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“Modeling Post-disaster Business Recovery: A semi-Markov estimation framework”

Understanding the post-disaster recovery process of industrial sectors is critical for ensuring a quicker recovery and estimating economic losses instigated by disasters. However, the recovery process of firms is complex, multidimensional, and the impact of uncertainty and relevant determiners on recovery has not been adequately addressed in past studies. Therefore, this research developed a recovery function for a firm’s post-disaster recovery process, which integrated the impact of initial damage rates and lifeline service supply status. To model the stochastic recovery process of industrial sectors, this research establishes a multi-state semi-Markov modeling framework that considers both the sojourn time before production capacity state transitions and the probability of state transition in each production capacity state. The proposed methodology is applied to two case studies: the 2016 Kumamoto earthquakes and the Heavy Rain Event of July 2018 in Japan. The results were consistent with the actual observed dataset and recovery tendency. Such a model can contribute by providing empirical evidence to decision-makers and business managers about the systematization of recovery strategies, as well as the prediction of business recovery processes in case of future incidents.