

ACCEPTABILITY OF FREIGHT POLICY INNOVATION FROM A STAKEHOLDER PERSPECTIVE: ROME'S LIMITED TRAFFIC ZONE

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ABSTRACT

City logistics initiatives aim to minimize the negative economic and environmental costs of freight movement within urban areas. Within this broad objective, policy schemes need to seek solutions that take the role and needs of different stakeholders and their acceptance of the policy scenarios envisioned into account. Indeed a more sustainable management of the urban area requires a deep knowledge, not only of the traffic and regulatory context, but the problem perceptions and operative constrains of the main stakeholders of the distribution chain. Active consultation among stakeholders is crucial to define more coherent and realistic city logistics policy-mixes. What is more, any pre-existing regulatory context is bound to influence the feasibility of policy innovation as well as the acceptability among the main stakeholders. This paper presents findings from a series of stakeholder consultations in a specific and complex political and urban environment: the Limited Traffic Zone (LTZ) in Rome. In a first stage the main perceived freight problems and preferred policies are mapped by means of expert-panel consultations. The identified core freight policies are then presented to a sample of LTZ operators to explore the behavioural reactions to a shift in the regulatory context on behalf of three main agent types, carriers, retailers and own-account operators. This allows an in dept study of individual acceptance and reactions along with the role of interdependence among urban freight operators in assessing novel policies.

Keywords: city logistics, urban freight, stakeholders, freight policy innovation, freight decision making, Rome's LTZ

1 INTRODUCTION

Urban freight transport has become an important issue in city planning. For years transport economists and urban planners have studied the many challenges related to organizing efficient freight movement within an urban setting. The complexity of the urban freight distribution problem along with the potential conflicts between different key stakeholder groups (customers, local government, transport companies or logistic service providers, inhabitants, retailers) requires an all-inclusive solution. Indeed, the movement of goods in the urban context is inherently complex due to the high number of stakeholders involved, intricate routing patterns and the diversity of goods. City logistics is a branch of transport modelling studying the typical problems relating to urban freight transport, such as congestion, time-window regulations, on street loading and unloading of goods, parking and environmental emissions caused by freight vehicles. To facilitate a successful introduction of city logistic policies, it is important to recognize and adequately understand the concerns of different stakeholders and their problem identification with respect to urban freight transportation (Puckett and Greaves 2009). This paper presents results from two sets of consultations with freight stakeholders regarding goods movements in Rome's LTZ. We focus on four main interrogatives.

- What are the main perceived problems that different types of stakeholders associate with urban freight transport?
- What are the most preferred policy solutions promoted by these stakeholders to improve the problems?
- What is the effect of these policies in terms of real-life freight operator's policy acceptance and reactions?
- What role does freight operator interactions play in ensuring acceptance and modulating reactions?

To gain a thorough understanding of the first two points, that is the uncovering the problem perception and revealing the most appropriate policy responses to apply in a specific context, in-dept stakeholder surveys were carried out. The subjects were representatives for three broad groups, namely, representatives for freight carriers, local policy makers and retailers operating in the LTZ. Important findings from this stage pertain to the large disparity for each group in terms of sensitivity to policy instruments. Based on input from these consultations several policy-scenarios were defined with the aim of testing the findings in a larger stated preference questionnaire study among freight operators in Rome's LTZ. The aim in this second stage was to explicitly consider the reaction of carriers, retailers and own-account operators to the selected policies. Such analyses are important for the formulation of freight policies. Indeed to ensure efficiency, city logistics policies need to identify feasible and acceptable, to the important stakeholders, policies. Another essential objective is to identify areas of potential conflict derived by the different interests held by the various stakeholders involved in the supply chain. A failure to account for stakeholder-specific problem perceptions and interaction among operators not only jeopardizes the successful introduction of innovative policies but also their continuation in time.

The paper is organized as follows. In the next section we outline main findings from the research on urban freight distribution, including problems and policy solutions. In section three the expert stakeholder consultation is described along with the main results. Section

four overviews the operator survey, which focuses on the behavioural reactions to the policies, identified in the previous section. Section five closes with a discussion.

2 URBAN GOODS MOVEMENTS

2.1 Problems caused by urban freight

The efficiency of the freight distribution system plays a significant role in the competitiveness of urban areas, and is an important element in the urban economy, both in terms of the income generated and employment levels sustained. At the same time, urban freight movements also contribute towards important problems. The rapid increase in freight vehicles in urban and metropolitan areas contributes to congestion, air pollution, noise and increases in logistic costs, and hence the price of products. In addition, a combination of different types of vehicles on the road increases the risk of accidents. City logistics is concerned with ensuring efficient transport of goods within the urban area, i.e., from production sites to shops, and lastly to final consumers.

In the period between 1990-2007, Italy has witnessed a substantial increase of the demand for transport (+34% for passengers and +27% for goods with national carriers), which is in line with growth in GDP (ISPRA 2009). This indicates that no decoupling effect is at play in the current context. The Italian situation is cause for concern due to its strong reliance on road transport and high degree of fragmentation¹. Concerning Italian companies - the buyers of logistic services – there is a low propensity to externalize logistic activities to third parties. In line with this, the Roman context has been associated with severe congestion and a strong dependence on road transport for both passenger and freight movement for several decades. The Italian freight panorama is characterized by low externalization and innovation, mainly due to pulverization of companies and cultural backwardness (ISFORT 2003).

In the case of Rome, the good deliveries make up 6% of traffic volumes (Comi et al. 2008; Filippi and Campagna 2008). 25 000 goods vehicle movements are carried out daily, of which 40% is through-traffic (STA 2001). Moreover, 2/3 of the operations are concentrated between 7-13 am, in coincidence with passenger work travel. Regarding loading practices there is an improper use of the designated loading/unloading bays. A widespread practice in Rome has been a large number of micro operators (called “padroncini”) a factor that aggravates the common issues of inefficient routing, low load factors and lack of innovation in urban freight. Another prevalent feature in the Roman logistic system is the quantity of own account transport associated with problems such as inefficient load factors and the prevalence of goods that are unlikely to be incorporated in city logistics initiatives. A large imbalance between in-bound and out-bound traffic is observed for Rome (Crainic et al. 2004). This is one explanation behind the pervasiveness of empty returns. Another central concern is that of clashes between the interests of freight companies and those of other stakeholder groups involved in urban mobility such as residents and workers (Muñuzuri et al. 2005). Overall the strong links with overall economic growth appear hard to break leading to

¹ The Italian productive system relies almost completely on road transport, with an overall percentage of almost 94% (Domanico & Musso 2002). The Italian panorama of freight transport is characterized by a fragmented supply and demand. In 2006 there were around 134 000 freight enterprises in Italy employing a total of 446 000 workers. The lion part is made up of very small operators, with the average road freight company having 2.7 employees (Confetra, 2007).

a fatalistic view of the possibility to reduce growth in freight demand and movement (Pastowski 1997).

2.2 Freight policy objectives

Urban freight logistics policies need to take the conflicting objectives and interests of the different stakeholders involved in urban goods delivery into account. To mitigate the identified problems several measures are typically contemplated, such as route optimization, optimal location of logistics terminals and depots, load factor controls and cooperative delivery systems. Such measures can be classified into six broad classes.

- fiscal measures (market based incentives),
- regulatory measures (command and control regulations)
- land use planning measures
- infrastructural measures
- new technologies and ICT measures
- management measures.

Freight planning authorities are progressively recognizing the importance of consultative planning, when defining these measures. Policy-makers and private agents collaborate to identify the measures to implement aimed at achieving the jointly defined objectives. *Market-based measures* aim to alter the market prices of the goods whose production/consumption generates negative external costs (Maggi 2007). Congestion charging represents the most economically appealing measure in this category and may be differentiated to deal with specific externalities caused by freight movements (Rotaris et al. 2009). *Regulatory* or command-and-control measures are essentially a bundle of rules and regulations, sustained by a control system. Specific measures aimed at freight traffic, in this group include: physical or temporal restraint on traffic in specific areas (e.g. LEZ or LTZ), volume, weight or emission standard restrictions on urban vehicle access. Time windows and access restrictions are the most frequently used measures. They can be differentiated according to vehicle characteristics (volume, weight, length, emissions, propulsion) or other parameters such as the load factor or the organization of the transport services (own-account or third party) (Comi et al. 2010). Among the *land use measures* carrying a large impact on city logistics are zoning of economic and non-economic activities and relocation of freight generators (e.g. logistics or industrial activities). The concentration of commercial activities may allow rationalization of deliveries benefiting both private operators and the community (Maggi 2007). *Infrastructural* measures aim to encourage a modal shift, away from the dominance of road. One way to promote freight flows rationalization is through the installation of logistics platform aimed at consolidating deliveries and collection operations. *Information-based* policies focus on promoting the exchange of information between agents, supporting routing and scheduling of vehicles according to the degree of congestion in the transport network and to efficiently allocate the use of the l/u bays. The last category concerns *management* methods. This includes measures implemented by private and public agents aimed at reducing the social impact of urban freight and promoting cooperation between operators. The promotion of collaboration among agents, both private and public, is usually pursued by establishing local or national forums to discuss the design of the freight measures to implement.

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Two clarifications are needed regarding the joint study of policies and agents, alone or along with partners, in line with the aim of the current study. Most policy measures in the real world are part of a bundle. A policy bundle is a combination of individual policy measures (e.g. an increase in time window prohibitions is coupled with a decrease of the flat fee to enter the LTZ). Finally, it needs to be noted that the current academic studies typically focus on a single type of agent and a single or a small sub-set of freight policies. What we propose in this paper is a wider perspective, considering different types of actors and their preferences regarding a set of policies.

2.2.1 Rome's Limited Traffic Zone

The historical city centre of Rome has been subject to a Limited Traffic Zone since the late eighties. The institution of a formal LTZ in Rome can be traced back to 1989 when a 5 km² area was restricted to non-resident vehicles. The bans on traffic apply to both passenger and freight vehicles. Access and circulation in the larger peri-central area termed "ZTL Anello Ferroviario" is prohibited for pre-Euro-1 and Euro-1 light and heavy vehicles. Instead the central area that is the focus of this study has a more detailed legislation in place. It corresponds to a 4 km² area in the historical centre. The entrance is reserved for the least polluting vehicles (Euro 1 and later) with permission to access the LTZ only for residents while other subjects, such as retailers and freight carriers pay. The scheme operates during daytime hours (passenger cars: 06.30–18.00 Monday to Friday and 14.00–18.00 on Saturday). The passenger LTZ largely overlaps with the "LTZ for goods" area aimed at goods vehicles that operates between 10.00–14.00 and 16.00–20.00. The yearly fee is 565€ per number-plate. Initially the Police enforced the scheme manually, but this resulted in many vehicles entering the zone illegally. The system has subsequently become automatized based on the use of camera technology. The access and parking of freight vehicles is subject to specific time windows in the "ZTL merci". However a range of freight operators are exonerated from payments. A synthetic summary of the regulatory regime as defined in the latest LTZ municipal resolution (n. 44 from 2007) is shown in the appendix. Indeed the regulation appears designed essentially to create incentives for third account operators while discouraging lengthy parking of own account vehicles, given the shortage of on-street space in the area. Currently the time windows are not systematically enforced. Due to the many exceptions to the scheme it can hardly be characterized as a congestion reducing policy. Neither can it be classified as an environmental LEZ (low emission zone) since the vehicle emissions standards are not currently part of the scheme. However the exclusion of Euro-1 and below and the fee reduction for alternative fuels imply that environmental objectives prevail over efficiency goals. In the goods distribution context, recent years have seen a decrease of own account transport dropping from 54% in 1999 to 21% in 2008. In the same period the vehicle size for this category has shrunk sensibly, with 69% using an automobile up from 61% in 1999 (Filippi and Campagna 2008). Possibly this is due to differentiations in Rome's LTZ legislation provoking a decrease in the number of retailers choosing to manage their freight consignments with their own vehicles.

2.3 Freight stakeholders

In addition to the difficulty to fully identify the actors involved in the supply chain several papers contribute towards giving us a more complex characterization of the relationships among agents. Indeed this is seen as a precondition to adequately plan for urban freight distribution. In the words of Hensher and Puckett (2004) "Policies that do not take into account the complex interactions within the chain may yield suboptimal outcomes, based on inaccurate projections of the likely effects.". The overall aim is to gain insight regarding the most plausible behavioural strategies implemented to meet the requirement of a policy (including elasticity of behaviour, transaction costs, external effects and impact on residents). A main insight to from this particular line of research is that lacking the proper understanding of the relations established between agents we will not be able to engage in the type of institutional design that can ensure collaboration, or at least, decrease inefficient interaction provoking external costs. Also, ignoring interaction and distribution of power within the urban logistic chain makes it difficult to predict the reactions to policy shifts. In the following we overlook the literature on the dyadic relations between the main stakeholder groups surveyed in this paper.

A first distinction that needs to be drawn is between the responsibilities of private and public agents. For the current study, concentrating on the movement of commodities, it is important to distinguish between private operators (retailers, wholesalers or freight companies) and public ones (Visser et al. 1999). Since the decisions that generate the flows of goods in the urban area are generated by the private sector, policy makers have the task of facilitating/restraining these flows specifically or regulating the wider transport system (Harker and Friesz 1986). Typical public measures include pricing, licensing or regulations, in line with the policy instruments listed above. However the private subjects are responsible for fine-tuning the collaboration with their commercial partners including decisions on shared use of loading-unloading facilities and adoption of new technologies/routines.

Freight behavioural analysis and data collection are particularly difficult, in part due to the large quantity of decision makers that need to be surveyed (Hutchinson 1985; Musso 2006; Pan 2006). Among the actors traditionally identified in the goods movement system are receivers, carriers and forwarders (Ogden 1992). Here we concentrate on representing three main agent types in the chain. The first two, transport operators (carriers and forwarders) and retailers that receive the goods, are well identified in the literature. However we extend the analysis to include policy makers, since they dictate the policy scenario in which the private operators operate. Once the main actors have been identified, one has to address the more complex problem of analyzing the interaction between them (in the act of delivering/receiving goods in the city) and the different needs/constraints associated with each type of agent in complying with city logistics policies. Indeed possible asymmetries of power in dictating the rules of the freight distribution game determine the level of adherence to the policy and the degree of cooperation as well as the distribution of costs and benefits among actors. In the following we give a brief overview of the results from empirical studies concentrated firstly on each actor type separately and, subsequently, on the dyadic relation between stakeholder types.

2.3.1 Freight carriers

City logistics may be analyzed in more detail from the point of view of each agent type. In considering freight operators the most relevant aspect is minimizing the cost of transportation (Danielis and Marcucci 2007). Therefore, the main problems revealed in the literature are related to the planning of pickup and delivery, the vehicle routing and operational costs such as fuel cost oscillations. Numerous stated preference and other questionnaire surveys have explored the behaviour of freight operators. There is a rich literature on the choice of freight mode (García-Menéndez et al. 2004; Marcucci and Scaccia 2004; Shinghal and Fowkes 2002). Evaluations of the reliability of time among freight agents are overviewed in Fowkes et al., (2004). Hensher and Puckett (2004) emphasise to the presence of transaction costs and vested interests in decision-making by agents in a freight chain. A more limited number of papers look into the choice between own account and externally purchased transport (Marcos and Martos 2004). An important carrier behaviour causing concern in the roman context is the fact that 57% of loading operations are carried out while illegally double-parked while a third occurs while parked on the roadside instead of the l/u bays (STA 2001). To consider environmental impacts, 86% of freight vehicles are diesel fuelled.

2.3.2 Freight receivers

The receivers of goods need to respond, on their part, to the demands of the final consumers. In line with this, they require shorter delivery times along with the progressive elimination of warehouse spaces due to the elevated urban land cost (Maggi 2001). However a general classification to relate commercial establishments to urban freight movement is difficult due to the large variation in types of goods moved, store size and employment structure in different urban areas (Van Binsbergen and Visser 2001). A central component in these studies is the type of goods moved. For instance in Rome hotel, restaurant and catering (HoReCa) make up 71 % of all retailers in the LTZ area (Filippi and Campagna, 2008). Regarding freight receivers in the roman context, for larger operators, the main concern is related to l/u of goods, such as the lack of l/u bays (36%) and overall difficulty of vehicle access to the historical centre (33%). For smaller craft businesses the main weaknesses are the lack of adequate trolleys and lifting equipment for the unloading of goods (39%) (STA 2001).

2.3.3 Local public institutions

The chief area of concern to local policy makers is that of moderating the social costs generated by freight movement in the urban area. Here the concern lies primarily with the impact on traffic congestion and planning problems connected to the provision of l/u facilities for freight in competition with other uses of the road capacity (Maggi 2001; Muñuzuri et al. 2005). Then the problem is managed by designing effective policies for the regulation of freight traffic. This may imply imposing temporal and/or spatial limitations to circulation and/or parking of freight vehicles and creating dedicated stopping areas for loading/unloading manoeuvres. An important ingredient in policy innovation is the consultation with both the general public and freight stakeholders (Browne et al. 2003).

Besides the difficulty to fully identify the actors involved in the supply chain several papers contribute towards giving us a more complex characterization of the relationships among agents.

2.4 On interaction among freight agents

In order to gain a deeper understanding of policy acceptance, we cannot ignore the fact that freight chains are made up of agents with specific, and sometimes, irreconcilable needs, expectations and constraints. Many authors consider city logistics a privileged field of application for developing appropriate actor-based micro models (de Jong and Ben-Akiva 2007; Gray 1982; Hensher and Figliozzi 2007; Roorda et al. 2010; Wisetjindawat et al. 2005). As a prominent example Wisetjindawat et al., (2007) study interactions between freight actors at the urban scale and put forward a model for urban freight movement incorporating the behaviour of freight actors and their interactions in the supply chain.

The recent developments in behavioural freight modelling mainly revolve around the analysis of decision makers' choice processes. This implies uncovering underlying motivations for behaviour and looking at costs and benefits of alternative actions. Previous modelling approaches generally abstracted from these features. The innovations introduced have ensured greater realism in the treatment of the behavioural aspects influencing and motivating freight stakeholders when: 1) choosing among different strategies, 2) dealing with specific constraints, 3) interacting with others. These aspects are important when analyzing freight policy feasibility. This wider approach will ideally provide a better understanding of the potential impacts the selected policies might have on market outcomes. To do so one has to understand which decision makers are involved, how they interact, how power is distributed along the chain, under which constraints they operate and what specific freight service attribute is at the core of the negotiations. Thus, before proceeding to look closer at the interactions that are under play among the main stakeholder types analyzed in this paper it is worth underscoring the importance of this further dimension of analysis. The selection of feasible and realistic freight policy measures needs to consider such interactions and find an optimal compromise between the interests of the actors involved (Puckett 2009). This is a critical factor in the success of each city logistics measure. A leading example of a forum to learn about perceptions and interdependencies are the UK based Freight Quality Partnerships (FQPs). These forums may be considered a key factor for studying and implementing successful city logistics initiatives (DFT 2007). A FQP group might aim to identify problems, policy solutions and examining sustainable best practices, and help implement them. As Van Binsberger & Visser (2001) have underlined, the objective of these methods is to create a "supporting environment" for defining and implementing city logistics measures.

2.4.1 On policy measures and carriers

To date, the most studied freight agent interaction is the one incurring between freight carriers and institutional actors, or the policies they emanate (Daughety and Inaba 1981). Based on an extensive review on the linkage between decision makers and urban freight

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transport actors Allen et al., (2003) note that the authorities concede a low level of participation to operators. Policy makers typically ignore the chain nature of goods distribution and even regard freight operators as an obstacle to policy implementation rather than as a core participant. Likewise, Hensher and Golob (1999) underscore that not only are the very actors involved in freight operation often overseen in analyses of policy options but also that there is considerable differences in attitudes towards urban freight policies within this group. Great Britain takes the lead on studies considering the link between policy measures and company initiatives. Allen et al., (2003) study the relation between policy measures such as low emission zones (LEZ), time restrictions and congestion charging on the change in patterns of distribution operations. Japanese surveys on the introduction of cordon pricing show that the reaction of trucking companies depend on the business style, size, and current regulation (Kato et al. 2009). At the urban level, Browne et al., (2005) study the impact of different LEZ policies on freight companies operating in London. The survey shows that the main behavioural adaptation would be to renew their fleet to meet the Euro-3 standard. According to some SP studies certain policies may produce unattended or distorted outcomes. As an example, the use of weight restrictions, according to Quak and de Koster (2006) may in some conditions lead to decreased transport efficiency and an increase of CO2 emissions.

2.4.2 On policy measures and receivers

The policies aimed at receivers of goods are a much less studied issue. There are few contributions considering policies of city logistics aimed at commercial activities explicitly. Likewise little is known regarding the attitude of receivers towards policy measures and how they are thought to react to policy scenario changes. Among the most studied policies are time-window regulations. Considering the sensitivity to time-window pressure among retailers Quak and de Koster (2007) discover drop size to be a main factor. With the decrease of time-window lengths the financial and environmental performances of retailers are shown to deteriorate more than proportionally. Holguin-Veras et al., (2008; 2007) analyze the reaction of retailers to the prospect of night delivery using SP data. The findings imply that receivers are the dominant party in deciding on delivery times and that their sensitivity to delivery options is largely dependent on the type of goods received. A general result is the difficulty to find appropriate policy instruments to effectively influence the behaviour of retailers. One of the main reasons for this is the limited knowledge of the relevant factors that determines the relation between receivers and freight operators, which is the theme of the following section. In several stakeholder consultations Holguín-Veras (2005) reveal the obstacles to collaborative off-peak delivery solutions. The main impediment to emerge is the asymmetry in costs sustained, where carriers reap the benefits of the off-peak delivery while the retailer hurdles most of the costs.

2.4.3 Receivers vs. freight carriers

In this section we look at the relation between receivers and deliverers of goods. Several papers approach the complexity of the relationships between different freight agents.

Wisetjindawat et al., (2006) propose a microscopic modelling approach considering each freight agent's individual behaviour and their interaction with other freight agents in the supply chain. Among the most interesting empirical efforts to study interaction between buyers and sellers of freight services originates from the Interactive Agent Choice Experiment (IACE) methodology (Hensher et al. 2007; Puckett and Hensher 2006; Puckett et al. 2007; Rose and Hensher 2004). One of the main focuses of the IACE research effort is to evolve the understanding of freight and travel choices made by individuals and groups. While the IACE methodology starts out as a sequence of steps to analyze the relationship structure within a supply chain, the overarching aim is to estimate the probability of reaching a coordinated solution among the stakeholders. Holguín-Veras et al., (2009) carry out an experimental test of shipper-carrier interactions in a game-theory setting. They find that in a competitive setting both agents cooperate in the selection of the shipment size and mode. The departure from applying the individual as the unit of analysis is seen as necessary to understand relations, foresee reactions and forge cooperation based on what is discovered during the interactive SC experiment. This simulated interaction, where subjects are told what other members of a network are thinking and allowing for revision and counter offers has a reasonable face-validity for mimicking a market type interaction.

3 SURVEY I: STAKEHOLDER CONSULTATION

3.1 Description of stakeholder consultation

Stakeholders were interviewed in a sequence of focus group meetings to establish the problem identification surrounding freight delivery in Rome's LTZ. To ensure an adequate representation of stakeholders to participate in the focus groups the selection was carried out in concert with professors at the Centre for Logistics and Transport studies at Rome Sapienza University. The key stakeholders were then divided into three main categories.

1. Demand: Representatives of associations for Traders and Producers, Rome's Industry and Enterprise Association.
2. Supply: Associations of Transporters, Forwarders, Freight Transport Companies, Industrial Freight Associations.
3. Local policy makers: Transport Department, Local Authorities, Urban Planners, Local Public Transport Company

In the freight demand category several trade organizations and retail representatives were contacted. However there was a limited interest to participate, as is reflected by the low number of participants in this category. Instead a strong interest on behalf of local policy makers and the freight supply sector was observed Overall the participation of 14 interviewees was secured. The interviews were conducted in the period between June and July 2009. The meetings were organized stakeholder-wise with 2-5 participants. Each respondent was asked to enlist the main perceived goods distribution problem in Rome's LTZ. Following this, each stakeholder was given a questionnaire asking her/him about

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possible policies to improve the current urban freight regulatory regime in Rome's LTZ. In particular, the questionnaire solicited their views on the most adequate policies to solve or contribute towards solving the problems identified in the first phase of the interview. To structure the task each single policy was allocated to one of five macro categories. These were i) loading/unloading, ii) vehicle access, iii) vehicle standard, iv) information provision and v) delivery system policies. Each respondent was given 100 points to allocate to specific policy measures within each category according to their perceived importance. On average, each interview lasted for approximately one hour. All interviews were conducted by a study team with members from University of Trieste, University of Roma Tre and University Sapienza. The information gained is essential for the overall aim of the survey which is to assess the acceptability of the various parties to variations of the current regime of regulations governing goods distribution in Rome's LTZ

3.1.1 General stakeholder problem-perception

The analysis of the stakeholder responses revealed three main problems areas, namely concerning loading/unloading facilities, time-window regulations and the fare. Concerning the l/u bays these were regarded as too few, by all stakeholders and the main problems surrounding them were illegal occupation, lack of surveillance, distance from shop and an inadequate structure for certain vehicle-configurations. Regarding the time windows the main concern was the presence of several exemptions making the policy ineffective. Most operators agreed with the implicit aim of discouraging own-account transport by means of time-window restrictions in view of the difficulty to use any other policy to ensure their operations are efficient. Few agreed with the current fee, proposing a lowering or a different articulation according to vehicle type and weight/dimension. Lastly, a few innovative proposals were mentioned in the discussions, namely the urban distribution centre and reserved lanes for goods distribution. These last issues are closer to a policy proposal, than simple problem recognition since they do not as of yet exist in Rome.

3.1.2 Stakeholder specific problem perception

The discussion has, thus far, focused on the overall problem perception. It is essential to also look at agent-specific views of problems. Notable, policy makers tended to take a more social stance, valuing general efficiency and worrying about illegal occupations of bays and the complexity of the time windows regulation. The demand side tended to include a note on the lack of distribution centres. Lastly the supply looks at the problems influencing their operations more directly. In Table 1 the list of the problem areas described by each type of stakeholder.

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Table 1 – Stakeholder specific problem perception

Policy makers	Demand	Supply
1. Inefficiency of distribution system * (lack of control of load factors and number of entrances)	1. Fluidity of traffic * (congestion)	1. Loading/Unloading bays ** (lack of surveillance)
2. Loading/Unloading bays ** (illegal parking)	2. Loading/Unloading bays ** (illegal parking)	2. Time Windows *** (problem with unfair distribution of authorizations)
3. Time Windows*** (too many exemptions)	3. Urban Distributions Centres and Pick-up-points ☆☆ (placement and fees)	3. Annual fee ☆ (perceived as too high)

Notes: Asterisks indicate problem type: * general traffic system, ** loading/unloading practices, *** time windows, ☆ access fee, ☆☆ UDC

Supply or carriers denounce the lack of control by the municipality over the illegal/improper use of the l/u bays. Considering the time window regulation there is concern regarding unfair allocation of exemptions, to numerous ordinary operators based on type of good distributed and municipal post distribution also carrying express mail in competition with commercial operators. The entrance fees are, not surprisingly in view of the large increase in later years, regarded as too high.

3.1.3 General policy proposals

As described above, each stakeholder received a questionnaire to fill in at home. The form described five macro policy areas each completed with a list of specific policy measures that the respondents were asked to assess according to importance. To facilitate the orientation among these single policies we refer to the UK Department for transport's guide on the implementation of freight quality partnerships (DFT, 2007). Here five main policy areas are identified as, a) information policies, b) distribution system policy, c) accessibility policies, d) loading/unloading facilities, e) vehicle policies. In correspondence to each macro category 6-9 specific policy measures were listed along with a space dedicated to own proposals. Each stakeholder was asked to allocate 100 points among a set of policies belonging to each macro category. The aggregate result from this exercise is given in Table 2. It can be noted how each of the five macro categories are represented among the policies gathering the most support.

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Table 2 – Top twelve policies with percentage of points obtained within macro policy area*

List	Macro cat.	Specific policy measure	Points*
1	Vehicle	Incentive to buy vehicle with higher environmental standard	47,14
2	Information	Real time information on reservation of l/u bays	38,63
3	Vehicle	Incentive to use alternative propulsion systems	34,29
4	Loading/unloading	Policies to control (illegal) use of l/u bays	33,57
5	Distribution	Promotion of intermodal UDC such as for specific types of goods	31,45
6	Information	Realization of a free information service via SMS/Internet reporting on state of traffic	31,19
7	Loading/unloading	Increase, where possible, the number of parking stalls	25,71
8	Loading/unloading	Implementation of a computerized booking/payment service for loading-unloading bays	22,86
9	Accessibility	Variation of time windows for allowed access and exemptions	20,00
10	Accessibility	Realization of a system of tradable permits related to environmental standard (standard Euro 1-2-3-4)	20,00
11	Accessibility	Pricing, including fee differentiation, time articulation, exemptions	18,57
12	Distribution	Realization of pick-up-points dedicated to last mile delivery	18,34

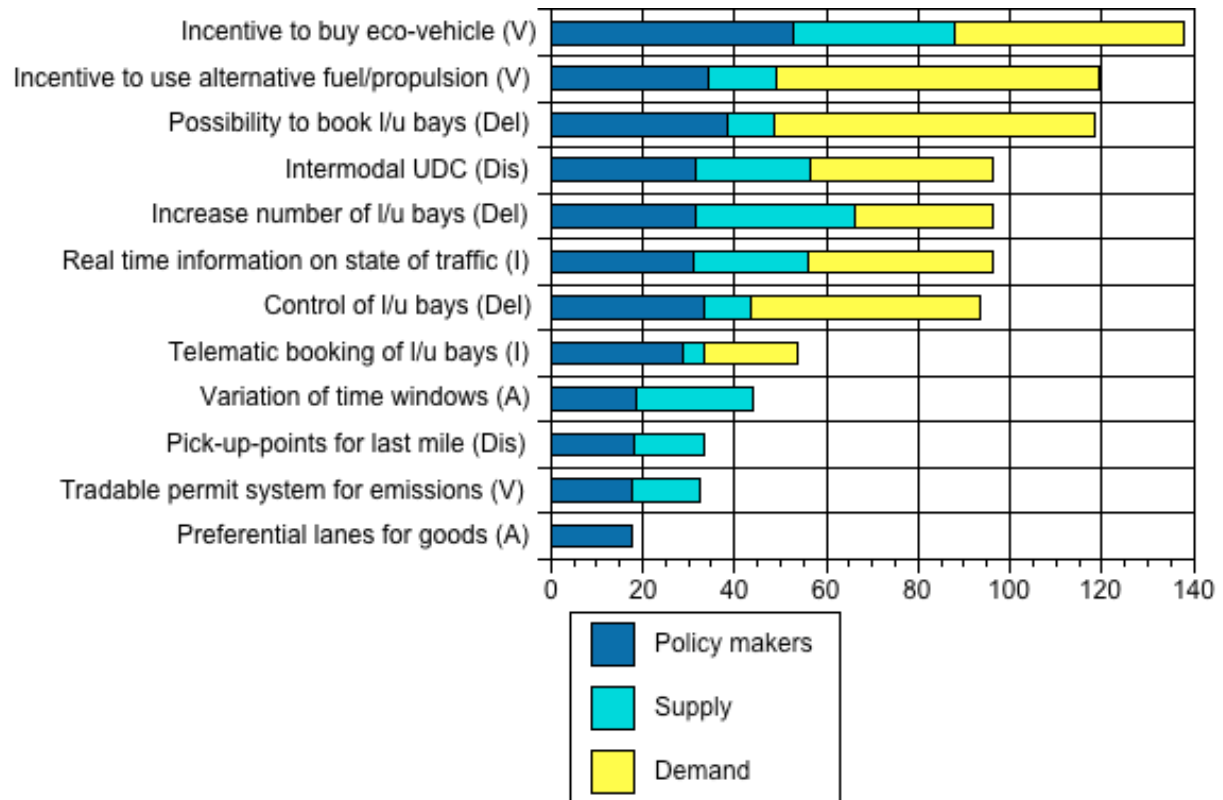
Notes: * Points are normalized for number of respondents in each stakeholder group and referred to specific macro category (a maximum of 100 would mean all agent had given all the points to a single policy within a category)

Not surprisingly, among the top rated policies we find the ones incurring least costs to users such as incentives and an information provision service, in line with the well-known equity-efficiency trade-off. Fundamentally, these policies require a minimal behavioural adjustment. Lower evaluations are given to policies requiring a larger amount of behavioural adaptation on behalf of operators to be effective. This includes overcoming illegal occupation of loading/unloading facilities and to start using urban distributions centres. Surprisingly policies that generally are seen as highly unacceptable, such as pricing, did make it into the top 12 policies list, although with only a fifth of the available points. Regarding the delicate question of time windows, agents were overall reluctant to propose it and as we will notice in the following section there is a quite unbalanced support for this policy. This is in line with the cited contributions defining city access time and delivery time restrictions to be a core issue behind disagreement among buyers and sellers of freight.

3.1.4 Stakeholder specific policy proposals

More detailed information can be gained by analyzing the responses of each stakeholder type. Indeed, a disaggregate approach allows us to reveal which among the stakeholders are behind the collective support for a policy. Figure 1 illustrates the distribution of responses by agent type.

Figure 1 – Top twelve policies by stakeholder type



Notes: Macro-category in parentheses, (V) = vehicle policies, (Del) = Delivery policies, (Dis) = Distribution system policies, (I) = Information policy, (A) = Urban accessibility policies

The first thing to note is the level of shared support for a policy. Notably there is a strong, and mutual, support for the eco-vehicle incentive, information provision and number of l/u bays. On the other hand, there are a few policies that receive unbalanced support like the introduction of a system of automatic booking of l/u bays. At the extreme end lies the policies that gain only a unilateral support, such as the preferential lane for goods. Indeed the policies where support is concentrated with a single agent, or, as with time windows, with policy makers and freight operators, run the risk of not securing the necessary support to be implemented, let alone voted through to the agenda-setting. Notably policies that require a joint effort among operators, such as time windows and pick-up-points fare badly in our survey. During the in-dept stakeholder interviews it was revealed how retailer representatives were overall positive towards innovative freight policies as long as retailers sustained none of the costs of keeping them alive. The allocation of points on behalf of the demand to typical transportation issues may reflect the lack of core retailer issues among the policies. On the

other hand, the freight carriers are interested in typical transport oriented problems like vehicle standards, I/u stalls and time-windows. This implies a more realistic stance on behalf of freight suppliers towards the policies that influence upon their daily operations. These operators have a negative view of both UDC and pick-up-points, policies that introduce a rupture in the chain of distribution. Reasons for this reluctance revealed in the discussions are a fear of losing control and legal responsibility of the goods transported seeing as couriers have a highly specialized and efficient distribution chain. Other reasons for the reservations are the lack of clarity over who should cover the operational costs and the ineptitude for many kinds of goods moved in the urban area (i.e. fresh foods). Policy makers had a highly distributed support comprising incentives, pricing and technological innovation, reflecting their broad-spectrum vision of the problems. However from the discussion we can also trace a long line of failed policy innovation and infrastructure melioration for the historical centre of Rome. This leads us to take some caution in evaluation the many innovative and bold initiatives to come out of the stakeholder survey exercise.

4. SURVEY II: OPERATOR QUESTIONNAIRE

4.1 Description of stakeholder consultation

To solidify these observations a further analysis of some of the more complex policy issues was designed. Thus, a second survey presented selected policy mixes to freight operators in the LTZ. The survey is part of a larger research project on innovative freight modelling for complex urban areas, carried out jointly with the Centre for Transport and Logistics (CTL) at Sapienza university in Rome. The results presented in the following are a component of an extensive stated preference survey with several agent-types. As declared above, the aim of the questionnaire is to evaluate plausible behavioural reactions to the policies that were identified as most promising in the previous phase of consultations. The sample in this component of the study is based on interviews with 195 operators. Sampling was carried out from a stratified representative sample of companies working in the LTZ. Three main operator types are interviewed in line with their centrality for the functioning of freight policies; carriers, third-account retailers and own-account retailers. Each respondent-type was given a specific policy scenario along with a list of possible responses. Each policy description and scenario was designed to seize upon an undesirable behaviour on behalf of the each operator-type. The presented policy-mix would offer an incentive to change this behaviour. More precisely, the aim of the exercise was to assess the behavioural reactions that operators would resort to if the policy were to be introduced. Following these indications the respondents were asked to evaluate how acceptable the policy-mix was, on a likert-type scale from 1 (unacceptable) to 5 (fully acceptable).

4.2 Own-account

For the own-account operator, a road pricing scenario was tested. The pricing was described as a 3€ entrance fee with exemptions for Euro-5 vehicles. The objective was to control whether such a policy would encourage the own-account group to externalize their goods

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transport operations. Based on the literature and stakeholder meetings, a series of behavioural responses were defined. The operators could then indicate a maximum of three options they would undertake if the policy-mix were realized. Additional space was available for defining own additional behavioural responses. The most common response, which a third of the operators claimed they would enact, was to buy a vehicle consistent with the Euro-5 standard (Table 3).

Table 3 – Own account: behavioural response to time-window and UDC scenario

Proposed policy-mix		
-	Peak hour road pricing (3€ per entrance) with exemption for Euro-5 vehicle	
-	Incentive of 1000€ to buy Euro-5 vehicle	
Behavioural reaction for own account and % stating they will enact the behaviour		
1.	Move deliveries outside charging hours	31.7%
2.	Buy Euro-5 vehicle to obtain exemption	33.3%
3.	Enter during peak hour and not pay the fee (risking a charge)	10.0%
4.	Enter during peak hours and pay the fee	23.3%
5.	Behave as currently since I do not enter during peak hours	10.0%
6.	Other	3.9%
Acceptance of policy scenario from 1-5		2.37

Another popular response, gathering the support of 32% was to shift the deliveries outside the charged peak-hours. It is interesting to note that the policy appears rather effective, considering that roughly a third of the operators would buy an environmental vehicle, and a third would shift the delivery times outside of the problematic peak-traffic hours. Another encouraging fact was the limited number of operators claiming they would enter the area illegally during the hours when the peak-pricings was active. Finally 23% claimed they would continue entering as usual and pay the additional fee.

Considering the pronounced behavioural adaptations required to comply with road charges, it was interesting to note the large degree of acceptance. In fact this was slightly higher than for the other agent-types. At 2.37 this is close to the neutral mid-point between acceptance and non-acceptance.

4.3 Carriers

The carriers were presented with a combined time-window and UDC policy scenario. The scenario presented to carriers and retailers are similar and complementary cases, designed to assess the effect of interaction on the responses of both operator types (Table 4).

Concerning the stated reactions, the, by far, most popular response was to utilize the reserved lanes for goods described in the scenario. The second most popular result was to optimize the current trip routing. In the third position we find the response to use the UDC for a part of the total deliveries. Among the operators stating they would use the UDC a follow-on question was included regarding the percentage of goods that would pass through the centre. The average percentage of deliveries that the carriers said they would channel through the UDC was 37%, although with a quite elevated standard deviation of 32. These results are interesting since they imply that one in five carriers would consider using a UDC if

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a time-window scenario was to be imposed. Another popular response was shifting the delivery hours, where an evening delivery was slightly more likely than a night delivery.

Table 4 – Carriers: behavioural response to time-window and UDC scenario

Proposed policy-mix	
- Restrictive Time windows,	
- Availability of UDC (5€ per delivery, half each paid by carrier and retailer)	
- Availability of reserved lanes for goods distribution	
Behavioural reaction for own account and % stating they will enact the behaviour	
1. Use UDC for a part of deliveries...	31.7%
...If UDC were to be used, for what % of deliveries?	37.3%*
2. Use UDC only if retailer covers the costs	5.3%
3. Use the reserved goods lanes	61.4%
4. Shift deliveries outside the prohibited time-windows	14.0%
5. Enter anyway under own risk	8.8%
6. Not change anything since I do not work in such hours	7.0%
7. Do evening deliveries (before 22.00)	15.8%
8. Do night deliveries	14.0%
9. Optimize the rounds for deliveries/pick-ups	35.1%
10. Other	3.5%
Acceptance of policy scenario from 1-5	2.09

Note: * The response refers to an average percentage stated only among agents that said they would use the UDC (behaviour n. 1)

The fact that night deliveries are given a similar evaluation as evening operations indicates that the disutility inherent in out-of-hours goods reception does not change much from evening to night. This appears to be in line with the wishes of the retailers, who are quite reluctant to accept deliveries outside of their normal store opening hours. It is interesting to note that the potential problem of distributing the costs for maintaining an UDC does not appear to be a big issue when it comes to carriers. Indeed, only 5% of the sample states that they will only use the UDC if the retailer is fully responsible for financing it.

As a last point, it can be noted that the acceptance of the scenario is quite low, around 2 on a 1-5 scale where 5 is fully acceptable and 1 indicated the policy mix is completely unacceptable.

4.4 Retailers

The retailer was presented with a scenario that was complementary to that of the carrier. The scenario presented a restrictive time-window and voluntary pick-up-point. The retailers appeared quite comfortable with the prospective of using the pick-up-point, with 26 percent stating they would use it for a quota of their deliveries. These potential clients claimed they would use the pick-up-point for a large portion of their deliveries, on average as high as 57% of the incoming volumes. These results are illustrated in Table 5.

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Table 5 – Retailers: behavioural response to time-window and UDC scenario

Proposed policy-mix	
<ul style="list-style-type: none"> - Restrictive Time windows, - Availability of Pick-up-point (5€ per delivery, half each paid by carrier and retailer) - Availability of reserved lanes for goods distribution 	
Behavioural reaction for own account and % stating they will enact the behaviour	
1. Use pick-up-point for a part of deliveries ...	26.0%
...If pick-up-point is used, for what % of deliveries?	57.1%*
2. Use pick-up-point only if carrier covers the costs	24.7
3. Accept evening deliveries (before 22.00)	16.9
4. Accept night deliveries	13.0
5. Not change anything since I do not work in such hours	6.5
6. Other	16.9
Acceptance of policy scenario from 1-5	2.01

Note: * The response refers to an average percentage stated only among agents that said they would use the UDC (behaviour n. 1)

Here a very interesting finding emerges. A sizeable quantity of retailers stated they would use the pick-up-point only if the costs were carried by the carrier. This implies a latent conflict between the agent-types, where the carriers appear to care less about the source of financing of distribution centres, whereas retailers see it as crucial. A surprisingly large portion of retailers said they would accept evening and even night deliveries (17 and 13 percent respectively). This finding partially goes against the common wisdom from Italian and European studies on delivery practices. However it is a promising fact, considering it closely matches the willingness among carriers to carry out deliveries during the evening. Also in this case the level of acceptability of the scenario is quite low, with an average of 2 on the scale from 1-5. Thus it appears that although operators do not perceive the policy scenario positively, they still accept important behavioural changes in view of it.

5 CONCLUSION

To ensure the functioning of freight improvement strategies there is a need to investigate the preferences of the various stakeholders in depth. In particular, for the study of urban supply chains, we need to understand what the main driving forces behind the behaviour of different agent types are. It is important to recognize and adequately understand the concerns of different stakeholders and their problem identification with respect to urban freight transportation in order to introduce city logistic policies successfully. To shed light on this issue this paper explores the responses of stakeholders in two separate stages. Firstly, this paper examines the problem structure as identified by three main stakeholder types in the discussion of introducing new policies to improve the current scheme of managing freight distribution in Rome's LTZ. The in-depth interviews were carried out to investigate the problem perceptions and positions of key players in the Roman city logistics sector. The interviews revealed differences in the problem identification among stakeholders. This stage of analysis reveals significant disparities among stakeholder sensitivities concerning sensitive policies such as time-windows and the provision of UDC's. These policies are often promoted as an efficient means to rationalize freight flows. However our analysis shows that

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the asymmetrical support and unbalanced costs and benefits derived by different agent-types makes the introduction of these measures highly risky. To deepen the understanding of the operational dimensions of the most popular policies a second survey is conducted. For this stage, 195 operators in the LTZ are asked to indicate a set of behaviours they would most likely enact if a given policy-mix were to be introduced. Findings indicate that some positive results can be expected, such as own-account operators switching towards higher standard vehicles or carriers channelling 1/3 of their deliveries through a UDC. Unfortunately some important barriers to cooperation are also revealed. Most notably a large portion of the retailers will not use a pick-up-point unless the costs for running it are covered entirely by the carriers.

A main point emerging in the consultations was the high degree of interdependence among stakeholders in the introduction of more economically and environmentally sensible policies. The results illustrated here gives a first indication to policy makers in identifying the policy issues that are shared by one or several stakeholder-types. Explaining and understanding empirical freight and retailer responses should lead to policy development that better reflect the complex and diverse needs of the freight sector.

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Annex – Rome's LTZ regulation

General regulation	
Laden weight < 35 q	Laden weight > 35 q
Transit and parking allowed from 20.00 to 10.00 and 14.00 to 16.00 and prohibited otherwise	Transit and stopovers permitted from 20.00 to 7.00 and prohibited otherwise
Exceptions from time window (around the clock transit and parking)	
Laden weight < 35 q	Laden weight > 35 q
1. Transport of perishable foods, pharmaceuticals, newspapers and precious goods	1. Trucks with justified request detailing time, place and route (for instance house moving)
2. All courier and transport companies operating as third account (if enrolled in the "National registry of auto transporters")	
3. Trucks involved in cleaning and maintenance services on account of the municipality or ATAC	
Fee reductions	
50% reductions offered for electric cars and 25% reduction for CH4, GPL and hybrid motor/fuel	