Cost-benefit evaluation of e-commerce last mile deliveries. A case study in Mechelen

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Extended abstract

Objectives and motivation
Urban logistics attempts to increase the efficiency of goods distribution in urban areas while the negatives externalities are mitigated. However the recent trends in e-commerce pose new challenges to the field of research. Home addresses still being the preferred point of delivery for e-commerce shopping (Copenhagen Economics, 2013), this preference comes with two drawbacks, (i) the customer has to receive the package by some mean, and (ii) if the product has to be returned the customer must coordinate the collection time and location. From an urban logistics perspective those two drawbacks are causing less efficient transport and more transport, on the one hand more trips are forced by failed attempts to deliver and on the other hand more trips are there to collect refunded items.

Logistics companies are looking for different solutions to overcome the drawbacks discussed above. One is a time windows agreement between the receiver and the carrier, which reduces the number of failed delivery attempts, which it usually creates a “Ping-Pong” effect in the routing of the delivery (Gevaers, 2013). Many papers has been devoted to the analysis of the outcomes of delivering at a different location in particular in pick up locations (see Dell’Amico & Hadjidimitriou, 2012, Quak, Balm, & Posthumus, 2014, Gonzalez-Feliu, Salanova Grau, & Beziat, 2014; Morganti, Dablanc, & Fortin, 2014; Morganti, Seidel, Blanquart, Dablanc, & Lenz, 2014, for some references). While this solution also reduces the number of failed attempts and usually the travel distance, there exist a few points to remark: (i) to receive products in a different location may discourage e-customers from buying online, (ii) considerations in terms of security and ownership need to be considered but are still missing, (iii) the refunds problem is not always solved.

The goal of this paper is to analyse the results of a trial in the city of Mechelen of an innovative solution for e-commerce deliveries: ParcelHome, by installing an automated locker at the home of voluntary customers, who will be able to receive e-commerce products, without the need of moving to a different location or being at home at the time of the delivery. With the analysis we seek to provide an evaluation of the private distribution costs for carriers and customers, and keeping an urban logistics perspective, we take account for the social costs in terms of emissions and congestion. This paper also challenges a solely cost perspective, by considering the variation in the e-shopping behaviour associated to the use of the home locker.

General description
To achieve this purpose we will develop a three-step exploratory and analytic methodology based in quantitative and qualitative variables. In the first step, a cost function will be developed in order to account for private and social costs associated to the distribution of e-commerce parcels. The cost function is inspired by previous research contributions in last mile deliveries costs (Gevaers, Van de Voorde, & Vanselander, 2014), but improved by adding the cost drivers of social costs for municipality as well particular characteristics of the e-commerce distribution in the city environment.

In the second step, two baselines will be constructed, one from the demand side by using survey methods to assess the current e-commerce behaviours of the customers involved, and one from logistics carriers, where data will be gathered to feed the cost function and develop a cost baseline for the logistics supply side. These two baselines will become an important contribution to provide insights in the current state of e-commerce adoption and urban logistics costs originated from the e-commerce business model.

Finally, as third step, data will be gathered during a four-month trial in the city of Mechelen. Around 100 ParcelHome automated lockers will be installed with voluntary customers to receive e-commerce parcels. The trial will be also coordinated with the main logistics carrier operating in the city and with the municipality. With this data we will be able to assess the impacts on the urban logistics from the proposed solution. Insights on types of goods, volume, shopping and delivery behaviours and reverse flows also will be analysed.

Results and conclusions
The expected results from this evaluation will shed light on the benefits of the use of ParcelHome automated parcel boxes in customer’s houses. Within this results we will provide a cost calculation tool to contrast the with baseline costs. The cost analysed will be useful for the stakeholders of the urban goods distribution, for private companies to provide a better and more efficient service, for the customers to receive the benefits of distance shopping without moving to a different location and for the government to understand to what extent this solution mitigates the adverse effects of urban logistics.
One of the main barriers of the e-commerce adoption is the difficulties in the delivery process, thus with the proposed analysis we intend to test the benefits from the logistics solution. With this analysis different decision makers can obtain insights from the relation between logistics service level and e-shopping. The results are important for retailers and suppliers as well as for policy makers facilitating the e-commerce adoption. The involvement of these stakeholders is important to ease the implementation of logistics solutions for e-commerce.

Finally the cost function proposed from the project will be a unique contribution in the cost calculation of e-commerce logistics. The cost calculation in this trial will work as a starting point for developing cost calculations in different contexts, and to analyse different solutions with a similar methodology. This represents a further step in the understanding of the impacts of e-commerce in urban logistics, and how to be prepared for a probable expansion of the e-commerce flows.

References


Keywords: urban logistics; last mile delivery; city logistics; cost-benefit evaluation; e-commerce