Public Abstract
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Title:DESIGNING A ROBUST SUPPLY CHAIN NETWORK AGAINST DISRUPTIONS

Supply chains are vulnerable to disruptions at any stage of the distribution system. These disruptions can be caused by natural disasters, production problems, or labor defects. The consequences of these disruptions may result in significant economic losses or even human deaths. Therefore, it is important to consider any disruption as an important factor in strategic supply chain design. Consequently, the primary outputs of this dissertation include insights for designing robust supply chains that are neither significantly nor adversely impacted by disruptions.

The impact of correlated supplier failures is examined and how this problem can be modeled as a variant of a facility location problem is described. Two main problems are defined, the first being the design of a robust supply chain, and the second being the optimization of operational inspection schedules to maintain the quality of an already established supply chain. In this regard, both strategic and operational decisions are considered in the model and (1) a two-stage stochastic programming model; (2) a multi-objective stochastic programming model; and (3) a dynamic programming model are developed to explore the tradeoffs between cost and risk.

Three methods are developed to identify optimal and robust solutions: an integer L-shaped method; a hybrid genetic algorithm using Data Envelopment Analysis; and an approximate dynamic programming method. Several sensitivity analyses are performed on the model to see how the model output would be affected by uncertainty.

The findings from this dissertation will be able to help both practitioners designing supply chains, as well as policy makers who need to understand the impact of different disruption mitigation strategies on cost and risk in the supply chain.