How are consumers using collection points? Evidence from Brussels

Heleen Buldeo Rai, Aysegül Cetinkaya, Sara Verlinden, Cathy Macharis

Abstract

Environmental assessments of e-commerce often focus on the last mile. Collection points are considered more beneficial than home delivery but this largely depends on how consumers’ collection trips are organised. Because this information is lacking, our objective is to find out how consumers make use of and travel to collection points by means of a street intercept surveys in the Brussels-Capital Region. Findings show that the majority of consumers use collection points after an unsuccessful delivery at home. Most consumers travel less than fifteen minutes by car, chaining several activities to the collection trip.

1. Introduction

Worldwide, a growing share of consumers are using the internet to purchase products and services. The frequency in which these purchases are made, is increasing too. As online retail is a global phenomenon, the logistics system behind this industry is investigated with great attention (Mena and Bourlakis, 2016). A key topic within these research efforts is whether online retail can bring along environmental benefits, both on a local and global level. After conducting a dedicated review on the environmental implications of e-commerce, Mangiaracina et al. (2015) concluded that transport activities and last mile deliveries in particular have the greatest impact on sustainability. This is explained by the fact that differences between online and conventional retail are limited in most other transport activities.

From an environmental point of view, deliveries of online purchases to homes, still the consumers’ preferred location (Comeos, 2018; Postnord, 2016), is the least beneficial option. Although consolidated roundtrips by logistics service providers are more efficient than individual consumer trips to stores (Edwards et al., 2010b), several issues at both the logistics (e.g. express deliveries, inefficient routing, empty running) and consumer side (e.g. delivery failures, order fragmentation, absent loading zones) lie at the root. A better alternative is provided by collection points. Such collection points are located in accessible (e.g. near parking or public transport) and/or residential areas (e.g. in local

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convenience stores), where consumers can pick-up their ordered products (Iwan et al., 2016). Collection points are either attended by staff (e.g. as part of a shop) or self-service kiosks in locker boxes. The environmental benefits of collection points stem from avoiding delivery failures and enabling delivery round optimization (Morganti et al., 2014b). However, how consumers travel to and from collection points is of importance as well. In their review on energy consumption in online and conventional retailing, Pålsson, Pettersson and Winslott Hiselius (2017) concluded that energy consumption from transport is greater in conventional supply chains, as the additional energy in passenger transport generally outweighs the increased energy of freight transport in e-commerce. Some studies introduce questionnaires to identify consumers’ most likely transport mode (McLeod et al., 2006; Moroz and Polkowski, 2016) or make use of secondary data (Zhang et al., 2018). Yet overall, studies assessing the environmental impact of collection points rely on strong and simplified assumptions to incorporate the consumers’ part of the last mile.

When it comes to collection points for parcel pick-up, the lack of knowledge on consumers’ user and travel behavior has been acknowledged, for example by Zhang et al. (2018) and Morganti, Dablanc and Fortin (2014). Others point out specific data needs, such as trip chaining behavior (Brown and Guiffrida, 2014; Cardenas et al., 2017b; McLeod et al., 2006) and modal choice (McLeod et al., 2006). This information is essential to make accurate assessments on the impact of last mile transport for online retailing. Accordingly, our research objective is to fill this gap in the literature. By means of street intercept surveys in the Brussels-Capital Region, we collected information from 385 consumers. We want to identify how consumers use collection points and how they travel to and from these points.

This article reviews the literature on collection points in the second section and clarifies our methodological approach in the third section. The fourth section elaborates on results. We draw conclusions in the final section.

2. Literature

On January 18th 2019, online searching using the combination of keywords “last mile”, “e-commerce”, “sustainability” and “collection point”, “pick-up point” or “locker” yielded 401 results. Only articles relevant to the research topic are included in this section, leading to a total of 22 articles. Transport and logistics journals feature the majority of articles. The oldest article dates back to 2006 (McLeod et al., 2006), but most articles are published in the last three years: five in 2016 (Giuffrida et al., 2016; Iwan et al., 2016; Lemke et al., 2016; Moroz and Polkowski, 2016; Nabot and Omar, 2016), five in 2017 (Cardenas et al., 2017a, 2017b; Kedia et al., 2017; Pålsson et al., 2017; Xiao et al., 2017) and five in 2018 (Carotenuto et al., 2018; Deutsch and Golany, 2018; Lachapelle et al., 2018; Yuen et al., 2018; Zhang et al., 2018). The research topic is thus gaining traction. The rationale behind this growing attention can be found in the many advantages that collection points offer, which are summarized in Table 1.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Sources</th>
</tr>
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<tbody>
<tr>
<td>More consolidation</td>
<td>(Brown and Guiffrida, 2014; Deutsch and Golany, 2018; Kedia et al., 2017; Yuen et al., 2018)</td>
</tr>
<tr>
<td>More successful deliveries</td>
<td>(Cardenas et al., 2017b; Deutsch and Golany, 2018; Kedia et al., 2017; Morganti et al., 2014b, 2014a; Nabot and Omar, 2016; Yuen et al., 2018; Zhang et al., 2018)</td>
</tr>
<tr>
<td>More efficient delivery rounds</td>
<td>(Cardenas et al., 2017b; Giuffrida et al., 2016; McLeod et al., 2006; Morganti et al., 2014b)</td>
</tr>
<tr>
<td>Less vehicle-kilometers per delivery</td>
<td>(Cardenas et al., 2017b; Carotenuto et al., 2018; Durand and Gonzalez-Feliu, 2012; Kedia et al., 2017; Morganti et al., 2014a; Moroz and Polkowski, 2016; Xiao et al., 2017)</td>
</tr>
<tr>
<td>Less transport-time per delivery</td>
<td>(Xiao et al., 2017; Zhang et al., 2018)</td>
</tr>
<tr>
<td>Less fuel consumption per delivery</td>
<td>(Moroz and Polkowski, 2016)</td>
</tr>
</tbody>
</table>
Less operational costs per delivery
(For consumers)
(Carotenuto et al., 2018; Deutsch and Golany, 2018; Morganti et al., 2014b)

More flexibility
(For consumers)
(Cardenas et al., 2017a; Carotenuto et al., 2018; Morganti et al., 2014b; Xiao et al., 2017)

More convenience
(For consumers)
(Deutsch and Golany, 2018; Edwards et al., 2010a; Yuen et al., 2018)

Less waiting time
(For consumers)
(Yuen et al., 2018)

Less risk of theft due to unattended delivery
(For consumers)
(Kedia et al., 2017; Nabot and Omar, 2016)

More local pick-up (compared to depots)
(For collection points owners)
(McLeod et al., 2006)

More footfall
(For collection points owners)
(Weltevreden, 2008)

More revenue
(For collection points owners)
(Carotenuto et al., 2018; Weltevreden, 2008)

For society

Less emissions
(Carotenuto et al., 2018; Iwan et al., 2016; Lemke et al., 2016; Moroz and Polkowski, 2016; Yuen et al., 2018)

Less congestion
(Moroz and Polkowski, 2016; Yuen et al., 2018)

Less noise
(Moroz and Polkowski, 2016)

Less sidewalk parking
(Yuen et al., 2018)

In summary, collection points are found to offer a more efficient, sustainable and flexible alternative to deliveries at home. Yet, almost all research articles on the topic stress the importance of consumers’ trips to and from collection points. Not only are these collection trips inconvenient and costly to consumers (Zhang et al., 2018), they represent the majority of emissions (Edwards et al., 2010a) and potentially outweigh the environmental gains of reduced vehicle-kilometers on the logistics side (Cardenas et al., 2017b; Morganti et al., 2014a; Pålsson et al., 2017). Although some attempts for closer investigation have been made, e.g. by McLeod et al. (2006) and Moroz and Polkowski (2016), comprehensive information on these consumer trips is lacking. Therefore, our objective is to fill this gap, by investigating how consumers make use of and travel to collection points.

3. Methodology

To identify how consumers use collection points and how they travel to and from these points, we collected information from 385 consumers in the Brussels-Capital Region by means of street intercept surveys. Intercept surveys take place at sites where respondents are intercepted in the course of carrying out an activity of some type (Richardson et al., 1995). In this research, we specifically target consumers using attended collection points. Despite many limitations, the survey is considered a reliable tool to collect information for research purposes (Gillham, 2000).

To ensure a good representation of the overall population, we carried out the survey at eight different types of collection points (following Morganti et al. (2014b)), i.e. bookshop/press, florist, supermarket, computer shop/household appliances, tobacco shop, gas station, photoshop, musical instrument shop), in different parts of the region (east, south, west, north and central areas) and for several time periods (morning, afternoon and evening, weekday and weekend). The Brussels-Capital Region has 1,191,604 inhabitants (Briobrussel, 2017), of which 67% shop online (Comeos, 2018). This results is a population of 798,375 Brussels’ e-consumers. With a confidence level of 95% and a margin of error of 5%, the ideal sample size contains 384 respondents.
The survey consists of four sections. The first section captures information on the survey context, i.e. survey date, location and type of collection point. The second section collects information on the way consumers are using the collection point at the time of the survey, covering questions on the nature of the parcel pick-up (i.e. if the parcel was intended to be delivered to the collection point or if it concerns a failed home delivery), information about the parcel (i.e. product type), consumers’ satisfaction with the collection point and travel information (including modal choice, trip chaining and travel time). We specifically asked for travel times in minutes, as this is easier for respondents to estimate as compared to distance, e.g. in kilometers. This section also addresses consumers’ general delivery preferences. The third section covers consumers’ online purchasing behavior (i.e. order frequency, return frequency, online spending and whether consumers feel like their online purchases replace their offline purchases), while the last section consists of socio-demographics (i.e. gender, age, place of residence, household situation, professional situation and income). Table 2 provides an overview of socio-demographic characteristics of our survey sample.

Table 2. Socio-demographic characteristics of survey sample

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger than 24</td>
<td>72</td>
<td>18.7%</td>
</tr>
<tr>
<td>Between 25 and 34</td>
<td>106</td>
<td>27.5%</td>
</tr>
<tr>
<td>Between 35 and 44</td>
<td>99</td>
<td>25.7%</td>
</tr>
<tr>
<td>Between 45 and 54</td>
<td>72</td>
<td>18.7%</td>
</tr>
<tr>
<td>Older than 55</td>
<td>36</td>
<td>9.4%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>190</td>
<td>49.4%</td>
</tr>
<tr>
<td>Female</td>
<td>195</td>
<td>50.6%</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>106</td>
<td>27.5%</td>
</tr>
<tr>
<td>Cohabitng</td>
<td>95</td>
<td>24.7%</td>
</tr>
<tr>
<td>Married</td>
<td>139</td>
<td>36.1%</td>
</tr>
<tr>
<td>Divorced</td>
<td>30</td>
<td>7.8%</td>
</tr>
<tr>
<td>Widow(er)</td>
<td>15</td>
<td>3.9%</td>
</tr>
<tr>
<td><strong>Professional status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee, full-time</td>
<td>214</td>
<td>55.6%</td>
</tr>
<tr>
<td>Employee, part-time</td>
<td>45</td>
<td>11.7%</td>
</tr>
<tr>
<td>Independent</td>
<td>26</td>
<td>6.8%</td>
</tr>
<tr>
<td>Student</td>
<td>73</td>
<td>19%</td>
</tr>
<tr>
<td>Retired</td>
<td>24</td>
<td>6.2%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3</td>
<td>0.8%</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch-speaking</td>
<td>181</td>
<td>47%</td>
</tr>
<tr>
<td>French-speaking</td>
<td>204</td>
<td>53%</td>
</tr>
</tbody>
</table>

For accessing the survey questionnaire, please contact the corresponding author.
To analyze the collected data, we use descriptive statistics and simple inferential statistics (i.e. contingency tables, chi-square test, Cramer’s V) to highlight potential relationships between user-related attributes, travel-related attributes and socio-demographics.

4. Results

In this section, we present the results of our analysis in three parts. The first part reflects on how consumers use collection points and which types of consumers are more keen on using collection points as opposed to alternatives. The second part covers consumers’ transport behavior related to collection points and the third part challenges five assumptions on the topic.

4.1. Collection point use and users

Analysis of the survey results shows that 72.2% of consumers visited a collection point following a failed delivery at home, meaning that less than one third (27.9%) of consumers actually selected collection point delivery when checking-out. Around one fourth of consumers (24.4%) prefer to receive their online orders at a collection point. Among consumers that selected a collection point as the delivery location, this is true for the majority (76.7%), although an important share still prefers delivery at home (10.3%) or at work (6.5%). Consumers that do prefer collection points refer to its main advantages, i.e. flexibility (44.7%), location (41.5%) and the possibility to chain several activities within one trip (10.6%). Lower delivery pricing for collection points (as opposed to delivery at home) was not covered in the survey, nor was it mentioned by consumers in the open question probing for other advantages. This is because price differentiation among delivery locations is not standard practice in Belgium (Cardenas et al., 2017b). The majority of consumers (42.6%) picked up clothing items, shoes and/or accessories. Other frequently mentioned product categories include electronics (18.7%), toys and hobby products (15.1%), health and beauty products (11.9%) and books (9.1%).

Consumers that prefer collection points over other delivery locations are more likely to select this location for their online orders (p=0.000; Cramer’s V=0.754). They travel more by bike or on foot (p=0.000; Cramer’s V=0.541), are more likely to visit a collection point within their postal code zone (i.e. an “intrazonal visit”) (p=0.011; Cramer’s V=0.130) and are more likely to take the shortest route from their previous destination to their next destination instead of making a detour, e.g. for other activities (p=0.000; Cramer’s V=0.321). Consequently, their travel time is likely to be shorter (p=0.000; Cramer’s V=0.237). These consumers indicate shopping online more frequently (p=0.000; Cramer’s V=0.285) and their online orders replace purchases in physical stores (p=0.000; Cramer’s V=0.306). Consumers that prefer collection points are also found to pick-up more books and clothing items, shoes and/or accessories, as opposed to consumers with other delivery location preferences (p=0.013; Cramer’s V=0.224). Additionally, they are more likely to be very satisfied with their collection point (p=0.000; Cramer’s V=0.583). Consumers with a preference for collection points are generally younger (p=0.000; Cramer’s V=0.374), single (p=0.000; Cramer’s V=0.350), students (p=0.000; Cramer’s V=0.359) that do not have children (p=0.001; Cramer’s V=0.164).

The above analysis is useful to construct a user profile for collection points, but it also indicates the type of consumer that prefers other delivery locations. Hence, these consumers can be targeted with actions encouraging collection point advantages. They are more likely to be car-users with a longer travel time and use the internet to buy electronics, toys and hobby products every one to three months or less, complementing purchases in physical stores. Moreover, these consumers are more likely to be older than 35, cohabiting or married with children and working as an employee (either full-time or part-time) or independent. This profile description corresponds to the profile of consumers using the collection point because of home delivery failure.

4.2. Collection point travel

In terms of travel behavior, the survey shows that almost half of consumers (47%) travelled by car to and from the collection point. Around one fifth (22.3%) used public transport, another fifth (21.6%) travelled on foot and a minority cycled (9.1%). Most (65.7%) consumers visit a collection point within the postal code zone in which they live. Such
intrazonal visits are more likely to induce travel by foot or by bike (p=0.000; Cramer’s V=0.387). The majority of consumers (69.4%) chained other activities to the collection point visit. “Tripchainers” are more likely to take cars and public transport, instead of walking or biking (p=0.000; Cramer’s V=0.310). The most popular activity to combine with collection point visits is shopping for groceries or other necessities (26.6%), followed by picking up or bringing someone (13.1%) and visiting family or friends (11.6%). Among consumers that chained several activities in one trip, almost half (47.2%) indicated that the collection point was located on the fastest route from their previous destination to their next destination, while 52.8% stated that they had made a detour. This detour took on average three minutes, only in 5.7% of the cases did the detour take longer than five minutes. No consumer indicated a detour of eleven minutes or more. Total travel time from the previous destination to the collection point was less than ten minutes for more than half of consumers (55.6%). One third of consumers (29.6%) spent between eleven and fifteen minutes travelling, 11.9% between sixteen and twenty minutes and 2.9% travelled more than 20 minutes.

4.3. Assumptions about collection points

Knowledge on consumers’ user and travel behavior related to collection points is limited. Therefore, studies on the topic often rely on assumptions. In the following, we address five statements found in research and verify them by using our research results. Zhang et al. (2018) assume that consumers walk from their homes to collection points along the shortest distance. As reported earlier in our results section, consumers’ travel behavior was shown to be more motorized and more complex (e.g. chaining several activities in one trip). Acknowledging this complexity, Cardenas, Dewulf, et al. (2017) state that consumers’ preference of collection points varies according to the type of product they purchased. Our research results validate this. We find that consumers picking up books, clothing items, shoes and/or accessories are more likely to prefer collection points over alternative delivery locations, while electronics, toys and hobby products are preferably delivered on another location, i.e. home or work (p=0.013; Cramer’s V=0.224). Yuen et al. (2018) found that consumers hold a rather neutral to slightly positive view towards self-collection, which our results confer. Less than one third of consumers (24.4%) prefers to pick-up their orders at a collection point, despite the fact that our sample only consists of collection point users. The majority still favors delivery at home (46%) or at work (25.7%). Consumers’ view on collection points specifically, is more positive. While around one third (31.9%) are neutral, only 1.3% of consumers are unsatisfied. No consumer indicated that they were very unsatisfied. Kedia et al. (2017) found that acceptance of collection points depends on network density, parking availability, location, proximity, security and opening hours. In our research, we did not cover network density, parking and security as motivation to prefer collection points, but we did include location and opening hours, next to personal service, flexibility, convenience and the possibility to combine parcel pick-up with other activities. This list was built on earlier works on the topic (Chaberek-karwacka, 2017; Kämäräinen et al., 2001; Morganti et al., 2014a; Weltevreden, 2008). While location proved a motivation among consumers that prefer collection points (41.5%), none of the consumers selected opening hours. Additionally, flexibility (44.7%) and the possibility to combine parcel pick-up with other activities (10.6%) were found decisive. Finally, Kedia et al. (2017) also assume that consumers collect parcels on their daily commute to and from work. Our results show that this is only in 1.5% of trip chaining consumers the case, while 0.6% chain parcel collection with other work-related purposes.

5. Conclusion

Consumers are increasingly using the internet to make purchases. Whether e-commerce is more or less beneficial for the environment, is determined by the way in which consumers receive these purchases, i.e. the last mile. Home delivery could be the best solution, but several issues relating to logistics (e.g. express deliveries, inefficient routing, empty running) and on the consumer side (e.g. delivery failures, order fragmentation, absent loading zones) tilt the balance in favor of local collection points. However, this largely depends on consumers’ transport to and from these collection points, but knowledge on these trips is lacking. Hence, our objective is to identify how consumers use collection points and how they travel to and from these collection points. To this end, we organized street intercept surveys with 385 consumers in the Brussels-Capital Region. Analysis of the survey results shows that around three-quarters (72.2%) of consumers use collection points following an unsuccessful delivery attempt at their homes, indicating considerable inefficiencies in the last mile. Almost half (47%) of consumers use cars to pick-up their
purchase, while the remaining half takes public transport (22.3%), walk (21.6%) or cycle (9.1%). Most consumers visit a collection point within the postal code zone in which they live, travel less than fifteen minutes and chain other activities to parcel collection (primarily grocery shopping). Consumers that prefer collection points over other delivery locations are generally younger, single students that have no children. They are also more frequent online shoppers, in which their e-purchases replace purchases in physical stores. Our analysis contributes to last mile practice by identifying consumer profiles that could be targeted to encourage collection point selection on the web-shop’s check out page. With respect to existing studies on the topic, our results contradict assumptions of consumers primarily walking to collection points or combining collection with work-related trips, but confirm the importance of product type on collection point preference. The research is geographically limited to responses from collection point users in the Brussels-Capital Region and should be tested further in other contexts and geographical settings. Future research on retail supply chain sustainability should build on our approach for a more accurate representation of the consumers’ part of the last mile.

6. Acknowledgements

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References


