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Fashion consumer behaviour impact on the model of last mile urban area emissions

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Abstract

To enhance the validity of a mobility emission-effects model, a research is conducted on consumer behaviour. Consumer mobility preferences are the main determining factor in the proposed model that describes the kilometre and emission outcome under several scenarios. Motorized mobility of consumers buying fashion in shopping areas cause more kilometres in the network and subsequently more emission than when the fashion is bought online and the delivery is done by the parcel delivery services. The model provides an indication of best practice: if consumers change their shopping preferences they reduce emission and they also enable the PDSs to optimize their delivery operations.

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Keywords: online; fashion; urban; parcel delivery services; emission model

1. Introduction

In the past two decades the growth of online shopping by consumers has led to a strong growth in the number of parcels shipped to consumer homes. This change is caused by new shopping patterns of consumers who buy goods online, which twenty years ago, would have been bought in shops. The percentage of online purchased articles ranges from 5% to 90%, depending on the type of article (Javelin Group, 2011, Cushman & Wakefield, 2013). This change has also led to a growth in parcels volume (Weltevreden and Rotem-Mindali, 2009, Ducret and DeLaitre 2013, Rotem-Mindali and Weltevreden 2013).

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Cities experience traffic problems like congestion and pollution, such as CO_2, NO_x, PM_{10} and SO_2. In addition, motorized traffic of both the shopping public as well as parcel delivery services can cause dangerous situations and lethal accidents. In order to organize land use, transport routes and environment zones, policy makers in cities need specific information about mobility patterns in the towns. And, more precisely, information about mobility effects due to changes in consumer shopping patterns that change the kilometres travelled motorized. Parcel delivery services (PDSs) will benefit by optimizing their routes and enhancing the number of drops per stop. Using less fuel and less time for the process of delivery is beneficial for both the city environment and the efficiency of the PDS's (Weltevreden, 2008; Russo and Comi, 2012). The impact of the increase of online shopping on traffic by increasing home deliveries is unclear. Expectations range from less traffic due to a decrease of consumer shopping trips by car, to more traffic due to an increase of delivery trips by the PDSs.

2. Current state of the art

Dixon and Marston (2002) found that almost two thirds of the online buyers indicated that some or all of their online purchases replace an offline purchase in a town or city centre. This substitution effect is also partly expected in fashion purchasing, although researchers contradict in their conclusions about the substitution effect (Dixon and Marston, 2002, Krizek et al., 2005). Corpuz and Peachman (2003) suggested a substitution effect because 35% of their respondents would have made a physical shopping trip if they had not purchased their products online. Schellenberg, (2005) also found a substitution effect between online shopping and offline shopping, whereas Hernandez et al., (2001), Ferrel, (2004) and Farag et al. (2007) found a complementary effect. Moreover, approximately 45% of the substitution trips would have been made as a multiple purpose trip. Only 38% of all online purchases lead to a decrease in personal travel, 50% are multiple-purchase trips and 11% would have been undertaken when travelling from work to home (Esser and Kurte, 2005). Frequent online shoppers make as many trips to a physical store as infrequent online shoppers and the time saved from online shopping is spent on additional trips (Winslott Hiselius, Smidfelt Rosqvist and Adell, 2015). Functional motivated shoppers are often time pressured and therefore more inclined to shop online (Kaltcheva & Weitz, 2006, p. 112). The value of delivery time for a purchased book from an online bookstore to a consumer is approximately $0.53 per day, which means that a delivery delay can be expressed as an amount of money determining price differences between offline and online purchased products (Hsiao, 2009). But, according to Li, Kuo and Russell (1999) online buyers are not more price-sensitive than offline buyers.

Most simulations of mobility effects of online shopping lack the consumer behaviour parameters and are focused on either personal (consumer) travel changes or PDSs efficiency, but not both. (Barone, Crocco and Mongelli, 2014; Salomon, 1986; Visser. Nemoto and Browne, 2014). Research on car-free households suggests that taking goods from the shopping area back home is perceived "to be a major problem in everyday life" (Visser & Lanzendorf, 2003, p. 197). Visser. Nemoto and Browne, (2014, box 1, p.20) stated that "*The people in the Netherlands made approximately 3.4 billion trips to go shopping in 2011, 44.3 % of these were made by car.*", and estimated *"the total travel distance in 2011 for home delivery by vans on 670 million vehicle kilometres. The number of home deliveries is estimated on 100 million parcels in 2011 (based on OPTA, 2011). In case these 100 million deliveries substitute a movement to a shop, these 100 million (on 3.4 billion moves) represent 3% (in vehicle kilometres) of the total trips for shopping*."

Crocco, Eboli and Mazzulla (2013), found that online consumers tend to purchase computer hardware and software, while clothes are more purchased in-store. Even within one product group large differences exist. In fashion percentages between 10% and 40% of the total fashion purchases have been mentioned. Since fashion is a product group which, according to the consumers, is both a fun shopping experience (recreational motivation) as well as a need (functional motivation) (Mokhtarian, 2003), it is expected that consumers will show personnel strategies and choices in what to buy online. The product characteristics also influence consumer's intentions to shop online (Lee, 2002). Fashion purchases are known to depend on the 'size fit' and the 'good looks', and therefore fashion consumers will have an ambiguous attitude towards buying online. Therefore, the fashion product group is well suited for a research of consumer preferences for online and offline shopping behaviour and mobility effects. Although the number of kilometres driven and the substitution effects are small as compared to total traffic movements, it is interesting to find out what the emissions are because environmental issues in dense population