



Do driving restriction policies effectively motivate commuters to use public transportation?



Yunxia Liu^a, Zaisheng Hong^b, Yong Liu^{a,*}

^a College of Management and Economics, Tianjin University, 92 Weijin Road, Nankai District, Tianjin, PR China

^b Research Institute of Architectural Design & Urban Planning, Tianjin University, 92 Weijin Road, Nankai District, Tianjin, PR China

HIGHLIGHTS

- Attitude towards public transport has an impact on policy acceptance.
- Driving habit indirectly affects policy acceptance and perceived behavior control.
- Driving restriction policy and public transport are not popular among car owners.
- Attitude towards public transport correlates positively with commuting time.

ARTICLE INFO

Article history:

Received 6 September 2015

Received in revised form

23 December 2015

Accepted 29 December 2015

Keywords:

Driving restriction

Smog

Public transport

Policy acceptance

Behavior control

ABSTRACT

Driving restriction policies have been implemented in some large Chinese cities to cope with severe urban smog pollution. We explored the roles of policy acceptance and other factors in commuters' transport mode decisions, based on the Theory of Planned Behavior. A questionnaire survey was conducted in Tianjin, China. A structural equation model was developed to test eight hypotheses, two of which were rejected. The results indicate that a driving restriction policy alone cannot effectively motivate commuters to use public transport if the policymakers fail to improve public transport, enhance commuters' awareness of consequences, increase commuters' perceived behavior control, and encourage car owners to change driving behavior. Comparisons between car owners and non-owners indicated that car owners view driving restriction policy and public transport more negatively. These negative views could be a barrier for the promotion of public transport among car owners. In addition, attitude toward public transport was found to have positive correlation with commuting time.

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1. Introduction

Smog pollution is attracting increasing attention in China. It threatens public health, daily life, and the sustainable development of the economy (Zhao et al., 2011). Smog conditions are worsening especially in the Beijing–Tianjin–Hebei area (Su et al., 2014). According to data from China's Ministry of Environmental Protection, among the top 10 cities with the worst air quality in China, 8 are located in this area.

Transport emission is one of the main causes of smog pollution. According to an official analysis, released in August, 2014, of the source of particulate matter 2.5 μm or less (PM_{2.5}), motor vehicle emission accounts for 31.1%, 20%, and 15% of PM_{2.5} pollution in Beijing, Tianjin, and Shijiazhuang, respectively. In Beijing, motor

vehicle emission ranks number one among the four main pollution sources; its percentage of contribution to pollution (31.1%) is far greater than that of coal (22.4%), the second greatest source of PM_{2.5} pollution. In Tianjin, motor vehicle pollution ranked third, compared with pollution from dust (30%) and coal (27%). Motor vehicle emission is also reported to be the primary reason for smog pollution in other large cities such as Hangzhou, Guangzhou and Shenzhen.

Scholars have noted the negative effect of car use on air quality, and efforts have been made to promote sustainable public transport (Collins and Chambers, 2005; Stern, 2000; Wall et al., 2007) because reducing car use and increasing public transport are helpful for alleviating smog pollution. Policymakers have taken measures to manage severe air pollution, including implementing driving restriction policies. Beijing was the first city in China to implement a driving restriction policy to manage air pollution and congestion problems, and many big cities followed. By the end of

* Corresponding author.

E-mail address: stefanie@tju.edu.cn (Y. Liu).

2014, about 10 cities in China had implemented such policies. In addition to these regular policies, cities may temporarily issue stricter driving restrictions under special conditions. One form of non-temporary control is an “odd–even” driving restriction, whereby nearly 50% of private vehicles are restricted from driving on certain days, determined by the last number on their license plates. Governors in Beijing and Shijiazhuang have suggested that these odd–even restrictions may become normal, eventually taking the place of temporary measures used only in cases of severe smog.

The purpose of the present research was to explore the role of driving restriction policy acceptance in transport mode decisions among the general population of Tianjin, China. Interactions among five constructs were tested and validated; the variables measured included perceived behavior control, attitude toward public transport, driving restriction policy acceptance, awareness of consequences, and driving habit.

2. Literature review and hypotheses

The Theory of Planned Behavior (TPB) is widely applied in explaining the psychological mechanisms underlying people's behaviors and exploring determinants that influence intention and behavior. According to Ajzen (1998), planned behavior theory holds that people's behavior is goal directed, and behavior is directed by behavioral intention, which is influenced by attitude, subjective norms, and perceived behavior control (PBC).

Many scholars have conducted research on modes of transportation using the TPB, and research has led to extensions of the theory with new constructs in new contexts. Donald et al. (2014) introduced the contextual constructs of commuting habits and environmental concern (Donald et al., 2014; Gardner and Abraham, 2007). To enhance the efficiency of the standard TPB, other scholars have introduced the constructs of moral norms, situational factors, and past behavior (Boldero, 1995; Chan and Bishop, 2013; Tonglet, 2004).

Ajzen noted that the theory is open to added variables in different contexts, as long as the variables can be shown to have a significant and distinct contribution. As an extension of the TPB, we have explored the interrelationships among the standard TPB constructs and contextual constructs that impact PBC.

2.1. Perceived behavior control

Perceived behavior control is one of the three traditional indicators of the TPB. Ajzen provided the original definition of PBC as individuals' perceived ease or difficulty of performing a particular behavior, and it reflects the degree to which individuals believe they are capable of performing a behavior. Perceived behavior control is measured by assessing a person's self-efficacy and beliefs related to behavioral control. The items measuring the PBC include, “It is easy for me to...”, “I am free to...”, “It is convenient for me to...”, and “I have many opportunities to...” (Chen and Chao, 2011; Noblet et al., 2014; Nordfjaern et al., 2014). These items are used to measure confidence about the probability, feasibility, or likelihood of executing given behavior.

Scholars have compared the relative importance of PBC with the other two standard TPB concepts: attitude and subjective norms. Armitage and Conner (2001) studied the predictive efficacy of the TPB and found that the PBC construct accounted for significant variance in intention and behavior. The addition of PBC as a key construct has helped account for this variance (Taylor and Todd, 1995).

Previous researchers have found that non-car travel behavior depends on PBC as well as attitude or awareness of consequences,

with the former having a stronger effect on the choice of mode of transportation (Gardner and Abraham, 2008). Botetzagias et al. (2015) found that the PBC is consistently the most important predictor of recycling intention, and PBC has been reported to act as an even stronger predictor of behavior when it is operationalized as a global measure and conceptualized to reflect control over factors primarily internal to the individual (Notani, 1998).

However, few studies have discussed the antecedents of PBC in specific domains. Our research focuses on antecedents of PBC within the domain of mode of transportation choice in China.

2.2. Attitude toward public transport

Attitude refers to a stable, evaluative response (affective, cognitive, or behavioral) to a particular entity, referred to as the attitude object (Eagly and Chaken, 1993, 1998). Attitude objects vary widely depending on the context. The most popular questionnaire items used to measure attitude include, “It is good to...”, “It is useful to...”, “It is helpful to...”, “It is rewarding to...”, and “It is pleasant to...” (Donald et al., 2014; Knabe, 2009; Pakpour et al., 2014).

Attitude toward public transport (ATT) reflects commuters' evaluation of public transport, including the extent to which they are satisfied with public transport and their preferences with regard to public transport. Attitude is one of the three indicators that affect intention and behavior in the TPB; a number of studies based on the TPB have confirmed the impact of attitude and PBC on intention and behavior (Beirao and Cabral, 2007). Wall et al. (2008) explored the interaction between PBC and personal-normative motives. However, few researchers have explored the interaction between attitude and PBC. In our research, we assumed that attitude has a direct impact on PBC, as well as an indirect impact through policy acceptance (see Hypothesis 2). In other words, a positive attitude will motivate PBC, and more positive attitudes toward public transit will promote more powerful perceptions of control over public transport.

Hypothesis 1. (H1): Commuters' attitude toward public transport (ATT) has a positive impact on the perceived behavior control (PBC).

2.3. Public acceptance of policy

Public acceptance of policy is a latent variable designed to measure commuters' attitudes toward driving control policies, and it reflects the extent to which commuters support implementing those policies. It is important to increase the level of policy acceptance because policy is more effective with public cooperation.

Wang et al. (2014) studied the effect of driving restriction policies in Beijing and found that 47.8% of regulated car owners did not follow the restriction's rules and instead drove illegally to their destinations. Khademi and Timmermans (2014) emphasized the importance of public acceptance for successful policy implementation and noted that resistance is a barrier to public transit promotion. Jackbsson et al. (2000) explored the determinants of car users' acceptance of road pricing. Chen and Zhao (2013) investigated public acceptance and its influence on the car license auction policy in Shanghai, and additional studies have been conducted to explore the factors that influence the acceptance of a measure or policy in an effort to maximize beneficial effects (Aini et al., 2013; Eriksson et al., 2006).

Combined with the TPB, we assume that public acceptance of policy plays a role in public transport intention and behavior through PBC. As intervention measures, driving restriction policies affect different types of commuters: when restricted to a specific

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