

Global Production Relocation with Gravity: A Triangle Perspective

Topic: Input-Output Modelling: Trade and Global Value Chains policies (2)

Author: Xiang Gao

Standard gravity models treat global production relocation as a bilateral process between an origin (the previous production location) and a destination (the new host economy). This perspective fails to capture the triadic nature of modern value-chain dynamics. We propose a triangular framework that introduces a third node: the buyer economy, whose demand shocks trigger and direct relocation. Proposing a refined measure of global production relocation based on the input-output framework (Gao et al., 2022, 2025), we use the 2022 edition of OECD-ICIO tables to trace changes over time in the roles of major economies and the structure of global production. We find, for example, China, long a dominant destination economy, emerged as one of the world's leading origin economies after 2016, a position it never held in earlier periods. Moreover, when the US acts as buyer, China became one of the leading origins of US-driven relocation after 2016, while the magnitude of production relocated to China diminished markedly, unfolding a measurable US-China decoupling dynamic. In summary, our entropy metrics of global production relocation formalize its structural shift. They show that the complexity of global production relocation flows rose sharply after 2016, particularly for intermediates. The within-buyer relocation networks became more diversified as buyers broadened their supplier bases to strengthen resilience, and production capacity spread across a wider set of economies, rather than merely from one dominant hub to another.

Furthermore, using this measure, we estimate a triangular gravity model that uncovers a clear two-stage relocation mechanism in buyer-driven production networks. In the first stage, origins are pushed into adjustment by their cost-based exposure to buyer-specific demand shocks, as captured by traditional gravity linkages between buyers and origins. In the second stage, displaced production capacity is pulled toward destinations that offer more favorable access to the same buyer's market, shaped by tariffs, geopolitical alignment, and institutional ties. A central empirical finding is a pronounced asymmetry in tariff effects. Tariffs imposed by the buyer on destinations strongly deter relocation into those destinations, while tariffs on origins have little effect on production outflows. Tariff policy, therefore, governs where production can be rerouted, not where it must leave. Once buyer-specific linkages are accounted for, the direct origin–destination gravity, representing pure relocation costs, becomes muted. This explains why bilateral models fail to detect geopolitical effects: they miss the triadic logic through which alignment matters by shaping a destination's attractiveness within a buyer-specific network.

Previous related work:

Gao X*, Hewings GJD, Yang CH (2022) Offshore, Re-shore, Re-offshore: What Happened to Global Manufacturing Location between 2007 and 2014?. *Cambridge Journal of Regions, Economy and Society*. 15(2): 183-206.

Gao X*, Hewings GJD, Yang CH (2025) Measuring the Industry Relocation at the Macro-level. *Economic Systems Research*. 37(3), 475–499.