

Firm-level Propagation of the Effect of the Disruption of International Trade through Domestic Supply Chains

Topic: Agent-Based Modeling and Input-Output Analysis - I

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The risk of disruption to global supply chains is rising because of the increasing frequency of pandemics and natural disasters and deteriorating geopolitical stability, threatening the sustainability of global supply chains. This study simulates how the disruption of imports from various regions affects the total production of Japanese firms. We particularly incorporate the propagation of the economic effect through domestic supply chains using data on more than one million firms and four million supply chain ties. We find that the negative effect of the disruption of intermediate imports grows exponentially as its duration and level increase because of downstream propagation. In addition, the propagation of the economic effect is substantially affected by the network topology of importers, such as the number of importers (affected nodes) and their upstreamness in supply chains, but not necessarily by their centrality. Furthermore, the negative effect of import disruption can be mitigated by the reorganisation of domestic supply chains, even when conducted only among network neighbours. Our findings highlight the differences between the propagation of economic effects through supply chains and the diffusion of information and behaviours through social networks and provide important policy and managerial implications for the achievement of more sustainable global supply chains.