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Psychological factors influencing the public acceptability of congestion pricing in China

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ABSTRACT

This paper investigated the factors influencing the acceptability of an assumed congestion pricing scenario in a commercial center of Nanjing China. A hierarchical structural model was proposed to analyze determinants of the acceptability according to the planned behavior theory and norm activation theory combined with the evaluations of the measure. Furthermore, the role of the socio-demographic in affecting acceptability was examined. A sample of 897 Chinese car users was used to test the model. Results of the SEM indicate that perceived fairness and freedom seem to be strong determinants of car users' congestion pricing acceptability. Personal norm and perceived behavior control are proved to be additional direct predictors of acceptability. In contrast to previous studies, perceived effectiveness is not significantly related to fairness. Furthermore, results indicate a low association of socio-demographic variables with congestion pricing acceptability.

1. Introduction

China's economy has been growing on a high speed in the last 30 years, which resulted in rapid expansion of automotive industry and a sharp increase in vehicle ownership. By the end of June 2011, the number of national vehicles has reached to 225 million (Zhou & Shi, 2012). Various car-related problems such as congestion, air pollution, noise, accident victims and energy consumption have seriously influenced people's daily life. The government has made great efforts on infrastructure construction and management, but these serious problems have not been fundamentally improved.

Congestion pricing is considered as an effective approach to solve urban traffic problems by economists. It is used to charge motorists at times and places when the road system is congested. Though it undoubtedly is a theoretically elegant way of closing the gap between private and social costs for car driving, there are few practical experiences. The low level of implementation is not so much caused by technical or administrative problems. It is generally acknowledged that lack of public support is a major barrier to successful implementation.

In China, some cities like Hong Kong, Beijing, Nanjing, and Guangzhou have considered implementing congestion pricing in recently years to moderate the increasing level of congestion. However, none of these plans has ever been implemented mainly due to low level of public acceptance. Hong Kong carried out a trial of congestion pricing in central business district in 1985, but it was not permanently introduced because of road electronic toll collection system may infringe on personal privacy (Sun & Yuan, 2014). Beijing put forward congestion pricing to solve traffic problem as early as 2005. Moreover, it

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completed a feasibility study report of congestion charging in 2009. The report presented that the technology has already been very ripe, but more than 60% citizens were against it. Due to the air pollution caused by traffic is very serious, the government may enforce the measure (BMTC, 2009; BTRC, 2005). Nanjing Transport Bureau suggested charging car user for entering the business district in 2007. But the measure has not been implemented because of the opposition from the public and government. A survey about the measure in 2012 showed that 89.2% of car users were against it (NTB, 2007). Guangzhou proposed to fee for driving in the inner ring road in 2009. The government conducted a public comment, and the results showed that more than 95% of citizens were against it, so the policy was stalled (GCC, 2009). Internet survey also illustrated that the measure had low approval rating in China. More than 80% of internet users were against congestion pricing in an online survey by iFeng and Tencent Micro-blog (Fu, 2012).

The main objectives of this paper are to identify key influence factors for acceptability of congestion pricing, to analyze the role of the socio-demographic in affecting acceptability and to verify whether previous findings concerning the influencing factors on acceptability are transferable.

In the Section 2, we provide the previous literature on acceptability. Section 3 presents a basic structural equation modeling of public acceptability. The methodology is elucidated in Section 4. Afterwards, in Section 5, the results are presented and discussed more in detail. Finally, Section 6 summarizes the findings and proposes some suggestions to enhance the acceptability.

2. Previous study

The factors influencing on acceptability of congestion pricing included socio-psychological factors, system characteristics and the personal background features.

A multitude of studies have shown that problem perception, social norms, information about options, perceived effectiveness and fairness were essential factors determining acceptability. For example, Jakobsson, Fujii, and Garling (2000) found that fair and infringement on freedom had direct effect on acceptance. Income, expectation of others' car use reduction and intention of car use reduce were indirect factors that influenced acceptability. Bamberg and Rölle (2003) replicated and extended the causal model presented by Jacobson, and their results confirmed perceived fair and Infringement on freedom were strong direct determinants and found effectiveness as an additional direct determinant on acceptability was as high as that of fairness. Eriksson, Garvill, and Nordlund (2006, 2008), and Cools et al. (2011) indicated that public acceptability of push measures (tax on fuel, road pricing), besides being determined by perceived effectiveness and fairness, was also a function of personal norm.

There were large differences in acceptability in terms of system features (e.g. the method of charging, the charged areas and the time of charging). Several studies found that the level of charge was sensitive to the attitude: the higher the level of charge, the lower acceptance. Fixed daily charges were significantly more acceptable than variable charges (distance-based, time-based, and delayed-based charges). Charges within the city centre are much more acceptable than in a wider area. Charge during the peak-time and all day had no difference in acceptability (Glazer, Link, May, Milne, & Niskanen, 2001; Jaensirisak, Wardman, & May, 2005; Sheldon, Scott, & Jones, 1993).

Acceptability of congestion charge also depended on socio-demographic features such as age, income and place of residence. High income group had a higher value of time, and they may be more acceptable to road pricing than people with lower incomes. Verhoef, Nijkamp, and Rietveld (1997) found that income had a significant impact on the support for road pricing. Yet other studies (Harrington, Krupnick, & Alberini, 2001; Odeck & Brathen, 1997; Rienstra, Rietveld, & Verhoef, 1999) were failed to find income was significant. Dieringer Research Group (2007) and Jaensirisak et al. (2005) found that age is 55 or over were more opposed to pricing. Living condition also affected acceptability to some extent, for example, in New York and Stockholm, people living in the charged area were more acceptable to congestion pricing than outside the area (Winslott-Hiselius, Brundell-Freij, Vagland, & Byström, 2009).

3. Hypotheses and model specification

TDM measures are rarely considered to be both effective in a more objective sense and perceived as acceptable by car users. Congestion pricing as a push measure is regarded as an effective way to solve urban traffic problems, but it influences car use to a larger extent and is unacceptable by most users. Examination of factors important for acceptability of congestion pricing from the perspective of car users may further improve the understanding of the measure.

Acceptance is a psychological behavior intention, which may be influenced by problem awareness, moral principles, social environment and other factors. According to planned behavior theory (Ajzen, 1991), attitude, social press (subjective norm) and perceived behavior control lead to behavior intention, indicating that more favorable the attitude and subjective nom and greater the perceived control, the stronger should be person's intention to perform the behavior. In the norm activation theory (Schwartz, 1977), social norm influences personal norm, individual may internalize the norm and still not act in accordance with it. When awareness of the consequences (AC) and ascription of responsibility (AR) are high, personal norm guides subsequent behavior. In combination of these two theories, acceptability may be influenced by general beliefs of social norms, personal norms, problem awareness, and perceived behavior control. In addition, acceptance also depends on the evaluations of the measure. In accordance with previous research (Bamberg & Rölle, 2003; Eriksson et al.,