

The Geopolitics of Technology: Techno-nationalism, Decoupling, and Shifts in China–us Value Chains

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Abstract

Background and Motivation

Global value chains (GVCs) in technology-intensive industries have been buffeted by two reinforcing sources of uncertainty: (i) geopolitical frictions—most saliently in US–China relations—and (ii) climate policy uncertainty (CPU). While each strand has been studied in isolation, their joint effects on technological GVC participation and specialization remain underexplored. This study integrates these dimensions and examines how they reshape Sino-American technological GVCs under uncertainty, bridging GVC/specialization theory, real-options logic, and the techno-nationalism literature.

Research Questions and Hypotheses

We ask: (RQ1) How and to what extent do climate and geopolitical uncertainties influence decoupling - proxied by technological GVC participation (DECOUP) - and techno-nationalism - proxied by technological export specialization in domestic value added (EXDVA)? (RQ2) Do DECOUP and EXDVA interact, and how do these interactions evolve under uncertainty in China vs. the US?

We test three hypotheses: H1) CPU and US–China tension (UCT) reduce DECOUP, with CPU exerting deeper, more persistent effects than UCT; H2) CPU/UCT increase techno-nationalism (i.e., lower EXDVA) over the medium run; H3) higher baseline EXDVA (capability depth) buffers the adverse effects of CPU/UCT on both DECOUP and EXDVA.

Data and Measures

The sample covers 1995–2020 and combines low-frequency macro fundamentals with high-frequency uncertainty indicators. Endogenous low-frequency variables are DECOUP (technology GVC participation) and EXDVA (domestic value added–based revealed comparative advantage in technology exports). Low-frequency exogenous controls include FDI/GDP, GDP per capita, employment in industry, tariffs, and environment-related patents. High-frequency exogenous indicators are CPU

(climate policy uncertainty index) and UCT (US–China Tension Index), aggregated to the half-year to preserve information content while aligning with the mixed-frequency structure. Stationarity is addressed via log-differences; diagnostic tests (ADF) inform transformations.

Methods

We estimate an unrestricted MIDAS VAR (U-MIDAS VAR) that accommodates mixed frequencies without imposing parametric weighting schemes on high-frequency lags. This design lets the data determine the contribution of monthly/biannual uncertainty indicators within the VAR system for DECOUP and EXDVA. We compute impulse response functions (IRFs) to CPU and UCT shocks and conduct robustness checks against classical (annual) VARs that require aggregating the uncertainty measures—thereby benchmarking the informational advantage of mixed-frequency modeling.

Key Findings

1. Uncertainty lowers technological GVC participation (supports H1). Both CPU and UCT depress DECOUP on impact. Effects are stronger for China and more persistent for CPU than for UCT, which behaves like a shorter-run shock. IRFs show negative responses that fade over several periods; MIDAS equations for DECOUP attain relatively high explanatory power.
2. Uncertainty tilts specialization toward techno-nationalism (supports H2). CPU and UCT reduce EXDVA on impact—again more visibly in China—consistent with precautionary retrenchment in outward-oriented technological specialization. Persistence is moderate, indicating reconfiguration rather than a permanent collapse.
3. Capabilities buffer shocks (supports H3). Higher baseline EXDVA mitigates the adverse effects of CPU/UCT on both DECOUP and EXDVA—evidence for a capability-buffer mechanism whereby deeper domestic technological ecosystems shorten and dampen uncertainty-driven contractions.
4. Controls and propagation. Tariffs exhibit at most marginal effects on uncertainty and GVC outcomes relative to non-tariff/geopolitical channels. Patents (environment-related) raise UCT in China, linking green-tech competition to geopolitical salience. GDP per capita shows asymmetric influences across countries. Wald tests underscore the role of CPU/UCT and lagged GVC variables in driving dynamics.
5. Model superiority. The MIDAS-VAR outperforms classical VARs on AIC and yields more statistically meaningful coefficients, validating the mixed-frequency approach for fast-moving uncertainty indicators. Residuals pass normality checks.

Contributions

Substantive: Provides the first integrated, macro-level evidence that climate policy and geopolitical uncertainties jointly reshape technological GVC participation and specialization in the Sino-American system, with CPU as the more persistent headwind.

Methodological: Demonstrates how U-MIDAS VAR can fuse high-frequency news-based indices with annual/biannual fundamentals to recover richer short-run dynamics in GVC research.

Conceptual: Operationalizes techno-nationalism via EXDVA, connecting specialization patterns to

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resilience

under

uncertainty.

Keywords: Technological Gvcs; Climate Policy Uncertainty; Geopolitical Tensions; Techno-Nationalism; Midas Var; Chinaus–US.