# Visiting Place and Staying Time Analysis using Discrete-Continuous Choice Model in Downtown Kumamoto

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## Abstract

Since rural cities in Japan declined in competitiveness of its downtown, downtown revitalization policies has attracted attentions. As an example, large-scale downtown redevelopment is now in progress in Kumamoto. To evaluate the redevelopment plan, it is crucial to clarify the change of visitors' time-use patterns in downtown before and after the redevelopment. In this study, as a primary step of evaluation, we examine that visitors' time-use patterns in downtown Kumamoto before the redevelopment.

We conducted a smartphone-based visitors' behavior survey in downtown Kumamoto during the weekends in November and December of 2013 and collected GPS-based tracking data of 1,086 participants. We divide the target area into eight zones and prepare data set of visitors' staying time for eight zones using the tracking data.

In this study, we employ the multiple discrete-continuous extreme value (MDCEV) model which is proposed by Bhat (2005 & 2008). We analyze individual's zone choice behavior and duration choice behavior simultaneously using the time-allocation data. The model employs the random utility maximization framework as the fundamental basis. It is quite practical for modelling time-use behavior even for a large number of zones and hence a lot of its applications to time-use analysis has been reported.

Key findings from the estimation result of the MDCEV model are summarized as follows: (1) Elderly people tend to spend more time in a zone with department store. Specifically, Sakuramachi zone attracts elderly people; (2) Shimotori zone, in which many leisure facilities are located, attracts young generations; (3) West Shimotori zone and Shinshigai zone attract visitors with leisure purpose. Kamitori zone attracts visitors with shopping purpose. These findings can be reasonably understandable, and the model will enable us to evaluate the downtown revitalization policy in the future.