Risk-Based Input-Output Analysis of Influenza Epidemic Consequences on Interdependent Workforce Sectors*

Abstract

Outbreaks of contagious diseases underscore the ever-looming threat of new epidemics. Compared to other disasters that inflict physical damage to infrastructure systems, epidemics can have more devastating and prolonged impacts on the population. This paper investigates the interdependent economic and productivity risks resulting from epidemic-induced workforce absenteeism. In particular, we develop a dynamic input-output model capable of generating sector-disaggregated economic losses based on different magnitudes of workforce disruptions. An ex post analysis of the 2009 H1N1 pandemic in the National Capital Region (NCR) reveals the distribution of consequences across different economic sectors. Consequences are categorized into two metrics: (i) economic loss, which measures the magnitude of monetary losses incurred in each sector, and (ii) inoperability, which measures the normalized monetary losses incurred in each sector relative to the total economic output of that sector. For a simulated mild pandemic scenario in NCR, two distinct rankings are generated using the economic loss and inoperability metrics. Results indicate that the majority of the critical sectors ranked according to the economic loss metric comprise of sectors that contribute the most to the NCR’s gross domestic product (e.g., federal government enterprises). In contrast, the majority of the critical sectors generated by the inoperability metric include sectors that are involved with epidemic management (e.g., hospitals). Hence, prioritizing sectors for recovery necessitates consideration of the balance between economic loss, inoperability, and other objectives. Although applied specifically to the NCR region, the proposed methodology can be customized for other regions.