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Investigating the potential for off-hour deliveries in the city of Rome: Retailers' perceptions and stated reactions

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ABSTRACT

This paper investigates the potential for off-hour deliveries in the city of Rome. It focuses on retailers that play a fundamental role in the decision making process often determining delivery times. It explores their preferences for three off-hour delivery prototypes and inquires retailers' willingness to adopt them, both with and without the provision of dedicated incentives. Finally, it analyses retailers' reactions to a hypothetical scenario where a mandatory off-hour delivery policy is imposed. The overall results show a good inclination towards off-hour deliveries. This induces optimism with respect to their potential introduction as well as skepticism about the lack of attention local decision makers have, so far, paid to this policy option.

1. Introduction

Cities' competitiveness hinges on research, innovation and services. They need to attract qualified human capital that asks for high living standards which, in turn, are negatively impacted by the externalities transportation produces (Camagni, 2007). Cities are characterized by significant economies of density (Ciccone and Hall, 1996) and proximity (Duranton, 1999). They generate ideas and innovations engendering economic growth but also consume more goods than they produce. Cities need to be supplied from outside due to this structural deficit. In fact, they have to: import goods, get rid of waste and accommodate all city dwellers' movements together with other city users coming from outside. All this often induces congestion, noxious gas emissions and excessive noise. Economic activities generate a robust and rigid demand for both passenger and freight transportation. Decoupling economic growth from transport demand is fundamental to foster sustainable city development (Ben-Akiva et al., 2013).

City logistics (Taniguchi et al., 1999, p. 17) represents a part of transport modeling and studies archetypal urban freight transport problems (e.g. congestion, on-street loading and unloading, environmental emissions, etc.). Recent literature (e.g. Gatta and Marcucci, 2014, 2016a, 2016b; Holguín-Veras et al., 2007, 2008; Lindholm and Browne, 2013; Macharis and Melo, 2011; Marcucci and Gatta, 2013, 2014, 2016; Marcucci et al., 2015) points towards the importance of explicitly considering different stakeholders' perspectives. Acknowledging and understanding the concerns different agents have and identifying their specific priorities greatly enhances the probability of deploying effective solutions. This approach has proven successful in tackling city logistics problems and represents a necessary pre-condition for the effective introduction and retention of innovative urban freight policies.

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The almost road-only urban freight distribution is concentrated in regular business hours. Various initiatives have been put into place to tackle this daunting problem. Different Authors have provided alternative categorization of the policies implemented (e.g. Ambrosini and Routhier, 2004; Arvidsson et al., 2013; Muñuzuri et al., 2005; Ogden, 1984; Russo and Comi, 2010; Stathopoulos et al., 2011; Visser et al., 1999). One can distinguish, adopting a widely accepted classification (NCFRP, 2015), urban freight policies in different categories: (1) *Infrastructure management*; (2) *Parking/loading areas management*; (3) *Vehicle-related strategies*; (4) *Traffic management*; (5) *Pricing, incentives, and taxation*; (6) *Logistical management*; (7) *Freight demand/land use management*; (8) *Stakeholder engagement*.

More recently, a specific focus has been devoted to off-hour delivery (OHD) programs with the intent of evaluating their potential for shifting a substantial part of the deliveries to off-hours (e.g. Brom et al., 2009; Holguín-Veras, 2006; Holguín-Veras et al., 2011a). Within this stream of literature, behavioral research has acquired a prominent role. Its most important aim is identifying the relevant players and defining possible drivers capable of inducing the changes needed. Receivers are at the core of this analysis and the role incentives play in favoring the adoption of OHD schemes cannot be underestimated. In fact, incentives are fundamental given the asymmetric distribution of benefits and costs OHD implementations produce notwithstanding their socially overall positive effects (Holguín-Veras, 2008).

This paper contributes to the understanding of practical issues relating to retailers' evaluation of urban freight policies aimed at stimulating OHDs' adoption in Rome. In fact, there is now plenty of evidence that OHDs can be successfully introduced producing sizable private as well as public net benefits. The most important and well known cases, where this solution has been effectively introduced, are: New York City (Holguín-Veras et al., 2014), London (Transport for London, 2012), Barcelona (NICHES, 2010), Dublin (BESTUFS, 2006) Bogotà and Saò Paulo (Holguín-Veras et al., 2016).

The main motivation of this paper resides in the stark contrast between OHDs successful implementations in various cities comparable to Rome and the lack of attention paid to this specific policy in the recently passed Urban General Mobility Plan (UGMP) adopted in April 2015 (City of Rome, 2015a). The paper examines the potential for OHDs adoption by investigating retailers' perceptions and stated reactions to this policy should it be implemented in the limited traffic zone (LTZ) in Rome's city center. The focus on retailers is justified by both the results obtained in a set of preliminary in-depth interviews performed by the Authors as well as the suggestions put forward in Holguín-Veras et al. (2014, p. 44). More in detail, the paper delves into retailers' preferences for three OHD types. This inquiry is twinned with another exploring the willingness to adopt OHDs with respect both to the *status quo* situation as well as after the potential introduction of specific incentive types. Finally, the paper scrutinizes which would be the most likely reactions to a mandatory hypothetical introduction of such a change.

The paper is structured as follows. Section 2 reports a short theoretical description of the issues to be considered when designing sustainable urban freight policies and the main characteristics of the OHD schemes evaluated. Section 3 describes urban freight distribution key features in Rome and provides a synthesis of its complex regulatory framework while Section 4 illustrates the survey instrument and retailers' organizational/behavioral data. Perceptions and stated reactions are analyzed in Section 5 along with the role incentives play. Section 6 concludes summarizing the results obtained, providing some policy implications and illustrating future research.

2. Off-hour delivery schemes for sustainable urban freight distribution

This section is articulated in two subsections.

The first discusses *a-priori* expectations, derived from economic theory, with respect to sustainable urban freight distribution policy design that also apply to OHDs. In fact, having clear in mind the fundamental tenets is helpful when interpreting the results obtained.

The second describes the main characteristics of the three prototypical OHD types considered, namely: (1) staffed OHDs (ASSISTED); (2) OHDs without staff present in the receiving establishment (UNASSISTED); (3) delivery to a urban consolidation center at night and final consignment to retailers during regular business hours the next day (UCC&OHD).

2.1. Economic a-priori expectations and sustainable urban freight distribution policy design

Basic microeconomic theory suggests no public intervention if the market does not fail. In fact, under these circumstances, the market can optimally allocate scarce resources. Therefore, before considering any policy intervention, one should first check for market imperfection to be corrected.

Taking any microeconomic textbook one discovers that at least four are the main characteristics needed to consider a given market competitive. More in detail, one should check for product homogeneity, numerous buyers and sellers, free market entry/exit and symmetric and full information for market operators. None of these characteristics is fully satisfied in the case of urban freight transport. Most important, while transport providers are very cost conscious and quick to react to market signals, their limited market power and asymmetric information, compared to that of retailers and shippers, usually hinders their ability to pass on to their customers the additional costs that the public sector imposes on them (Holguín-Veras et al., 2014; Yushimito et al., 2015).

A strongly unbalanced power relationship among transport providers, shippers and receivers is at the base of their dealings. This clearly emerges when analyzing the effects of increasing the cost of road use for transport providers who, in the

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