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Restocking in touristic and cbd areas: Deterministic and stochastic behaviour in the decision-making process

Francesco Russo^a, Antonio Comi^{b*}

^a *Dipartimento di ingegneria dell'Informazione, delle Infrastrutture e dell'Energia Sostenibile, Mediterranea University of Reggio Calabria, Località Feo di Vito, Reggio Calabria, 89100, Italy*

^b *Department of Enterprise Engineering, Tor Vergata University of Rome, Via del Politecnico 1, Rome, 00133, Italy*

Abstract

The paper examines urban activity restocking process. The proposed models aim at examining how city logistics measures could modify the restocking process of retailers and ho.re.ca. managers located within the urban area. The process is considered in terms of distribution channel: pull or push movements to bring freight to the economic activities. The analysis has been based on surveys carried out in the inner area of Rome. The study points out that deterministic behaviour exists in relation to goods types and that the choices for acquisition (i.e. distribution channel and restocking area) are generally joint choices. For this scope, different behavioural models were tested according to different hypothesis on random residual distributions.

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1. Introduction

Continuous growth of traffic congestion, especially inside urban areas during the last two or three decades, has resulted in significant problems, such as increased air pollution, noise nuisance and visual blight, as well as decreased traffic safety levels. Currently, in the field of urban freight transport, due to the need to deliver small parcels to

* Corresponding author. Tel.: +39-06-7259-7059; fax: +39-06-7259-7053.
E-mail address: comi@ing.uniroma2.it

customers, the above emerging problems and inefficiencies are mostly associated to flexibility issues, as suggested by DG MOVE (2012) leading to low load factors – empty returns, a large number of deliveries made to individual premises in a given time period, long dwell times at loading/unloading points and ultimately significant traffic problems in urban areas, lowering the effectiveness of city logistics, lowering the level of services provided and jeopardizing the environmental performance of the freight transport system. The freight sector (including product deliveries to shops as well as service activities) is often seen as a major contributor to congestion and traffic problems in urban areas, but little is understood about the individual supply chain characteristics that is the core of urban retail and shopping centres (Cherrett *et al.*, 2012).

In Europe, with its historic city centres and dense living areas, the nuisance of freight traffic has been dealt with a wide range of city logistics measures (Sugar, 2011; Russo and Comi, 2010a; Rizet *et al.*, 2012; Visser, 2013; Holguin-Veras and Aros-Vera, 2014) mainly devoted to introduce restrictions (e.g. time windows and access constraints) that, if they are not properly investigated, could increase both internal and external costs (McKinnon *et al.*, 2010). However, while most of the implementable measures could produce good results in terms of transport external cost reduction, some of them could increase the internal transport costs incurred by urban freight actors (e.g. receivers, shippers, carriers). Therefore, in an urban planning process (Munuzuri and Gonzalez-Feliu, 2013), the choice of the most appropriate set of solutions should be based on a quantitative analysis that points out all the different actors involved in urban goods movements. In this process, a key role is played by demand models as they can assess the effects of the scenarios to be implemented. The models and methods for scenario assessment must thus investigate the variables that have an important role in successful scenario implementation, pointing out the actors' behaviours.

Besides, urban areas are mainly freight attractors (Schoemaker *et al.*, 2006; Nuzzolo *et al.*, 2015) with commodity flows destined to satisfy the end-consumer needs at shops or at ho.re.ca. activities (hotel, restaurant and catering; mainly in urban historic centres). Even if the ho.re.ca. activities represent the final destination for the use/consumption of goods and subsequently it could be addressed to consider their restocking behaviour alike to end consumers' one, ho.re.ca. decisional process differs from end consumer's one due to three main elements: large quantity of freight daily moved (1), distribution channels used (2) and places of acquisition (3). Therefore, in the following, ho.re.ca. activities are considered as an intermediate point between production/warehousing and consumption.

Ho.re.ca. represents the majority of activities (especially in the touristic and CBD areas, where the related employees are about 6 times higher than shop employees; Sanchez-Diaz *et al.*, 2013; Nuzzolo *et al.*, 2015) in many worldwide city centres. The freight flows destined to these activities, in some urban areas, averagely represent about 31% of total daily quantities moved in urban areas (Schoemaker *et al.*, 2006; Nuzzolo *et al.*, 2015). Besides, a specific survey carried out in the city of New York (Sanchez-Diaz *et al.*, 2013) revealed that ho.re.ca. can determine a high number of movements per day, and although they have the lowest level of average sales, they have one of the highest employment levels. At the other hand, this segment of demand is very important because, for example, an establishment located in a high value location will prefer to have more frequent deliveries than using a larger area for storage of supplies. Additionally, establishments in this sector are usually small so they have to cope with space constraints to receive goods.

In the field of freight demand management, the analysis of the behaviours of the above decision makers (i.e. retailer and ho.re.ca. manager) becomes crucial to modify the impacts due to freight transport (Marcucci and Gatta, 2014). Several studies have pointed out that the external costs of freight transport in urban areas is greater than passenger one (Gonzalez-Feliu *et al.*, 2014; Taniguchi and Thompson, 2014). Urban authorities have traditionally considered freight only related to negative environmental impacts, often neglecting that it is an important element in the urban economy, both in terms of the income it generates and the urban development it supports (Lindholm, 2013). The inattention of public authorities to the trade-off between the increasing of internal cost (for the receivers, e.g. retailer and ho.re.ca) and the reduction of external cost for the collectivity determine "myopic" policy for the urban centre. For example, according to Stathopoulos *et al.* (2012), measures that often are promoted by local administrators as efficient such as time-windows and Urban Distribution Centre (UDC) can produce significant disparities among stakeholder sensitivities. Then, the subsequent low degree of acceptability among stakeholders can be solved through the analysis and selection of implementable measures, which consider all actors' needs and allow to pursue an optimal compromise among all involved interests. Therefore, a first objective of the paper is to review urban freight context pointing out the impacts produced, the decision makers involved and thus the city logistics measures implemented around the world for improving city sustainability and liveability.

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