PREPARING FOR THE UNEXPECTED: SHOCK MODELING & SUPPLY CHAIN SECURITY

When it comes to supply chain resilience, the ability to anticipate, adapt to, and recover from disruptions is critical. With this in mind, MITRE's **Modeling Supply Chain Resiliency simulation framework** provides a method for testing and evaluating the ability of a supply chain to withstand and recover from disruptions across industries and regions.

We create virtual scenarios or models (sometimes referred to as "shock modeling") that mimic real-world events such as natural disasters, trade restrictions, or transportation delays. By simulating these disruptions, MITRE helps sponsors assess national-level supply chain vulnerabilities, including identifying critical points of failure and developing strategies to minimize the impact of potential disruptions.

Our framework is powered by quantitative simulation models that assess the impact of economic shocks and their impact on supply chains at the macro level. These interactions capture the flow of inventory, demand, orders, and intermediate consumptions, as well as labor and industry production on a day-by-day basis, and allow for a variety of shocks to be invoked into a simulation experiment. Metrics outputted from the simulation relate to production and gross output per industry in the United States and can be observed in terms of cumulative gross output loss, maximum loss in gross output, and time to recover.

This simulation framework also incorporates optimization procedures to explore the space of inventory allocation alternatives that best maximize different types of resiliency measures. Additional models are then developed to produce a more complete simulation framework for wider ranging applications. A lighter weight System Dynamics model provides a more transparent interface to enable policymakers to isolate significant connections between variables of interest. Successful case studies involving labor shocks, transportation delays, and other disruptions have already been performed with a number of sponsors.

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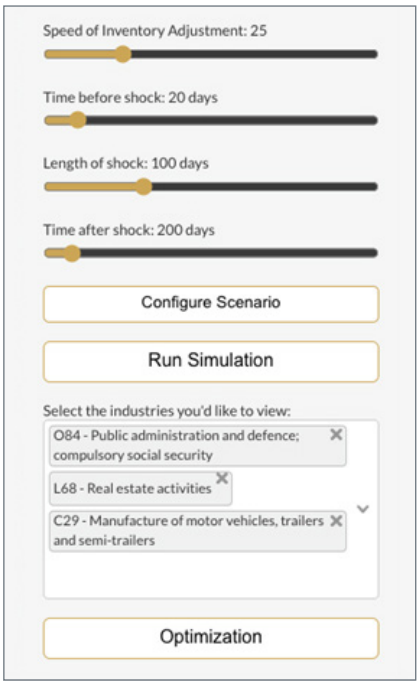
Transportation Shock Modeling

Transportation Shock

The simulation has the capability to measure regionalized economic production and inventory levels and also provide these measures for individual industries. The current data for the simulation reflects the flow of supplies between the U.S. and the rest of the world. The simulation has a time step of one day. During the execution of the simulation equations according to production, demand, intermediate consumption, inventory, orders, and labor are updated daily. These equations are based on the flow of goods between industries and geographical regions.

Scenario Control

The User can control the start of the shock, the length of the shock and the severity of the shock. The shock in this scenario pertains to an increased delay in transportation. More specifically an increased dependency level and dwell time at the Port of Mobile. It is assumed that 53% supplies going through the Port of Mobile stay in state. This value can be adjusted in order to increase the severity the shock.



Example Dashboard

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