Disaster ▶ Disrupts transport ▶ Perturbs supply chains ▶ Economic losses

- Transport is often the first infrastructure to get disrupted when a disaster hits (e.g., flood, landslide, earthquake).
- Transport is crucial for supply chains.
- Disruption at one point of the supply chain can propagate across sectors and regions.

We build a dynamic, agent-based, and spatially-explicit supply-chain model which is fully embedded in the transport network:

- A set of firms — namely one per sector — is modeled on each node of the transport network.
- Firms buy inputs from and sell outputs to (i) other firms located in other nodes, (ii) firms abroad, (iii) households. They use inventories.
- Products are delivered using the lowest-cost path on the transport network.

Losses result from two mechanisms:

- A disaster hits a transport infrastructure
  - Deliveries are blocked ➞ delays
  - Deliveries are rerouted ➞ higher transport costs

- Prices increase, propagation along supply chains
  - Shortages, which propagate along supply chains
  - Impacts on households & international buyers

Calibration data: transport (OSM, OIA), input–output table (GTAP), spatial distributions of population, GDP, and land use (CIESIN, RCMRD), listing of firms (Tanzanian authorities), dedicated survey to 800 Tanzanian firms (World Bank)

Criticality varies with the type of supply chains

- Loss of food products for households
- Losses for international buyers

Shocks get exponentially amplified

<table>
<thead>
<tr>
<th>Duration of the disruption</th>
<th>Household losses</th>
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</thead>
<tbody>
<tr>
<td>1 week</td>
<td>0%</td>
</tr>
<tr>
<td>2 weeks</td>
<td>5%</td>
</tr>
<tr>
<td>3 weeks</td>
<td>15%</td>
</tr>
<tr>
<td>4 weeks</td>
<td>20%</td>
</tr>
</tbody>
</table>

Resilience can be improved through supply and demand-side measures

Supply-side = offer better transport in critical corridors
- Strengthen the quality of roads
- Build alternative pathways
- Improve preparedness to repair quicker

Demand-side = manage how firms use transport
- Larger inventories
- More suppliers for the same inputs
- Shorter supply chains

The model can test both types of measures and helps widen the spectrum of resilience policies.