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Connecting short and long distance perspectives in freight transportation: Introduction to a Special Issue

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Abstract

Research on short and long distance freight transport artificially separates the segments of transport chains, which are interrelated and which might be better viewed as a continuum. The eight papers of this special issue aim to bridge this gap. The major disruptions in global supply chains of the last years brought to light the vulnerability of the transport system and the need for a more integrated approach for effective transport policies. This special issue explores some of the challenges facing freight transport in three research areas: supply chain studies, transport networks and warehouse location. It also identifies avenues for further research.

Keywords: freight transportation; transport chain; supply chain; resilience; city logistics; transport terminals; first mile/last mile.

1. Why a special issue on the relationship between short and long distance in freight transportation?

Within social sciences, scholars have tried to understand how cargo is moved, in many different ways, theoretically, descriptively, and through empirical modeling. This diversity of approaches partly results from a growing demand from society to understand various facets of freight and freight shipping. But it also reveals the state of fragmentation of this community of research practice, where researchers interested in related issues of cargo movement are simply not talking to each other. In transportation studies, this diversity is associated with two broad traditions through which cargo movement is studied. One of these, inter-urban or long distance transport, is often viewed as a 'dirty activity' (Hall and Hesse, 2013). A dominant feature of this line of research is to articulate patterns in freight flows in relation to the evolution of transport systems (Rodrigue et al., 1997), to the global

impacts of cargo movement --such as economic development (Banister and Berechman, 2001)-- and to the evolving conditions that favor modal shift (Woodburn, 2003). The tradition of urban freight/ city logistics, on the other hand, is concerned more with local issues such as congestion, noise or local air pollution (see, for example, Figliozzi, 2007, Holguin-Veras et al, 2006, Anderson et al., 2005).

We argue this division is unhelpful because it artificially separates segments of a same transport chain, which are interrelated and might be better viewed as a continuum (Robinson, 1970). For example, the optimal location of logistics activities within an urban area is often viewed as a problem of distance minimization to a barycenter (Dablanc and Rakotonarivo, 2010). That is, it implies that logistics activities are exclusively focused on local deliveries, which may in fact be far from reality (Sakai et al, 2017, Giuliano & Kang, 2018). Taking into account what happens outside and between urbanized regions (inter-urban flows) can lead to a better understanding of the factors governing the location of terminals within the city itself (Niérat, 1997).

This lack of integration between short and long distance perspectives is not specific to urban freight research. For example, within maritime transport, while many works underline the benefits related to the achievement of economies of scale on the maritime segment (Cullinane & Khanna, 1999), less work explains how this advantage is dramatically lessened by the bottlenecks around ports or on hinterland connections (Monios and Wilsmeier, 2016, Merk, 2018, Guerrero, 2019). The current crisis of global supply chains, which has resulted in major problems such high freight rates, supply chain disruptions and inflation, largely results from problems at the level of inland transport segment, such the shortage of chassis and drivers, and the temporary lack of containers (Ng, 2021, Toygar et al., 2022). Although inland connections only represent a small fraction of the overall transport distance, they are particularly costly and therefore crucial for the competitiveness of entire transport chains.

Of course, the lack of integration between long and short distance perspectives is not just an academic issue. It reflects broader competing/conflicting interests, for example between city governments, on the one hand, and regional and national authorities, on the other. While the former generally try to avoid the negative consequences of the bottlenecks of long

distance transport in large urban areas (De Lara, 2018) the latter are rather concerned with the efficiency and consistency of national/regional transport systems (McKinnon, 2006). These interfaces between long and short distance are critical, as many of the problems, such congestion, take place here (Steinbach, 2022). Therefore, a coherent regulation of the different segments of the transport chain remains a challenge for public policy (Reme-Harnay, 2022).

In the last decades, while considerable gains in efficiency have been achieved on medium and long distance transport, last mile/first mile segments have lagged behind. Freight flows have become more fragmented, favoring the use of road transport and small vehicles for frequent deliveries (Guilbault and Gouvernal, 2010). This exacerbates the negative impacts of freight activities in urban areas such congestion and pollution, and has become a sensitive issue for local policy makers. In response to growing urban freight problems, studies and surveys on urban freight have been encouraged or promoted by local authorities, particularly since the 1990s. Meanwhile, the research field of urban freight/urban logistics has progressively penetrated academic journals, eventually consolidating as a research field on its own (Browne et al, 2019, Wolpert and Reuter, 2012).

Consequently, today it becomes necessary to increase the dialogue between researchers in short and long distance freight transport. Even if some have developed both approaches (see, for example Barthel and Woxenius, 2004, Behrends, 2011, Nemoto et al., 2006), researchers have seldom discussed the potential incongruities between these perspectives. This is rather surprising given the international research networks that have emerged on urban freight during the last two decades. One could argue that the main challenge for the dialogue between short and long distance approaches is the lack of data. Or one could argue that the expectations about the outputs that research on short and long distance freight would generate are very different. But by avoiding the potential conflicts between approaches, the possibilities for cross-fertilization are missed (Bissell and Laurier, 2011).

To foster the agenda of integrative science along the supply chain, including long- and short-haul shipping, and to encourage this dialogue, we proposed in this special issue a list of shared themes that would be familiar to scholars working on both long distance (e.g.,

intermodality, terminal systems, routing and allocation problems) and short distance researchers (e.g., location of logistics activities, optimization of urban deliveries, urban freight policies).

2. The Special Issue contributions

This special issue of eight papers addressed this agenda through a range of themes, including supply chain organization, transport connectivity and the location of terminals.

The articulation between long and short distance freight transportation is critical in supply chain organization. Button (2020) presents a case study on the Africa's floriculture air-cargo supply chain which shows that flower growing is geographically concentrated around airports, so as to minimize first-mile transport costs and shipping time in a context of poorly developed transport infrastructure. Market size appears to be crucial for the development of efficient air supply chains, encouraging competition between airlines and providing market power for large shippers to obtain better fares. Given the highly perishable nature of flowers, supply chains are technically challenging, and highly dependent on passenger flights, which are particularly vulnerable to disruptions such as during the Covid-19 pandemic.

For other agricultural products, like wine, first-mile logistics from rural areas are also particularly challenging. Guerrero and Thill (2021) analyze the port choice and routing decisions for French AOC wines to the US, using disaggregated shipment data on individual shipments and a discrete choice model. They highlight the key role played by freight forwarders in the consolidation of wine in containers. When a container is loaded with wines from several AOC regions, the effect of inland distance on port choice is less prominent than for containers exclusively carrying wines from a single region. This suggests that port-choice decisions may result from a more complex trade-off including the location of wine regions and the overall geographical organization of freight forwarders. This work also raises an issue about the quality of O/D data in transport studies, and suggests a novel method based on the identification of O/D through wine names.

A second theme analyzes the connectivity in maritime transport chains, including ports and hinterlands. Three papers discuss the ways in which port systems develop in different parts of the world, and the main challenges for connecting local and distant markets. Ducruet

(2020a) reviews the evolution of maritime networks studies in geography and other sciences, and discusses potential research pathways for future work. He shows that during the second half of the 20th Century transport geography studies were mainly focused on the land connections of ports (hinterlands), largely overlooking the maritime side. This changed during the past two decades with the emergence of a maritime networks subfield within transport geography, fostered by advances in complex networks analysis and progress in data availability. It is suggested that to become more than a "purely quantitative experiment", maritime networks should be seen as parts of larger systems including shippers and the territories served by maritime transport.

Accordingly, Ducruet et al. (2020b) analyzed the relationship between the population of port cities and the containerized services between those cities, using a gravity-model. Their results show that, despite the development of networks in containerized transport, population size and distance still matter a lot in the organization of maritime networks. The study also measures the correlation between port throughput, on one side, and the population of port-cities and port-regions, on the other side. It shows that while the relationship between port throughput and local population has decreased, it has increased with regard to regional population. This finding supports the idea that the inland scope of port system extends beyond the vicinity of the ports to a wider regional scale, as suggested by Notteboom and Rodrigue (2005).

Jung and Thill (2022) also explore the interdependence between forelands and hinterlands, using disaggregated data on containerized shipments from Europe to the US. In doing so, they implemented within the scope of trans-Atlantic containerized commerce the seminal ideas on hinterland-foreland continuum (Robinson 1970) and port triptych (Vigarié 1979, Charlier 1992) advanced over three decades ago. Jung and Thill's approach, based on network science algorithms of meso-scale analysis, is particularly original because it provides for the first time, clusters of ports and regions simultaneously based on the inland and maritime routes followed by shipments. These clusters differ from the ones exclusively based on inland routes identified by previous studies (Guerrero, 2014). Interestingly, some of the 9 regional clusters identified in Europe include several countries (France and Belgium, Germany and the Netherlands), confirming that the functional areas of ports go beyond national borders. Papers in this theme underscore the need to transition our analytical

thinking to encompass the entire logistics chain spanning the landsides and the seasides to avoid the mischaracterization of shipping networks and structures they form.

The third theme relates to the location of logistics activities, taking into account their geographical orientation towards local or distant markets. Guerrero et al. (2022) study the spatial scope of large warehouses through a national survey describing their operational characteristics. They show, on one hand, that the warehouses located in the Greater Paris and in a few large urban areas and more oriented towards international markets. On the other hand, they find that the warehouses located in inner Paris are more oriented to local deliveries than those located on the outskirts of the Greater Paris and in the other large cities.

Also in the Greater Paris, Robichet and Niérat (2021) analyze a large dataset of pick-ups and deliveries for a large parcel deliver carrier to determine the optimum location of its terminals. The predicted locations, resulting from the minimization of distance to clients, that are outside Inner Paris. Therefore, when a firm operates several terminals, the location outside inner Paris is not necessarily suboptimal. This result shows that logistic sprawl is not always synonymous with increasing the distance traveled for the first and last mile, neither, by extension, with increasing pollution.

Sakai et al (2020), using an extensive shipment survey, in the Tokyo Metropolitan Area, analyze locations and goods vehicle trips for four types of logistics facilities. These types are defined on the basis of the geographical scope of the shipments generated by these logistics facilities: intra or inter urban. An interesting finding of this study is that an important share of the logistics facilities located within the Tokyo Metropolitan Area, are not oriented to intra-urban deliveries and pick-ups. Therefore, their location outside inner Tokyo does not lead to longer trip distances. The three papers in this theme highlight the need of taking into account the geographical scope of shipments for the study of the optimal location of warehouses and question the validity of approaches exclusively based on distance to a barycenter.

3. Conclusion and research agenda

This special issue covered a wide range of topics on short and long distance perspectives in freight transportation, through the themes of supply chain organization, transport

connectivity and the location of logistics activities. Interestingly, most of the papers were mostly focused either on long distance or short distance but only few of them dealt simultaneously with both perspectives. This simultaneous treatment of long and short distance is mainly found in the papers on the theme of warehouse location and the relationship of urban/non urban scope of shipments. In the papers focused on long-distance transportation, although there is an effort to integrate several transport segments, there is not much information linking the ends of the chain to the middle parts. Maybe this difficulty stems from the lack of datasets that combine first and last mile data because both ends typically occur in different jurisdictions. The linkage data is often broken somewhere in the middle of transport chains.

Connecting intra and inter-urban freight markets through the prism of urban hierarchy offers new possibilities to study these relationships. Specifically, through an analysis of commodity flows it is possible to study the freight advantages or disadvantages of firms located in large urban areas. A recent study based on the Japanese Commodity Flow Survey has showed that shipping cargo from small to large urban areas is less costly than in the reverse direction (Guerrero et al., 2021). A related strand concerns the relative benefits of hub-and-spoke network structures on the landside and their primary drivers, when cargo is traded internationally. The study of the relevance of intermodal solutions may also be viewed from an urban perspective, by focusing on the ways in which short distance segments of intermodal transport determine the competitiveness of the whole transport chain (Nierat, 1997 ; Behrends, 2017). Another important aspect of these interconnections are the operational constraints within terminals, and how workers add fluidity to the constraints of different transport modes. There are several works paving the way on this labor perspective in transport geography, such the study of subcontracting in global logistics (Gutelius, 2015) or the work conditions within intermodal terminals (Munduteguy, 2012). Another important perspective relates to the relationships between transport companies in the short and long distance segments. A recent study comparing subcontracting practices in urban and inter-urban transportation, shows that transport firms operating urban parcel delivery services are more economically vulnerable than those operating in inter-urban transportation (Reme-Harnay, 2022).

[perhaps one final sentence calling for further research]

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