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Location of logistics companies: a stated preference study to disentangle the impact of accessibility

Ann Verhetsel [a,*], Roselinde Kessels [b], Peter Goos [b,c], Toon Zijlstra [a], Nele Blomme [a], Jeroen Cant [a]

[a] University of Antwerp, Faculty of Applied Economics, Department of Transport and Regional Economics, Prinsstraat 13, B-2000 Antwerpen, Belgium
[b] University of Antwerp, Faculty of Applied Economics, Department of Engineering Management & StatUa Center for Statistics, Prinsstraat 13, B-2000 Antwerpen, Belgium
[c] Erasmus Universiteit Rotterdam, Erasmus School of Economics, Department of Econometrics, Postbus 1738, 3000 DR Rotterdam, The Netherlands

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ABSTRACT

Due to the globalization and the fragmentation of industrial production processes, the logistics sector, organizing the linkages between different production plants and the market, is growing fast. This results in an increasing demand for suitable new business locations. Previous research has indicated that accessibility is a key factor in the location decision making process. Though the literature on this subject is extensive, little research has been done to quantify the impact of the different dimensions of accessibility on the location decision process of logistics companies. This paper aims to fill this void in the literature by means of a revealed preference study (using a Geographic Information System (GIS) analysis) and a stated preference study (using a designed discrete choice experiment) in Flanders (Belgium). The results of the revealed preference study served as input to the design of the choice situations in the stated preference study. In the stated preference study, the respondents were confronted with a series of choice situations described by means of accessibility variables as well as land rent information. An analysis of the resulting data by means of discrete choice modeling revealed that land rent is the most important factor in the location choice of logistics companies in Flanders. Access to a port is the second most important factor, followed by access to a motorway, the location in a business park and an inland navigation terminal, which are all about equally important. Access to a rail terminal plays no significant role in the location choice of logistics companies in Flanders.

1. Introduction

In recent years, globalization has resulted in an increasing spatial division of production and consumption, and an ongoing fragmentation of production. This evolution entails a major growth in the demand for logistics. One key decision in the planning process of the logistics operations is the decision where to locate these activities. This paper aims to provide new insights into the driving factors of location decision and to quantify the relative importance of the different characteristics of potential locations for logistics companies. Logistics is very important for the economy of the European Union, as demonstrated by the words of the European Union's Commissioner for transport Siim Kallas (2012): "Freight transport and the accompanying logistics industry represent one of the most dynamic and important sectors of the European economy, accounting for at least 10% of GDP". The local importance of logistics should also not be underestimated. According to the National Bank of Belgium logistics created 7.9% of Belgium's GDP and 8% of domestic employment in 2005 (Lagneaux, 2008).

Logistics companies act as intermediaries that connect all stages of the international supply chain. The heterogeneity of logistics firms, however, makes that neither a consistent nor a standardized notion of logistics exists. On its homepage, the Council of Supply Chain Management Professionals (CSCMP, 2014) uses the following comprehensive definition: "Logistics is that part of the supply chain that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point-of-origin and the point-of-consumption in order to meet customers' requirements". For the purpose of this study, we solely focus on logistics plants dealing with material flows of goods between separate locations and the related storage activities. The reason for this is that logistics plants engaged in these activities require large amounts of land. Logistics providers focusing mainly on services will instead often opt for standard real estate such as office blocks.

Despite the general economic climate, the logistics real estate market appears to remain an important factor of growth. Many

* Corresponding author.
E-mail address: ann.verhetsel@uantwerpen.be (A. Verhetsel).

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global leading logistics groups have a presence in Belgium. Flanders in particular seems to be an attraction pole because of its seaports and its important links to the European hinterland. Within Flanders, the Antwerp region is by far the most important location for logistics activities. Further, the axis between Antwerp and Brussels is also a preferred location for many logistics companies. The Flemish government has therefore initiated a process to make Flanders one of the main smart hubs of Europe in terms of sustainable logistics by 2020 (Flemish Government, 2012). This endeavor inspired us to study the location choice decisions of logistics companies in Flanders. The case study of Flanders may be useful for other regions that are interested in raising the number of logistics locations.

The location choice decision is a function of the locations' many different characteristics, such as the proximity to ports, highways and railroads, and the cost. A method suitable to quantify the importance of each of these dimensions and to acquire insight into the trade-offs made between the different dimensions is the stated preference method, also known discrete choice method (Hensher et al., 2005). Instead of asking respondents directly which attribute they find most important, the discrete choice method combines several attributes in one location profile in order to create a more realistic context. As in Bolis and Maggi (2003), one of the key outputs of the stated preference study we present in this paper is the Willingness to Pay for certain characteristics of a location. In the choice of locations for logistics businesses, however, the use of stated preference studies is rather uncommon. According to Hall et al. (2006), there is a need for more empirical research on this topic. When conducting a stated preference study, two important challenges are (i) to decide on the attributes of the choice alternatives and the levels of these attributes, and (ii) to determine the exact choice tasks to be performed by the respondents. To determine the attributes and the attribute levels in our study, we built on revealed preferences of logistics companies. To decide on the exact choice tasks, we utilized the optimal experimental design approach advocated by Bliemer and Rose (2010) and Kessels et al. (2009, 2011a,b).

The remainder of this paper is organized as follows. In Section 2, we provide a review of the literature on the location decision process of logistics companies. In Section 3, we discuss the stated choice approach in detail. We pay attention to the choice model as well as to the design of the questionnaire and the computation of the Willingness to Pay. A major step in the design of the study was a preparatory GIS exercise to identify the actual accessibility characteristics of existing logistics sites in Flanders. In Section 4, we discuss the results of our stated choice exercise. Finally, in Section 5, we come to a conclusion and articulate some policy recommendations.

2. On logistics companies, accessibility and location decision making

The logistics firms under study, namely those that deal with material flows of goods between separate locations and the related storage activities, require large amounts of land. In that, their geography is close to that of most industrial companies. Therefore, to shed light on the theory of logistics firms' decision making, it is useful to draw upon the long history of conceptual and empirical research on industrial firm locational decision making within the field of economic geography. Research on the location of logistics companies is hitherto somewhat underdeveloped, in spite of its growing importance in the global economy. Few publications focus on the locational patterns of logistics on a macro scale (Hesse and Rodrigue, 2004), but little is known on the location decision process.

From the 1970s on, the behavioral approach became quite popular in studies dealing with the location decision process of economic activities. This research line stresses the subjective dimension in the location decision making process, hereby reacting on the 'homo economicus' assumption of the (neo)classical location theories. The behavioral approach resulted in a multitude of papers based on extensive surveys and in-depth interviews and describing the importance of different variables in the location decision process either using simple frequency statistics or using a narrative style. This resulted in severe criticism of both the (neo)classical approach and the emerging structuralist schools. A major criticism was that no generally accepted methodology was available, which resulted in a lack of strong empirical regularities and generalizations in behavior. Consequently, the behavioral approach did hitherto not contribute substantially to the development of theory explaining economic location (Healey and Ilbery, 1990).

The introduction and development of the stated preference method, also known as the discrete choice method, allows us to lift the behavioral approach to a much higher level. The location choice decision is a function of the locations' many different characteristics. A method suitable to quantify the importance of each of these dimensions and to acquire insight into the trade-offs made between the different dimensions is the stated preference method (Hensher et al., 2005). The use of stated preference studies is nowadays common in transportation (modal choice) and marketing, and increasingly also in health economics and environmental economics. In the choice of locations for economic activities like logistics businesses, however, the use of stated preference studies is so far uncommon.

Hayashi et al. (1986) applied an early discrete choice model to study the impact of accessibility (defined here as the distance in kilometers to the nearest motorway junction), and transport and land use policies on location preference of industrial companies in Japan. Accessibility came out as the most important factor in the location decision process of industrial companies. In contrast with Hayashi et al. (1986) , we focus on logistics companies and we utilize different levels of the attributes in our stated preference study. The use of attributes with multiple levels in stated preference studies gained popularity since Hensher et al. (1988) pointed out the usefulness of stated preference methods in transportation research after many years of almost exclusively using revealed preference methods. Leitham et al. (2000) applied a discrete choice model for the location choice of industrial organizations in Scotland, 12% of which were specialized in distribution. We have to jump in time to Willigers and van Wee (2011) to find a more recent stated preference study on accessibility and location of companies. The study is, nevertheless, limited in scope as only rail accessibility of different types of firms is taken into account.

In our study, we focused on Flanders, the northern part of Belgium situated just south of the Netherlands. In Flanders, there has been a substantial amount of locally disseminated qualitative research based on classic interviews or surveys within companies aimed at identifying the factors that drive the location decisions of logistics companies (Bus et al., 1999; Idea Consult, 2001; Reijs et al., 2001; IBM, 2004; BCI, 2007, 2008; Cabus et al., 2008). According to these studies, the most important factors appear to be accessibility, infrastructure, the availability and cost of land, and labor and market proximity. By far the most important factor is accessibility by road. The increasing importance of multimodal accessibility is often offset by cost, especially for smaller logistics companies. Trade-offs need to be made between the availability of multimodal transport infrastructure and the cost of the location. With this article, we follow up on the qualitative research performed concerning the Flemish logistics sector, and quantify the trade-offs made by key players in their location decision. When