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Impacts of Motorcycle Demand Management in Yangon, Myanmar

Hiroki Inaba^a and Hironori Kato^{a*}

^aThe University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan

Abstract

This study analyzes the potential impacts of motorcycle demand management and its contribution to the transportation market in Yangon, Myanmar, where motorcycles have been banned since 2003. A vehicle ownership model with travel demand models of modal choice, destination choice, and trip frequency is estimated using a dataset comprising 8,289 households and 24,373 trips in Yangon, compiled by the Japan International Cooperation Agency in 2013. Next, a traffic demand forecast system is developed in which a traffic assignment model is integrated with a vehicle ownership model and travel demand models to evaluate the impacts of the motorcycle ban. Then, the expected impacts of the motorcycle ban are estimated by comparing multiple scenarios for 2013 and 2035. The results show that the ban could reduce traffic volume and vehicle kilometers traveled by approximately 18.0% and 26.9% in 2013, but only 4.5% and 6.0% in 2035. In other words, the ban significantly contributes to the mitigation of the current urban transportation problems; however, it would promote car ownership and the substitution of motorcycles in line with income growth, wiping out the effects of reduced motorcycle trips in the future. These findings suggest that developing cities should consider the long-term dynamics of motorcycle demand management.

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1. Introduction

Motorcycles are a key mode of urban transportation in many Asian developing cities (Barter, 1998; Tuan et al., 2005; Koizumi et al., 2013). In particular, they have been known to provide flexible and inexpensive mobility for low- and middle-income individuals. However, the growing number of motorcycles has led to severe traffic congestion and accidents in developing cities (Phan and Shimizu, 2011; Uy and Regidor, 2011). To tackle these issues, various related transportation policies have been proposed: motorcycle lanes and parking as well as improvements in motorcycle

* Corresponding author. Tel.: +81-3-5841-7451; Fax: +81-3-5841-7496.

E-mail address: kato@civil.t.u-tokyo.ac.jp

regulations (Hung, 2006; Institute for Transportation and Development Policy, 2009). A potential policy measure to regulate the number of motorcycles is introducing traffic demand management of motorcycles (Barter, 1998; Lai, 2007), including a ban on motorcycles in specific areas, regulation of motorcycle ownership and parking, and cordon pricing for motorcycle users. Although motorcycle demand management could contribute toward solving traffic problems in developing cities, its impacts have not been sufficiently studied, possibly because few cities have implemented policies that regulate motorcycle ownership and use (Ye et al., 2009). An exception, however, is Yangon City, the former capital of Myanmar, where motorcycle use has been prohibited in most urban areas since 2003 (JICA, 2014; Kojima et al., 2015a).

Thus, this study analyzes the potential impacts of motorcycle demand management and its contribution to the transportation market in Yangon. To do so, a traffic demand forecast system is developed using large-scale travel data collected by the Japan International Cooperation Agency (JICA) in 2013. The expected impacts of a motorcycle ban are then estimated using a scenarios analysis, in which traffic demand is simulated with a demand forecast system. An advantage of this study is that it empirically analyzes the potential impacts of a motorcycle ban from the viewpoint of not only a modal shift but also changes in vehicle ownership, trip generation, and destination choice using a consistent model framework. This approach is expected to provide an understanding of the overall impacts of a motorcycle ban in a systematic manner, which could facilitate a holistic discussion on policy implications.

The remainder of this paper is organized as follows. Section 2 reviews the extant literature. Section 3 describes the current conditions of the urban transportation market in the Yangon metropolitan area and presents the data used in the empirical analysis. Section 4 formulates the models of an individual's vehicle ownership and travel behavior and presents the estimation results of the model. Section 5 develops the travel demand forecast system using the estimated models and presents the simulation results of the impact analysis. Section 6 summarizes the findings and suggestion for future research.

2. Literature Review

Some studies have demonstrated the importance of motorcycle ownership management and use in developing cities. For example, Hung (2006) assessed traffic management measures using multiple criteria and accordingly, listed strategies for motorcycle-dependent cities. The Institute for Transportation and Development Policy (2009) reviewed existing knowledge on management policies for two- and three-wheeler use and summarized recommended strategies. Ye et al. (2011) estimated the impacts of a motorcycle ban policy using travel preference data of local residents in Huizhou, China, and showed that while the policy suppresses motorcycle use, it promotes the use of other transportation modes. Xingdong et al. (2009) studied restrictions on motorcycle use across main urban areas in Guangzhou, China, since 2007 and reported that the ban decreased the use of motorcycles and increased that of public transportation, bicycles, and cars. These studies have highlighted the impact of a motorcycle ban mainly on an individual's modal choice, such as a shift from the use of motorcycles to other transportation modes. However, we expect that such a regulation also influences an individual's trip generation and/or vehicle ownership, which could significantly affect urban traffic demand. In particular, vehicle ownership is strongly connected with its usage in developing cities, where provisions of public transportation are lacking (Dissanayake et al., 2001). Thus, this study investigates the potential impacts of a motorcycle ban with an integrated travel demand model that incorporates trip generation, vehicle ownership, and modal choice in Yangon City.

Although urban transportation is one of the most critical issues in Yangon City, it has been rarely studied mainly because of poor data availability. An exception is Zhang et al. (2008), who during Myanmar's closed-market era examined the potential impacts of introducing a new public transit on individual's behavior using stated-preference data in Yangon. Similarly, Kato et al. (2010a) analyzed the route choice behavior of bus commuters using stated-preference data for Yangon, while Kato et al. (2010b) reported on the city's urban bus system, including the regulatory framework and cost structure of bus operators. Kato et al. (2011) further studied the potential impacts of introducing a bus rapid transit system in Yangon by conducting a cost-benefit analysis using urban travel demand forecast models. Since the economic liberalization of Myanmar in 2012, an increasing number of studies have highlighted urban transportation problems in Yangon. For instance, the Japan International Cooperation Agency (JICA, 2014)

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