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► To cite this version:

Corinne Blanquart, Saskia Seidel, Ina Frenzel. A conceptual framework to identify key drivers for logistics and transport demand - testing the scheme for goods movement in the pharmaceutical supply chain in France and Germany. RTS. Recherche, transports, sécurité, 2018, Logistics practices and freight transport challenges: a French-German comparison, 2018, 13p. 10.25578/RTS_ISSN1951-6614_2018-07. hal-01919122

HAL Id: hal-01919122

<https://hal.science/hal-01919122>

Submitted on 12 Nov 2018

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DOSSIER / ISSUE

Pratiques logistiques et enjeux du transport de marchandises : une comparaison franco-allemande
Logistics practices and freight transport challenges: a French-German comparison

A conceptual framework to identify key drivers for logistics and transport demand – testing the scheme for goods movement in the pharmaceutical supply chain in France and Germany

Un cadre conceptuel pour identifier les principaux déterminants de la demande logistique et de transport – application à la logistique pharmaceutique en France et en Allemagne

Corinne Blanquart, Saskia Seidel, Ina Frenzel

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Abstract Geographical analyses regarding retail mainly stress business concentration and formations of supply chains. Hereby, main works focused on spatial re-organizations [e.g. 1]. The development of transport and factors that attract transport are rarely or even not considered. But, particularly with an eye on forecasts of increasing commercial transport, the aspect of transport influencing factors becomes more important. The authors developed a conceptual framework for analysing retailer's logistics and transport organization and its relationship to external factors. In this framework, factors that affect retailing companies are classified to different categories which are organized on three different levels: micro-, meso-, and macro-level. In this article the conceptual framework is implemented for the pharmaceutical sector in France and

Germany. The authors' main assumption is that retailers' logistics and transport organization in the pharmaceutical sector in both countries are dependent to non-transport-related context. It is defined by a strictly regulated macro structure where prices, distribution, service obligations, pharmacy ownership, stocking etc. are ruled by government guidelines. As a consequence the identified indicators for logistics and transport demand are at a certain level shaped by these circumstances.

Key words pharmaceutical retail, pharmaceutical sector, logistics and transport

Résumé La géographie du commerce fait état des dynamiques de concentration et de formation des chaînes logistiques, et de leurs réorganisations spatiales [e.g. 1]. Si le rôle du transport n'est que rarement considéré, sa prise en compte devient de plus en plus importante au regard de la croissance du fret. S'intéresser à la demande de transport et aux facteurs générateurs de flux prend dès lors tout son sens.

Le papier propose un cadre conceptuel pour analyser les organisations logistiques et de transport des commerces et leurs déterminants, en distinguant les déterminants micro, méso et macro. Ce cadre conceptuel est appliqué au cas de la pharmacie en France et en Allemagne. L'hypothèse principale est que les déterminants des choix logistiques et de transport du secteur de la pharmacie sont dépendants

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de variables non liées au transport, et notamment des modalités de régulation publique du secteur sur les prix, les obligations de service, de stockage, ou les conditions d'ouverture des pharmacies. L'article propose donc des indicateurs logistiques et de transport, façonnés par les contextes macro, méso et micro dans lesquels ils évoluent.

Mots clés pharmacies, secteur pharmaceutique, logistique, transport, fret.

Introduction

The European Union has stated that Greenhouse Gas (GHG) Emissions should be reduced by 20 % by 2020 compared to levels of 1990 [2]. In view of achieving this goal also the transport sector having a share of 23 % of all GHG emissions needs to be considered. Despite to good intentions the commercial transport experienced only a slight decline in the last years [3]. Most approaches, gaining for a sustainable transport system, concentrate on analysing the transport sector, focusing on technological solutions or restructuring organizations and processes. As a result the suggestions consider only the transport sector directly. These approaches are important but as transport always serves the needs of other branch activities it is in a first instance necessary to analyse and understand the demand side, which means the trade sector that "produce" transport and its organization of operations as well as its sourcing of inputs and serving of markets [4, 5]. The trade sector itself, due to the size of its activities, generates impacts on transportation, especially in cities.

In the context of retail controlled supply chains, it is therefore important to understand retailers' role regarding transport demand and also of its suppliers and other partners. The goal of the research conducted by the Institute of Transport Research at the German Aerospace Centre (DLR) and the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) was to analyse the impact of the distributive trade on transport and also to understand the key drivers for transport demand. This understanding of the relevant key drivers for freight transport demand is really important to propose new policy tools for sustainable freight transport policy. To analyse retailers' logistics and transport demand and its influencing factors a systemic view of key drivers is needed [4; 5]. A systematic analysis dealing with demand side in this context does not exist. Therefore a conceptual framework was developed [4]. This article tries to illustrate the influencing factors and key drivers for the pharmaceutical retailers and therefore

applies this conceptual framework for the pharmaceutical sector in Germany and France. The pharmaceutical sector is one of the most important industries in Germany as well as in France. The German pharmaceutical industry generates a turnover of EUR 30.4 billion in 2013. In France the market produces values of EUR 20.9 billion in 2014 [5]. The health economy constituted 12 % of the whole German and 11 % of the whole French gross value added [6].

The work involves the analysis of the retail trade and includes the upstream trading stages. Comparisons are also being made in the course of transnational cooperation. The focus is on the physical movement of goods, which is one of the most elaborate trading activities [7].

The analysis presented in this article stresses following questions:

- Which factors or drivers affect trade-related transportation?
- How could these influencing drivers be classified?

Due to missing empirical knowledge about retail organization and consequences on transport as well as about organizational transformation influencing transport and transport demand the analysis is based on an own study conducted in France and Germany. Meanwhile the article focusses on retailers all groups of actors along the supply chain were addressed.

The analytical framework – the non-transport-related drivers

For describing retailers' transport and logistics organization different features (attributes) can be considered which at the same time characterize retailers' transportation strategy.

Blanquart et al [4; 5] collected characteristic features from literature and allocated them to three different groups: "type of organization", "type of services/physical activities" and "type of material and immaterial assets". These three dimensions are essential to describe retailers' logistics and transport best (figure 1). The features collected from literature were complemented after interviews in the retail sector [4; 5].

Furthermore the authors assume that all these features are influenced and formed by various external factors which can be seen as the environment of transport and logistics. The authors distinguish this environment, according to economic theories, into a micro-, meso- and macro-level [5]:

General framework conditions of the market are assigned to the macro-level which, focusing retail trade, includes the economic environment (competition between retailers etc.), the political and lawfully environment as well as the given consumer market.

The meso-level describes the network of a single retailer whereby the following questions are in the centre of interest: in what kind of distribution network acts the retailer? With whom or with which actors of the supply chain does the retailer cooperate? Where are these players located?

At micro-level the single retail company is stressed. What kind of retail companies is analysed? Which products are sold? Which strategy is used? And where is the company spatial located?

We assume these factors, dimensions and levels are related to each other and suggest therefore the following classification to bring these different units together. The developed scheme can be seen in figure 1.

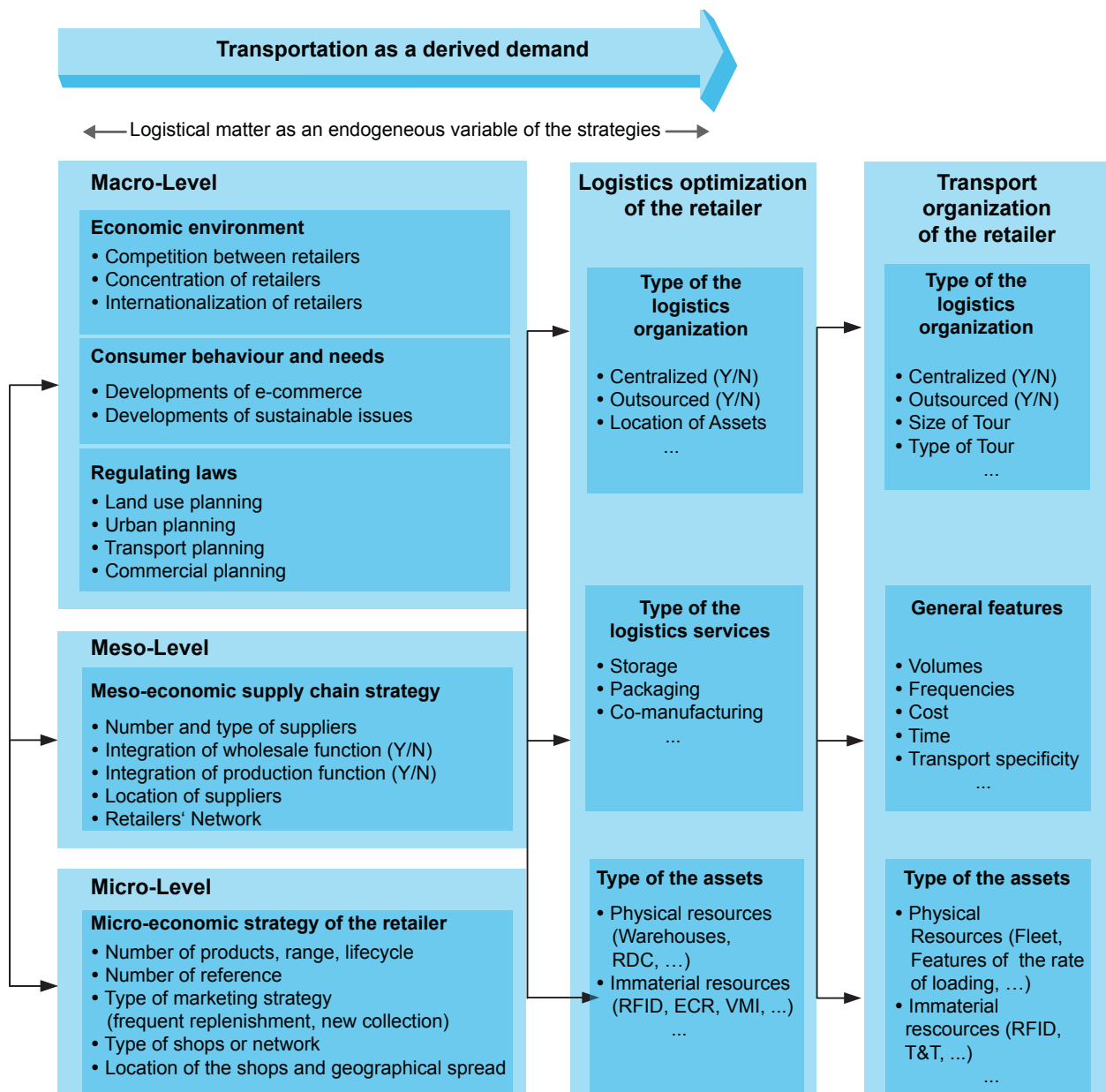


Figure 1. Conceptual framework for decision-making process in retail.

Source : Blanquart et al. 2014

1. Methodology

The methodology applied in this study consists of two successive parts. In a first step a comprehensive literature review was carried out to gain information about the market structure, actors and players as well as facts and figures about the pharmaceutical sector in France and Germany. Followed by a second step in which information about the logistics and transport strategies in the pharmaceutical sector and their links to the economic environment on different levels were derived. In about 38 interviews with different actors in the supply chain (see Table 1) following topics have been addressed: gaining knowledge about the interviewed company, their geographical locations (choices), their relation to other supply chain actors, their overall activities, their

assortments, and their used physical and immaterial assets. By the selection of companies interviewed, care has been taken to ensure that all players of the supply chain as well as companies of different formats, of different sizes, and of small and high market shares were captured. The interviews, conducted in France and Germany, were held in the period from January to April 2012.

Based on a guideline face-to-face and telephone interviews were held with logistics experts and employees directly involved in ordering and transport processes. The duration of interview varied from 20 up to 90 minutes. With the interviews we realised to get information out of the full range of actors in the supply chain (see Table 1).

Table 1. Overview of interviews

	Producer / Suppliers	Wholesaler / pre-wholesaler	Pharmacies	Transport service providers
France	2	7	6	3
Germany	4	5	4	7

2. Results

Due to the interviews a comprehensive picture of the enterprises' daily business, their relationship to other supply chain actors, and insights in their strategies could be derived. Together with the gained knowledge of literature survey the results were summarised to a comprehensive picture, transferred to the conceptual framework and influencing factors for logistics and transport demand were deduced. Hereafter selected findings from the interviews and literature review are presented according to the concept outlined above.

2.1. The macro environment of pharmaceutical retailers

Through the literature review we found out that looking on pharmaceuticals, the regulatory regime has divided Europe into a series of distinct national markets. Europe is split by national regulations on drug authorisation, packaging and labelling into a series of small national markets. Thus, these national regulations have an impact on the spatial patterns for logistics, i.e. on the location of the wholesalers (national location determination). The active ingredients of drugs are manufactured at a small number of sites by large international companies, but normally require further processing at plants closer to the market, from which drugs are distributed by national wholesalers [8]. The EU guideline Good Distribution Practice (GDP) 2013 had also a large influence on the

pharma logistics of the past years. Traceability, product safety and active temperature control are covered in the GDP. Overall, it led to an improvement of quality and compliance especially in the distribution. The national and also the EU regulations are the reason why the pharmaceutical industry is perceived as specifically complex. The transportation, storage, handling and production activities are strictly regulated by national governments. For this reason the pharmaceutical logistics is such a specialized discipline that pharmaceutical companies have always strived for direct control over their total supply chain. Thus, drug manufacturers have long been reluctant to outsource to third-party logistics service providers. And also looking on pharmaceutical wholesaler, the total share of supply chain management outsourcing is quite limited. It also means that wholesalers are obliged to comply with strict regulations ensuring that medicines delivered meet high quality standards, thus enhancing patients' safety. In this context an end-to-end-supply-chain-transparency stands for the guaranty of safety and traceability.

Regulation also concerns health care costs that have led to a series of purchasing reforms which have required manufacturers to lower their prices, transferred more of the costs to consumers, and encouraged the use of self-medication and cheaper over-the-counter (OTC) drugs. High price markets such as Germany, Britain and the Netherlands also encourage the use of generics to lower government drug bills. In this context, logistics, that has

received little attention, becomes an important issue as much as pressure on costs increase. A reduction in supply chain costs provides one of the best means to decrease the costs of goods sold and improve profit margins. This is especially the case in the pharmaceutical sector where supply chain costs cover about 17 % of total costs of goods sold in average [9]. In this margin improvement process, the outsourcing of logistics activities within the pharmaceutical supply chain can definitely be a valuable tool to increase supply chain efficiency and to derive a competitive advantage. Within Europe, manufacturers are striving to rationalise production and distribution costs. This compression of the generics product life-cycle (when compared with the branded drug) and the extreme pricing sensitivities make supply chain costs a very real issue. Although direct delivery to dispensing sites is an option, it is not economically viable due to pharmacy space constraints coupled with availability of twice daily deliveries through the wholesale-channel. Consequently, pharmaceutical manufacturers are increasingly recognising distribution as a non-core activity and are outsourcing their regional distribution activities to a specialist pharmaceutical pre-wholesaler, which is licensed to handle pharmaceutical products and has the ability to process and deliver orders throughout the supply chain.

The turnover of the wholesale sector has also been negatively affected by reduced margins following health care reforms and/or austerity measures. Range of services offered by the wholesalers is also part of public services obligations. In several countries, pharmaceutical wholesalers are legally obliged to provide the full range of products to pharmacists, thus prohibiting short-line wholesaling. Such regulations do exist in France and also in Italy, Belgium, Greece, Portugal and Spain and in some of the new eastern member states of the EU, but these laws are regularly not enforced. So, the market share of full and short-line wholesalers in the European pharmaceutical wholesale markets can be interpreted as being a result of different public service obligations. In France, minimum wholesale service requirements (e.g. the need to stock 90 % of medicines with marketing authorisation) made the development of short line wholesalers impossible [10].

Each country had defined its own payment system, which in addition to defining the reimbursement rules, also defined the remuneration of wholesalers and pharmacies. As the margins decrease, once again the pressure on the logistics costs increase. Pharmacists were predominantly paid on a margin basis, receiving a percentage of the retail price, ex VAT, for their services. A breakdown

of the retail price of a medicine in Europe in 2014 shows a share of 65.9 % for manufacturer, 4.8 % for wholesalers, 19.8 % for the pharmacies and 9.5 % for the state (including VAT and other taxes [5]. In Germany, it is a combination of a fixed and variable component (e.g. a fixed fee of 8.30 EUR payments per prescription and a 3 % mark-up in Germany) [11]. The tendency in the EU appeared to be to question the traditional margin payment scheme. There were initiatives to seek lower margins, or go to a fixed fee payment scheme.

Wholesalers in nearly all countries in Europe were remunerated as a percentage of the price of the products they distributed. As with pharmacists, there were significant differences in the degree to which this margin was regulated. In France, the regulated margin varied between 10.3 % and 2 % of the manufacturer's price before tax depending on the price of the prescription [12]. A regressive scheme was also in place in Germany, varying between 15 % and 6 %.

The organization of the pharmacy profession also differed substantially: mixture of chains and independents: chains could be small (e.g. a maximum of 2 pharmacies in France and 4 in Germany). Now a single pharmacist in Germany is allowed to own one main pharmacy and up to three branch pharmacies all located within one county ('Landkreis') or in adjacent ones. Restrictions in Germany and France stipulating that chains of pharmacies have to be owned and operated by a pharmacist had further limited chain expansion (third-party ownership ban of pharmacies).

Aspects describing the macro environment of retailer's strategy are also visible in consumer behaviour and needs as well as in economical characteristics. Especially in Germany a new ordering system relieves consumer's purchase of pharmaceuticals, e-commerce. German consumers are able to get their medicine, generics and OTC products online. This simplifies ordering. The online pharmacies supplying customers in Germany are partly located abroad, e.g. the Netherlands, to avoid price maintenance for prescription drugs. In Germany price maintenances apply for all drugs to ensure same competitive conditions for all pharmacies. The price maintenance is controversial as the EU sees a restriction on the free movement of goods. The European Court of Justice stopped the price maintenance for drugs sold by foreign online pharmacies in 2016. An interview with a German wholesaler revealed that the online selling of prescription drugs was once prohibited as control is more difficult and to avoid susceptibility. In Germany a renewed restriction is currently discussed [13].

From an economic perspective an increasing competition of all actors especially regarding margins and cost pressure are affecting retailer's strategy and logistics and transport organization. The cost pressure is intensified by increasing research and development costs. Finally, new biotechnologies reinforce efforts on the market competing with traditional pharmaceuticals.

2.2. The meso-environment of pharmaceutical retailers

In most European countries, the majority of medicinal products are distributed through the following distribution pathway: from manufacturer (to pre-wholesaler), to pharmaceutical full-line wholesaler, to retail pharmacy, and finally to patient. Only a small part is handled by direct sales of pharmaceutical manufacturers to pharmacies (DTP). This is also true for France and Germany.

The interviews showed that pre-wholesaler are mainly used in terms of reimported products like e.g. for the contraceptive pill.

Pharmaceutical full-line wholesalers supply the majority (74 %) of medicinal products sold in Europe. Moreover, pharmaceutical full-line wholesalers distribute medicinal products to retail pharmacies (93 %), hospital pharmacies (4 %), dispensing doctors (2 %), drugstores, and others (1 %) [14].

Pharmaceutical wholesalers have been facing tough times, as drastic cost containment policies implied by national health care authorities cut prices and margins therefore increasing competition within the branch. Wholesale market growth (EU-22) declined continuously since the year 2000 as a reaction to tightened cost-containment measures and increasing generic penetration. Amongst others, especially the German market was hit hard by drastic margin-cuts (from 12.5 % in 2003 to 4.5 % in 2016) [15]. In Germany, productivity decreased due to drastic cost-containment measures.

This resulted in a process of market consolidation, vertical integration and regional expansion.

Over the last decade, increasing competition induced companies to consolidate in order to reap economies of scale. In 2004, the three biggest European pharmaceutical wholesale companies together had a market share of more than 46 % in the EU-22 [16]. The numbers of wholesalers had shrunk in France and Germany. Consolidation had led to the emergence of three groups, Phoenix, Alliance and Celesio. The 12 pharmaceutical full-line wholesalers

in Germany are organized in the federal association PHAGRO. All together have a network of 112 sites all over Germany [17]. The German pharmaceutical wholesale has reached within the consolidation process an oligopolistic structure in Germany as the biggest five wholesalers control 90 % of the market (Wirtschaftswoche 2014). Despite this dominance of big wholesalers in the market there are still regional wholesalers in France and Germany.

The supply chain has also seen the arrival of new players in Europe like DHL and UPS. Due to inefficiencies in the wholesale model and increasing cost pressures on manufacturers, some manufacturers decided to distribute medicine directly by using third party logistics providers. Faced with competition from direct deliveries, and the growing importance of express parcels carriers, wholesalers are seeking closer partnership arrangements with manufacturers, based on the sharing of information, marketing expertise and risks. Wholesalers also have to broaden their product ranges to include non-pharmaceutical items, which may affect future decisions on distribution networks [18]. With direct deliveries creaming-off the high volume flows, there is a danger that wholesalers will be left with the high cost end of the business – deliveries to small, dispersed customers – forcing them to examine opportunities for collaboration with other organizations in the same position, such as the express parcels carriers and deregulated postal services. Services creating added value for manufacturers and pharmacies have also become the most important competitive factor in pharmaceutical wholesaling giving companies the opportunity to stand out against their competitors [16].

Short-line wholesalers (existing in Germany but not in France) typically distributed only high-selling items, offered higher discounts, and delivered once or twice a week. With lower costs, short-line wholesalers can offer pharmacies preferential terms, but allied to an inferior service (e.g. minimum order size, carriage charge etc.)

With the exception of the UK, wholesalers could not own pharmacies. However, in Germany and in France pharmacies were allowed to organize themselves into buying groups and so were effectively involved in the wholesale business as shareholders. The share of trade wholesale co-ops in the various countries stood at close to 40 % in Germany, 15 % in France [19].

Concerning the retailers, in France, the model is rather small pharmacies that serve approximately 2 000 - 2 500 clients, and sell pharmaceuticals as well as cosmetics.

In Germany, the pharmacies are focusing on all kinds of healthcare provision and serving 3 000 - 5 000 people on average [20].

Pharmacies have a monopoly on the supply of all medicines to the public in France, Spain and Sweden, whereas in a growing list of countries, including Germany, OTC can also be purchased in non-pharmacy outlets.

2.3. The micro-environment of pharmaceutical retailers

The decision about the logistics starts at the producer's site of the supply chain and is based on two different criteria defining the micro-environment. First the characteristics of the products and second the type of actors which are procuring.

Basically, pharmaceutical products are differentiated in prescription drugs (Rx) and OTC drugs [22]. OTCs are available to the public without prescription [21].

The pharmaceutical portfolios change because the increasing number of patents expiring has led to a number of cheaper products. But the full-line wholesalers have to handle all medicinal products, whereas pharmaceutical short-liners and direct sales distributors have the option to predominantly distribute specialty, high volume and high margin products (mainly branded patented Rx products). In Germany the patents are highly interested in generics. The share of generics on the pharmaceutical market is 2.25 times higher than in France [5].

One influence by the type of product shown by effects of innovation on pharmaceutical market growth which is somewhat dampened the wholesale market, because highly innovative medicines are predominantly sold in the hospital market which is dominated by direct sales [16].

Hospital pharmacies order the majority of their drugs directly at the producer, mostly once per week. If a pharmacy is ordering the products needed it depends on the products characteristic which type of logistics and transport organization will be chosen and whether it is delivered directly from the producer or via wholesaler. The majority of the (high priced branded and refunded) prescription drugs (RX) are delivered directly. For OTC and the lower priced generics the producers left the wholesalers the distribution. So the pharmacies order these types of products at the wholesaler. The efficiency of pharmaceutical wholesaling is further endangered

by the continuous increase in direct sales especially in context with generics.

The type of assortment pharmacies offer is influenced on spatial patterns. If the pharmacy has a clinical surrounding or it is located closed to specialized doctors the patents and their prescriptions etc. are focusing a concrete type of medicines. So the pharmacies assortment will be focusing these specialized needs. If the pharmacy is not facing specialized surroundings the assortment is more influenced by the buying power of the inhabitants at the geographical catchment area. The share of generics sold is higher if the buying power is lower.

Summarising our observations we find interactions between the micro-economic framework of retailers' strategies and their environment. The micro-structure is thereby depending on depending on the type of products (Rx or OTC) and spatial patterns of each pharmacy (i.e. density per inhabitants). The macro-environment, above all public policy and its type of regulations (i.e. price margin), has an impact on the retail format and on the relationships with the suppliers. However, the unbalanced structure of the distributive supply chains also explains the genesis of this last, public form of regulation. The meso-environment characterised by how many and which types of intermediaries (pre-wholesaler, wholesaler, or none) are involved in the supply chain is closely linked to the retail format and retailers' marketing policy. All these elements and interdependencies have consequences for the logistics and transport organization of retailers. As shown the German and the French pharmaceutical market are differing only in few aspects. One main varying characteristic lies in the amount of production and consumption of and trust in generics. German costumers trust more often in generics. OTC products sold in non-pharmacy outlets and the existence of short-line wholesalers are further aspect describing especially the German pharmaceutical market. Whereas in France exists a monopoly of sales by pharmacies.

2.4. Consequences on logistics and transport organization of pharmaceutical retailers in France and Germany

In the following, the logistics consequences of environmental structures will be described and their impacts on transport discussed.

Logistics consequences

The dominant form of drug distribution had long followed a pattern where pharmacist acted primarily as a retailer and health service provider, sourcing

products from wholesalers who purchased medicines from manufacturers, and stocked them in anticipation of demand. Nowadays, the pharmaceutical wholesalers link about 1 500 suppliers, which produce about 60 000 drugs and additional 30 000 products [23] which can be ranged to pharmaceutical products ("Rand- und Nebensortiment"), with 20 962 pharmacies in Germany [24; 25]. But the delivery with drugs and other pharmaceuticals to hospital pharmacies is mainly done by producers. Direct distribution for pharmacies is on the rise, but it is still limited. In Germany in 2010, direct distribution from manufacturers stood at 16 %. Comparable numbers for the other major European countries as France were 37 % [26]. Direct delivery is the distribution scheme for hospitals. Manufacturers have established a pattern of direct deliveries and less frequent delivery cycles in many countries. As described pharmaceutical full-line wholesalers are obliged to stock 90 % of medicines with market authorisation for two weeks. This is why pharmaceutical distributors in six countries (France, Germany, Italy, the Netherlands, Spain and the UK) are holding 57 000 items on stock on average. German pharmaceutical distributors hold the largest number of different stock keeping units (SKU), more than 100 000 [14]. With 60 000-85 000 SKU per site these sizes could be confirmed in our German interviews. The French sites hold only about 25 000 SKU which comes up to 8 700 different medicines. The stocking of pharmacies is therefore mainly done by wholesalers; this is a special characterization for the Germany market. Most drugs are directly re-ordered after they have been sold at the pharmacy. The 12 wholesalers in Germany therefore operate from about 112 sites [15]. Meanwhile their network is spread all over the country, with a higher concentration in urban areas due to pharmacies density and aiming to guarantee short delivery times and frequencies. Pharmacies we interviewed stated that they have in general two responsible wholesalers, one for 80 % of the procurements, and the other for 20 %. Due to the obligation of stocking the wholesalers offer a special service: almost all orders are placed by EDI terminals in the pharmacy, and generally are delivered within a few hours. Delivery frequencies in the EU comply in average twice each weekday, more frequently in Germany than on average [14]. Here pharmacies are delivered on average 3.3 times per day. Our interviewees stated even three up to seven times per day. The interviewed wholesalers ordered their drugs from about 1 000 suppliers whereby only 2 % of them are responsible for the highest turnover. 20 % of all orders are organized via pre-wholesalers. The commissioning times are low to deal with the needed speed of deliveries. The order fill rate, which means the

ability of the wholesaler's supply to meet a pharmacy's demand, is with more than 95 % very high.

From the manufacturer perspective, only a small part of the non-core logistics activities is outsourced [27]. In relation to other industries the outsourcing of logistics activities in the pharmaceutical industry is limited. Logistics accounts for a relatively small proportion of the delivered cost of drugs (around 2 %) and has received little senior management attention as the industry focuses on more urgent issues such as the discovery of new block-buster drugs or mergers and acquisitions [18].

As described, due to prices and margin regulation costs are one further main aspect defining logistics organization. Especially in Germany there is a high pressure on the logistics costs caused by the decrease of margins. Searching for new ways to cut costs, manufacturers started to outsource their logistics and related services. Pre-wholesalers increasingly provide these specialist services, like warehousing, storage, distribution, and financial administration to the pharmaceutical industry. In many cases, pre-wholesale services are offered by full-line wholesalers, thereby becoming the prolonged arm of the manufacturers, as they hold their stocks in consignment [16]. Further due to high price and margin regulations resulting in a reduced cost competition wholesalers try to create unique selling points via value added services like inventory management, offering free ICT services or by acting as consultants.

Due to its special condition hospitals often procure pharmaceuticals via public market procedure. Their procurement frequency is therefore lower than for pharmacies.

Transport consequences

The delivery time is different regarding the type of distribution scheme. On average, a pharmaceutical full-line wholesaler supplies a pharmacy within a delivery time of 4.53 hours (France: 4.8 hours and Germany: 2.85 hours) [14]. These times could be proofed during the interviews whereby the theoretical time between order and delivery needs only 45 minutes. This signalizes a high quality in services. Due to increasing pressure on logistics costs wholesalers try to decrease the number of daily deliveries via fixed delivery times in contracts. They aim to ensure static routes and delivery times.

The choice for a transportation modality (air, sea, road, rail) is mainly determined on product value density in relation to the working capital in (pipe-line) stock [27].

The inbound and intercompany transportation for patented drugs and the high valuable medical devices are therefore mostly shipped by air. The low valuable pharmaceutical products are mostly shipped in full containers or in full truck loads from drug manufactures to (pre-) wholesalers. In export and domestic distribution the road transport dominates. The outbound transportation from the pharmaceutical companies to their customers (final distribution) is mostly carried out using parcel services or delivery vehicles. The vehicles are not always fully loaded. Especially in Germany service providers compete with wholesalers for these transports.

The requirements of storing and transporting medicines in the cold chain are also onerous. With bulky products and long transit times, refrigerated vehicles must be used. With small volume deliveries and short (less than three hours) shipping times, insulated packaging without cooling elements may provide adequate protection, but temperature stabilizing materials such as cool packs within isotherm boxes are used if transit is more prolonged.

Temperature monitoring devices must be used to demonstrate compliance with regulations. The cost of shipping at an assured 2°-8° range is approximately double that for products able to withstand ambient conditions.

In Germany the transport to the pharmacies is done by wholesalers' subsidiaries like (e.g. Transmed Transport GmbH for wholesaler Phoenix) or done by service providers (SP) whereby the SP are commissioned and paid by the wholesaler. The tours are organized by the SP themselves, only the pharmacies to be delivered are given. Each supplier is assigned to certain pharmacies.

The results of the interviews and the literature demonstrate the complexity of the decision-making process for the retailers as far as transportation is concerned. Transferred to our general scheme the following figure can be drawn (see Figures 2):

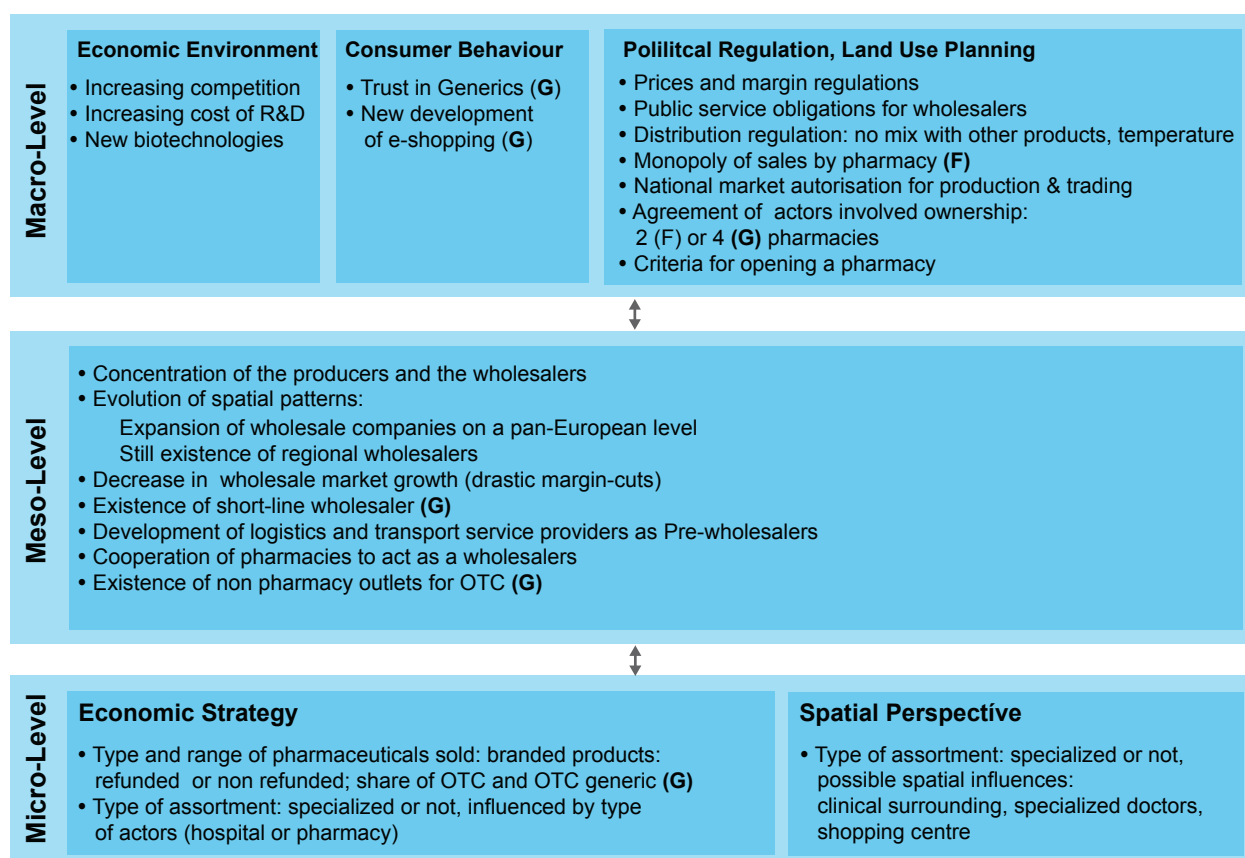


Figure 2.1. Findings for pharma retail in France (F) and Germany (G), based on a “decision-making conceptual framework”

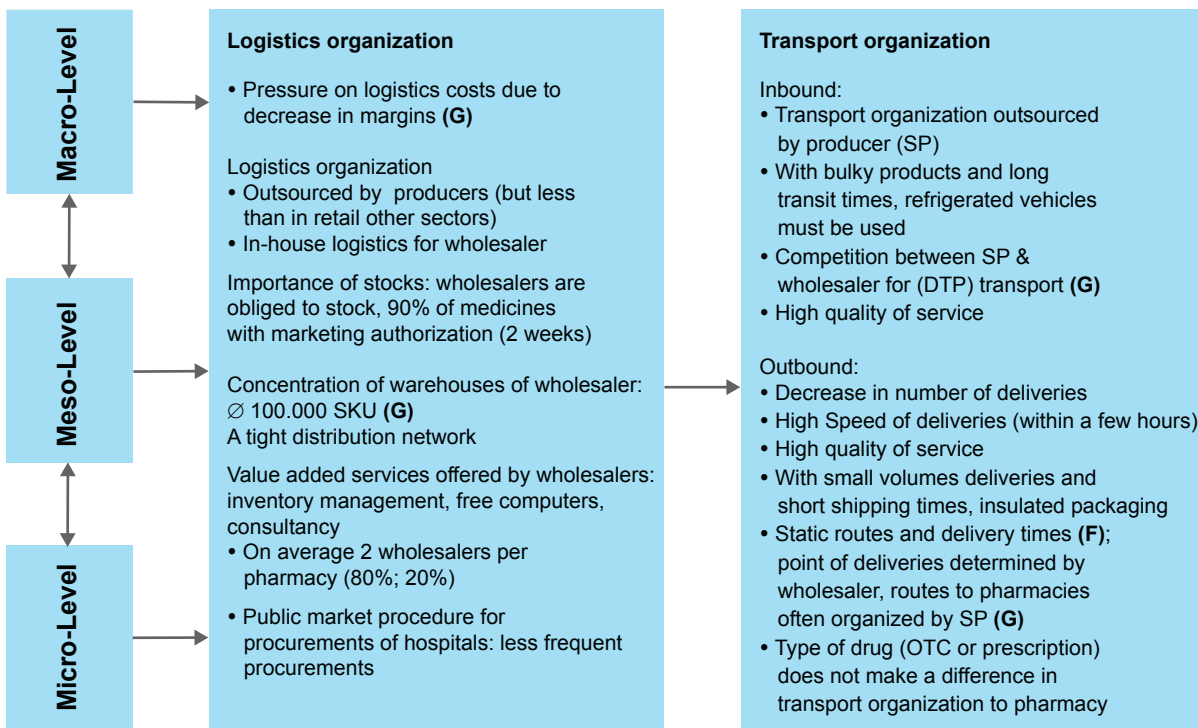


Figure 2.2. Findings for pharma retail in France (F) and Germany (G), based on a “decision-making conceptual framework”

3. Synthesis and conclusions

We analysed the pharmaceutical sector in France and Germany to explain how logistics and transport is organized and which features drive the organization. Our findings show that the organization of logistics and transport in pharmaceutical retail is influenced by various framework conditions that can be allocated to different levels of its environment: the micro, meso, and macro. Nine major transport features for both countries were identified. Features of transport in the pharmaceutical supply chain are frequencies, service performance, deliveries, outsourcing, load rate, size of the tour, modes, type of trucks and transport costs. The interview results allowed the derivation of specific indicators of retailers’ transport and key drivers that have an influence on transport demand taking for example frequencies of delivery which are strongly influenced by the type of actor (pharmacy/hospital pharmacy, full-line wholesaler/short-line wholesaler/producer). Looking at transport operations, the type of actor is the main key driver by influencing furthermore differences in service performance as well as the share of outsourcing. The deliveries are in addition characterized by the type of intermediaries and order time. Time plays another important role with respect to transport organization in

the pharmaceutical market. Thus the size of delivery tour is influenced by the time of (fixed) delivery as well as the density of pharmacies. Which types of trucks are used to deliver is time-dependent in two ways: time of order and time of exposure to adverse conditions (high and low temperatures and fluctuations). Load size and the nature of product (chilled or urgent etc.) are two more influencing factors on the types of trucks used. One further indicator of transport organization of pharmaceuticals is modes. Which kind of mode is used differs due to frequencies of order and the location of the pharmacy.

The identified indicators of transport and the factors which have the strongest influence on it are summarised in table 2:

Table 2. Indicators of transport and their key drivers

Indicators of transport organization	Key drivers rivers
Frequencies	Inbound: Type of recipient (wholesaler, pharmacy or hospital) Outbound: Type of recipient (pharmacy or hospital) Location of recipient
Service performance	Type of actor (pharmacy or hospital)
Deliveries	Inbound: Type of drug (narcotic, OTC, chilled...) Type of intermediaries Time of order Outbound: Time of order
Outsourcing	Type of actors (producer, wholesaler)
Size of tour	Outbound: Density of pharmacies Time of delivery
Modes	Inbound: Location of recipient (domestic or abroad) Outbound: Frequencies Location of recipient (pharmacies/hospital)
Types of trucks	Inbound: Load size Type of drug (e.g. chilled) Outbound: Time of order Nature of product (e.g. urgent) Time of exposure to adverse conditions
Transport costs	Frequency Size of tour
Load rate	Type of recipient (wholesaler, hospital, pharmacy)

Regarding policy and regulations we found that they have an impact on location of wholesalers, they ensure that drugs and drugs' transport meet high quality standards and regulate the pharmaceutical prices. Furthermore regulations have an influence on the organization of pharmacies as one pharmacist cannot run more than two pharmacies in France and three branch ('filialisert') pharmacies besides their main pharmacy in Germany. Nevertheless, policy tools were not identified as key drivers for indicators of transport in the pharmaceutical sector. Therefore it is difficult to make recommendations regarding policy for achieving a reduction in GHG.

All in all we could demonstrate how sales related strategies of retailers influence logistics and transport, and based on our empirical findings for the pharmaceutical retail in Germany and France we were able to allocate relevant factors and key drivers to our conceptual framework. The

results underline that for an understanding of transport (demand) a systemic view that is going beyond logistics and transportation is needed. The scheme helps thereby to understand the decision making process and to distinguish the complex determinants into internally and externally. By applying the scheme to other countries, the country-specific background has always to be considered.

Acknowledgment

The authors would like to thank the pharmaceutical-industry interview partners who gave the authors a comprehensive insight and overview of their companies every day.

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