated in Eastern Europe, Cuba, and select African and Middle Eastern allies, with China notably hostile (reflecting the Sino-Soviet split). China's 2024 map shows a fundamentally different pattern: positive relations extend broadly across Sub-Saharan Africa, Central Asia, and Latin America through economic engagement, though China faces hostile relations



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

FIGURE A.5. Map of Geopolitical Alignment with the United States

World maps showing bilateral geopolitical alignment scores with the United States in 1980 and 2024. Blue colors indicate positive alignment; red colors indicate negative alignment. 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.



A. Soviet Union, 1980 B. China, 2024

FIGURE A.6. Map of Geopolitical Alignment: 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 alignment was concentrated in Eastern Europe and select developing countries, China's positive alignment extends broadly across Asia, Africa, and Latin America through economic engagement.

with the United States, Australia, and India. The contrast between the near-mirror-image U.S./Soviet maps of 1980 and the overlapping U.S./China maps of 2024—where many developing countries maintain positive relations with both—is consistent with the shift from Cold War bipolarity to the more complex distributional patterns documented in Figure 5.

A.5. 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 A.7 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

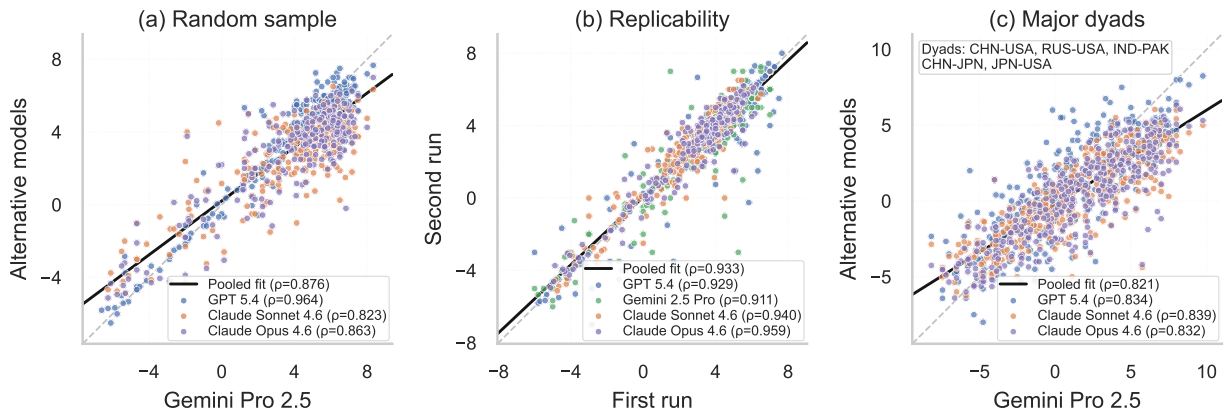


FIGURE A.7. Model Robustness and Replicability of Geopolitical Alignment Scores

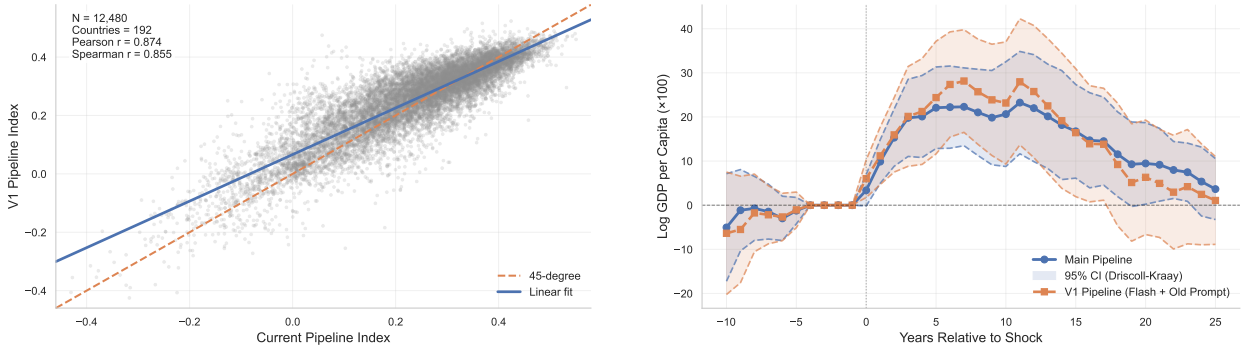
Notes: Each point represents the mean Goldstein score for a country-pair-year observation. Panel (a) compares scores from alternative models (vertical axis) against Gemini 2.5 Pro (horizontal axis) for 300 randomly selected dyad-years. Panel (b) tests within-model replicability by running each model 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.

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.[49] Within-model correlations exceed cross-model correlations (pooled $\rho = 0.93$): the within-model residual reflects only stochastic decoding, whereas cross-model differences additionally capture variation in training data and scoring conventions. Among the models tested, Opus 4.6 and Sonnet 4.6 exhibit the highest replicability, 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 the measurement is robust to the choice of LLM.

Full-Pipeline Robustness. The preceding exercises hold the prompt structure fixed and vary only the model on subsamples. We next vary the entire measurement pipeline (both the LLM and the prompt structure) to check whether the economic conclusions change. We compare our baseline index to an earlier version (V1) constructed using Gemini 2.5 Flash with a different prompt

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

structure developed prior to the current specification.[50] To isolate measurement from aggregation differences, we reconstruct the V1 country-year index using the same 24-partner universe and the same time-varying GDP-share weights as the baseline.



A. Country-Year Index Correlation

B. Impulse Response Overlay

FIGURE A.8. Full-Pipeline Robustness: Alternative LLM and Prompt Structure

Panel (a) plots the country-year geopolitical alignment index from the V1 pipeline (Gemini 2.5 Flash with an earlier prompt structure) against the current baseline (Gemini 2.5 Pro) for all 12,480 overlapping country-year observations across 192 countries. The blue solid line shows the linear fit; the orange dashed line shows the 45-degree line. Panel (b) overlays the baseline impulse response of log GDP per capita (×100) from the main pipeline (blue) with the corresponding estimate using the V1 pipeline index (orange), both estimated on a common sample of 150 countries. Shaded areas represent 95% confidence intervals based on Driscoll-Kraay standard errors.

Figure A.8 reports the results. Panel (a) shows that the two country-year indices are strongly correlated (Pearson $\rho = 0.874$, Spearman $\rho = 0.855$), with the linear fit closely tracking the 45-degree line. Panel (b) overlays the baseline impulse response with the V1 pipeline estimate on a common sample of 150 countries. Both pipelines produce the same qualitative dynamics: no pre-trends, a hump-shaped response peaking around years 5–8, and gradual decay thereafter. The V1 point estimates fall within the 95% confidence interval of the main pipeline at all 26 post-shock horizons, and the horizon-by-horizon correlation of point estimates is 0.97. Because this exercise varies both the LLM and the prompt structure simultaneously, it provides a joint test of sensitivity to the complete measurement pipeline rather than any single component.

Measurement Validity. The exercises above demonstrate that different models and pipelines converge on similar scores, establishing measurement *reliability*. A distinct question is whether this convergence reflects accuracy or a shared bias: frontier LLMs are trained on overlapping corpora

[50]The V1 prompt pursues the same objective of identifying and scoring bilateral geopolitical events using the CAMEO/Goldstein framework but differs in scope, organization, and event taxonomy. Complete V1 prompt specifications are available upon request.

that encode historical narratives linking geopolitical cooperation to economic success, and could systematically assign more cooperative assessments to country-periods associated with known prosperity.

The measurement architecture limits the scope for such contamination. The LLM does not assess bilateral relations in an open-ended manner. It identifies events within a predefined ontology of six dimensions and 25 subcategories (Table A.1), classifies them using the CAMEO taxonomy, and scores them on the Goldstein scale—external frameworks that predate our study. The remaining discretion is whether a specific event within a predefined subcategory meets the significance threshold, not what kinds of events matter for bilateral relations. Moreover, scores are constructed from Goldstein-weighted averages rather than sums, so retrieving more events for well-documented periods does not mechanically raise cooperation levels.

On the identification side, region-year fixed effects absorb documentation patterns common to a region-period; the IV using non-economic verbal conflicts isolates a narrow event category unlikely to reflect growth narratives (Section 3.5); and sub-period estimates for 1960–1989 and 1990–2019 are comparable (Section 3.4.2), indicating that the thinner digitized record in earlier decades does not attenuate the relationship. Nonetheless, a definitive test would compare LLM-generated scores against human-coded benchmarks on a stratified sample of dyad-years, and we view such validation as a priority for future work.

A.6. Dynamics of Geopolitical Alignment

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

Methodology. We estimate impulse response functions using local projections for two key measures. For the geopolitical alignment index, we estimate:

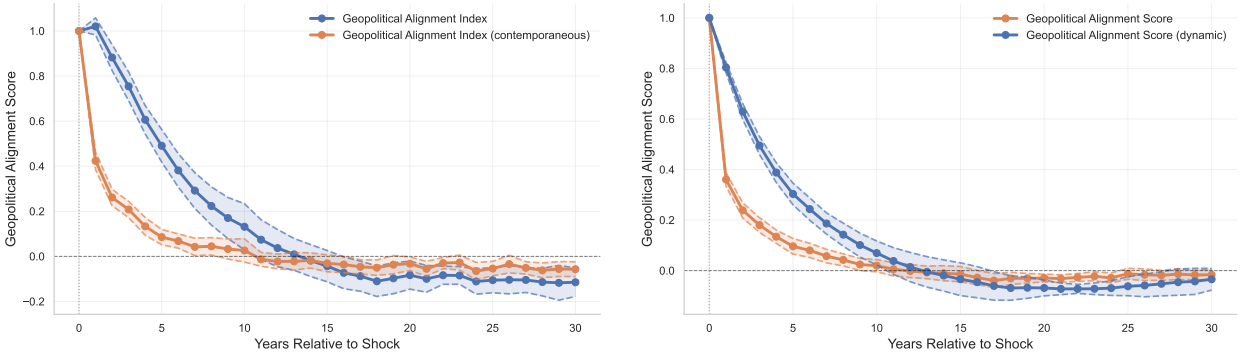
$$p_{c,t+h} = \alpha_h^{\text{Geo. Align.}} p_{ct} + \boldsymbol{\gamma}_h' \mathbf{x}_{ct} + \mu_{c,t+h}, \quad h = 0, 1, \ldots, 30$$

where p_{ct} denotes either our dynamic geopolitical alignment index or the contemporaneous average, $\mathbf{x}_{ct}$ includes four lags of GDP and the respective geopolitical alignment 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.



A. Country-Level Geopolitical Alignment Index B. Bilateral Geopolitical Alignment Scores

FIGURE A.9. Impulse Response Functions of Geopolitical Alignment Measures

Local projection impulse responses to own shocks. Panel (a): Geopolitical alignment index with dynamic measure (blue) and contemporaneous average (orange). Panel (b): Bilateral geopolitical alignment scores with dynamic score (blue) and yearly average (orange). Shaded areas represent 95% confidence intervals. Panel (a) includes four lags of GDP and the respective geopolitical alignment 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.

Results. Figure A.9 presents the impulse responses for both country-level relations and bilateral scores. Panel (a) shows that the dynamic geopolitical alignment index exhibits substantial persistence with a half-life of approximately 4 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.

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 support our dynamic specification's ability to capture the inherent persistence in geopolitical alignment while filtering out short-term noise from individual events.

A.7. Statistics of the Geopolitical Alignment Index

Table A.4 presents summary statistics for the geopolitical alignment index across seven decades, revealing systematic patterns in the evolution of global geopolitical alignment.

TABLE A.4. Summary Statistics of the Geopolitical Alignment Index by Decade, 1960–2024

	1960s	1970s	1980s	1990s	2000s	2010s	2020s	Overall
Summary Statistics								
Mean	0.177	0.193	0.182	0.260	0.287	0.296	0.281	0.237
Median	0.194	0.207	0.209	0.284	0.315	0.319	0.302	0.262
Std. Dev.	0.141	0.119	0.138	0.152	0.132	0.108	0.114	0.140
Min	−0.323	−0.315	−0.275	−0.430	−0.256	−0.335	−0.160	−0.430
Max	0.499	0.531	0.466	0.550	0.548	0.479	0.482	0.550
5th Pct.	−0.055	−0.013	−0.103	−0.027	0.023	0.082	0.059	−0.029
25th Pct.	0.069	0.111	0.111	0.188	0.226	0.251	0.223	0.156
75th Pct.	0.286	0.281	0.284	0.371	0.378	0.368	0.367	0.340
95th Pct.	0.379	0.368	0.359	0.451	0.446	0.425	0.422	0.422
N Country-Years	1,883	1,911	1,925	1,930	1,930	1,930	965	12,474
Countries with Lowest Geopolitical Alignment Index (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 Alignment Index (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	–

The geopolitical alignment index is the GDP-weighted average of bilateral geopolitical alignment scores for each country. Statistics are calculated using all available country-year observations within each decade. Countries are ranked by their decade-average geopolitical alignment index values.

The summary statistics reveal three key patterns. First, the mean geopolitical alignment index improved from 0.177 in the 1960s to 0.296 in the 2010s—an increase of approximately 0.85 standard deviations—before declining 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 substantially 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 alignment index 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.8. Bilateral Outcomes: External Validity

Table A.5 reports gravity regressions of four bilateral outcomes on the geopolitical alignment score $S_{od,t}$. Columns (1)–(3) include distance controls and origin-year and destination-year fixed effects for each sub-period; column (4) adds dyad fixed effects, identifying off within-pair temporal variation. Bilateral alignment is strongly associated with trade, sanctions, migration, and foreign aid. The cross-sectional associations generally strengthen over time for trade and sanctions, though the pattern is non-monotonic for aid. The within-pair estimates confirm that improvements in alignment predict higher trade, lower sanction probability, and greater aid flows, supporting the external validity of the measure.

TABLE A.5. Geopolitical Alignment and Bilateral Outcomes: Gravity Regressions

	Cold War 1963–1990 (1)	Globalization 1990–2010 (2)	Fragmentation 2010–2024 (3)	All Years (Dyad FE) (4)
Panel A. Dependent Variable: Log Bilateral Trade				
Geopolitical Alignment ($S_{od,t}$)	1.145***	1.351***	1.456***	0.355***
	(0.056)	(0.046)	(0.053)	(0.019)
Observations	294,249	431,435	393,405	1,087,543
Panel B. Dependent Variable: Sanction Indicator (LPM)				
Geopolitical Alignment ($S_{od,t}$)	−0.023***	−0.030***	−0.049***	−0.021***
	(0.002)	(0.003)	(0.004)	(0.001)
Sanction Rate	0.020	0.084	0.106	0.052
Observations	1,037,568	778,176	555,840	2,779,200
Panel C. Dependent Variable: Log Bilateral Migration				
Geopolitical Alignment ($S_{od,t}$)	0.745***	0.960***		
	(0.057)	(0.063)		
Observations	48,640	36,955		
Panel D. Dependent Variable: Log Bilateral ODA				
Geopolitical Alignment ($S_{od,t}$)	2.334***	2.120***	2.436***	0.969***
	(0.115)	(0.092)	(0.125)	(0.047)
Observations	35,432	55,870	51,966	139,006
Distance Controls	Yes	Yes	Yes	—
Origin × Year, Dest. × Year FE	Yes	Yes	Yes	Yes
Dyad FE	—	—	—	Yes

Gravity regressions of bilateral outcomes on the geopolitical alignment score $S_{od,t}$. Columns (1)–(3): origin×year and destination×year fixed effects with distance controls. Column (4): dyad, origin×year, and destination×year fixed effects (distance controls absorbed by dyad FE). Panel A: log bilateral trade from COMTRADE (1963–2024). Panel B: linear probability model for bilateral sanction indicator from the Global Sanctions Database V4; Sanction Rate reports the unconditional probability. Panel C: log bilateral migration stocks from the World Bank (decadal, 1960–2000); the 2010–2024 and dyad FE columns are omitted as data are available only through 2000 (four decadal cross-sections). Panel D: log gross ODA disbursements from the OECD DAC (1963–2024, constant prices); the sample comprises 48 donor and 156 recipient countries. Distance controls include normalized geodesic distance, contiguity, and tree-weighted linguistic distance. Standard errors clustered at the dyad level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

A.9. Comparison with the Geopolitical Risk Index

The Geopolitical Risk Index (GPR) of Caldara and Iacoviello (2022) infers geopolitical risk from newspaper article counts discussing wars, terrorism, and military tensions—measuring media *attention* rather than the events themselves. Figure A.10 compares our GDP×GDP–weighted conflict intensity against the historical GPR for the global aggregate and three major powers. The two series co-move during traditional military confrontations (Vietnam War, post-Cold War peace dividend, Russia-Ukraine war), with correlations of $\rho = 0.28$ (aggregate), 0.50 (China), and 0.36 (Russia).

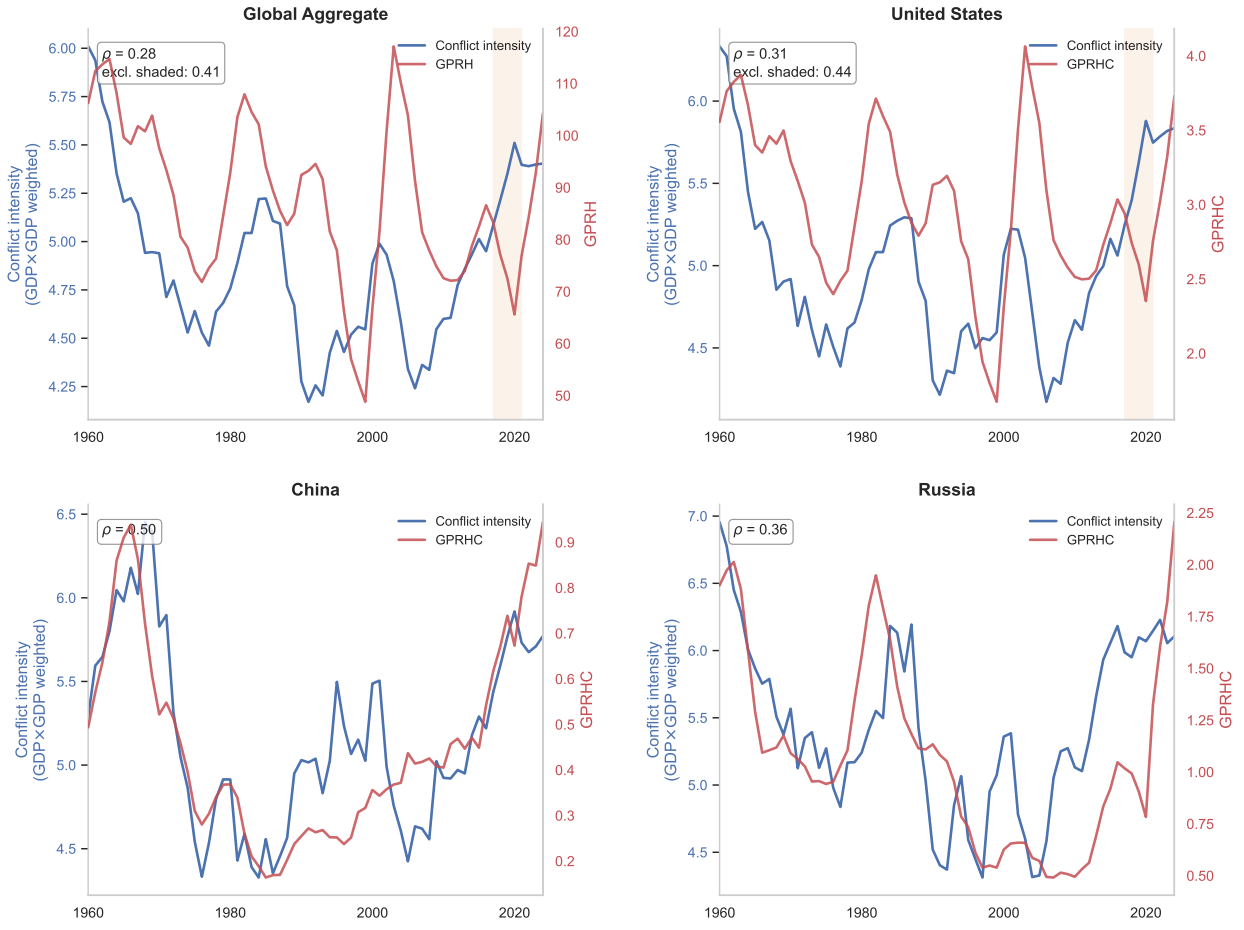


FIGURE A.10. GDP-Weighted Conflict Intensity versus Geopolitical Risk Index

Each panel plots our GDP×GDP–weighted conflict intensity (blue, left axis) against the historical Geopolitical Risk Index (GPRH/GPRHC, red, right axis) from Caldara and Iacoviello (2022). Conflict intensity is defined as $-\sum_n g_n \cdot w_{ij} / \sum w_{ij}$, where $g_n < 0$ are Goldstein scores of conflict events and $w_{ij} = \text{GDP}_i \times \text{GDP}_j$ are bilateral GDP product weights; higher values indicate more intense conflict among economically significant country pairs. Both series smoothed with a four-year centered moving average. Orange shading highlights the 2017–2021 geoeconomic divergence period.

Two divergences are informative. During 2001–2004, the Iraq War produces the largest post-Cold

War GPR spike yet our measure barely responds, since Iraq's GDP was less than 0.1% of world output. During 2017–2021 (orange shading), our measure rises with the U.S.-China trade war and technology restrictions while the GPR stays flat, as its keywords target military threats rather than geoeconomic competition. Excluding 2017–2021 raises the aggregate correlation to $\rho = 0.41$ and the U.S. correlation to 0.44, confirming that the divergence is concentrated in the geoeconomic channel. The GPR is also limited to countries with extensive English-language media coverage, whereas our event-based approach covers all 193 countries.

A.10. 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 underpin our instrument and motivate the exclusion restriction.

Figure A.11 synthesizes patterns across 37,519 non-economic verbal conflict events from our dataset. These events exhibit three properties supporting instrument relevance and plausibility. 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 score of −3.91 (with a standard deviation of 1.16) confirms that these events consistently deteriorate geopolitical relations without involving economic content.

Table A.6 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 alignment 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

TABLE A.6. 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.

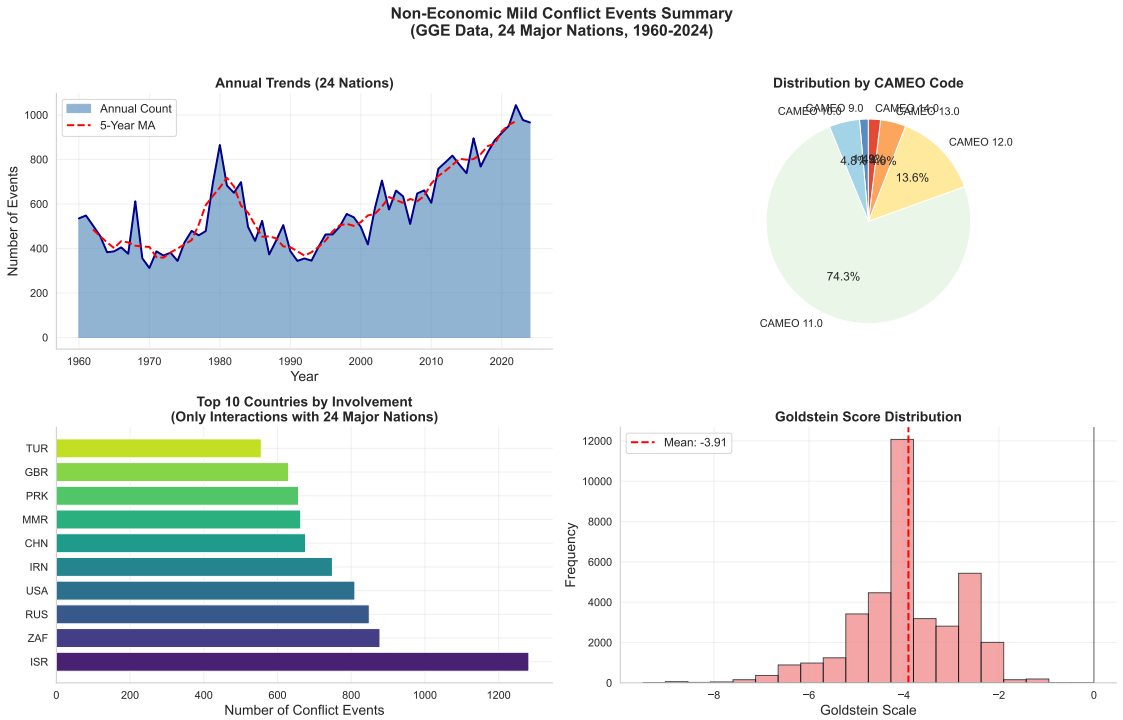


FIGURE A.11. Non-Economic Verbal Conflict Events: Summary Statistics (1960–2024)

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 countries by involvement, 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.

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 alignment. This assumption is plausible 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 alignment index through our GDP-weighted aggregation. The instrument's strength derives from both the frequency of these events (averaging 577 per year, with a median of 524) and their cumulative impact on diplomatic relations. Event counts exhibit substantial year-to-year fluctuation, 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. For identification, these temporal patterns exhibit substantial year-to-year variation beyond smooth trends, providing the within-country variation that our instrumental variables strategy exploits.

Online 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 B.1 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 108 countries (TFP) to 192 countries (demographic variables), depending on data availability and statistical capacity across countries and time periods. All monetary variables are in constant prices for temporal comparability.

Domestic Unrest. Our domestic unrest indicator is a binary variable equal to one if any of eight domestic conflict components—assassinations, general strikes, guerrilla warfare, government crises, purges, riots, revolutions, and anti-government demonstrations—is strictly positive in a given country-year. We construct this variable from the 2024 edition of the Cross-National Time-Series Data Archive, which extends coverage through 2023 (191 countries, 10,324 country-year observations). The original Acemoglu et al. (2019) unrest variable, derived from an earlier CNTS edition, covers 179 countries through 2010. Our updated indicator agrees with the original in 83% of country-years in the overlap period, with all discrepancies reflecting events added in the 2024 edition rather than removed.

TABLE B.1. 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 (ANRR)	Acemoglu et al. (2019)	179 countries	1960–2010
Unrest (CNTS 2024)	Cross-National Time-Series	191 countries	1960–2023
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; CNTS = Cross-National Time-Series Data Archive (2024 edition). Unrest (ANRR) is the original variable from Acemoglu et al. (2019), retained for comparability. Unrest (CNTS 2024) is our updated indicator, used throughout the analysis.

B.2. Cross-Sectional Correlation with Economic Fundamentals

Table B.2 reports within-year cross-sectional correlations between economic fundamentals and (i) GDP per capita (Panel A) and (ii) the geopolitical alignment index (Panel B). GDP per capita correlates strongly with human capital (0.7–0.8), capital stock (0.5), and investment (0.4). In contrast, the geopolitical alignment index shows near-zero and sign-unstable correlations with the same variables across all decades, indicating that it captures a dimension of international relations orthogonal to standard measures of economic development.

TABLE B.2. Cross-Sectional Correlation with Economic Fundamentals

	Overall	1960s	1970s	1980s	1990s	2000s	2010s	2020–2024
Panel A: Correlation with GDP per Capita								
Investment Share	0.388	0.404	0.311	0.374	0.430	0.444	0.406	0.438
Capital Stock	0.486	0.602	0.469	0.477	0.473	0.475	0.474	0.465
Internal Rate of Return	−0.196	−0.429	−0.302	−0.250	−0.101	−0.083	−0.128	−0.070
TFP	0.027	0.049	0.166	−0.105	0.030	−0.030	−0.437	
Trade Openness	0.313	0.092	0.235	0.294	0.282	0.346	0.387	0.409
Human Capital	0.739	0.764	0.628	0.732	0.755	0.767	0.792	0.775
Panel B: Correlation with Geopolitical Alignment Index								
GDP per Capita (PWT)	0.095	0.094	0.112	−0.168	0.239	0.128	0.134	0.007
Investment Share	0.102	−0.036	0.147	0.018	0.130	0.186	0.195	0.100
Capital Stock	0.127	0.080	0.257	−0.006	0.256	0.163	0.060	−0.153
Internal Rate of Return	−0.013	0.001	−0.082	−0.010	0.001	−0.041	0.005	0.137
TFP	−0.069	0.018	−0.146	−0.085	−0.077	−0.173	−0.160	
Trade Openness	0.114	−0.045	0.089	0.024	0.181	0.160	0.146	0.120
Human Capital	0.079	−0.009	0.067	−0.188	0.333	0.163	0.056	−0.094

Entries are pooled within-year cross-sectional correlations. Panel A reports correlations between GDP per capita and economic fundamentals. Panel B reports correlations between the geopolitical alignment index and the same variables. For each period, variables are first demeaned within year, and correlations are computed across country-year observations. Only years with at least 20 countries and nonzero cross-country variation are included.

B.3. 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.

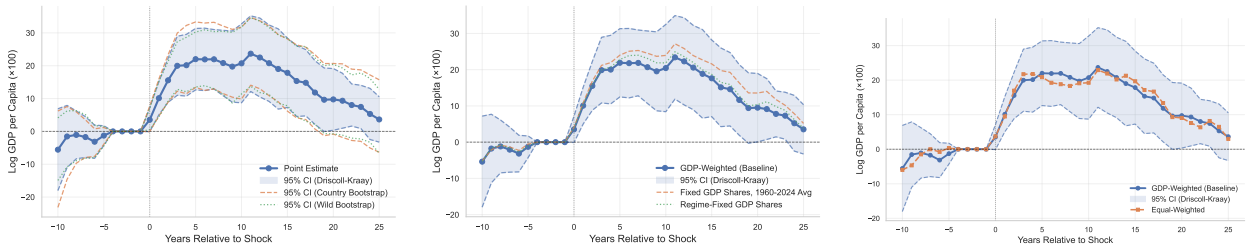
Table B.3 presents the complete local projection coefficients underlying Figure 6.

Alternative Inference and GDP Weights.

TABLE B.3. Local Projection Estimates: Effect of the Geopolitical Alignment Index on GDP per Capita

Horizon (years)	−15	−10	−5	+0	+5	+10	+15	+20	+25
Geopolitical Alignment Index	−12.332	−5.562	−1.278	3.532*	22.001***	20.732***	17.849***	9.742**	3.639
	(8.240)	(6.351)	(1.533)	(1.849)	(4.771)	(6.128)	(5.386)	(4.792)	(3.520)
Within-R^2	0.553	0.790	0.983	0.983	0.786	0.550	0.354	0.214	0.120
Observations	6,534	7,274	8,014	8,154	7,414	6,674	5,934	5,194	4,454
Countries	148	148	148	148	148	148	148	148	148

This table presents local projection estimates from equation (4) for the effect of the geopolitical alignment index 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 alignment. Driscoll-Kraay standard errors in parentheses. The sample uses the 148-country balanced panel (countries with at least 40 years of GDP data) spanning 1975–2024, with varying observation counts across horizons due to lead requirements. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.



A. Alternative Inference B. Alternative GDP Weights C. Equal-Weighted Index

FIGURE B.1. Robustness Checks for Baseline IRF Estimates

Panel (a) displays the baseline IRF with three types of confidence intervals: Driscoll-Kraay standard errors (blue shaded band), 500 country-block bootstrap iterations (orange dashed), and 500 wild bootstrap iterations using Rademacher weights (green dotted). Panel (b) compares the baseline using time-varying GDP shares (blue) with two alternatives: fixed GDP shares averaged over 1960–2024 (orange) and regime-fixed GDP shares using Cold War versus post-Cold War averages (green). Panel (c) compares the baseline GDP-weighted index (blue) with an equal-weighted index assigning uniform weight to each of the 24 major nations (orange). All panels show the response of log GDP per capita (×100) to a unit shock in the geopolitical alignment index with country and region-year fixed effects.

Bootstrap-Based Inference. Our baseline Driscoll-Kraay standard errors treat the geopolitical alignment measure as fixed, potentially understating uncertainty. Panel (a) examines robustness using two alternative bootstrap procedures. First, we implement a block bootstrap that resamples entire countries with replacement, capturing within-country serial correlation and sampling uncertainty across countries. Second, we employ a wild bootstrap with Rademacher weights that preserves the panel structure while accounting for potential heteroskedasticity and within-cluster correlation.[51]

The confidence intervals from 500 iterations of each bootstrap method are marginally wider

[51]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).

than the Driscoll-Kraay bands, particularly at medium horizons (5–15 years), but the differences are economically modest. The wild bootstrap intervals (green dotted) are slightly narrower than the country-resampling bootstrap (orange dashed) at most horizons, suggesting that accounting for heteroskedasticity provides efficiency gains while maintaining valid inference.

Alternative GDP Weights. Panel (b) of Figure B.1 addresses the concern that time-varying GDP weights in equation (2) could generate mechanical variation correlated with economic outcomes. We compare the baseline (time-varying GDP shares) with two alternatives: fixed GDP shares averaged over 1960–2024 and regime-fixed shares using Cold War (1960–1989) versus post-Cold War (1990–2024) averages. All three weighting schemes produce nearly identical impulse responses, confirming that the identifying variation comes from changes in bilateral geopolitical scores rather than from shifts in GDP weights. Panel (c) further confirms this by replacing GDP weights with equal weights across the 24 major nations (correlation with baseline: 0.86). The resulting IRF closely tracks the baseline, reinforcing that the estimates are driven by changes in bilateral geopolitical scores rather than the aggregation structure.

Alternative Lag Specifications. Figure B.2 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.

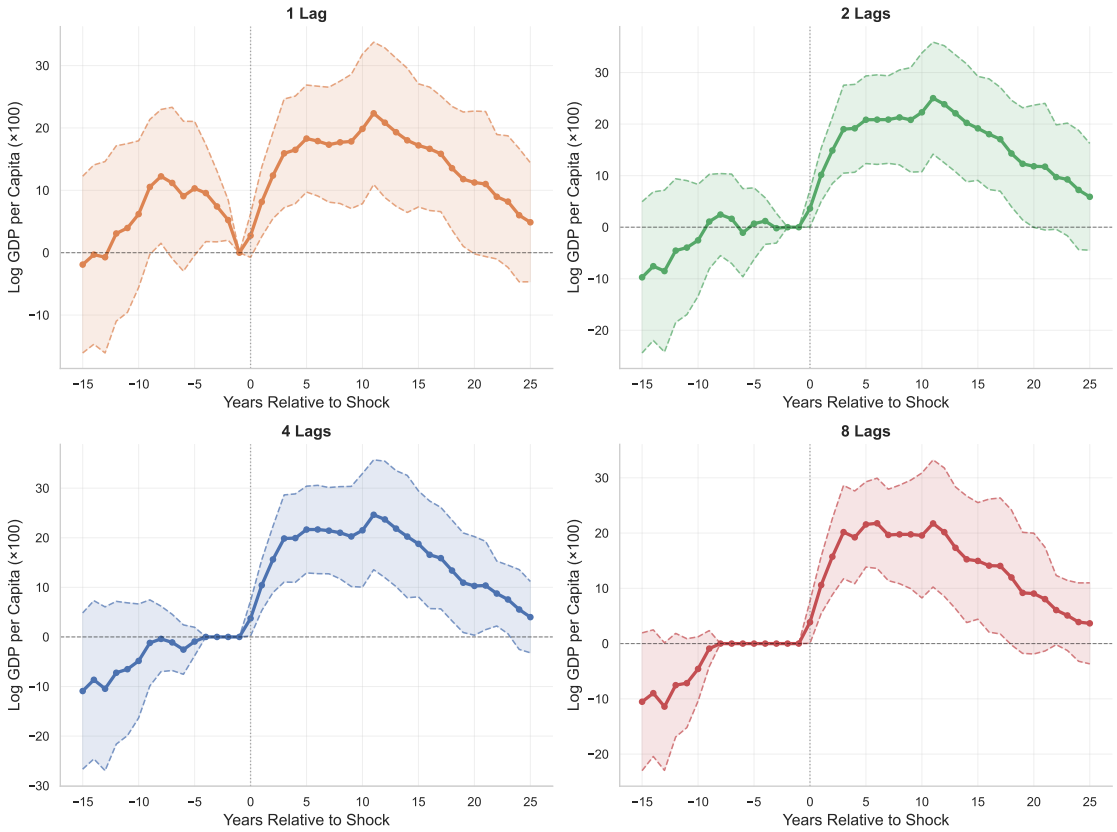


FIGURE B.2. Impulse Response Functions Under Alternative Lag Specifications

IRF of log GDP per capita (×100) to a unit improvement in the geopolitical alignment index. Each panel shows results with the indicated number of lags for both GDP and geopolitical alignment. 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.

B.4. 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 (2026), we combine the impulse responses of geopolitical alignment and GDP to construct this counterfactual transitory response.

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

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

where $\{\phi_h^p\}_{h=0,\ldots,H}$ represents the impulse response of the geopolitical alignment index 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:

$$\underbrace{\begin{pmatrix} p_0^{\text{shock}} \\ p_1^{\text{shock}} \\ \vdots \\ p_H^{\text{shock}} \end{pmatrix}}_{\boldsymbol{p}^{\text{shock}}} = \underbrace{\begin{pmatrix} 1 & 0 & \cdots & 0 \\ \phi_1^p & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ \phi_H^p & \phi_{H-1}^p & \cdots & 1 \end{pmatrix}^{-1}}_{(\boldsymbol{\Phi}^p)^{-1}} \underbrace{\begin{pmatrix} 1 \\ 0 \\ \vdots \\ 0 \end{pmatrix}}_{\widetilde{\boldsymbol{\phi}}^p} \tag{B.2}$$

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

$$\underbrace{\begin{pmatrix} \tilde{\alpha}_0 \\ \tilde{\alpha}_1 \\ \vdots \\ \tilde{\alpha}_H \end{pmatrix}}_{\widetilde{\boldsymbol{\alpha}}} = \underbrace{\begin{pmatrix} p_0^{\text{shock}} & 0 & \cdots & 0 \\ p_1^{\text{shock}} & p_0^{\text{shock}} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ p_H^{\text{shock}} & p_{H-1}^{\text{shock}} & \cdots & p_0^{\text{shock}} \end{pmatrix}}_{\mathbf{P}^{\text{shock}}} \underbrace{\begin{pmatrix} \alpha_0 \\ \alpha_1 \\ \vdots \\ \alpha_H \end{pmatrix}}_{\boldsymbol{\alpha}} \tag{B.3}$$

The resulting impulse responses $\widetilde{\boldsymbol{\alpha}}$ represent the GDP effects following a one-time, purely transitory improvement in geopolitical alignment. 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 alignment permanently increases by one unit. Statistical inference employs block bootstrap resampling across countries to account for estimation uncertainty in both stages.

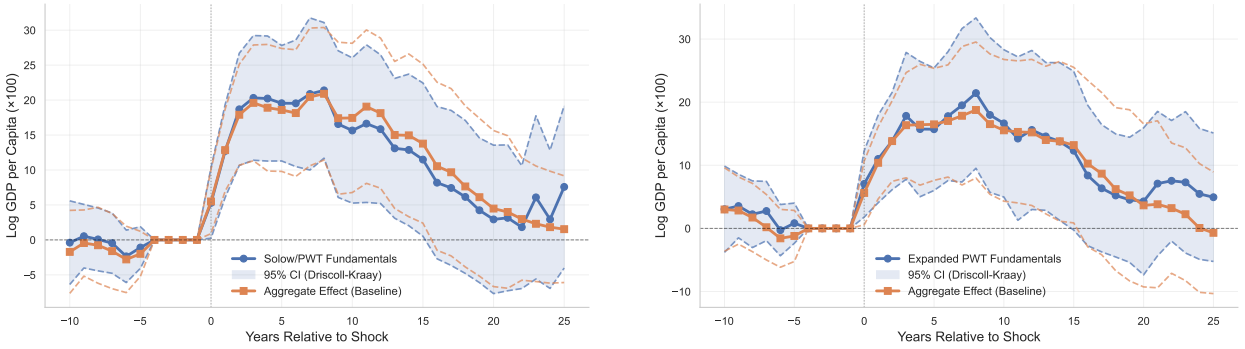
Methodological Caveat. This approach assumes that the economic effects of a sequence of unanticipated geopolitical shocks equal those of an anticipated path announced at time zero. While this

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.5. Controlling for Economic Fundamentals

Figures B.3A and B.3B show that our baseline results survive controlling for a broad set of observable economic fundamentals from the Penn World Tables.[52] The Solow/PWT specification adds four lags of trade openness, population, age-structure variables, the investment share, capital stock, and human capital index. The expanded specification further adds lagged internal rates of return, labor shares, employment-to-population ratios, real consumption, and real domestic absorption per capita. In both cases, the impulse response closely tracks the baseline, with peak effects of approximately 20 log points and similar hump-shaped dynamics. The stability of the estimates after absorbing these growth determinants indicates that geopolitical relations operate through channels beyond those captured by standard observable fundamentals.

[52]The Solow/PWT specification covers 99 countries and the expanded specification covers 85 countries. Both baselines are re-estimated on the same country sample to ensure comparability.



A. Solow/PWT Fundamentals

B. Expanded PWT Fundamentals

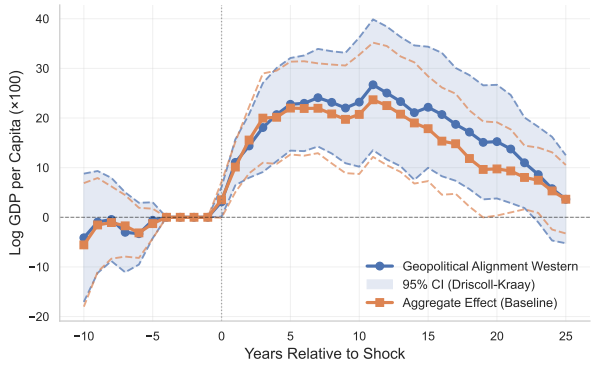
FIGURE B.3. Robustness to Controlling for Economic Fundamentals

Impulse responses of log GDP per capita (×100) to a unit improvement in the geopolitical alignment index. Blue lines with shaded 95% confidence intervals show specifications controlling for lagged economic fundamentals. Orange lines show the baseline re-estimated on the same country sample. Panel (a) adds four lags of trade openness, log population, age-structure shares, investment share, log capital stock, and log human capital index (99 countries). Panel (b) further adds four lags of internal rate of return, labor share, employment-to-population ratio, real consumption per capita, and real domestic absorption per capita (85 countries). All specifications include country and region-year fixed effects with Driscoll-Kraay standard errors.

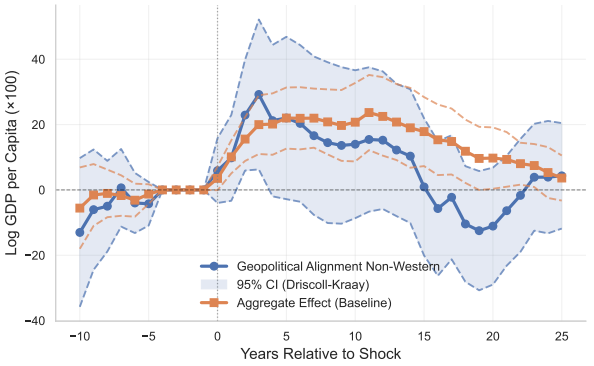
B.6. Geopolitical Alignment with Western and Non-Western Countries

This section extends the US/non-US partner decomposition in Section 3.4.2 to a Western versus non-Western partition. We decompose geopolitical alignment into relations with Western countries (United States, United Kingdom, Germany, France, Canada, Australia, Belgium, Denmark, Italy, Netherlands, Spain, Switzerland, and Poland) and non-Western countries (China, Russia, India, Japan, South Korea, Brazil, Mexico, Argentina, Indonesia, Turkey, and Saudi Arabia), then jointly estimate their effects.

Figure B.4 shows that both components generate sizable growth effects. The Western component peaks at 21–23 log points around years 5–10 with relatively tight confidence intervals, while the non-Western component reaches 28–35 log points around years 3–5 but with wider confidence intervals and faster attenuation. The conditional correlation between Western and non-Western alignment—after partialling out country fixed effects, region-year fixed effects, and lagged controls—is only 0.27, confirming that the two components capture largely distinct variation. Both track the baseline aggregate closely, reinforcing the partner-symmetry result in the main text.



A. Geopolitical Alignment with Western Countries



B. Geopolitical Alignment with Non-Western Countries

FIGURE B.4. Decomposing Geopolitical Alignment: Western versus Non-Western Countries

Impulse responses of log GDP per capita (×100) to unit improvements in geopolitical alignment with Western countries (panel a) and non-Western countries (panel b). Blue: decomposed effect with 95% Driscoll-Kraay CIs; orange: baseline aggregate for comparison. Baseline specification as in Figure 6.

B.7. Placebo Design and Randomization Inference

This appendix documents the placebo exercises summarized in Section 3.4.4 and reports scalar randomization-inference results.

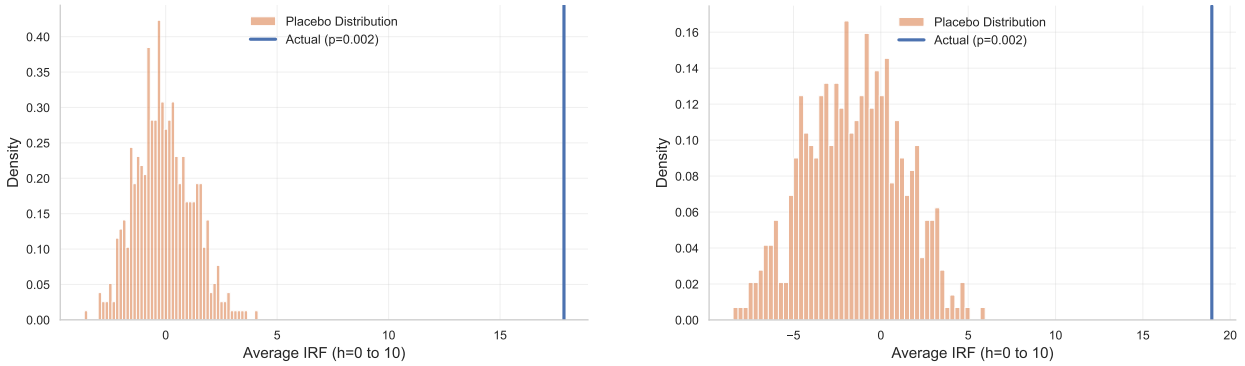
Implementation. Both exercises use 500 independent placebo draws. In each draw, the full baseline local projection is re-estimated from scratch using the same specification: four lags of GDP and geopolitical alignment, country fixed effects, and region-year fixed effects—with Driscoll-Kraay standard errors. The summary statistic is the average estimated impulse response over horizons $h = 0, \ldots, 10$, computed from the re-estimated LP in each draw.

Placebo A: within-region-year reassignment. For each draw, we randomly permute the realized values of the geopolitical shock variable across countries within each region-year cell. This preserves the region-year distribution of shocks and the panel structure of outcomes and controls while breaking the country-specific assignment of the geopolitical shock.

Placebo B: future-year timing. For each draw and each country, we replace the contemporaneous shock with the shock observed 8 to 15 years in the future, where the lead is drawn uniformly at random. To ensure that all leads are well defined, the base-year support is restricted to 1960–2009.

This preserves each country's own shock distribution (up to a time shift) while breaking the contemporaneous timing between the shock and subsequent GDP dynamics.

Randomization inference. Figure B.5 presents the distribution of the average response over horizons 0 to 10 across 500 placebo draws under each design. In the within-region-year reassignment, the placebo distribution is centered near zero (median = 0.09) with a 95th percentile of 1.92, while the realized statistic is 17.87. In the future-year timing placebo, the placebo distribution is again centered near zero (median = −0.56) with a 95th percentile of 3.55, while the realized statistic is 18.16. In both cases, the randomization p-value is at most 0.002 (no placebo draw exceeds the realized value in 500 draws).



A. Within-Region-Year Reassignment

B. Future-Year Timing Placebo

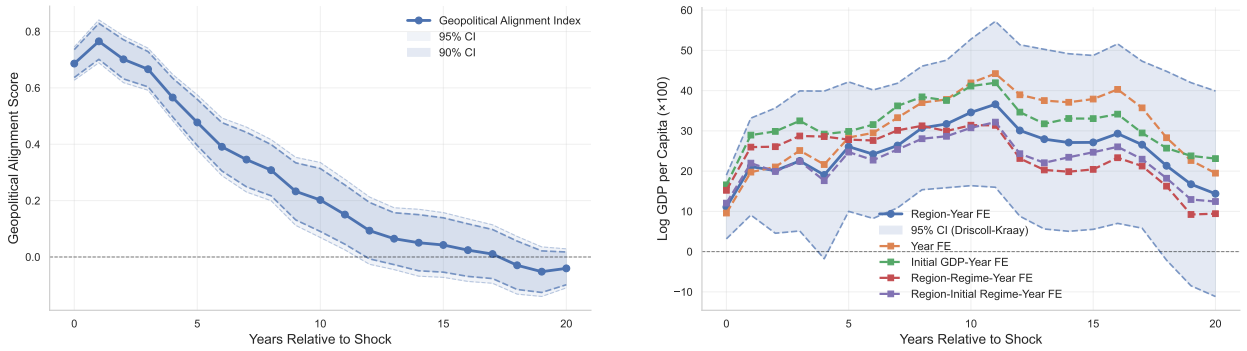
FIGURE B.5. Randomization Inference: Distribution of Placebo Average Responses

Each panel shows the distribution of the average estimated impulse response over horizons 0 to 10 across 500 placebo draws. Panel (a) randomly reassigns geopolitical shocks within region-year cells; panel (b) replaces contemporaneous shocks with future shocks drawn 8 to 15 years ahead. The solid blue vertical line marks the realized average response (17.87 in panel a, 18.16 in panel b), which lies far to the right of the placebo distribution. All specifications re-estimate the full baseline local projection in each draw with four lags of GDP and geopolitical alignment, country fixed effects, region-year fixed effects, and Driscoll-Kraay standard errors.

B.8. 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 alignment, as well as LP-IV estimates under alternative fixed effects specifications.

First-Stage Dynamics. Panel (a) of Figure B.6 demonstrates the strength and persistence of the first-stage relationship. The instrument raises overall geopolitical alignment by approximately



A. First-Stage: Instrument → Geopolitical Alignment B. LP-IV Estimates with Alternative Fixed Effects

FIGURE B.6. First-Stage Relationship and LP-IV Robustness

Panel (a) displays the first-stage impulse response of overall geopolitical alignment to a unit shock in the instrument (non-economic verbal conflicts). The specification includes four lags of geopolitical alignment, 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.

0.69 units on impact, with the effect decaying gradually over 15 years, consistent with how verbal diplomatic conflicts propagate through bilateral relationships.

LP-IV Robustness Across Fixed Effects. Panel (b) of Figure B.6 examines the sensitivity of our IV estimates to alternative fixed effects structures. All five specifications yield effects between 31 and 42 log points at the 10-year horizon, with effects of 9–23 log points persisting at the 20-year horizon. All show insignificant pre-trends. The stability across these diverse assumptions about unobserved heterogeneity, combined with the similarity between IV and OLS estimates, supports a causal interpretation and indicates that the results are not driven by regional patterns or specific institutional contexts.

B.9. Leadership-Change IV: Event List and Robustness

This section documents the leadership-change instrumental variables strategy presented in Section 3.5. The instrument exploits bilateral shifts induced by 67 leadership changes across 21 of 24 major nations: 25 unexpected deaths in office (from the Archigos database, 1950–2015) and 42 close election turnovers with vote margins below 10 percentage points (from Marx, Pons, and Rollet (2024), 1960–2018). Switzerland is excluded due to its annually rotating presidency. For each event in major nation j at time t, the instrument is $z_{ct}^{\text{LC}} = (S_{cj,t+1} - S_{cj,t-1}) \times \text{GDP share}_{j,t-1}$.

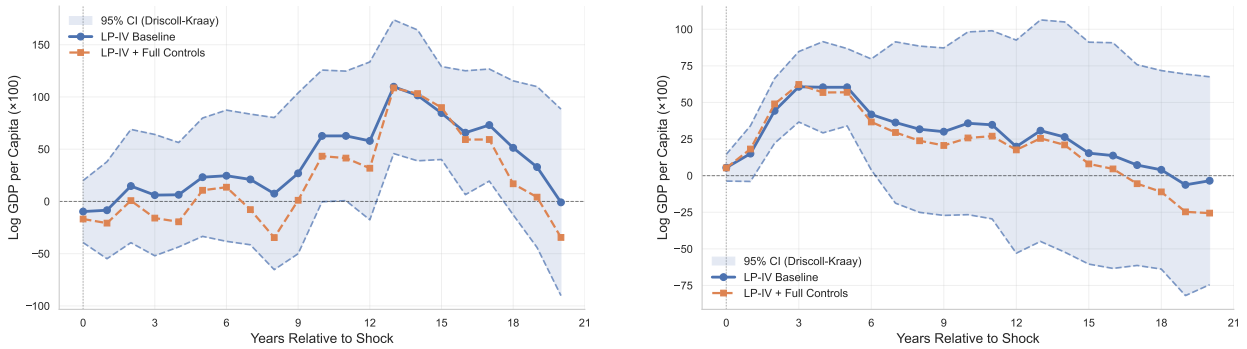
Window Robustness. Table B.4 reports reduced-form and LP-IV estimates at horizon $h = 5$ under six alternative bilateral-shift windows. The reduced-form point estimates are stable across windows (24–31 log points at $h = 5$), while the IV estimates are larger with wider post-windows as the first stage attenuates. The preferred window ($S_{t+1} - S_{t-1}$) balances first-stage strength with a clean post-treatment measurement window.

TABLE B.4. Leadership-Change IV: Window Robustness

Window	$F(h = 0)$	$F(h = 3)$	$F > 10$	RF($h = 5$)	IV($h = 5$)
$S_t - S_{t-1}$	53.6	18.2	15	31.0 (16.4)	22.3 (11.2)
$S_{t+1} - S_{t-1}$	16.9	18.7	12	24.3 (17.0)	42.4 (24.7)
$S_{t+2} - S_{t-1}$	17.7	18.0	12	25.0 (20.1)	57.9 (35.7)
$S_t - S_{t-2}$	35.4	15.0	9	29.1 (18.1)	21.5 (15.1)
$S_{t+1} - S_{t-2}$	15.7	19.4	11	24.0 (19.8)	41.1 (30.1)
$S_{t+2} - S_{t-2}$	14.7	18.7	12	24.9 (22.6)	56.7 (42.0)

Each row uses a different bilateral-shift window to construct the leadership-change instrument. $F(h)$: first-stage Wald F-statistic at horizon h. $F > 10$: number of horizons (out of 21, $h = 0$–20) with $F > 10$. RF($h = 5$) and IV($h = 5$): reduced-form and LP-IV coefficients at $h = 5$ with Driscoll-Kraay standard errors in parentheses. All specifications use 67 events (25 deaths + 42 close elections), country and region-year fixed effects, and four lags of GDP and geopolitical alignment. Sample: 148-country balanced panel.

Deaths versus Close Elections. Figure B.7 splits the leadership-change IV by event type. The close-election component (panel b) yields a smooth hump-shaped response broadly similar to the combined estimate, peaking around years 3–5. The deaths-in-office component (panel a) is substantially noisier and less informative on its own, as expected given the smaller number of events (25 versus 42). Pooling the two types yields a more stable instrument that balances the cleaner exogeneity of deaths with the greater statistical power of close elections.



A. Deaths in Office (25 events)

B. Close Election Turnovers (42 events)

FIGURE B.7. Leadership-Change IV by Event Type

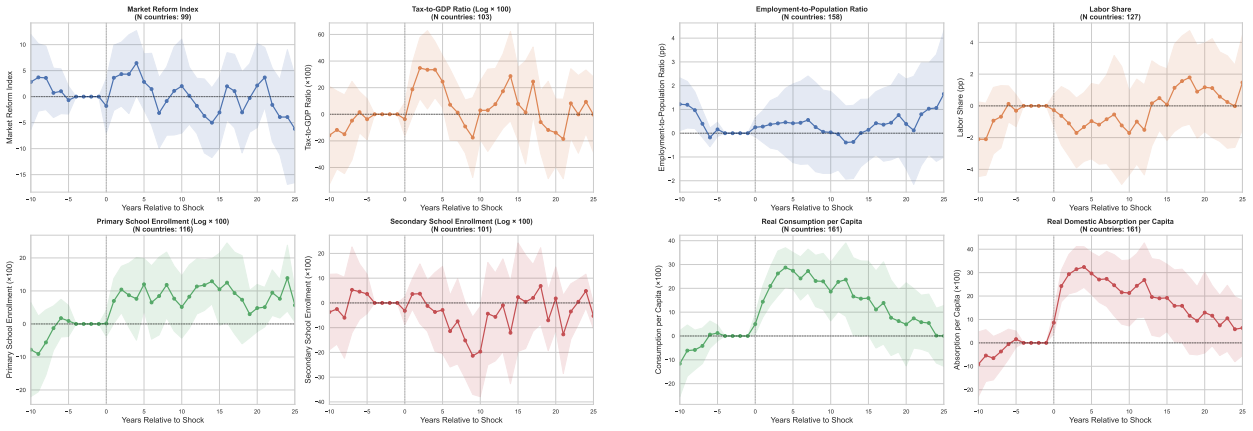
LP-IV impulse responses of log GDP per capita (×100) to a unit improvement in geopolitical alignment, estimated separately using deaths in office (panel a) and close election turnovers with margins below 10 percentage points (panel b). Blue solid: baseline specification. Orange dashed: adding progressive controls. Shaded bands show 95% confidence intervals for the baseline. Driscoll-Kraay standard errors.

B.10. 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 B.8 shows heterogeneous institutional and educational responses. The tax-to-GDP ratio responds positively (20–30 log points over the first decade), and primary enrollment improves gradually (10–15 log points over 25 years). Market reforms and secondary enrollment show no significant response.

Labor Markets and Domestic Absorption. Panel (b) shows that both consumption measures closely track GDP dynamics, confirming that growth translates into household welfare improvements. Employment and labor share show no significant response, suggesting that geopolitical improvements operate through existing economic structures rather than labor market restructuring.



A. Market Reforms and Education

B. Employment and Consumption

FIGURE B.8. Dynamic Effects of the Geopolitical Alignment Index on Additional Growth Correlates

Panel (a) displays impulse responses of market reform index, tax-to-GDP ratio (log × 100), primary and secondary school enrollment (log × 100) to a unit improvement in the geopolitical alignment index. Panel (b) shows responses for employment-to-population ratio, labor share, real consumption and domestic absorption per capita (log × 100). All specifications follow equation (5) with four lags of the dependent variable, GDP, and geopolitical alignment, 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.

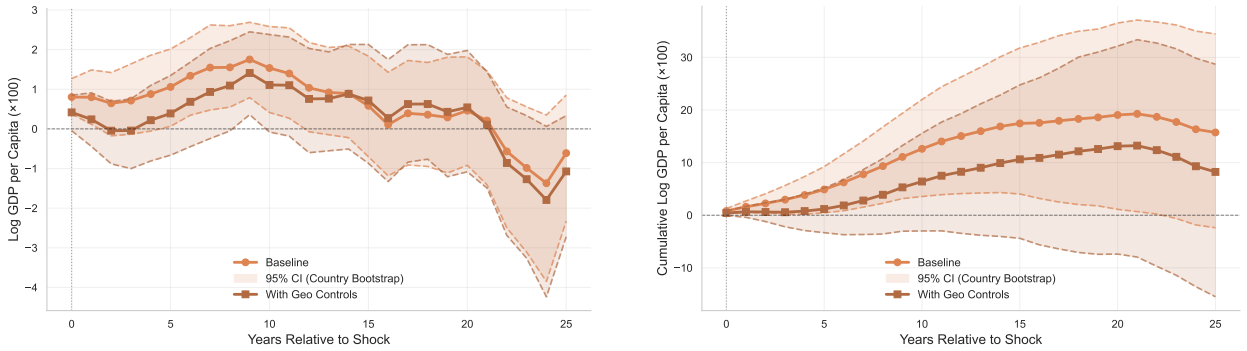
B.11. Additional Results for Democracy and Geopolitics

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

B.11.1. 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.4, we construct counterfactual impulse responses that isolate the effects of purely transitory democratization (a one-time shock that immediately reverts) from permanent democratic transitions.

Figure B.9 reveals clear 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 alignment, the short-run effect virtually disappears—the point estimates hover near zero. This attenuation suggests that temporary democratic episodes



A. Response to Transitory Democratization

B. Response to Permanent Democratization

FIGURE B.9. 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 alignment. Shaded areas represent 95% confidence intervals from 500 bootstrap iterations using country-block resampling.

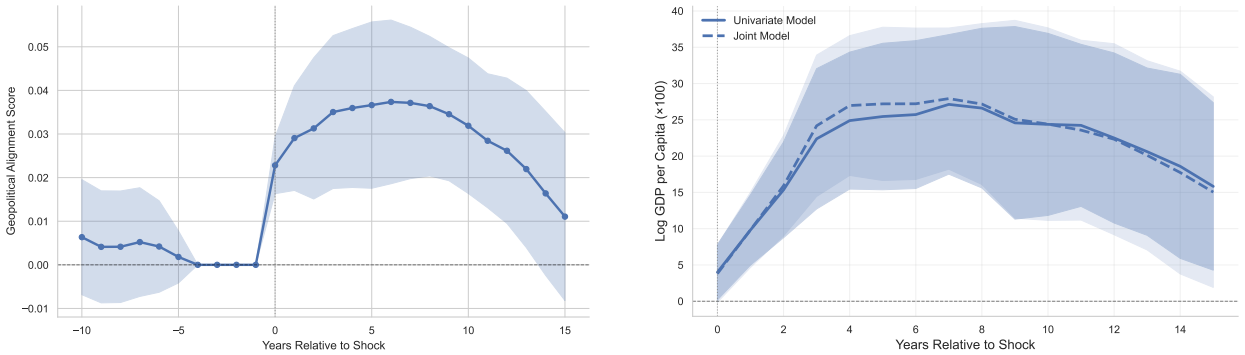
generate immediate growth primarily through improved international relations rather than domestic institutional changes.

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 alignment 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.11.2. Democracy and Geopolitical Alignment: Conditional Correlation

While our main analysis examines how democracy and geopolitics jointly affect growth, understanding their mutual relationship provides additional insights. Figure B.10 presents two complementary perspectives.

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



A. Geopolitical Alignment and Democracy

B. Geopolitical Effects with Region-Year FE

FIGURE B.10. Democracy-Geopolitics Nexus: Additional Evidence

Panel (a) shows the impulse response of overall geopolitical alignment to a democratization shock, estimated using local projections with four lags of geopolitical alignment, country fixed effects, and year fixed effects. Panel (b) compares the growth effects of geopolitical alignment 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.

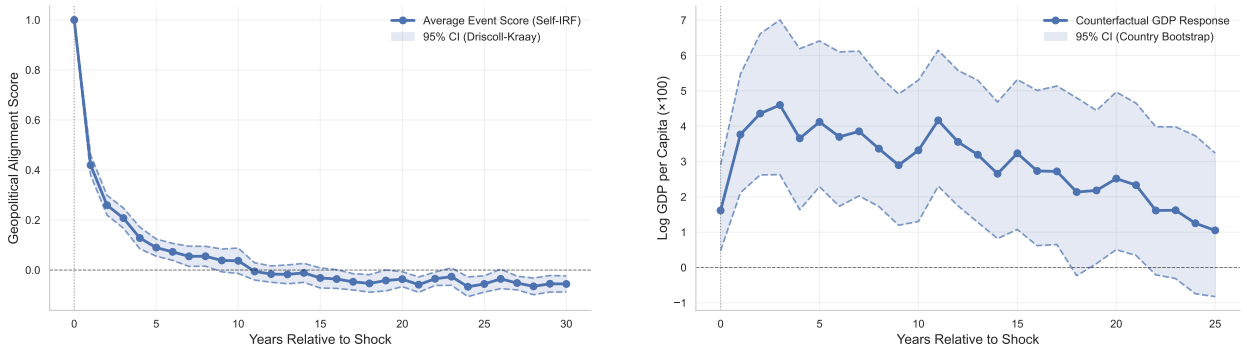
democratization, with effects persisting through year 15. This complements our bilateral analysis: while democratization primarily improves Western relations, these gains are sufficient to raise the GDP-weighted aggregate measure.

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 alignment drives 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 alignment captures distinct variation from democratic institutions within region-year cells. Geopolitical alignment generates substantial growth differences unexplained by shared democratization waves.

B.12. 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.

Panel (a) of Figure B.11 reveals strong mean reversion in event scores: approximately 58% of the initial impact dissipates within one year, and the effect becomes statistically indistinguishable from



A. Persistence of Event Scores

B. Response to Transitory Event Shock

FIGURE B.11. 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 500 bootstrap iterations.

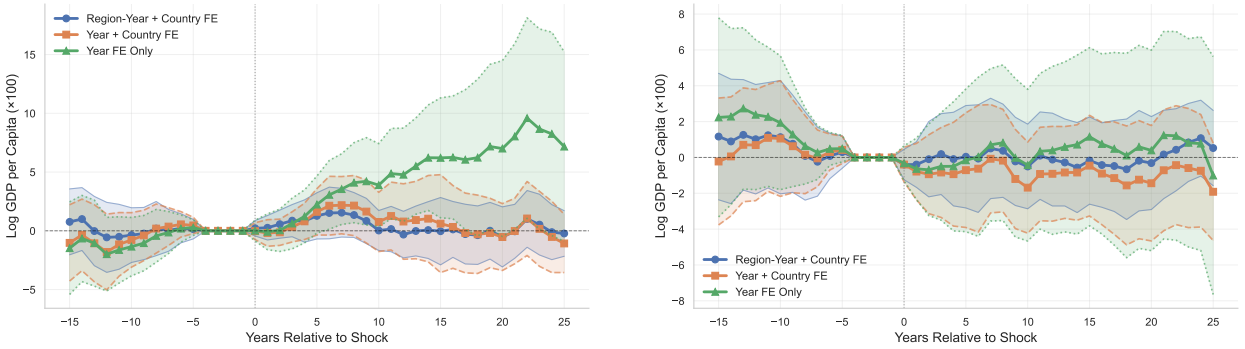
zero after 7–8 years. This rapid decay reflects the episodic nature of individual diplomatic events, in contrast to the greater persistence of our smoothed measure (Figure 6A).

Panel (b) isolates the GDP response to a purely transitory event shock using the decomposition in Appendix B.4. GDP rises to a peak of 4–5 log points around years 2–3, then gradually declines while remaining positive throughout the 25-year horizon. The rapid event-score decay in panel (a) explains why the direct response to $\tilde{S}_{ct}$ in Section 6.2.1 appears muted relative to our baseline: the observed IRF combines the direct impact with the indirect effects through event persistence. When we construct the response to a permanent change in event flows, we recover comparable long-run effects to our smoothed measure, confirming that the baseline approach filters noise from isolated events while preserving the economically relevant variation.

B.13. UNGA Voting and Economic Growth: Detailed Results

This appendix presents comprehensive results using UNGA voting alignment as an alternative measure of geopolitical alignment. 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 B.12 reveals why UNGA voting patterns fail to capture the economic effects of geopolitical



A. Alignment with United States

B. GDP-Weighted Alignment

FIGURE B.12. 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.

alignment. Panel (a) examines alignment with US voting positions. With our 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 alignment index but using IPD rather than bilateral events. The pattern is even clearer: 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 reflect three limitations of UNGA voting as a bilateral measure: votes primarily address multilateral issues rather than bilateral economic or security concerns; strategic bloc voting and vote trading add noise unrelated to bilateral dynamics; and the annual session calendar

creates temporal misalignment with the continuous flow of diplomatic interactions. The positive cross-sectional relationship between US alignment and GDP (green line, panel a) likely reflects reverse causality—wealthier countries tend to share US positions on international law and market economics—rather than a causal effect of voting similarity on growth.

B.14. Sanctions and Geopolitical Alignment: A Horse-Race Analysis

This appendix examines the relationship between our comprehensive geopolitical alignment index 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.

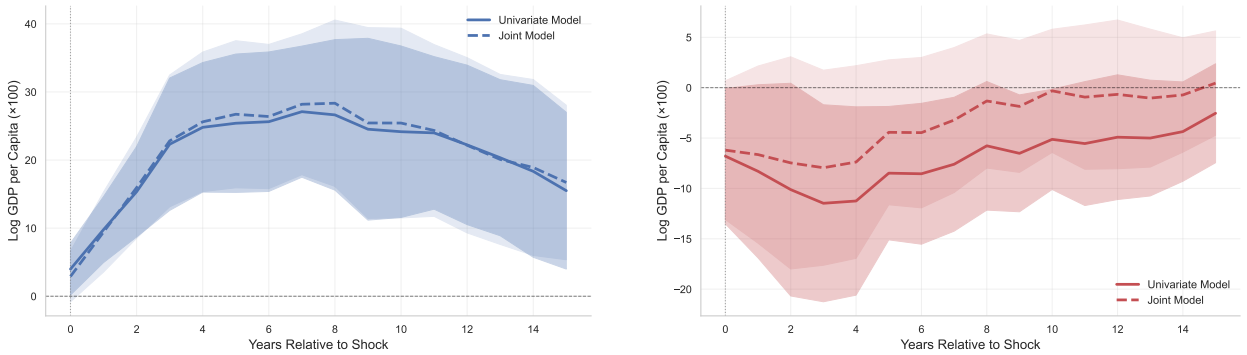
Empirical Specification. We estimate both univariate and joint specifications to assess how sanctions and the geopolitical alignment index interact:

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

$$\begin{aligned} \text{Joint:} \quad y_{c,t+h} = {} & \alpha_h^{\text{Geo}} p_{ct} + \alpha_h^{\text{Sanc}} p_{ct}^{\text{Sanction}} + \sum_{\ell=1}^{4} \beta_\ell y_{c,t-\ell} + \sum_{\ell=1}^{4} \gamma_\ell^{\text{Geo}} p_{c,t-\ell} \\ & + \sum_{\ell=1}^{4} \gamma_\ell^{\text{Sanc}} p_{c,t-\ell}^{\text{Sanction}} + \delta_c + \delta_{rt} + \varepsilon_{c,t+h} \end{aligned} \tag{B.5}$$

where $k \in \{\text{Geo}, \text{Sanction}\}$ indexes the measure type. The univariate specifications include four lags of GDP and the respective geopolitical alignment 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 alignment.

Results and Interpretation. Figure B.13 presents the results. Panel (a) confirms that controlling for sanctions has minimal impact on the geopolitical alignment effect, with both specifications peaking at 26–27 log points around year 7–8. Panel (b) shows that sanctions reduce GDP by approximately



A. Geopolitical Alignment Index

B. Sanctions

FIGURE B.13. Horse-Race: Geopolitical Alignment Index versus Sanctions

This figure compares univariate and joint specifications for geopolitical alignment and sanctions. Panel (a) shows impulse responses for our geopolitical alignment 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.

10 log points at the trough (year 3), but the joint specification attenuates this by roughly 30%, with the effect approaching zero by year 10. This attenuation indicates that our event-based measure already captures the broader diplomatic deterioration surrounding sanctions.

Comprehensiveness of Event-Based Measures. Our event-based approach captures formal sanctions announcements alongside the diplomatic context 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 alignment index to controlling for sanctions (the most explicit and measurable form of economic coercion) reinforces the breadth of our event-based approach relative to narrow categorical indicators.

B.15. Formal Alliances and Geopolitical Alignment: A Horse-Race Analysis

This appendix extends the sanctions horse-race analysis to formal military alliances, the cooperative counterpart to sanctions on the spectrum of bilateral geopolitical alignment.

Data and Variable Construction. We use the Alliance Treaty Obligations and Provisions (ATOP) dataset, version 5.1 (Leeds et al. 2002), which codes all formal military alliances among independent states from 1815 through 2018.[53] For each country c and year t, we construct a GDP-weighted alliance exposure measure:

$$p_{ct}^{\text{Alliance}} = \sum_{j \in \mathcal{N}} \mathbb{1}_{cjt}^{A} \times \text{GDP share}_{jt},$$

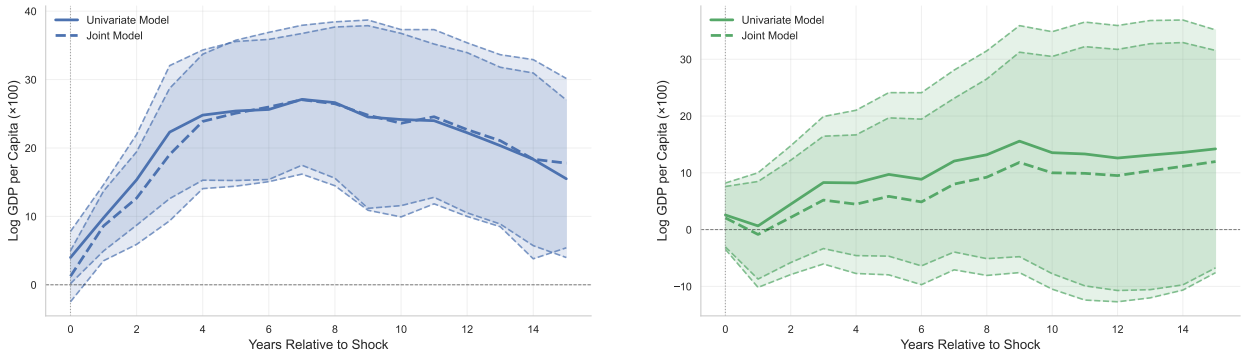
where $\mathbb{1}_{cjt}^{A}$ equals one if country c maintains any active formal alliance—defense pact, offensive pact, neutrality agreement, non-aggression pact, or consultation agreement—with major nation j in year t. The measure ranges from zero (no alliances with major nations) to approximately 0.80 (alliance with most of the world's economic weight). Alliance status after 2018 is forward-filled from the last observed year, reflecting the high persistence of formal treaties; this imputation affects only the final six years of the sample and is unlikely to drive the estimated medium-run impulse response pattern. Country identifiers are mapped from Correlates of War codes to ISO3 using standard concordances.

Results. We estimate the same univariate and joint local projection specifications as in the sanctions analysis (equations B.4–B.5), replacing p_{ct}^{Sanction} with p_{ct}^{Alliance} and including four lags of each measure.

Figure B.14 displays the results. Panel (a) confirms that the geopolitical alignment effect is stable: the impulse response peaks at approximately 26 log points around year 7 in both the univariate and joint specifications, with the two trajectories closely tracking each other throughout the 15-year horizon. Controlling for alliance exposure does not alter the estimated effect of geopolitical alignment.

Panel (b) shows that alliance exposure has a positive univariate effect on GDP per capita, rising gradually to approximately 10–12 log points by year 10–15. In the joint specification, this effect attenuates to approximately 5–8 log points—a reduction of roughly 40–50%. The timing of the attenuation is informative: the short-run alliance coefficient largely disappears once geopolitical

[53] The original ATOP dataset (Leeds et al. 2002) covered 1815–1944. We use version 5.1, which extends coverage through 2018.



A. Geopolitical Alignment Index

B. Formal Alliances

FIGURE B.14. Horse-Race: Geopolitical Alignment Index versus Formal Alliances

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

alignment is controlled for, consistent with the event-based measure absorbing the diplomatic cooperation surrounding alliance formation and maintenance. At longer horizons, a modest positive residual persists, though with wide confidence intervals. This residual is consistent with the broader measure's dominance: treaty-based security commitments are durable institutional stocks that may contain information about long-run coordination beyond what annual event flow fully summarizes.

Defense Pacts. As a robustness check, we restrict the alliance measure to defense pacts—the strongest form of alliance commitment, excluding non-aggression pacts and consultation agreements. The geopolitical alignment coefficient remains stable in joint specifications. The defense pact effect is noisier, consistent with the narrower scope of this measure, but displays a similar pattern of attenuation when the broader geopolitical score is included.

Online 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 and the Goldstein scale, both detailed 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 of the following mutually exclusive categories, 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 membership 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.