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Workshop synthesis: Commercial trips patterns and demand for goods from firms and households

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Abstract

In this paper we present the findings of the 12th ISCTSC conference workshop on commercial trips patterns and demand for goods from firms and households. With discussions structured on 3 key dimensions (subjects of observation, indicators and factors of change), this workshop highlighted the complexity of observational methods combining household and company behaviors. Given this first conclusion, participants identified 2 methodological challenges for commercial trips observation: discussing the pertinence of traditional surveys regarding these forms of mobility and involving respondents in surveys on this complex and sensitive topic. Elements were presented and proposed in the perspective of limiting respondents burden specifically for company related surveys and tailoring survey methods specifically for fast changing behaviors such as e-commerce. An additional challenge identified by the participants was also the need for a better connection between freight and passenger reflexions.

1. Introduction

Over the past twenty years, commercial trip patterns and freight transport have undergone significant changes in response to an increasingly diversified demand for goods and a pressing need to consider environmental issues.

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Innovations in transport modes, vehicle technologies, logistics services, and business models have been adopted, making new households' purchasing practices possible (Mokhtarian, 2004; Visser et al., 2014).

The workshop "Commercial trips patterns and demand for goods from firms and households" addressed the advantages and limitations of different types of data collection in understanding these issues (e.g., quantitative surveys, interviews, big data, administrative sources). The discussion carried out in this workshop focused on three methodological questions allowing for an efficient description of the commercial transport system:

- What are the relevant indicators needed for an efficient description of the system?
- Which subjects must be observed, and how should this be done?
- How can factors of change and their nature be identified?

To begin with, commercial trips' observation was broken down into general questions concerning the changes in the transport system:

- Where do changes in commercial trips occur (e.g. territories, stakeholders)?
- What are the natures of these changes?
- Why do they happen (e.g. policies, technology)?

These questions encouraged the participants to discuss the subjects that must be observed to account for commercial trips' evolution, and to focus on the factors influencing this evolution and their intensity. This is essential if one is to question the importance of assessing commercial trips for policymaking. The following sections relate to the three dimensions presented above (subjects of observation, relevant indicators and factors of change), followed by a discussion and a conclusion.

2. Subjects of observation

The first element of the discussion was the identification of relevant subjects for observing commercial trips. Five subjects of observation were identified in the debate. These were, in turn, divided into two subgroups: (1) actors that play a direct role in the transport system and (2) subjects that play a more indirect role but influence the context in which this system evolves.

This first subgroup of subjects is composed of diverse actors.

- Consumers of goods and services, who are also individuals with different interests and practices. However, since individuals organize in social layers, including more complex constructs such as households and communities was also necessary. These social constructs may account for various motivations influencing the individuals' practices, ultimately leading to change.
- Establishments, receiving, producing and selling goods. Not unlike the consumers, the establishments are also arranged into several groups and organizations. Hence, it is also vital to bring a broader vision to this group of actors by including companies in general in the discussion (for which establishments are constituents) and ecosystems.
- Transport operators, which carry out the movements of goods. This category includes professional freight carriers (third party transport) but also companies that are not specialized in transport (own account) or even individuals (crowd shipping, end-consumer trips).

As is noted above, these subjects are organized into imbricated layers, making their observation complex. The context in which the interviewees are questioned must always be considered in data collection. Moreover, they evolve in a specific environment dictated by physical and regulatory elements. Therefore, the second subgroup of subjects is constituted by elements related to this context.

- Public authorities, with a crucial role in building and implementing public policies and planning, and hence in mobility. We consider the various public authorities ranging from local to national governments, with competencies from traffic regulations to environmental laws.
- The environment, which is here considered in its broader definition: the physical world we evolve in and its ecological implications.

The purpose of this picture of the commercial trips system is not to be exhaustive but to represent all of its most important constituents. This observational structure allows the construction of relevant indicators to understand the practices related to commercial trips.

3. Indicators

Closely linked to the identification of subjects of observation is the construction and production of relevant indicators. This element is fundamental since it determines methodological observation approaches. It also has substantial implications for practitioners (public authorities and private actors alike). Moreover, relevant indicators contribute to building a "common language" between different actors from various sectors and with different (and sometimes divergent) motivations. Therefore, the construction of relevant indicators questions the nature of these and how to build them.

To structure these indicators around the framework of previously presented subjects, we present families of indicators and their related subjects. The first series of indicators was built around the main actors of commercial trips. Some indicators are shared between different types of actors, while others are specific to a type.

Table 1. Indicators for commercial trips actors

Type of actor	Specific indicators	Shared indicators
Communities, households, individuals	Well-being (health, general satisfaction)	Time budget
	Accessibility (digital, physical)	Financial budget
	Values	Inventory strategies
Ecosystems, Firms, Establishments	Scales	Temporal patterns and expectations
	Business models	Resources (digital, transport)
	Labor characteristics	Energy consumption
Transport actors	Transport organizations	Size
	Fleet characteristics	
	Cost/pricing	

The second series of indicators is concerned with more contextual elements such as the environment and public authorities.

Table 2. Indicators for indirect stakeholders

Type of actor	Indicators
State, public authorities	Labour conditions
	Market regulation
	Social welfare
	Governance
	Environmental regulations
	Incentives and economic development policies
Environment	Land use, land consumption
	Emissions
	Noise
	Infrastructures (physical and digital)
	Congestion
	Safety/security

Several methodological questions were raised from these exploratory lists of indicators concerning the feasibility of data collection for all. As we can infer from this preliminary work, many indicators can be collected to describe the transport system from the perspective of a commercial trip. Their nature is highly heterogenous and requires various modes of collection. These modes include quantitative data (input-output flows, budgets, fleets, resources, emissions),

but also qualitative data (cultural values, strategies, governance, laws) and complex multidimensional objects (transport organizations, accessibility, well-being). This attempt at systematically representing commercial trips and their explanatory dimensions shows the complexity of such a task.

Although part of these issues can be answered through existing data collection methods, innovative and original concepts and methodologies have to be implemented to capture emerging practices and new trends. This diversification can also be a double-edged razor. On the one hand, it provides new approaches and perspectives on emergent problems. On the other hand, it can lead to poorly comparable datasets if not carefully monitored. The diversification of data collection methods also incited the workshop participants to discuss their comparability, complementarity, and transferability to other observational data and contexts.

Finally, the problem of motivating respondents to answer was also debated. Incentives have two drawbacks. The first one is potential budgetary constraints. The second is the potential bias introduced by such retributions that can in some cases lead to the collection of fake or biased data.

4. Factors of change

Even though it is theoretically possible to draw a picture of a given system, this picture is a still image of practices at a given moment. Longitudinal surveys produce more dynamic observations but are more complex and expensive to implement. To cope with a changing environment, one has to identify the factors that influence the changes occurring in a system. Such factors impact the intensity of a practice (increase or decrease – of online purchases for example) and the pace of the evolution (slow or quick changes – e.g. COVID accelerated online purchasing trends).

For example, one of the main questions raised by the emergence of e-commerce is the growth potential of e-commerce for the years to come. This growth is now mainly supported by the maturation of new technologies, facilitating the connection between suppliers and customers through information technologies or innovative logistics services. Although the past years have seen a substantial increase in e-commerce practices, the sector's growth before the COVID crisis was in a slight slowdown in Europe. But the new context redefined our relation to e-commerce with an arguable imprint on our practices in the long term. Since it is still difficult to anticipate the evolution of this sector, interrogating the acceptance of new technologies and the impact of these disruptive practices tied in relation to commercial trips is essential.

Incidentally, recurring crises (pandemics, wars, natural catastrophes) also beg us to question results' interpretation and validity in such unstable periods. As the most recent example, COVID accelerated the evolution of e-commerce and precipitated the closure of some shops. The emergence of this crisis took the research community by surprise and immediately questioned its capacity to design data collection that does not overlook systemic phenomena such as COVID.

5. Discussion

Given the nature of the framework structured in the workshop, some main questions pertaining data collection for commercial trips can be identified.
- The weakness of traditional travel surveys concerning deliveries. How can we improve the observation of such practices?
- How should we involve respondents more? How should the respondents' burden be reduced?

Additionally, with commercial trips being closely linked to freight transport, an underlying question of the workshop was the complexity of surveys on freight flows, establishments and transport organizations, which contributed to the enrichment of the discussions.

5.1. Specific surveys for commercial trips vs redefining traditional surveys

The disruption of e-commerce modified traditional shopping behaviours and mobility patterns to restructure our daily life. Measuring the impacts of such practices implies understanding how e-commerce substitutes or complements traditional purchasing trips. As for household mobility patterns, it can be asked how e-commerce leads to the substitution of freight flows at the establishment level or complementarity (Cao, 2009): click and collect and pick up

logistics appear to be superimposed over the regular supply patterns. It is not well understood how these supply chains tend to be consolidated or not. This effect of substitution is relevant for flows and the general structure of employment in retail. Where do we lose or create jobs? This implies going in-depth in the practices and representations of consumers and jointly approaching at least several complex research objects. These can be mobility patterns, consuming practices and their effects on the economy and the environment.

The question of the trade-off between quality and frequency of surveying emerged as an essential stake in terms of public policy and decision making. Integrating new observational tools related to urban freight and e-commerce in more traditional collection methods, such as household mobility surveys carried out in a vast majority of modern cities, was also discussed.

In this perspective, Colaço et al. presented in this workshop a comparison between traditional travel surveys reporting a one-day travail diary and a purposed built one-week collection of shopping trips (Colaço and de Abreu Silva, 2022). The main lessons of this work show that a longer period avoids underreporting and highlights a different structure of shopping trips: the one-week collection methodology reports a higher number of trips per capita. It appears to report more non-dedicated shopping trips.

Complementary to this work, presenting a survey based on an inclusive concept tackling all forms of shopping generating deliveries, Gardrat exposed the difficulties and biases of a nested survey built on phone and internet data collections on e-commerce. Implemented over a year and relying on diaries, this survey was designed to be connected with household mobility surveys and gave insights into household mobility patterns related to e-commerce. Also pleading for differentiated data collection methods, this experimentation is nonetheless bound by a methodological framework inherited from traditional household mobility surveys (Gardrat, 2022).

Confronting traditional data sources with purpose-built methodologies, participants recognized the weakness of household travel surveys in observing freight-related trips, specifically when home deliveries generate the movements of goods. For e-commerce related practices, the main problem is that these movements occur with a wide spectre of frequencies from never to several times a week. Because these events do not necessarily happen very frequently (comparatively to general trips or even traditional purchasing trips), the problem of building an appropriate data capture method is paramount. At the centre of this methodological consideration lies the frequency of data collection, from a day to several weeks, to observe e-commerce related trips efficiently. From the perspective of diary collection methods, it was determined during the discussion that a day of data collection is not enough to collect precise information on freight-related trips for households, given the low frequency at which these events occur. Consequently, a week to several weeks of data collection seems necessary to account for relevant data capture. However, the drawback of this procedure is to put a burden on respondents and achieve poor sampling rates for high resource consumption.

The same question was asked concerning the impact of e-commerce on professionals' freight mobility patterns that also have been, at least for some segments, vastly modified by the arrival of e-commerce. The variety of reception channels and the mix between B2B and B2C flows are elements that change sensibly the structuration of urban freight flows. A similar question can also be asked for specific segments of e-commerce or urban freight, such as service or intervention trips or, in the case of e-commerce, for C2C exchanges or even crowd shipping.

5.2. Involving respondents and limiting their burden

Involvement and recruitment have become problematic for all of these approaches (household, establishments oriented or else). This problem is even more severe when surveying establishments and companies. Since data collected are sensitive and valuable, it is hard to justify a counterpart, an incentive to motivate respondents to give information on their organizations. And although companies are aware that the data they produce is valuable, such actors still struggle to put a specific worth on such knowledge. Additionally, establishments and companies are complex organizations that generate large flows. Therefore, identifying the relevant interviewee as an observation point to collect data more efficiently is fundamental in survey approaches, which are both appropriate for establishments and household surveys.

This brought the question of limiting the burden on respondents who are highly solicited in our modern context. Various collection methods were listed in the discussion, and some were presented as potential solutions as acceptable methods. For example, the work by Bönisch et al. explored an original, lightened method to capture shopping

behaviours and their relation to home deliveries (Bönisch et al., 2022). Defending a holistic approach and in-depth analysis of attitudinal elements, this work proposes a skeleton framework better to understand the aspects of resistance or adoption towards e-commerce and discuss the psychological constructs underpinning such attitudes. Relying on self-assessed general behaviours, rather than travel diaries, this approach allows the reduction of the respondents' involvement while integrating psychological items explaining individual behaviours with a more generalistic mapping of practices.

This involvement problem is similar when it comes to surveys on freight flows generated in the B2B sector. In order to account for the large variety of supply chains, types of goods, and vehicles, the surveys operated are usually quite complex to carry out. For example, on the subject of technology innovation, Polydoropoulou et al. (2022). presented an approach dedicated to understanding the specific potential of autonomous vehicles in adopting deliveries for end consumers and their willingness to pay for such modes of delivery. Showing the importance of new transport technologies in the future of e-commerce, this research indicates that although industrials heavily research the implementation of autonomous vehicle deliveries, individuals' acceptance is still uncertain. But the willingness to pay for such services is relatively high, specifically for drones.

Because of this heterogeneity, freight flows have to be measured at several points of observation: establishments to understand the inputs and outputs of freight flows; transport operators and their drivers to understand the logistics organizations that are mobilized to structure these inputs and outputs. Therefore, data collection for such sectors is complex to implement, especially given the pace at which technology advances.

Since e-commerce and freight transport practices are mostly digitalized, data are now generated on most of our online activity, and our daily objects become vast sources of potential information (Apps, smartphone location, etc.). Asking the pertinence and risks of using such non-purpose-built data collection is particularly relevant in the context of massively produced data and constant redefinition of behaviours (Greaves and Figliozzi, 2008; Nguyen et al., 2017). Although big data represent massive volumes, they are not well characterized and intense data refinement has to be done to understand who is doing what and where.

Consequently, the main limit we can highlight because of this specificity is the uncertainty of representativeness of such large data sets. This is bypassed (or at least not documented enough) in the case of normal surveys, thanks to a socio-demographic or socio-economic screening of the sample. However, the strength of such data collection is the potential for critical longitudinal sets of data, opening an interesting prospect for monitoring efficiently the fluctuations of the urban freight system related to end-consumers. Therefore, another question can be formulated on the necessity to generate less frequent and more detailed data or more frequent or continuous data collection, but with poor detail.

In this perspective, a possible solution to limit respondents' burden is using data fusion and machine learning techniques to infer the behaviours of transport actors using uncharacterized data (GPS, mobile phone traces…). Bringing some elements on this inquiry, Toilier et al. discussed the relevance of non-characterized data for observing urban goods mobility carried out by professional freight operators (Toilier and Gardrat, 2022). By confronting field data collected by embarked observers in delivery vehicles and GPS traces, the authors expose a methodology to qualify GPS traces and delivery stops and the difficulties of building a coherent set of data coming from various data collection methods: GPS declarative maps and questionnaires. This work showed the viability of poorly characterized data to identify delivery stops and types of vehicles used for B2B delivery routes operated by professionals, using classification techniques and machine learning. Questions remain open on the characterization of goods and consignee.

However, even if data fusion is a promising approach, not everything is high tech and digitalized in transport. Automated data collection is not as easy as it seems since it will not necessarily represent all kinds of practices. In this sense, it seems hardly possible to do without surveys in short to a mid-term timeline.

6. Research perspectives and conclusion

During this workshop, some challenges were identified, specifically concerning tailoring appropriate data collection methods related to commercial trips. This workshop summarised the living questions of mobility observation: respondents' burden, data quality, collection frequency, data fusion, and adapting collection methods to fluctuant contexts.

The discussions and research mobilized in this workshop laid out promising inquiries for the years to come.

- Refining methods for observing shopping and online purchases and pertinent collection periods for infrequently occurring events.
- Developing new techniques to identify and involve respondents with limited burden, specifically for companies.
- Accounting for the systemic complexity of commercial trips involving individuals and companies.

Additionally, throughout the workshop, it was made clear that more in-depth analyses could complement usual transport data collection. In this sense, rather than focusing solely on collecting practices, more qualitative approaches should be encouraged to observe commercial trips to understand social representations, cultural values and firm strategies related to this form of mobility. Of course, these approaches raise some specific methodological questions that the participants could not explore thoroughly during the workshop sessions.

One last conclusion of this workshop was the lack of connection between freight and commercial trips with household mobility in general. Somehow highlighted by the low attendance of this workshop, one of the main observations that could be made is that commercial and freight transport is still a niche in the research field of survey methodologies. Even though significant communities gather on freight transport and logistics subjects, few works in such communities relate to the methodological problems of observing B2B or B2C flows.

Moreover, commercial trips being at the crossroads of passenger and freight traffic, this subject of study is therefore eminently complex and poses, as we have exposed, many challenges. For the past years, freight and commercial trips mainly were disconnected from household mobility questions. However, since the explosion of e-commerce, it has become evident that these two research fields cannot be separated anymore. Of course, mixing subjects of observation in an all-purpose form of data collection is an unreasonable endeavour in the short term. However, a reasonable target would be to guarantee the comparability of data sources and methodologies for commercial trip observation and passenger mobility and make this question more identifiable in public policies and the field of passenger mobility. Therefore, further research could include more work on the interactions between freight and passenger mobilities.

7. Acknowledgments

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