Distribution structure and distribution centre location decision-making – A review

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DISTRIBUTION STRUCTURE AND DISTRIBUTION CENTRE LOCATION DECISION-MAKING - A REVIEW

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ABSTRACT

Distribution structures and distribution centre (DC) locations are essential for logistics companies to optimise logistics costs and service levels. This paper reviews Supply Chain Management (SCM), Geography and Economic Geographic literature on distribution structure and DC locations decision-making. Two central decision-making elements are discussed: process steps and decision-making factors. Added value of our paper is 1) A literature review 2) Conclusions on the state of current scientific knowledge in three research streams 3) A research agenda.

Reviewing literature shows decision-making factors are renowned, however, importance of factors in each process step is unknown. Results also show literature diverges on which process steps logistics companies take (descriptive) or should optimally take (prescriptive) in distribution structure and DC location decision-making. Thus, more research is needed. Developing a descriptive conceptual model and testing on several industry sectors will be valuable to understand differences on distribution structure and DC location decision-making.

Keywords: distribution centre, distribution structure, facility location, logistics, freight transport.

1. INTRODUCTION

In this literature review we investigate decision-making on distribution structures and distribution centre (DC) locations. Two central decision-making elements are discussed, process steps logistics companies follow and important decision-making factors. We supplemented our literature review with preliminary empirical (interview) results. This review is structured according to - what we concluded as - three important research streams for our research: Supply Chain Management (SCM) including Operations Research, Geography and Economic Geography (figure 1).

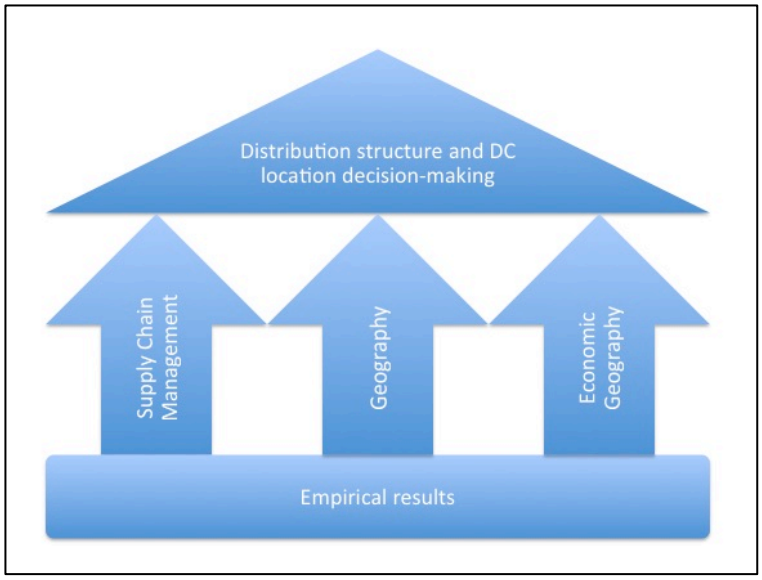


Figure 1 Structure literature review paper.

Understanding decision-making on distribution structures and DC locations is important for several reasons. First, decisions on distribution structure and DC locations can result in lower logistics costs – e.g. through bundling of goods - (Friedrich, Tavasszy and Davydenko, 2014) and higher service-levels (Korpela and Tuominen, 1996) resulting in a competitive market position.
Second, large flows of international trade developed, implying new logistics challenges to bridge the increasing gap between production and consumption (Rodrigue, 2006), e.g. delivering the right product on time (Lambert and Stock, 1993). Indirect distribution via distribution centres (DCs) is essential to achieve these logistics challenges (Van Thai and Grewal, 2005; Christopherson and Belzer, 2009).
Third, because of rapid changes in consumer preferences, distribution structures and DC locations need continuous reconsideration. As such, these are dynamic study objects. Fourth, DC numbers are growing - especially e-commerce DCs (Prologis, 2013; CBRE, 2015) - understanding decision-making on distribution structures and DC locations is relevant for policymaking, e.g. on land use or congestion. Fifth, from scientific viewpoint, our research contributes to quantitative DC location models (frequently used in DC location decision-making), by investigating significant factors to model. Often not all relevant factors or incorrect factors are modelled (Mangiaracina et al., 2015). In practice, mainly cost related factors are modelled (Ashayeri and Rongen, 1997). Finally, little academic research on DC locations and DC location decision-making has been executed (McKinnon, 1984, Jakubicek and Woudsma, 2011; Tavasszy et al., 2011; Van den Heuvel et al., 2013; Verhetsel et al., 2015).

Our literature review shows decision-making factors are renowned, however, the importance of factors in different process steps is unknown. Our results also show there is no consensus in literature on which process steps logistics companies take (descriptive) or should optimally take (prescriptive) in

distribution structure and DC location decision-making. To the best of our knowledge, no literature review on this topic has been presented thus far. The literature review adds value to academic discussion by providing:

1) A review of literature on distribution structure and DC location decision-making factors and process steps;
2) Conclusions on the current state of scientific knowledge;
3) A research agenda organised according to studied research streams.

Our review starts from the viewpoint of *distribution structures* (figure 2), as DC-locations heavily depend on distribution structure organisation. Friedrich (2010) defines a distribution structure (or what he calls a 'mesostructure') as the organisation on *"…how, where and when the goods of the commodity flows are transported, reloaded and stored"* (Friedrich, 2010, p.14). We define a distribution structure as 'the organisation of distribution from production locations via distribution centres to consignees, e.g. retail locations or consumers'. Within distribution structures our focus is on DC locations. Our main question is: *Which factors and process steps explain decision-making on distribution structures and distribution centre locations?*

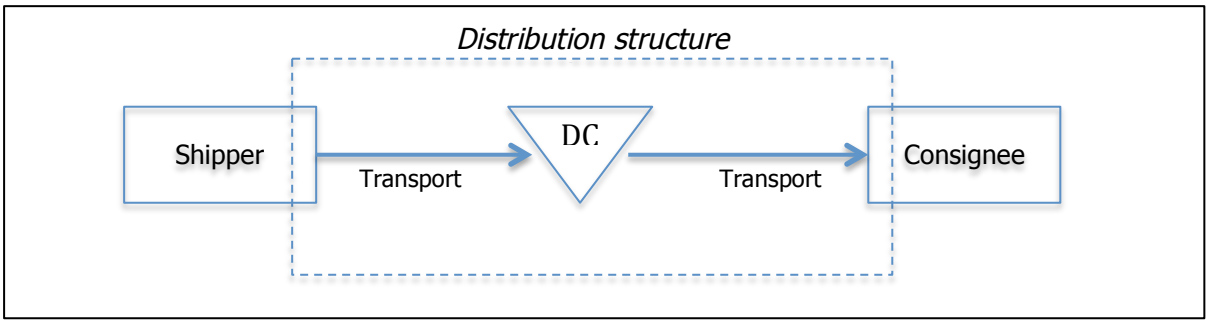


Figure 2 Research focus within distribution structures: DC locations.

This paper is organised in 7 sections. Section 2 contains our research methods. In section 3 we discuss distribution centre trends. Section 4 explains theory on distribution structures. The fifth section includes a literature review on distribution structure and DC location decision-making factors. Section six discusses decision-making process steps. Finally, conclusions and a research agenda are given.

2. RESEARCH METHODS

We used the Systematic Literature Review (SLR) method (Colicchia and Strozzi, 2012) to identify, select and analyse relevant literature. Following SLR methodology, a brainstorm with transport scholars resulted in several keywords to search for relevant literature, e.g. distribution structure, distribution structure process, distribution structure decision-making (+ process), distribution centre geography, logistics facilities location decision-making, firm location decision-making (+ process) (+ logistics facilities). As our research combines 1) decision-making processes, 2) distribution structures

and 3) distribution centre locations, strings were designed to find relevant literature. By using Boolean logic, literature dealing with at least two of these subjects was found. Only peer-reviewed articles published in international scientific journals or conference proceedings are selected in order to guarantee high quality literature. Selected articles stem from the 1980s until 2015. In total, over 100 articles are reviewed. For the sake of brevity not all articles are included in this paper. To test literature review results, we conducted seven semi-structured interviews with experts: two professors, two logistics real estate consultants, a port authority business manager and two supply chain managers.

3. DISTRIBUTION CENTRES – TRENDS

As our research deals with distribution centres as central elements within distribution structures, we first define DCs and give an overview of some trends. A DC is defined as "*a physical facility within a distribution structure dedicated to the rapid movement of goods, performing (1) goods receiving and goods shipping (2) warehousing and/or transloading and/or cross-docking and (3) (optional) performing Value Added Logistics*". VAL activities - such as packing, labelling and even postponed production of goods (Van Hoek, 1996) - are optional in our definition. In the last decades VAL activities have been increasingly relocated from production locations to distribution centres. Some distribution centres trends are:

- 55% of Dutch logistics companies (shippers and LSPs) expect location changes within four years. 60% of these companies preferably relocate within the current region (Ploem and Van Geffen, 2015). As such, only 22% of Dutch logistics companies is expected relocate on a supra regional scale. This conflicts with Hesse (2007) declaring a trend of logistics facilities expanding into the hinterland;
- Major reasons to relocate are business growth in combination with a lack of expansion capabilities, inefficient distribution structures and out-dated business locations (Ploem and Van Geffen, 2015);
- Construction of distribution centres has increased significantly in the Netherlands. In 2011, approximately 340.000 m^2 of DC space was added to the market, followed by 530.000 m^2 in (2012) and 760.000 m^2 (2013). Most DC space has been built in the provinces of Noord-Brabant (Oss/Eindhoven and Tilburg/Waalwijk) and Limburg (Venlo/Venray) (DO Research (2013). As such, DCs increasingly move from port locations towards hinterland consumption locations (Hesse, 2007);
- E-commerce sales have been growing rapidly last decennium. In 2015 Q1, Dutch consumers bought 20% of total expenditures online (Thuiswinkel.org, 2015). Companies increased their online market share. As a consequence, increasing numbers of e-commerce DCs are built to fulfil online customer demand (Holberton and Gariel, 2013). Total DC numbers may not increase, however, as logistics companies continually centralise operations (Prologis, 2013);

- DCs are increasingly built as large-scale logistics facilities. XXL-warehouses spread over Europe accounting for nearly 20% of European logistics real estate investments in 2012-2013. Drivers for building XXL-warehouses are operation centralisation and transport costs reduction (Holberton and Gariel, 2013).

Empirical results: DC location trends

Centralisation of distribution and increased building of large-scale logistics facilities – driven by logistics cost reduction - are important DC trends (Anonymous, 2015; Atzema, 2015; Schroeders, 2015) acknowledged by academic literature (Tavasszy, Ruijgrok and Davydenko, 2012; Andreoli, Goodchild and Vitasek, 2010). New large-scale DCs often function as e-commerce fulfilment centres (Kuipers, 2015). To organise large-scale logistics facilities ICT is needed (Atzema, 2015). Rise of DC mechanisation and usage of ICT systems result in lower employment rates (Schroeders, 2015; Anonymous, 2015).

Logistics operations are increasingly outsourced to Logistics Service Providers (LSPs) in order to minimize logistics costs and risks (of staff, storage and transport assets) (Angel, 2015; Atzema, 2015; Kuipers, 2015; Ooijevaar, 2015). This is confirmed in literature (Hesse, 2004). Shippers or LSPs often rent DCs (Kuipers, 2015) owned by investment companies (Angel, 2015; Ooijevaar, 2015). DCs are frequently located in Dutch provinces of Noord-Brabant and Limburg (Atzema, 2015; Kuipers, 2015; Ooijevaar, 2015). Thus, DC location trends drawn from literature are confirmed by our preliminary interview results.

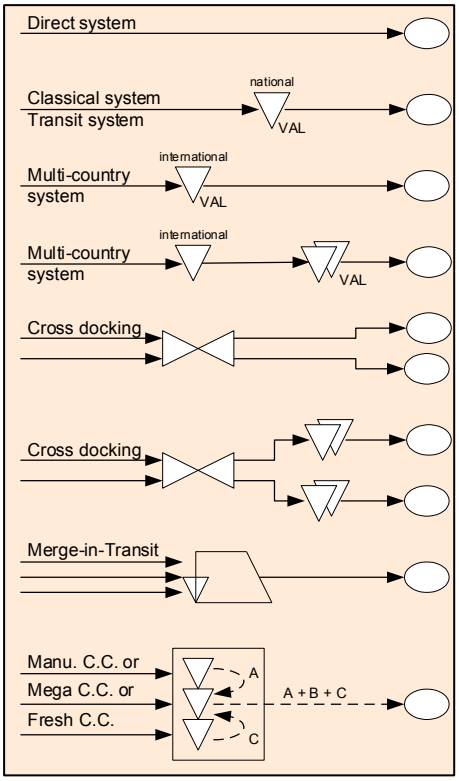
4. DISTRIBUTION STRUCTURES

Different types of distribution structures exist, each having advantages and disadvantages. A direct distribution system (figure 3) is cost-efficient when full truckloads are delivered. When deliveries contain LTL shipments (Less-than-Truck Load), stockholding points (triangles in figure) are often used to consolidate freight and realise scale economies. For example, a Multi-country distribution structure containing one international DC has inventory cost and inbound transport cost advantages. However, outbound transport costs and total distribution costs are high, as transport distances to consumer markets tend to be large (Christopher, 2011). This type of distribution structure is often used for high value products as inventory cost minimisation is critical.

An 'Multi-country' distribution structure containing one international DC complemented with several National DCs (NDCs) (figure 3, lower) has low transport cost and short lead-time advantages. Disadvantages are additional investments in land acquisition and DC construction as well as additional costs for receiving, handling and storing goods (Christopher, 2011). This distribution structure is often used for low-value products, for which transport costs are more important than inventory costs.

Thus, when designing a distribution structure, companies face a trade-off between transport (delivery) costs and stock keeping costs such as inventory costs and storage costs (figure 4).

Fierce competition for customer service, together with increased pressure on logistics costs and individualisation of customer demand (Fisher, 1997) caused evolutions in logistics networks (figure 5) and distribution structures.



In the 1980s, companies often used a classical 'decentralised' distribution system for the European market, containing one National Distribution Centre (NDC) for every European country. In the 1990s consumer mass-individualisation surfaced. As a reaction, between 1990 and 2010, logistics companies centralised distribution to lower stocks and meet individualised customer demand (figure 5, year 2000). The number of distribution centres decreased (Warffemius, 2007). Rapid transport became essential to deliver products on time - made possible by motorway network expansions (McKinnon, 2009). Simultaneously, 'rapid fulfilment depots' developed to guarantee supply in upcoming South and East-European markets.

Figure 3 Distribution structures (Kuipers and Eenhuizen, 2004, adapted).

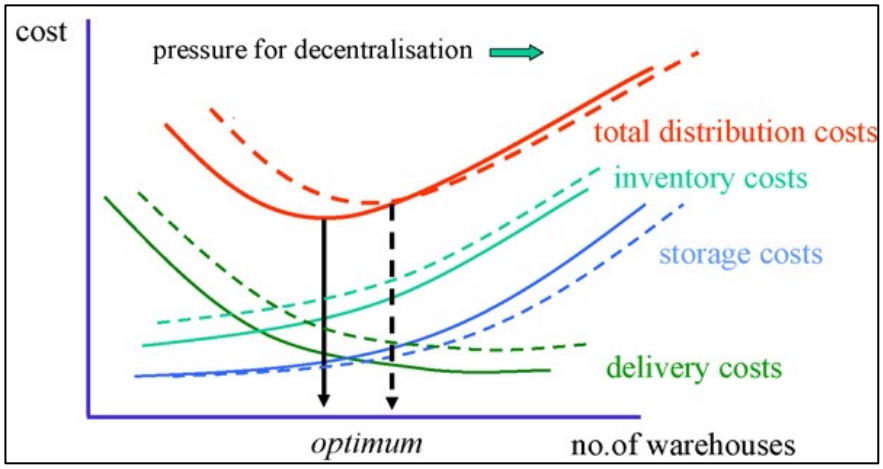


Figure 4 The optimum number of warehouses or distribution centres depends on inventory costs, storage costs and delivery costs (McKinnon, 2009, p. S297).

From 2000, direct distribution re-emerged on an international level, eliminating transport via international DCs. Full container loads leave production countries 'dedicated' for European mega stores. Towards 2020, logistics companies apply horizontal collaboration (with competing logistics companies) to improve service levels, while simultaneously reducing the number of DCs. Cross-dock DCs – company owned or outsourced – are used more and more to decrease transport lead times (Tavasszy, Ruijgrok and Davydenko, 2012).

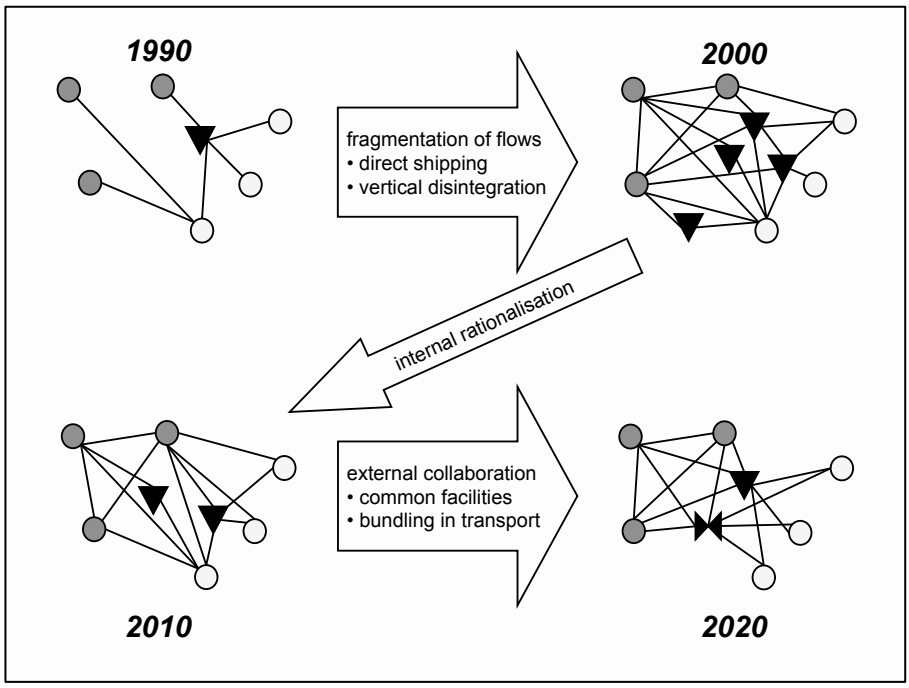


Figure 5 Evolution of logistics networks (Tavasszy, Ruijgrok and Davydenko, 2012, adapted). Grey dots indicate suppliers, white dots consumers, black triangles warehouses and cross-dock locations (double triangle).

5. DISTRIBUTION STRUCTURE AND DC-LOCATION DECISION MAKING – FACTORS

We reviewed decision-making on distribution structures and DC locations. We first discuss decision-making factors in order to understand decision-making processes.

Reviewing relevant literature shows SCM focuses on distribution structure as well as DC location decisions (figure 6). SCM mainly focuses on logistics costs, service and product demand related factors. On the contrary, Geography shows a location focus. Mainly location related factors are studied, e.g. land availability, land cost and multimodal accessibility. There is a lack of geographers studying the influence of logistics costs factors on DC locations. Economic Geography efforts to focus on both DC locations and distribution structures, however, DC locations are studied predominantly. Factors discussed are location related, e.g. congestion, zoning policy, labour market and taxes, as well as logistics costs related, e.g. transport costs. Although Economic Geographers have a broad history on studying production and trade facility locations (e.g. Atzema et al., 2002; Pen, 2002), a research gap exists regarding DC location decision-making.

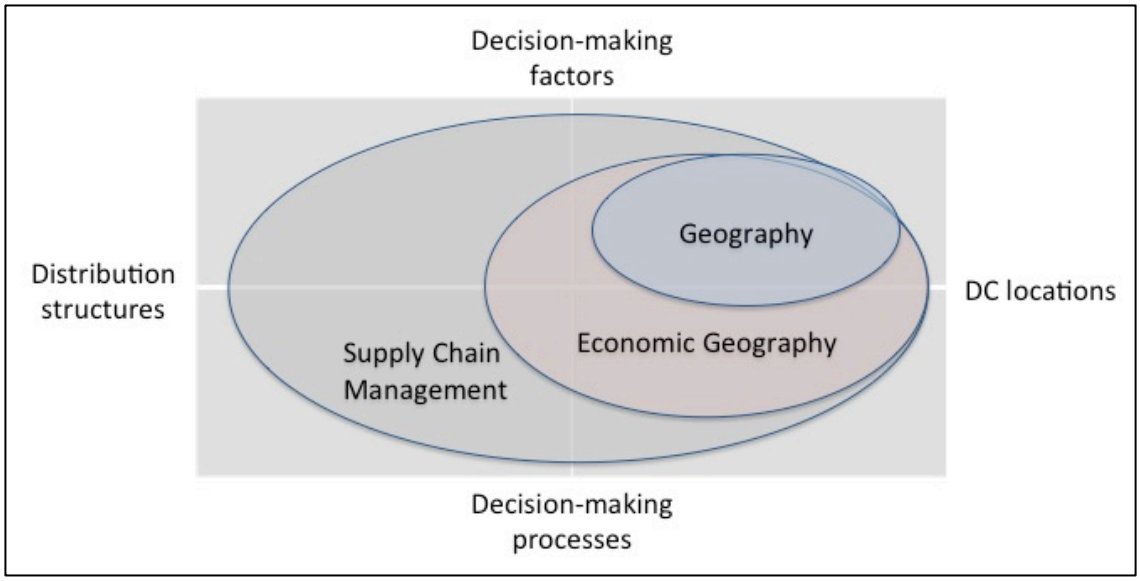


Figure 6 Contribution of research streams on distribution structure and DC location decision-making.

Table 1 gives an overview of *distribution structure* decision-making factors. Important factors for logistics firms in decision-making on distribution structures are product demand (Christopher, 2011; McKinnon, 1984), logistics costs (transport, inventory) (McKinnon, 1984; Ashayeri and Rongen, 1997), lead-time (McKinnon, 1984; Christopher, 2011), delivery frequency (Mangiaracina et al., 2015) and product characteristics, e.g. package density, value density and cycle time (the number of days between order placement and customer delivery) (McKinnon, 1984; Fisher, 1997; Christopher, 2011).

Distribution structure decision-making – FACTORS*					
Author	Ashayeri and Rongen (1997)	Christopher (2011)	Fisher (1997)	Mangiaracina et al. (2015)	McKinnon (1984)
Research stream	Supply Chain Management	Supply Chain Management	Supply Chain Management	Supply Chain Management	Supply Chain Management
Prescriptive / descriptive	Prescriptive	Prescriptive	Descriptive	Review: both prescriptive / descriptive literature	Descriptive
Product demand		x		x	x
Demand volatility			x	x	
Demand dispersion		x			
Transport costs	x				
Transport distance				x	
Inventory costs					x

Production locations					x
Troughput / lead time	x		x		
Product value density (VD)		x			x
Product density					x
Product cycle time			x	x	
Location costs	x				
Delivery frequency				x	
* Other factors may also be mentioned in reviewed literature, however, not explicitly as influencial on distribution structure decision-making.					

Table 1 Distribution structure decision-making factors.

For *DC location decision-making*, both logistics cost factors and location characteristics are significant. Often mentioned factors are transport costs, handling costs, total logistics costs, lead-time, labour market, distances to production locations, consumer markets, land costs and transport link availability (road and air). A table including all relevant DC location factors and literature references can be sent upon request.

SCM literature stresses logistics cost optimisation and customer service objectives (Chuang, 2002). Transport costs are critical as transport covers 50-60% of total distribution costs (Van Thai and Grewal, 2005). Transport distances to container terminals are important as goods are often shipped via container terminals (Kuipers and Eenhuizen, 2004). Logistics companies in Flanders (Belgium) consider land rent and port accessibility most important factors (Verhetsel et al., 2015).
Operations Research (OR) – stream within SCM - calculates optimal DC locations from a cost perspective. Emphasis is on prescriptive quantitative models to support decision-making. Reese (2006) presents an overview. The applicability of OR location models in DC location decision-making has been under discussion as not all factors in location decisions are or can be modelled (Melo et al., 2009). SCM overly focuses on logistics costs, which may result in poor DC locations from viewpoint of e.g. local workforce quality.

Geographers, traditionally give minor attention to distribution centre locations (McKinnon, 1983). Recently, more attention is given to the geography of distribution centres (Bowen, 2008; Dablanc, 2013) and freight transportation (Hesse and Rodrigue, 2004; Cidell, 2011). Bowen (2008) found air and highway network accessibility have strong relations with DC location importance of USA metropolitan counties. Important factors observing 'Ile-de-France' DCs are vicinity of motorways and

suburban airports (Dablanc and Rakotonarivo, 2010). Dablanc and Ross (2012) reviewed existing literature on DC locations and concluded existing studies do not address DC geography on regional and local levels, nor from the viewpoint of planning aspects. The authors distinguish two spatial DC trends, 'logistics sprawl' and 'polarization'. Logistics sprawl is *"the spatial deconcentration of logistics facilities and distribution centers in metropolitan areas"* (Dablanc and Ross, 2012, p. 432). Polarization refers to the fact that DCs, while sprawling into the exurban fringe, still concentrate in certain locations. Low cost land and accessibility are important exurban location factors (Idem, 2012). Cidell (2010) researched suburbanisation of warehousing (and trucking) in US metropolitan areas by analysing Economic Census data (1986 – 2005). Cidell states warehouse locations are similar to other industrial facilities. This is correct for the factors the author mentions – proximity to consumer markets, real estate costs, access to motorways. Yet, also factors exist especially relevant for DC locations, e.g. transport costs and inventory costs. Later Cidell (2011; 2015) concludes infrastructure and land availability are critical DC location factors.
Geographic research stream mainly considers location patterns of distribution centres (not distribution structures). A shortcoming of Geographic studies to our research stems from neglecting logistics factors when studying DC locations, especially logistics costs - e.g. transport costs and inventory costs – and logistics trade-offs. Sivitanidou (1996) is exceptional in mentioning the Total Logistics Costs (TLC) concept.

Location factors are the domain of Economic Geography. Although vast economic geographic literature exists and lots of location theories have been developed on production, office and retail locations - starting from Von Thunen's model of agricultural land use and Alfred Weber's theory on the location of industries up to Porters theory on clustering of economic activities (Atzema et al., 2002) – minor Economic Geographic literature can be found on distribution centres. For example, Pen (2002) studied company migration, o.a. Philips and Grolsch, in the Netherlands. Distribution centres, however, must not be lumped together with production facilities, headquarters or office locations. DCs have their own specific locations, for example minimal transport distances between production and consumption locations, while production facilities may be located in the vicinity of raw materials. Distribution centre and transport operations may also be outsourced to a logistics service provider, making DC locations more 'footloose' compared to production locations.

Hesse (2004) studied 'regional distribution complexes' in Berlin-Brandenburg. Distribution centres disperse further from central areas due to increasing competition on scarce land. Lower land costs, less traffic jams (excellent transport conditions), easier planning requirements, trade union power and future extension capabilities lead to peripheral DC locations. Jakubicek (2010) investigated logistics firms' location choices in Canada and concludes important factors are land costs, Total Logistics Costs (TLC), transport infrastructure (highway proximity), skilled labour and 24/7 operation abilities. Access to major customers is becoming more important due to Just-in-Time (JIT) deliveries. Warffemius (2007) investigated DC location factors and agglomeration economies of logistics firms near

Amsterdam Airport Schiphol (AAS). Accessibility seems to be one of the key drivers in DC location selection. Surprisingly, European Distribution Centres near AAS rely more on road than air accessibility. Hesse (2007) states DCs are increasingly footloose from local or regional geographic structures. McCann (1998) studied the influence of delivery frequency on firm location. Spatial linkage lengths and transport costs influence industrial costs of a firm more than assumed within location theory. Van den Heuvel et al. (2013) found large logistics establishments often locate in so-called AREC (Absolute and Relative Employment Concentration) areas, which may be explained by land prices.

Limitations of Economic Geographic literature for our research are 1) a focus on production and retail locations (Hesse, 2007) instead of distribution structures and DC locations 2) firm locations are sometimes studied as stand-alone facilities (McCann and Mudambi, 2005), whereas DC location decisions result from distribution structure organisation.

Empirical results: factors in DC location decision-making

Logistics costs – e.g. transport costs (Angel, 2015) - are critical in DC location decision-making, as the logistics market is highly competitive and profit margins are low (Atzema, 2015; Anonymous, 2015). Taxes, connectivity with mainports and ease of doing business are decision-making factors mentioned by Schroeders (2015). Lead-time from production to consumption needs to be short to enable inventory reduction (Anonymous, 2015). Infrastructure developments may attract DCs to certain locations due to improved accessibility (Atzema, 2015). Other important decision-making factors are land costs (Angel, 2015; Ooijevaar, 2015; Schroeders, 2015), labour market availability (Anonymous, 2015; Heijkans, 2015; Ooijevaar, 2015; Schroeders, 2015) and travel distance for employees (Anonymous, 2015; Ooijevaar, 2015).

Apart from employee travel distance, empirically collected decision-making factors are confirmed by academic literature. Employee travel distance, however, may be regarded as a part of labour market availability. Travel distance may influence employees' willingness to commute to a DC, negatively influencing labour market availability.

6. DISTRIBUTION STRUCTURE AND DC-LOCATION DECISION MAKING - PROCESSES

Our literature review shows decision-making on distribution structure, and especially distribution centre locations, is a relatively unexplored research field, mainly studied by SCM. Our results also show there is no consensus in literature on which process steps logistics companies take (descriptive) or should optimally take (prescriptive) in distribution structures and DC location decision-making.

Regarding *distribution structure decision-making process steps* we reviewed two studies by McKinnon (1984) and Ashayeri and Rongen (1997). Both disagree how to commence decision-making. The former starts with marketing channel selection, the latter with an analysis of current goods flows for each business unit. McKinnon (1984) emphasises number and locations of stockholding points (such

as distribution centres) as important decision-making elements whereas Ashayeri and Rongen (1997) stress decisions should be based on goods flow scenarios.

Compared to distribution structures more literature exists on *DC location decision-making process steps*, from both academic and practitioner point of view. SCM business expert literature (reviewed by NCFRP, 2011) states business strategy formulation is essential before selecting DC locations. Next site selection criteria should be discussed, followed by negotiations on three to four potential locations. Academic SCM literature is more divided on how the location decision-making process starts. Van Thai and Grewal (2005) suggest selecting a geographic area via Centre of Gravity principle. Chuang (2002) proposes company community participation in formulating location requirements as first process step. Next, location requirements are confronted with location characteristics. Alternatively, locations are selected by enumerating the distance to nearby airports and seaports (Idem, 2002).

Although similarities exist, process step models on distribution structures and DC locations disagree on:

1) How the decision-making process starts;
2) The exact content of the decision-making process;
3) The sequence of process steps.

Process step models on distribution structures and DC location decision-making often encompass qualitative as well as quantitative elements. Qualitative elements are e.g. negotiations on three to four potential locations. Quantitative models are frequently used to support decision-making, e.g. Centre of Gravity (CoG) models. Finally, reviewed process step models appear to be rational and linear. In practice, however, decision-making often includes non-rational elements – e.g. a location decision based on travel distance to a directors private address - and may need several iterations.

Empirical results versus literature: DC location decision-making process steps

In DC location decision-making respondents distinguish between shippers and Logistics Service Providers (LSPs) (Atzema, 2015, Kuipers, 2015, Schroeders, 2015). In studied academic literature this distinction is gentler.

Shippers often start by deciding whether or not outsource logistics activities (Schroeders, 2015). In case of outsourcing, LSPs are tendered. When performing logistics in-house, regularly a location criteria list is composed followed by selection of potential European DC locations (Angel, 2015; Schroeders, 2015). Literature confirms setting up a criteria list as important DC location decision element (Chuang, 2002). In studied literature, however, outsourcing is not explicitly stated as process step in DC location decision-making.

Shippers frequently contract logistics consultants to advise on distribution structure organisation (Kuipers, 2015). Example outcomes are DC centralisation, DC decentralisation (build additional DCs) or extent current DCs. Kuipers hypothesises shippers subsequently may hire a real estate

development company to advise on potential DC locations. Academic literature is ambiguous whether hiring a logistics or real estate consultant is part of decision-making.
Atzema (2015) starts from port of arrival viewpoint. If a shipper wishes to extend operations to Europe, first a port of arrival is selected. Then, a shipper decides on optimal location in relation to port of arrival and consumer markets. A shipper may locate in expensive (air)port regions in case of agglomeration economies.
Ooijevaar (2015) states DC location decision-making starts with a motivation, e.g. company growth. Next, a list of requirements is setup and a business real estate agent is hired – which corresponds with Schroeders (2015) and Kuipers (2015). Process steps of motivation and requirements list correspond most with our literature findings (NCFRP, 2011, Chuang, 2002). Compared to respondents, literature (Van Thai and Grewal, 2005) more heavily emphasizes on Centre of Gravity calculation.

7. CONCLUSIONS AND RESEARCH AGENDA

This paper provides a literature review on distribution structure and DC location decision-making by investigating three important research streams: Supply Chain Management (SCM, including Operations Research), Geography and Economic Geography. Two central decision-making elements are discussed, factors and process steps.

Reviewing literature shows factors are renowned, however, importance of factors in each decision-making process step is unknown. SCM concentrates on distribution structure as well as DC location decision-making factors. Geography shows a DC location focus. Economic Geography efforts to focus on both distribution structures and DC location factors, however, DC locations are prime focus.
In DC location decision-making, however, both logistics cost factors and location factors are significant. Often mentioned factors in our literature review are transport costs, handling costs, lead-time, labour market, distances to production locations, consumer markets, land costs and transport availability. Interview respondents mention identical factors, but add employee travel distance.

Distribution structure and DC location decision-making process steps are mainly studied by SCM.
There is no consensus in literature on which process steps logistics companies take (descriptive) or should optimally take (prescriptive) in DC location decision-making. Process start and process sequence are ambiguous as well. However, literature review and interviews both confirm creating a location criteria list as important process step. Centre of Gravity calculation is a process step primarily stressed in literature (Van Thai and Grewal, 2005). Interview respondents emphasise there are two decision-making actors, shippers and LSPs, and stress logistics outsourcing decision is an important first process step.

Research agenda

As there is no consensus in literature on which process steps logistics companies take in distribution structure and DC location decision-making, more research is needed. Developing a descriptive conceptual model and testing on several industry sectors will be valuable to understand differences in decision-making.

SCM might include more research on location related factors to develop more comprehensive understanding of DC location decision-making. As logistics costs heavily influence DC location decisions, geographers could pay more attention to logistics costs factors and logistics trade-offs. More geographic research on DC location decision-making is valuable to predict future DC influence on community interests, e.g. pollution, employment and congestion. Economic Geographers could study DCs as linking supply chain elements between production and consumption. This can enhance understanding of DC location changes as a result of production facility or retail facility relocation.
In subsequent research we develop a new conceptual framework to elucidate distribution structure and DC location decision-making. To ensure explanatory strength the framework combines factors, process steps and theories of declared research streams.

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