

Short-Term Effects of Tariff Shocks in Endogenous Production Networks: A Reconstructed Inter-Country Input–Output Model

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In recent years, tariffs have played an increasingly prominent role in international trade disputes. Changes in tariff rates affect not only exports but also the structure of production networks. This paper develops a framework to measure the short-term economic effects of tariff policies with endogenous production networks. Using counterfactual analysis, we examine whether allowing for endogenous adjustments in production networks significantly affects both the magnitude and the cross-country distribution of tariff shock effects. Our empirical analysis is based on ADB-MRIO 2022 and import data from China and U.S. customs statistics.

We reconstruct the ICIO model to endogenize production networks in response to tariff changes. We consider an economy with perfect competition and constant returns to scale. In each country-sector, a representative producer solves a two-stage cost-minimization problem: first choosing the optimal level of intermediate inputs, and then determining their sourcing shares across countries. Intermediate goods are assumed to be heterogeneous across countries. By incorporating the first-order conditions of the representative producer's optimization problem into the row-balance equations of the ICIO table, we construct a production network matrix that is endogenous rather than a fixed parameter matrix. We consider a scenario in which one country imposes tariffs and the targeted country responds with retaliatory measures. Within this framework, the effects of tariff shocks are decomposed into two main transmission channels. The first is the export channel, which operates through changes in final goods exports. The second is the production network channel, which arises from the endogenous reconfiguration of production networks. Leveraging the decomposability and interpretability of the input–output framework, we further construct a structural decomposition analysis (SDA)-based pathway decomposition framework.

Then, we conduct a counterfactual analysis using the U.S.-China trade conflict as an illustrative case. In the baseline scenario, we consider a bilateral tariff escalation between China and the United States, with mutual retaliation and unchanged tariffs toward third countries. This counterfactual design allows us to isolate the spillover effects of bilateral tariff interactions. We therefore adopt a three-country setting to facilitate this identification. We find that endogenous reconfiguration of production networks reshapes the incidence of tariff shocks relative to a fixed-network benchmark. China's losses are mitigated, whereas those of the United States increase markedly. Third countries gain from spillovers and emerge as indirect beneficiaries.

The decomposition results show that the export channel primarily captures the direct punitive effects of tariffs on the targeted country, whereas the production network channel generates a more complex redistribution across the three economies. Firms adjust their input sourcing along three margins: domestic expansion, displacement, and third-country substitution. Moreover, to examine how tariff intensity affects the global distribution of value added, we consider scenarios with varying tariff levels. We find that higher tariffs lead to substantially larger losses for both China and the United States.

This paper makes three main contributions.

First, we develop a parsimonious and tractable approach to endogenizing production network, which is particularly suitable for short-run analysis. This framework overcomes a key limitation of

conventional ICIO models, in which production networks are treated as fixed parameter matrices and thus cannot respond to tariff-induced changes in relative prices. Relative to structural models, it preserves the standard advantages of input–output models, including the ability to capture full network interdependence through matrix inversion, as well as transparency, decomposability, and tractability in counterfactual analysis. These features make it particularly well suited for studying the role of production networks in transmitting tariff shocks.

Second, under a setting of tariff escalation between major economies with mutual retaliation, we identify two categories and eight key transmission channels of tariff shocks. Specifically, we decompose the effects into export-channel effects and production-network effects, including domestic expansion, displacement, and absorption channels, thereby quantifying the impact of production network reconfiguration.

Third, we conduct counterfactual analysis based on the China–U.S. tariff conflict. We find that allowing for endogenous production network adjustments significantly changes both the magnitude and the cross-country distribution of losses.