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主 論 文 の 要 旨

論文題目 **Investigating Hydrogen Fuel Cell Vehicle Adoption in Japan: Realization of a Concept of Hydrogen Economy**
(日本における水素燃料電池車の採用の研究：水素経済の概念の実現)

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論 文 内 容 の 要 旨

In Japan, hydrogen has been touted as a clean alternative to fossil fuels in the wake of Fukushima Daiichi nuclear disaster. As the first country to adopt plans for a “Hydrogen Society,” which is a society that uses hydrogen as a major source of power, it becomes crucial to investigate the consumers’ attitudes towards this technology. In 2020, Japan declared to go carbon neutral by 2050, and role of hydrogen becomes more crucial in achieving transport sector emissions targets. Till to date, Japan boasts the largest network of Hydrogen refueling stations in the world, but sales of FCEVs remain small compared to what was envisaged in the Basic Hydrogen Strategy, lagging behind the initial projections mentioned in the governmental reports. In the Japanese market, there is a need for the in-depth study of the attitudes of the potential and actual early adopters, and subsequent barriers in the adoption of HFCVs. This research will guide to what extent public supports the government for making the nations a zero emission society. The thesis is comprised of seven chapters, in total, including four chapters (Chapter 3 – Chapter 6) which are based on journal publications. The data for Chapter 3 and Chapter 4 was collected using the first questionnaire survey conducted in 2018 (500 respondents) while the data for Chapter 5 and Chapter 6 emanated from the second questionnaire survey conducted in 2020-21 (89 respondents). Chapter 3 examines the preferences of Japanese citizens for HFCVs through a stated preference discrete choice experiment

involving carefully chosen vehicle attributes and incentives. Mixed logit model was applied on the choice scenario data to elicit the behavioral responses. Governmental incentives such as free public parking and free public transport significantly impact the preferences for HFCVs. Although the preference of Japanese consumers for HFCVs is significantly lower than that for conventional vehicles, a well-designed package of policy incentives involving free public parking and public transport can drive Japan's push for HFCVs in the long run. Chapter 4 examines the socioeconomic profiles of 500 potential car buyers with and without interest in HFCVs. The results show that the potential early adopters of HFCVs exhibit similar trends of sex, employment status, number of people in the households, weekly distance traveled, and frequency of using expressways that influence their decision. Chapter 5 examines the profile of 89 private HFCV adopters in the Aichi Prefectural region. Results suggest that HFCV adopters have a higher socioeconomic status than non-adopters, are mostly male in their 50s and above, and have a higher interest in new vehicle fuel technology. Chapter 6 examines the discontinuous rate of HFCV ownership among HFCV adopters in Aichi Prefecture, Japan, who were wanting to continue or discontinue their ownership. Approximately 50% of the private HFCV adopters, who purchased their vehicles between 2014–2020, wished to discontinue their HFCV ownership owing to factors such as driving range, vehicle performance, future viability, fuel tank safety, and density of stations.

In conclusion, it is evident that the Japanese consumers' interest in HFCVs is not at par with the expectations of the stakeholders who invested billions to make HFCVs a success, similar to when hybrids were first introduced in 1997. The provision of non-financial policy measures can act as a dominant factor in the widespread adoption of HFCVs. Currently, HFCV purchase in Japan comes with a generous financial support that includes subsidy, and a tax exemption as a policy measure to introduce a new technology. Study on behavior and attitudes of actual HFCV adopters reveal that the private HFCV users have some serious concerns on the future viability of these vehicle powertrains. The analysis show that the discontinuance rate of HFCV ownership stands at nearly 50%, with more people wanting to replace their HFCVs with other vehicle powertrains. There are still limitations and future research is needed in order to deeply understand the future of these vehicle powertrains in the Japanese auto-market. Data on actual HFCV adopters is too small to finally conclude results that would represent the sentiments of entire HFCV users. Additionally, there is a need to conduct assessment on HRSs vis-à-vis sales in the specific geography.