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## 主 論 文 の 要 旨

論文題目    **PUBLIC ACCEPTANCE AND ITS  
DETERMINANTS TOWARD CONGESTION  
CHARGING REFORM IN JAKARTA**  
(ジャカルタにおける混雑課金政策の変更  
に向けた社会受容性とその影響要因に関する研究)

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## 論 文 内 容 の 要 旨

### **Abstract**

Car ownership and car usage have continued rapid growth into the current decade in Jakarta, a capital of Indonesia. As a consequence, the areas of city center are suffering from not only heavy traffic congestion but also unmaintained externalities including travel times, air pollution, additional energy consumption, and even serious economic loss due to the extraordinary growth personal mobility. To counter negative effects of personal mobility in bad traffic congestion in Jakarta, the Government has introduced congestion charging (CC) scheme, and CC remains under consideration as an effective a way to mitigate acute private vehicle-dependence. Despite a well-established rationale for successful implementations of CC to mitigate congestion, these a potential powerful strategy remains a difficult policy to implement, due to the fact that related social and legal issues strongly depend on public acceptability rather than technical matters. Understanding this is crucial to any investigations of what might improve social acceptance for CC strategy, as it aims to design a scheme that it is not only effective in achieving the objective but also acceptable to the public. Given this a crucial issue, the aim of this dissertation focuses on public acceptance and explores the influences of its

determinants to the acceptability of CC proposal in Jakarta by developing an econometric methodology to model public acceptance. The outcomes of the developed models aim to provide insights for the Government to implement and provide a more acceptable policy thereby enhancing public support.

As an initial step, **Chapter 2** presents the mechanisms, implementations and barriers of CC policy. It briefly presents an overview related to CC proposal in Jakarta, followed by detailed review for the existing successful CC strategy implementations around the world, their challenges and barriers. Next, Chapter 3 presents the methodology necessary for empirical data collection. Two data sets are needed in this research, namely person trip (PT) data and stated preference (SP) questionnaire data. The PT data is provided by Japan International Cooperation Agency (JICA) and SP consists of survey data collection within proposed charging area in the city center of Jakarta. After data collection and processing, econometric frameworks are adopted for empirical modeling in this research.

**Chapter 4** explores the share of transportation expenditures of households taking into account life stage classifications. The essential household characteristics among life stage categories are taken into consideration. The reason for doing so is under the hypothesis that the CC policy will impose additional monetary expenditures, in particular for commuters having the destination within or the commuting trip passing through to the proposed charging area. It is presumably that certain income groups are saving the transportation expenditure attributable to their income constraints. Understanding commuter's transportation expenditure and its related factors and components could provide valuable insights into traveler's behavior under the range of CC proposal. The analysis was performed using Stochastic Frontier (SF) model and the concept of production frontier is adopted to estimate transportation expenditure frontier (TEF). TEFs are treated as unobserved production frontier that influences the actual transportation expenditures observed in transportation survey. Utilizing PT data, households which include person commuting to the target area were extracted. TEFs were estimated for each household life stage categories (i.e. single-person; childless-couple; families with pre-school children; families with college/university children; families only with adults) in order to investigate their different constraints. From the comparison analysis, it was shown that considerable differences in the average of TEFs across household categories. Particularly, larger amount of TEFs were identified for single-person and families with adult. Empirical results show that the

TEF is influenced by household attributes, life stage categories and life environments.

Further, taking into account the shortcomings of CC that lead to poor public acceptability, **Chapter 5** proposes a parking deposit system (PDS) as an alternative of ordinary road pricing (ORP). This PDS is based on partial or full refunds to automobile users when they enter the charging zone. Refunds are provided only on parking fees or as discounts on purchases within the charging zone; no cash refund is given. The purpose of the PDS scheme was to reduce the number of automobiles entering the city center, but increasing the turnover rate, avoiding a decline in visitors to the city center and eventually increasing social acceptability while raising revenue. Thus, the purpose of this chapter is to conduct a preliminary analysis to investigate and search explanatory variables that influence public perceptions considering Jakarta's citizen's consciousness with respect to the proposals of ORP and PDS. Using SP questionnaire data, a bivariate binary response (BBR) model is formulated to model and investigate public response to ORP and PDS bundles. Results suggest that there is a complementary relationship between approval and consciousness, with PDS offering better improvement for the scheme's acceptance accounts for 77% compared ORP with 69% of public acceptance. Empirical results also underscore the importance of accommodating structural relationship of an endogenous ORP on the PDS acceptance. The results shed new light on the determinants of ORP and PDS acceptance.

**Chapter 6** utilizes the framework of hybrid discrete choice (HDC) model to formulate a generalized ordered (GOR) model and uses proposed model to assess the effects of various factors on respondents' choice behavior with respect to a proposed CC policy considering latent variables. Aiming to capture observable preference heterogeneity across ordinal choices and also capture latent segmentation, an innovative latent class generalized ordered (LCGOR) model is further formulated, allowing the thresholds vary across observations. In this formulation, the thresholds are parameterized as a linear function of the exogenous variables for each class membership (i.e. selfish and altruistic classes). Using SP questionnaire data, a comprehensive set of explanatory variables into four categories: charges, latent variables related to respondent's psychological motivations, mobility attributes and socio-demographic characteristics. As an initial step, latent variables were estimated using multiple-indicators multiple-causes (MIMIC) model. Then GOR and LCGOR models are estimated. The findings of GOR model reveal that the key factors influencing public acceptability include the charge level and respondent's variables such as car dependency, awareness of the problem of

cars in society, frequency of visits to the city center and frequency of private mode usage. Further results from the LCGOR model obviously verify the existence of preference heterogeneity across outcomes. Sensitivity analysis confirms that the altruistic class are more sensitive to the scheme's acceptance. Finding further demonstrates that a charging level at 21,000 IDR (the initial government proposal) exceeds 51% share of probability acceptance. This is a substantially high level of acceptance at such a charge level and such a charge would not meet the objective of cutting car dependence. Charging level of 30,000-40,000 IDR, rather than the government's proposal of 21,000 IDR, would best balance acceptability with the desire to reduce car dependency.

In **Chapter 7**, causal paths among psychological determinants and their strength are measured and analyzed along with acceptability of the scheme's proposal from a cross-country perspective. Using similar context of the SP questionnaire data in Jakarta and Nagoya, a framework of hybrid discrete choice (HDC) is used. A multiple-samples multiple-indicators multiple-causes (MS-MIMIC) and binary response model are performed. The findings from analysis with MS-MIMIC model show that a number of psychological determinants provide an explanation for the acceptability of the proposed scheme in both cities. Psychological motivations including "awareness of the city's environment" and "awareness of the problem of cars in society" appear to be the most important direct determinants leading to recognition of the effects of a congestion charging scheme and they are indirect determinants of policy acceptance in both cities. However, the proposed scheme is found to be more "correct and acceptable" in Jakarta. Empirical evidence discloses that Nagoya is more "car dependent" than Jakarta even though congestion is recognized as worse in Jakarta. The effect of the specific measure indicator "trust in government policy" on perception of correct and acceptable policies is investigated, revealing a negative determinant for Nagoya and opposite for Jakarta. This indicates the important role of current government performance for achieving acceptability for these proposals. Moreover, findings from binary response analysis further suggest that tangible determinants, such as charge scenarios and individual mobility attributes can be a barrier to acceptance in both cities, along with the intangible determinant of "inhibition of freedom of movement" (IFM). On the other hand, the key intangible determinants "recognition of the scheme's effects" (REC) and "trust in government policy" (TGP) might enhance acceptability of the scheme in Jakarta, while TGP may form a considerable barrier in the case of Nagoya.

Finally, **Chapter 8** summarizes research conclusions and provides some

recommendations for future research. Empirical findings of this work should provide insight for the government as it is works to design a more acceptable policy by enhancing public acceptance of the CC proposal. This work might be a particular help in the design of a more effective policy for the promotion of a CC scheme in Jakarta. It also may provide general assistance for other big cities in Indonesia in which they are suffering from dependence on private motorized mobility. Furthermore, the econometric models proposed in this work could be used not only in Indonesia, but also other Asian developing countries perspective in order to analyze public acceptance behavior considering local individual consumer information that can be obtained from opinion survey such as SP questionnaire survey.