

# Well-Being Assessment for Transport, Natural Capital and Economic Factors

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## 論 文 内 容 の 要 旨

As economics and relevant academic fields has been progressing in recent studies, some limitations have been found in using choice-based methods as a single measure for policy making and enhancement of people's well-being. This study explores the techniques for improving policy effect estimation that can go beyond the conventional choice-based method, and applies them to several analyses using data collected by some original surveys. The main purpose of this study is to reveal factors that have not been found in the previous studies related to transportation, environmental and economic policy, by using some types of methods: extended choice-based technique and the other methods that focuses on satisfaction, sustainability and inclusive well-being of people.

This thesis consists of six chapters. **Chapter 1** gives the background of the study and reveals the overall research question.

In **Chapter 2**, we analyze individuals' travel behaviour by extending the discrete choice model by including subjective factors as explanatory variables in the utility function. Promoting pro-environmental travel modes is an important strategy for sustainable transportation. Previous studies have shown a positive relationship between environmental awareness and environmentally friendly travel modes, but very few studies have considered pro-environmental behaviour and choice of travel mode, particularly in the context of non-Western countries. This study examines the impact of pro-environmental behaviour on the choice of commuting mode in Tokyo, Beijing, Shanghai and Singapore using original survey data. We use the Multiple Indicator Multiple Cause model to construct latent variables of environmentally friendly behaviours. The multinomial logistic regression results indicate that 1) pro-environmental activities and commuting mode choice are unrelated in Tokyo and Singapore, 2) recycling and energy-savings activities are positively related to commuting by bicycle/on foot in Beijing, and 3) participants in organized pro-environmental activities are less likely to use pro-environmental commuting modes in Beijing and Shanghai. The results provide supporting evidence of the habit discontinuity hypothesis and suggest a possible substitution effect between environmentally friendly travel mode choice and other environmental activities.

**Chapter 3** analyzes the effects of in-vehicle crowding on trains using the SWB measure. In-vehicle crowding on public transportation is a serious problem that transportation planners must address. Recent studies have emphasized that in-vehicle crowding impacts travelers' stress and health, while other studies

have investigated how daily travel affects subjective well-being (SWB). Based on the findings of these studies, we provide useful insights into the value of a reduction in crowding in terms of SWB. The other factor we should consider is adaptation, as the effects of travel discomfort disappear after travelers become accustomed to them. In this paper, we analyzed the direct and stress-related indirect effects of dissatisfaction with in-vehicle crowding on life satisfaction, focusing on whether these effects differ by the length of time commuters have been using trains. Using a sample of 8,296 train commuters in Tokyo, we found that (1) dissatisfaction with in-vehicle crowding directly lowers life satisfaction among some groups of short-term train commuters and (2) dissatisfaction with in-vehicle crowding indirectly lowers life satisfaction through stress and health, regardless of whether commuters have used trains for more or less than one year.

**Chapter 4** investigates the value and the future of various types of natural capitals in Japan by estimating willingness to pay and projecting the value of natural capital with inclusive wealth approach. Previous studies have investigated the value of ecosystem services from specific areas or species. Although these studies have provided information on either the global value of natural capital or the local value of specific subjects, there is little evidence on the country-specific values of natural capitals in Japan, which will provide useful information for the national environmental policies. We investigated perceived values of the terrestrial and marine natural capitals in Japan by using internet survey and payment card methods. The data of various natural capitals are collected in a unified format and in a comparable manner. We found that some explanatory variables such as perceived importance and frequency of visits, as well as sociodemographic characteristics, are significant driver of WTP for maintaining each natural capital. Additionally, we conducted a future prediction of terrestrial natural capitals by using a scenario developed by a previous study. It is indicated that Japan should follow natural capital-based dispersed scenario for sustainable management of natural capital.

In **Chapter 5**, we introduce a novel and comprehensive approach for developing well-being index based on economic theory. To aggregate evaluations for various aspects for making one indicator, it is necessary to decide how to weight the evaluations for each aspect that contributes well-being. Previous studies have proposed the methods for estimating the relative marginal utilities of various fundamental aspects of well-being based on utility theory and actually estimate the weights by a survey of US respondents. One of the remaining topics that should be addressed is the difference in relative weights across countries. In this study, we estimate the relative marginal utilities of fundamental aspects by conducting a survey of Japanese residents. We reveal the relative importance of more than 100 aspects that constitute well-being both in terms of policy making and personal choice. We found substantial differences in the rankings of importance on each fundamental aspect between Japanese respondents in our sample and the sample of US residents in the previous study.

Finally, the discussion about the assessment of transportation, environmental and economic policy will be concluded in **Chapter 6**.