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Trade, market access uncertainty, geopolitics, and economic security

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Abstract: This short paper serves as input for the introduction of nine themes for the GTAP consortium "White Paper." As part of this process, the paper dives into one of these themes: "Trade, market access uncertainty, geopolitics, and economic security". A major focus is the distinction between realized shocks and the *threat* of disruption. Recent work on maritime chokepoints highlights that the economic impact of geopolitical tension often precedes physical blockages. For example, rising war risk premiums and insurance costs in critical arteries like the Red Sea or the South China Sea act as immediate trade barriers, altering shipping routes and costs even before trade flows stop. Similarly, in the context of critical minerals and "critical goods," vulnerability is not merely a function of scarcity but of network topology and concentration.

1. Introduction

The paper raises questions about the applicability of economic modelling for assessing the impact of uncertainty on trade through the lens of geopolitical and geographic shocks. A central question is whether by coupling network analysis within CGE frameworks, we can better identify structural vulnerabilities in supply chains that aggregate sector data obscure, offering a more granular picture of economic coercion risks and the potential costs of "friendshoring" or fragmentation. A related question is the applicability of computational tools in the scoping of quantitative risk exposure across supply chains in this context.

2. Background

For decades, the global trading system evolved under a paradigm of increasing predictability, anchored by the WTO and a network of preferential agreements designed to lock in market access and reduce policy volatility. However, the current landscape is defined by a retreat from these norms. Geopolitical rivalry, the weaponization of economic interdependence, and the fraying of the rules-based order have reintroduced profound uncertainty into the global economy. Standard Computable General Equilibrium (CGE) models, which typically treat trade policy through static tariff wedges or fixed non-tariff measures, are ill-equipped to capture the economic drag caused by this rise in systemic risk. To remain relevant over the next decade, the quantitative trade analysis community must integrate the cost of uncertainty itself—manifested through

risk premia, insurance costs, and investment hurdles—directly into our modelling frameworks.

In the shifting geopolitical landscape, the distinction between realized shocks and the *threat* of disruption has become increasingly clear. Recent work on maritime chokepoints highlights that the economic impact of geopolitical tension often precedes physical blockages. For example, rising war risk premiums and insurance costs in critical arteries like the Red Sea or the South China Sea act as immediate trade barriers, altering shipping routes and costs even before trade flows stop. Similarly, in the context of critical minerals and "critical goods," vulnerability is not merely a function of scarcity but of network topology and concentration. By coupling network analysis with CGE frameworks, we may be able to better identify structural vulnerabilities in supply chains that aggregate sector data obscure, offering a more granular picture of economic coercion risks and the potential costs of "friendshoring" or fragmentation.

Furthermore, the policy modelling community finds itself needing to assess the macroeconomic transmission of trade policy uncertainty. The erosion of tariff bindings and the looming threat of trade wars do not just affect relative prices. They fundamentally alter the cost of capital. Evidence suggests that rising policy uncertainty correlates with higher country and equity risk premia, which depresses investment and GDP in ways standard static trade models fail to capture.

In this paper we explore the need for methodological "hacks" and structural innovations to address these gaps, such as frameworks for treating market access and trade cost uncertainties as quantifiable trade costs and linking trade-related risk premia to the long-run capital accumulation effects of volatile policy environment. Addressing these issues is essential for providing credible, evidence-based analysis in an era where security and uncertainty are dominant drivers of trade policy.

3. Supply Chain Disruption and Choke Points

a. Context

Deeper integration in global supply chains has become increasingly important for the development strategies low- and middle-income countries. Such integration offers gains from a combination of efficiency gains (including cross-border scale/agglomeration effects) and access to better technology. It hinges not only on tariffs but also regulatory requirements (e.g., corporate due diligence) and administrative efficiency These dependencies underpin the logic for recent trade facilitation initiatives.

While better integration promises economic benefits, it also brings deepened exposure to network-related disruptions in global supply chains. Examples of past disruption include both natural disasters (Inoue and Todo 2019) and public health shocks (Moosavi 2022). More recently, there is heightened concern about supply chain shocks linked to geopolitical tension. The standard analysis of supply-chain trade relies on the gross value of direct bilateral flows. However, doing so implies a “veil of ignorance”

regarding supply chain vulnerabilities linked to the web of the upstream and downstream linkages in which a particular trade flow is embedded (Baldwin and Freeman, 2022).

Recent events have highlighted these acute vulnerabilities. Even before the Iran war, the Houthi attacks in the Red Sea, beginning in late 2023, effectively rendered the Suez Canal, a conduit for 12% of global trade, unsafe for most container traffic, forcing costly and time-consuming diversions around Africa (International Monetary Fund 2024). Concurrently, climate-induced drought, a manifestation of slower-moving but equally potent environmental risks, has severely restricted transit capacity at the Panama Canal, a critical artery for trade between Asia and the Americas (Panama Canal Authority 2025). These crises, occurring alongside the sustained disruption to Black Sea trade from the war in Ukraine and rising military tensions in the South China Sea, underscore a critical reality. Chokepoint disruptions are not theoretical tail risks but active and concurrent drivers of global economic volatility.

b. A Typology of Maritime Chokepoint Risk

To structure the analysis, we propose a typology of maritime chokepoints categorized by their systemic importance and the feasibility of rerouting traffic.

- **Tier 1: Irreplaceable & Systemically Critical.** These chokepoints have no viable, large-scale alternatives. A disruption would cause a severe global economic crisis. This category includes the **Strait of Hormuz** and the **Strait of Malacca/South China Sea** system. Their irreplaceability stems from the sheer volume of trade and the lack of any geographically or technically feasible bypass routes for the largest vessels (U.S. Energy Information Administration 2025).
- **Tier 2: Systemically Important, with Alternatives.** These chokepoints are essential nodes in the global trade network, but viable, albeit costly, bypass routes exist. The **Suez Canal** and **Panama Canal** fall into this category. The existence of an alternative (the Cape of Good Hope) means a blockage does not halt trade entirely, but rather transforms a logistical problem into a significant economic cost shock that reverberates through the global economy (International Monetary Fund 2024).
- **Tier 3: Regionally & Geopolitically Critical.** These chokepoints are vital for specific regions and global commodity markets. This category includes the **Turkish Straits**, **Danish Straits**, **East China Sea**, **English Channel**, and **Strait of Gibraltar**. A disruption here might not immediately trigger a global recession, but it could cause acute crises in specific markets or paralyze the highly integrated economies of specific regions like Northeast Asia or Europe.

c. Response Options

When a chokepoint is disrupted, economic actors face decisions regarding logistical continuity and financial exposure. The first option is re-routing, which is primary form of physical adaptation, involving sending vessels via alternative, often longer and costlier, routes. On the one hand, this maintains physical flow of goods and serves to can mitigate immediate supply shortages. Examples include the re-routing of Ukrainian gran exports after the Russian invasion. On the negative side, this significantly increases fuel costs, extends transit times (impacting freshness, inventory), strains port capacities elsewhere, and raises emissions. The feasibility of this adaption is highly dependent on the chokepoint (e.g., Suez has Cape of Good Hope; Hormuz has few viable alternatives).

The second option manifests as re-insurance (War Risk Premiums). This is a financial mechanism to manage heightened risk in transit. Indeed, marine insurance companies levy "Additional Premiums" for vessels entering high-risk areas (e.g., designated by Lloyd's Joint War Committee). An advantage is that this allows continued direct passage for those willing to bear the cost. By design if provides financial compensation for loss/damage in declared war zones. On the negative side, this again drives up shipping costs, which are passed on to consumers. These can become prohibitively expensive, leading to effective closure of routes even without physical blockage. A rise in re-insurance premiums is often the first economic signal of escalating chokepoint risk.

4. Challenges for Modelling

At the nexus of chokepoint chocks, macroeconomic impacts, and supply chain transmission, we have several tools at hand. The challenge is to re-purpose them. These includes MRIO-based exposure analysis, econometric analysis of trade facilitation and the cost of friction (to better quantify sensitivity to trade costs), and an integrating assessment combining the supply chain data and econometric estimates underlying numerical (CGE/NQT) modeling.

As Baldwin and Freeman (2022) argue, different types of shocks require different analytical tools, a "horses for courses" approach. Their work defines crucial measures of foreign exposure, distinguishing between the foreign value-added sourced for a nation's final consumption versus that which is sourced for its exports. This allows for a granular diagnosis of how foreign shocks might impact domestic consumers versus export-oriented industries (Baldwin and Freeman 2022). Applying these measures, Baldwin, Freeman, and Theodorakopoulos (2023) have mapped the "hidden exposure" of the U.S. economy, revealing deep reliance on specific foreign suppliers that are not apparent from gross trade data.

a. Hidden Supply Chain Exposure

To capture supply chain exposure, we can start with employing the framework developed by Baldwin, Freeman, and Theodorakopoulos (2023) and Baldwin and Freeman (2022a, 2022b). This offers a framework for computing "Look-through Exposure" measures. These are all based on MRIO methods:

- FPEM (Foreign Production Exposure: Import Side): This indicator measures the reliance of a domestic sector on inputs produced in a specific foreign nation, summing both direct imports and indirect value-added embedded in imports from third countries.
- FPEX (Foreign Production Exposure: Export Side): This measures the exposure of domestic producers to demand shocks in foreign markets, tracking value-added as it travels through intermediate processing hubs to its final destination.

This type of analysis can build on both GTAP and OECD/STAN data. Both datasets provide valuable time dimensions. This may allow mapping FPEM/FPEX measures against maritime geography and geographic chokepoints. Such an approach will allow us to quantify the volume of value-added that must traverse critical maritime chokepoints (Suez, Panama, Hormuz, Malacca), including both final demand in low- and middle-income countries, and the low- and middle-income value added contained in consumption by third countries that is exposed to such choke points through supply chain structures.

b. Quantifying the Impact of Geoeconomic Shocks and Chokepoint Vulnerability

The choice of a Computable General Equilibrium (CGE) frameworks seems obvious if we want to move from relative indicators to estimated impacts.

While MRIO models are unparalleled for this type of diagnostic mapping, their fixed-coefficient (Leontief) structure assumes no substitution possibilities in response to price changes. A maritime chokepoint disruption, however, is fundamentally a **trade cost shock**. Such a shock induces changes in relative prices, leading to behavioral responses from firms and consumers. A CGE framework, with its micro-foundations in utility and profit maximization, is explicitly designed to capture these substitution effects. It can endogenously model how economic agents react to the increased cost of trade—by absorbing costs, switching to domestic or alternative foreign suppliers, or altering consumption patterns. Therefore, for analyzing the economic impact of a trade cost shock, the CGE model is the more appropriate "horse for the course."

Supplementing Baldwin et al type MRIO analysis, and starting from the same underlying global MRIO structures of data, a logical flanking step is application of computational model of trade that includes international transport (e.g. Bekkers et al 2018) to simulate

disruptions at geopolitical chokes points (e.g., Hormuz, Malacca straights, etc.). This requires modeling increased shipping distances and time with data from sources like KPLER marine traffic data, combined with time cost estimates (e.g., Hummels & Schaur 2013, Djankov et al., 2010).

Rerouting (The Distance Shock): Real shipping industry data (Clarksons/EIA/KPLER should allow us to calculate the additional nautical miles required to bypass closed chokepoints (e.g., diverting Suez traffic via the Cape of Good Hope). Combined with time=money estimates (e.g., Hummels and Schaur, 2013), this distance can be converted into efficiency losses in the CGE model.

Financial Risk (The Insurance Shock): For scenarios involving geopolitical tension (e.g., Red Sea attacks, Strait of Hormuz instability), we may also approach shocks as a spike in insurance premiums (War Risk Surcharges), raising the margin cost of trade without necessarily closing the route.

5. Benchmarking Trade Cost Estimates
6. Capital Stock Linkages and Uncertainty Costs
7. Numeric Examples

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