Identifying the geography of online shopping adoption in Belgium

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ABSTRACT

The widespread adoption of the internet as retail channel is impacting a range of stakeholders. Retailers are expected to sell online, logistics operators are required to reconfigure their supply chain and public authorities try to keep local retail competitive while simultaneously attempt to manage the increase in freight transport. Within this context, a growing body of research is studying the socio-economic profile of the online shopper and the spatial variation in the demand for B2C goods. Yet, as can be expected for a relatively new evolution, little consensus exist. Therefore, in this paper, with data from the national retail federation on online shopping behaviour, we add to this growing field by first analysing the relation between socio-economic characteristics and the willingness to shop online. By mapping these characteristics, we then construct the geography of online shopping adoption in Belgium. Finally, we assess the impacts of this specific geography for the stakeholders that are adapting to this new reality. We conclude firstly that the well-educated man in his thirties with a well-paid job has the highest probability to shop online, independent of the level of urbanisation of the area he resides. Secondly, we predict over- and underestimations of the potential online buyers of up to 50% when assuming a homogeneous e-commerce penetration, especially in poorer urban areas. This implies a serious negligence for e-commerce practitioners and academics when ignoring the specific geography of the online shopping adoption.

1. Introduction

Twenty-three years after the founding of Amazon, business-to-consumer electronic commerce (B2C e-commerce) keeps rising. Over the last six years, Europe experienced an average annual increase in online sales turnover of 16% (E-commerce Europe, 2016b). Despite persistent growth rates around the EU however, levels of e-commerce adoption vary greatly among different member states. While only 16% of the population of Western Europe never shopped online in 2016, this number rises to 40% for Eastern Europe (Eurostat, 2017).

The popularity of internet shopping provides retailers the opportunity of opening an additional distribution channel. At the same moment however it offers customers a wider market to choose from, hence increasing local competition and consumer power (Boschma and Weltevreden, 2008; Weltevreden, 2007). In response, retailers are required to be present online and ideally consider effective integration of their online and offline channels (Rimmer and Kam, 2018). In addition, in order to stand out brand creation and marketing have now become even more important, both for traditional and virtual merchants (Doherty and Ellis-Chadwick, 2010).

In parallel, the demand for home delivery services is growing at

similar pace, resulting in a fragmentation of the goods distribution flows to the extent of a single item per delivery (Gevaers et al., 2011; Hesse, 2002). In consequence, recent literature estimates that up to 75% of the delivery costs originate from the last part of the distribution chain, i.e. the last mile (Gevaers et al., 2014). This not only puts pressure on traditional delivery models but threatens the livability of some urban areas, due to the increase in light good vehicles delivering parcels associated with the growth in online sales (Anderson and Leinbach, 2007; Browne, 2001; Cherrett et al., 2012).

Resultantly, local administrators are facing pressure to accommodate sustainable growth in online shipments while simultaneously attempting to prevent the disintegration of retail areas within their jurisdiction (Browne and Allen, 1999). The former has resulted in an increased awareness for freight planning within cities' administrations, a topic which up to now has always been overshadowed by the focus on passenger transport (Kiba-Janiak, 2017; Lindholm and Behrends, 2012). Furthermore, attempts are taken to improve the shopping experience within retail areas to limit the substitution of traditional purchases by online orders. Examples include investments in cycle hubs to store purchased goods or *facility areas* with pick-up points in main shopping streets as to attract online shoppers in nearby stores (Gómez

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et al., 2017).

As has been proven in multiple studies over the past two decades, the continuing relevance of geography for all stakeholders involved should not be underestimated (Anderson et al., 2003; Boschma and Weltevreden, 2008; Couclelis, 2004). Besides international differences, socio-economic and geographical factors do differentiate the online shopping behaviour within a single country (Clarke et al., 2015; Farag et al., 2006b). Whether these regional differences in online shopping are due to accessibility issues or varying openness to innovation remains under study (Motte-baumvol et al., 2017).

While there is agreement that knowledge on regional variations in online shopping holds great marketing value, these also imply that the demand for e-commerce goods can change from one neighbourhood to another. Given the forecast of continuing e-commerce growth, knowledge concerning the e-shopper's profile and his related delivery preferences or failed delivery rates may help the courier, express and parcel (CEP) industry to balance cost efficiency and environmental sustainability in the last mile of e-commerce. In addition, it may provide local authorities the possibility to more efficiently implement sustainable urban logistics planning initiatives or e-resilience measures. Finally, it can support retailers to further improve their offline and online integration.

Given the value of understanding the geography of the online shopper, we analyse in this paper the spatial pattern of e-commerce demand using data on Belgium. With nearly 60% of the population buying online (Eurostat, 2017) and growth rates of over 10% for the B2C online turnover (E-commerce Europe, 2016a), currently observed impacts will be fast growing in the coming years. As a result, there is an urge for more efficient and environmental friendly logistic solutions, for conscious local authorities and for well-informed retailers that take into account the geography of the demand of e-commerce.

This motivation leads to the construction of two research questions we target here. After the introduction of our methodology, we test in the first part whether previous findings of socio-economic factors impacting online shopping behaviour currently hold in Belgium. In other words: who is the Belgian e-shopper? Second, we advance the current literature on the topic, knowing the characteristics of the Belgian e-shopper and given the socio-economic profiles of each Belgian neighbourhood, by answering the question: where does the e-shopper live? The answers to these research questions should help to identify the extent to which the specific geography of e-commerce matters for the stakeholders involved. We conclude our work in the last section and suggest paths for further research.

2. Literature review

Already at the end of the nineties, at the height of the dot-com bubble, researchers in the field of marketing were studying the relation between socio-economic characteristics and the demand for e-commerce. The main goal of these studies was to predict the chances of online shopping based on behavioural characteristics. Early publications identified the better-educated males from 26 to 35 year old with high incomes as the earliest cybershoppers (Donthu and Garcia, 1999; Kau et al., 2003; Sim and Koi, 2002; Vrechopoulos et al., 2001). These findings were later confirmed by similar studies in the field of economic geography. First by Farag et al. (2006a, 2006b) in their study of e-shopping in the Netherlands, who found a nonlinear relationship between age and buying online: up to the age of 33, the likelihood of buying increases after which it decreases again. Nine years later Clarke et al. (2015) came to similar conclusions for e-shoppers in the UK, although the maximum frequency of online shopping fell in the age category 35–39. Like the previous studies, also in the UK a strong positive correlation seemed to exist between household income and online shopping frequency.

Later, researchers adopted spatial components like urban-rural differences in similar studies starting with Anderson et al. (2003). He

formulated two possible but opposite hypotheses concerning the spatial diffusion of e-commerce adoption. First, the *efficiency* hypothesis states a fast penetration of online shopping can be expected in more remote areas where e-commerce improves retail accessibility. Contrary the *innovation-diffusion* hypothesis expects early e-shopping to be limited to urban areas because new technologies are assumed to start in these centres of innovation, after which they diffuse to other regions.

Despite their contrasting nature, both hypotheses proved not to be mutually exclusive. Studies in various countries indeed find shoppers in metropolitan areas to be more prone to use the online channel and also observe the diffusion of online shopping to more rural areas over time, supporting Anderson's *innovation-diffusion* (Clarke et al., 2015; Farag et al., 2006a, 2006b; Kirby-Hawkins et al., 2018; Motte-baumvol et al., 2017; Zhou and Wang, 2014). However, others did find proof for the *efficiency* hypothesis as well, with higher frequencies for the online shoppers in less accessible areas and the identification of accessibility issues as a major driver for e-commerce (Cao et al., 2013; Farag et al., 2006b; Kirby-Hawkins et al., 2018; Motte-baumvol et al., 2017)

The work on the socio-economic and spatial characteristics of the online shopper implies that the e-commerce demand is not uniformly distributed over the population. As mentioned before, this has been acknowledged by various authors already. Examples include amongst others the assessment of infrastructure decisions in an e-commerce context. As such, in an attempt to improve the efficiency of the last mile of urban goods flows, Ducret et al. (2016) use population density and income figures to list recommendations for logistics infrastructure. This way the authors highlight the value of spatial data for urban freight modelling. In other works authors adopt a retailer perspective and use the socio demographic aspects of online revenue data to asses online and offline strategies (Birkin et al., 2017; Kirby-Hawkins et al., 2018).

The wider city logistics literature on the contrary, concerned with the trade-off between efficient and sustainable distribution in and around the city has paid little to none attention to the importance of geographical variables when studying (the distribution of) e-commerce. With the exception of a small set of works based on empirical data (e.g. Ducret et al., 2016; Weltevreden and van Rietbergen, 2007; Zhou and Wang, 2014), the majority of the B2C city logistics literature assumes the demand is uniformly distributed over the population. Nonetheless, the initial distribution of this demand is the starting point for most of the quantitative analyses, like the assessment of the potential of green transportation vehicles or the reduction of social costs through collaboration among logistics players (Arvidsson and Pazirandeh, 2017; Gonzalez-Feliu et al., 2012; Lin et al., 2016; McLeod et al., 2006; Park et al., 2016). This may imply significant differences, especially when working with detailed data.

In this paper, we first test whether previous findings concerning the role of socio-economic and spatial variables in the variability of e-commerce demand also hold in Belgium. This is done by identifying the relevant explaining variables of the probability a Belgian shops online. In a second step, we will predict for each spatial unit the number of expected online purchases. Finally, we confront this modelled demand with the population distribution to better quantify the variation in e-commerce demand. We then conclude by assessing the value of knowing the spatial variation for the different stakeholders involved.

3. Data and methodology

We make use of the *E-commerce in Belgium 2016* questionnaire organised by the Belgian retail federation Comeos to identify the online shopper. This online survey was conducted from the beginning of March to the end of April 2016 and polls the online shopping frequency of over 1500 Belgians for different categories (e.g. toys, food, …). The respondents were selected representatively according to the age, gender and regional quota of the country from a database of over 200.000 regular participants (www.futuretalkers.com). Although participation is to be decided by the respondent, response behaviour and time was