



[Registration No.] 242

[Author] Liu Huan

[E-mail] huan.liu.53m@st.kyoto-u.ac.jp

[Corresponding Author] Hirokazu Tatano

[E-mail] tatano.hirokazu.7s@kyoto-u.ac.jp

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### **[Abstract Title]**

Estimating Post-disaster Production Capacity Recovery with Multi-state semi-Markov Model

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Understanding the post-disaster recovery process in industrial sectors is a critical step towards achieving a quicker recovery and reducing economic losses caused by disasters. However, the recovery process of firms is complex, multidimensional, and nonlinear, and is conditional on the initial damage rate after a disaster. Hence, to model the stochastic recovery process in industrial sectors, this research establishes a multi-state semi-Markov modeling framework, which considers both the sojourn time before state transitions and the production capacity recovery process. A Weibull distribution is assumed for describing sojourn time between production capacity state transitions, and the effect of covariates on the recovery process is addressed. Then, the proposed model is implemented into the firms' recovery process after the 2016 Kumamoto Earthquake which occurred in Japan. Such a proposed industrial sectors' post-disaster modeling framework is essential for estimating economic losses caused by disasters and developing systematic knowledge on how firms quickly and efficiently recover from disasters.

### **[Keywords]**

Economic losses; Industrial sectors; Production capacity; Recovery curves; Semi-Markov model