Spatial patterns of logistics facilities in Gothenburg, Sweden

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\textbf{ABSTRACT}

In recent years, the location of logistics facilities, in particular with regard to “logistics sprawl,” has emerged as a topic in the literature that is, a process of spatial decentralisation of logistics facilities in large metropolitan areas. The aim of this paper is to look at logistics sprawl patterns in the Gothenburg metropolitan area, in the south-west of Sweden. Looking at a medium-size monocentric urban region that is also a major port gateway for the country, this study provides novel elements in the study of locational patterns of freight facilities in metropolitan areas. It also provides an opportunity to identify the role of freight in planning, land use and zoning policies. A literature review is carried out on the issues of freight and logistics facilities locational patterns. A quantitative analysis is proposed, using data from Swedish statistics about the number of establishments with a NACE code related to logistics, as well as an original method providing a “cleaned” and more comprehensive dataset. We look at data at two different scales, one metropolitan and one regional, for years 2000 and 2014, as to enable a comparative and diachronical analysis. Logistics sprawl is measured by the average distance of warehouses to their common centre of gravity. Finally, interviews with transport and logistics providers as well as real estate investors and public agencies in the region, add qualitative information on the relative importance of different location factors related to logistics facilities and the issues raised. Logistics sprawl in Gothenburg occurs in specific ways, and differently at the two geographical levels of analysis.

1. Introduction and research statement

Logistics sprawl is defined here as a process of spatial decentralisation of logistics facilities\textsuperscript{1} in large metropolitan areas (a more detailed definition is provided below). The aim of this paper is to analyse these locational patterns in the Gothenburg Metropolitan Area (GMA) and the county wherein it is located, namely Västra Götaland County (VGC), in the south-west of Sweden.

In recent years the location of logistics facilities has emerged as a topic in the literature (Cidell, 2010; Dablanc and Rakotonarivo, 2010; Raimbault et al., 2012; Sakai et al., 2016; Woudsma et al., 2016; Alijohani and Thompson, 2016). A set of 25 case studies around the world has been identified and a preliminary comparative analysis has been proposed in Dablanc et al. (2017). Many of these case studies describe a movement of decreasing presence of logistics facilities in urban centres, and their relocation towards more peripheral areas, also designated as logistics sprawl. This borrow from the concept of “urban sprawl” which, through an extensive literature, has discussed the morphological and functional changes of the location of people and activities that have transformed cities. Logistics facilities also participate in the metropolitan expansion (Heitz and Dablanc, 2015).

Changes in the economy and production and consumption patterns have involved important transformations in supply chains, translating into changes in types and volumes of commodities, location of departure and destination points, traffic flows, frequency of deliveries, and time of freight movements (Ogden, 1992). Large metropolitan areas have played an increasing role in these new supply chains (Hall and Hesse, 2013), concentrating flows and shipments’ processing. Technological developments have facilitated these changes, including digitization of communications and the standardization of logistics factors of production (Veltz, 2017). The growth and internationalization of specialized industries such as third-party logistics provision and logistics real estate and facilities management, have also contributed. Consequently, freight movements and the location of logistics facilities in metropolitan areas have dramatically changed over the past two to three decades, described as the “persistent urbanisation of freight” (Hall...
and Hesse, 2013, p.247).

The proximity to consumption markets, as well as accessibility and availability of transport infrastructure are commonly reported as explanation factors for the location of a logistics facility in a major metropolitan area. Availability of a local labour market and the role of attractive public policies (in favour of developing logistics policies) are also important location factors (Mérenne-Schoumaker, 2008). The availability of land is another key factor, and one that can explain that while polarizing in large metropolitan areas, logistics facilities increasingly find themselves in the periphery of metropolitan areas. Logistics operators, or their real estate investors (and often subsequent landlords), look for space, following the new standards for warehouses (which require large spaces), and for cheap land/rent. These can be found at the edges of urban areas, often in former agricultural lands. Endogenous factors also explain logistics decentralisation. Urban renewal, changes in regulated land use in dense parts of the metropolitan areas, create a less welcoming frame for logistics facilities (Heitz, 2017). Urban pressure increases, warehouses become more vulnerable and subject to a relocation to peripheral areas, in “pro-logistics” municipalities that see them as job and revenue pourvoyeurs (Raimbault, 2014). Like most port activities, but with more spatial flexibility (as ports retain a certain amount of spatial inertia), logistics facilities have generally been relocated to peripheral areas under the effect of urban transformations. At the same time, many ports in metropolitan areas have retained a key influence for the location of logistics facilities and port-related activities (Hall and Wouter, 2012).

The consequences of logistics sprawl can be land consumption, increasing distance of final deliveries, and changes in the logistics system, presenting a new challenge for planning the metropolitan area at local and regional scales.

In continuity with these works, we propose an analysis of logistics locational patterns in the GMA, Sweden, between 2000 and 2014, based on an original method of collecting a comprehensive dataset of warehouses. The case of Gothenburg is interesting in several ways. It is medium-size (in population) city, contrasting with other examples in the literature. It is also the home of Scandinavia’s largest port. GMA’s influence on logistics activities (and locations) goes far beyond the metropolitan area itself. Thus, an analysis of logistics locational patterns at the county level is also carried out. To include both metropolitan and county levels adds to the diversity of case studies currently conducted on spatial location patterns of warehouses in several metropolitan and urban regions in the world (Dablanc et al., 2017). This analysis allows us to put into perspective the development of the location of logistics facilities that occurred. Indeed, in the case of a maritime metropolitan area, logistics locational patterns can also be influenced by the evolution of the seaport and its hinterland.

This study also provides an opportunity to look at several surrounding issues such as the factors influencing industry decisions related to the siting of logistics facilities, the impact of the nature of logistics facilities on logistics sprawl, as well as the role of planning, land use and zoning policies in the location of freight facilities.

After a presentation of the Gothenburg case (Section 2), we describe the data and method used (Section 3). We then identify changes in the location of logistics facilities in the GMA (Section 4) and the VGC (Section 5) between 2000 and in 2014, specifying logistics sprawl indicators for both areas as well as providing industry perspective to provide more qualitative specifications of the quantitative trends observed. Finally, we present conclusions and perspectives in Section 6.

2. The Gothenburg case

The GMA is made up of 13 municipalities (including the City of Gothenburg) in the VGC, located on the west coast of Sweden. GMA and VGC are our two cases of investigation. The GMA represents 3700 km² and 973,000 people, translating into a density of 264/km², while the VGC, with 48 municipalities, has a population of 1.6 million and an area of 22,752 km², hence a density of 67/km².

Gothenburg is the second largest metropolitan area in Sweden. Its business clusters include automotive (e.g., Volvo Cars and Volvo Trucks), manufacturing industry (e.g., SKF), process industry (e.g., Preem and St1 oil refineries), biomedicine (e.g., AstraZeneca), environment technology, infrastructure and logistics (e.g., DB Schenker North), design and market communication. Port of Gothenburg acts as gateway to Scandinavia and some 25% of all Swedish foreign trade and 65% of all container traffic pass through the port (Port of Gothenburg, 2016). In 2017, however, the container port operated by APM Terminals was severely struck by a labour union conflict resulting in a 19% decrease of container throughput (Port of Gothenburg, 2018). The port handled 41 million tons of cargo in 2017, segmented into 24 million tonnes of oil, 644,000 TEU of containers, 593,000 RoRo units and 295,000 cars (Port of Gothenburg, 2018). Only a tiny share of the goods is transshipped directly to other ships and the port has a remarkably good balance between imports and exports.

Establishment of logistics facilities in Gothenburg often aims to serve the entire Scandinavian region. Accordingly, both Port of Gothenburg and Landvetter airport play an important role as logistics centres. Landvetter airport, located approximately 25 km to the east of central Gothenburg is Western Sweden’s international airport, second largest in Sweden, and particularly strong on cargo due to its geographical location in relation to freight-generating business in Scandinavia. The latest Gothenburg Master Plan identifies the area around the North Trail and E6 north as a logistics area, states that these large industrial and logistics areas are to be preserved for this purpose and should not be freed for regeneration activities, and notes that good access to this area should be secured (Gothenburg City Planning Office, 2009).

3. Method and data

The method we used is based on the collection and analysis of spatial data about warehouses in Gothenburg (including an original method to “clean” warehouses’ databases), as well as on-site semi-structured interviews with transport, logistics and real estate stakeholders and representatives from both local and regional public authorities.2

In order to measure changes in the location of logistics facilities, we investigated logistics facilities location at different time periods. Similar to many European countries, there is no dedicated database on warehouses and logistics facilities in Sweden. We used the NACE (European industry classification system) to identify establishments with warehouses in Statistics Sweden’s database. NACE code 52.10 (“warehouses”) is however not fully satisfactory. Several establishments with warehouses but whose main activity is not warehousing are not identified with this code. For instance, in 2014 only 51 warehouses were identified under the NACE code 52.10 in Statistics Sweden’s database. For GMA, which obviously underestimate the actual number of logistics facilities. As an alternative, we developed a methodology to build a new database based on national establishments databases, fieldwork and satellite image reconnaissance. We describe this methodology below, which resulted in 207 warehouses identified in the GMA in 2014.

To identify the location of logistics facilities in the areas of study, we used a database containing all economic establishments with a minimum of five employees in Sweden provided by Statistics Sweden. Data is available for all years, but we prioritised two years (i.e. 2000, and 2014) to make a diachronic analysis possible. In this study, only data for 2000 and 2014 is used, in order to measure the overall trend.
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