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Does the Use of Smartphone Influence Travel Outcome? An Investigation on the Determinants of the Impact of Smartphone Use on Vehicle Kilometres Travelled

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Abstract

This paper investigates the impact of smartphone on travel outcome that uses data from a web-based survey conducted in Halifax Regional Municipality, Nova Scotia in 2015. Following a Latent Class Modelling (LCM) Approach, the study analyses the change in vehicle kilometres travelled (VKT) as an influence of smartphone use and how this change differentiates among different socio-demographic groups, residential locations and life-style strata. Vehicle kilometres travelled has been examined on three choice contexts: smartphone use had i) reduced VKT ii) no impact on VKT and iii) increased VKT. The model identifies two classes based on socio-demographic characteristics where Class 1 can be characterized as student and young professionals, whose annual income is less than CAD 15K, female population with part-time or full-time employment and who are not full-time student. To facilitate the discussion, Class 1 has been branded as ‘Tech-Savvy’ and Class 2 of the model as ‘Non Tech-Savvy’. Results suggest that variation exists between Tech-Savvy and Non Tech-Savvy group. For example, in the Tech-Savvy group, the novice smartphone users have less probability of reduction in kilometres travelled compared to the other group, whereas in the Non Tech-Savvy group, the probability of substitution increases for the novice users. Determinants that can reduce VKT because of smartphone use are: higher use of smartphones for online shopping, active transportation as primary mode, home to work/school distance, pro-environment attitude, etc. This study offers important insights and could be useful for transport policy making.

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1. Introduction

This paper aims to study the reported influence of smartphone use on kilometres travelled using the data from ‘Smartphone Use and Travel Choice Survey, 2015’ conducted in Halifax, Nova Scotia. Following a discrete choice modelling approach, the study analyses the change in kilometres travelled as an influence of smartphone use and how this change differentiates across different socio-demographic groups, residential locations and life-style choice. A smartphone can serve as a ‘fully functional computer’ (Wang et al., 2014a) and with its various dynamic applications, it offers a wide range of travel supporting solutions (Gretzel, 2010 and Wang et al., 2012). Studies suggest that the number of smartphone users has significantly increased in recent years. In 2014, the smartphone penetration rate in Canada was 55% which is supposed to increase to 68% in 2015 (Catalyst, 2015). The interaction between ICT, society and travel is very complex (Lyons, 2002) and yet to be understood. As smartphones have become part of our lifestyle, it is expected that it has an influence on our personal travel. There is a potential relationship between the use of smartphones and daily travel, and improved understanding on this area is of paramount interest in recent years (Jain and Lyons, 2008 and Wang et al., 2014b).

Whether information and communication technology (ICT) reduces or increases travel has been long debated in transportation research. Mokhtarian and her colleagues have discussed the impact of several forms of ICT on travel behaviour. According to Mokhtarian (2009), existing researches on tele-commuting showed ‘substitution effect in short-term and direct researches whereas the complementary effect is more likely to be long-term and indirect’. The study further clarified that a short-term study may not reflect the ‘long-term effect on residential location and indirect effect of demand for additional communication and travel’. On the other hand, the long-term study findings may be weakened by the continuous improvement in telecommunication on travel. In 40 years of ICT and travel behaviour researches broadly used ICT as a generalized term. Several studies investigated preference of tele-commuting (e.g. Mokhtarian and Salomon, 1996), use of home computers and internet connection (e.g. Bhat et al., 2003), number of tele-phone calls, number of mobile phones (e.g. Senbil and Kitamura, 2003) etc. Literature suggest that a significant reduction of travel with the use of ICT might not be expected, but ICT gives more flexibility in daily activity and travel decisions resulting in different types of travel patterns (Mokhtarian, 1998; Mokhtarian and Tal, 2013). Following a Path Analysis Modelling approach, Ben-Elia et al, 2014 tried to explain the complex relationship of ICT, activity fragmentation and travel behavior. The study also concludes that as ‘ICT represent highly differentiated categories of information and communication devices and services, each type of technology or device should be examined separately in determining the direction of possible effects’ (p 71). One of the emerging ICT tool is smartphone which has become popular in the last decade. As a result, interest in how smartphone influence travel has grown in recent years.

Previous research that focus on smartphones and travel predominantly addressed technical perspective such as designing mobile systems and adoption of mobile information systems (Wang et al., 2014a). Some other recent research on smartphone use and travel behaviour focused on leisure or recreational trips. For example: Wang and his colleagues (e.g. Wang et al., 2012; Wang and Fesenmaier, 2013; Wang et al., 2014b; Tussyadiah and Wang, 2014) analysed the impact of smartphone use on travel experiences of tourists. Meng et al., 2015 explored the key influencing factors of tourists’ decision on adopting smartphone technologies/applications. However, it is not clear within transportation research how smartphone use has changed travel behaviour, which has been identified as a gap by Wee et al., 2013. Building upon this, this paper investigates the stated impact of smartphone use on overall travel outcome; more specifically vehicle kilometres travelled (VKT) and its determinants.

This paper uses data from a web-based survey conducted in Halifax Regional Municipality, Nova Scotia in 2015. Nova Scotia is the only region in Canada that faced increase in annual distance travelled by light vehicles from 2000 to 2009 (Canadian Vehicle Survey, 2009). This study emphasizes on how several sets of factors such as trip maker’s characteristics, smartphone usage frequency, neighbourhood and land-use characteristics and accessibility from major services are related with the reported effect of smartphone use on kilometres travelled. The paper uses a Latent Class

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