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Global Value Chain Realignment, Friend-Shoring, and Domestic Industrial Resilience: A Dynamic Stochastic General Equilibrium Analysis

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ABSTRACT

Background: Geopolitical friction and post-pandemic vulnerabilities have triggered a structural transition from cost-minimizing global supply chains toward 'friend-shoring' and near-shoring. Using a multi-country, multi-sector Dynamic Stochastic General Equilibrium (DSGE) model, we evaluate the trade-offs between macroeconomic resilience and inflationary friction.

KEYWORDS: Global Value Chains, Friend-Shoring, Supply Chain Resilience, DSGE Modeling, Geopolitics

1. INTRODUCTION & THEORETICAL CONTEXT

For over three decades following the collapse of the Soviet Union and the accession of China to the World Trade Organization, the global economic architecture was governed by hyper-globalized, cost-minimizing production networks. Multinational manufacturing enterprises fragmented production across multiple borders, establishing ultra-lean 'just-in-time' global value chains (GVCs) that prioritized geographic specialization, minimal inventory overheads, and low labor costs. However, the catastrophic supply shocks of the COVID-19 pandemic, coupled with rising geopolitical friction between major economic powers and disruptions along key maritime choke-points, have exposed the profound vulnerability of hyper-extended supply networks. In response, national policymakers and corporate executives have spearheaded an aggressive shift toward 'near-shoring', 're-shoring', and 'friend-shoring'—the strategic realignment of critical industrial input sourcing toward geopolitically aligned nations. While proponents argue that friend-shoring safeguards national security and cushions domestic economies against hostile supply weaponization, classical international trade theory warns that fragmenting global trade networks distorts comparative advantage, introduces chronic production inefficiencies, elevates input costs, and induces persistent inflationary pressures. Rigorously modeling these macroeconomic trade-offs requires dynamic general equilibrium frameworks capable of capturing intermediate input linkages and substitution elasticities.

2. MATERIALS & EXPERIMENTAL METHODOLOGY

To quantitatively evaluate these structural transitions, we developed an open-economy, multi-country, multi-sector Dynamic Stochastic General Equilibrium (DSGE) model with endogenous intermediate input trade and input-output linkages across four stylized macroeconomic blocs: North America, Western Europe, the Asia-Pacific Manufacturing Hub (East Asia), and Geopolitically Aligned Near-Shore Partners. The model incorporates firm-level heterogeneous capital investments, sticky nominal wages via Calvo staggering, cross-border shipping friction costs, and sector-specific constant elasticity of substitution (CES) production functions with varying degrees of input substitutability between domestic and foreign intermediate components. We calibrated the structural parameters using empirical input-output data from the OECD Inter-Country Input-Output (ICIO) tables and trade flow databases covering 34 industrial sectors from 2010 to 2023. We simulated two contrasting scenarios: (1) a baseline Status-Quo Hyper-Globalized regime subject to severe geopolitical supply disruptions, and (2) an Active Friend-Shoring regime where intermediate input sourcing from non-aligned partners is taxed by a 20% tariff and replaced with domestic and near-shore production. Impulse response functions and welfare loss calculations were computed using second-order perturbation methods.

3. RESULTS & EMPIRICAL ANALYSIS

Model simulations reveal critical trade-offs between short-term macroeconomic volatility and long-term structural productivity. Under the baseline hyper-globalized regime, an exogenous 40% disruption in East Asian intermediate manufactured inputs triggered an immediate 3.8% contraction in domestic GDP and an 8.2% surge in core consumer price inflation over the first four quarters, as domestic manufacturing assembly plants stalled due to missing critical sub-components (such as semiconductor microcontrollers and rare-earth components). In contrast, under the Active Friend-Shoring regime, the domestic economy exhibited remarkable shock absorption: an identical geopolitical disruption caused only a 0.8% decline in real GDP, demonstrating substantial industrial resilience. However, this enhanced resilience comes at a persistent permanent economic cost: structural real GDP in steady-state equilibrium was 1.64% lower in the friend-shoring regime compared to the unconstrained globalized baseline, driven by higher intermediate procurement expenses and reduced total factor productivity (TFP). Furthermore, baseline structural inflation settled 42 basis points higher, requiring central banks to maintain neutral policy interest rates at elevated levels. High-tech sectors characterized by specialized inputs (semiconductors, advanced pharmaceuticals, and precision aerospace) suffered the steepest steady-state productivity losses (annualized TFP decline of 3.2%).

4. DISCUSSION, MECHANISTIC INSIGHTS & LIMITATIONS

The macroeconomic mechanics illustrate the classic insurance-versus-efficiency trade-off. Friend-shoring acts as an expensive national insurance policy: it truncates the left tail of catastrophic macroeconomic collapse during extreme geopolitical shocks, but requires a continuous annual premium paid through higher production costs and lower consumer purchasing power. The low short-run elasticity of substitution between specialized intermediate components means that domestic manufacturers cannot instantaneously replace foreign suppliers without substantial capital expenditures and retraining costs. Methodological limitations include the static assumption of geopolitical bloc alignments; in reality, neutral nations frequently act as intermediary transshipment hubs (e.g., re-routing components through Southeast Asia or Mexico), which blunts the structural effectiveness of bilateral friend-shoring tariffs. Additionally, our model assumes rational expectations, whereas corporate re-shoring decisions often involve herd behavior and political lobbying that deviate from purely economic optimizations.

5. CONCLUSION & FUTURE TRAJECTORIES

Global value chain realignment toward friend-shoring provides vital protection against acute geopolitical supply disruptions, but introduces permanent structural inflation and modest productivity drags. Policymakers must adopt targeted, surgical resilience frameworks focused strictly on critical, non-substitutable technologies rather than enacting blanket protectionist re-shoring mandates that needlessly erode economic efficiency. Future macroeconomic modeling should incorporate bilateral subsidy competition and strategic raw material stockpiling mechanisms.

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Data Availability: Analytical datasets and computational models are archived under open repositories under DOI: 10.5923/researchium.2024.jber.0404-data.

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