

Impacts of Local Water Scarcity Risk on Global Trade Network

Topic: 811B Disaster Analysis

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Water scarcity is one of the most significant long-term risks worldwide. As economies become increasingly interconnected through international trade, local water scarcity risk in producing nations can potentially lead to cascading impacts to distant economies. Existing studies have revealed impacts of global production and consumption activities on local water use and scarcity; but the impacts of local water scarcity risk on the global trade network remain largely unknown. Analyzing the impacts of local water scarcity risk on the global trade network can reveal vulnerable nations and sectors, and hence support policy decisions on conserving water resources and strengthening the resilience of the world economy against water crises.

In this study we evaluate impacts of local water scarcity risk on the global trade network. Using data from the World Input-Output Database (WIOD) for 1995–2009, we first quantify local water scarcity risks for each sector in each nation based on water availability of the nation and water use and economic output of the sector. We then evaluate impacts of local water scarcity risks on the global trade network using the WIOD multi-regional input-output (MRIO) model. Based on the results, we identify nations and sectors that are vulnerable to distant water scarcity risks.

In 2009, approximately 9% of the global economic impacts due to water scarcity risk occur in foreign nations, a proportion that had been increasing steadily along with increasingly intensified international trade since 1995. For many nations, large portions of the economic impacts triggered by their local water scarcity risks happen abroad, such as Belgium (38%), Netherlands (38%), and Luxembourg (35%). At the same time, over half of economic impacts in some countries, such as Estonia (85%), Hungary (81%), Netherlands (78%), Lithuania (62%), Ireland (62%), Luxembourg (60%), and Belgium (52%), are due to foreign water scarcity risks.

The “hotspots” identified in this study can be largely invisible to relevant parties, due to the growing complexity of the global trade network and the uneven distribution of water availability and water demand across the world. We anticipate our findings is able to help strengthen the stability of the global trade network through guiding water-related investments of international institutions, foreign investments of firms, and the choices of upstream suppliers in critical sectors.