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The parcel industry in the spatial organization of logistics activities in the Paris Region: inherited spatial patterns and innovations in urban logistics systems

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Abstract

The aim of this paper is to study the location of the parcel industry, and its place in the spatial organization of logistics activities in the Paris Region. In particular, we wish to compare the location of the parcel industry to the location of other logistics activities. In order to do this, we review in part one the existing factors that determines the location of logistics activities. We use this literature review to draw initial conclusions on the distinctive characteristics of the parcel industry. In part two, we use existing data on the location of establishments in the Paris Region to study the dispersion of the parcel industry compared to the dispersion of other logistics activities. Finally, in part three, we provide a partial explanation for this difference: a spatial hysteresis of the big stakeholders of the parcel industry, and the emergence of innovative logistics solutions.

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Keywords: Parcel industry; Logistics activities; Spatial dispersion; Paris Region

1. Introduction

In the last few years, the issue of the location of logistics activities emerged in the literature, in Europe and in the United States, especially from the perspective of logistics sprawl in metropolitan areas. These issues of spatial dynamics question urban policies, because they underline the lack of interest in freight in the planning process. In a study of the Atlanta metropolitan area, Dablang and Ross (2012) demonstrated the existence of a sprawl of logistics activities, both at the local and macro-regional scale. In the case of the Paris region, Dablang and Andriankaja (2011) showed the same phenomenon, through a study of the location of the parcel industry from 1975 to 2010. The sprawl was concomitant to the formation of new logistics clusters in the periphery of the Paris Region (Heitz and Dablang, 2015).

Urban spaces are often considered in the literature as places of preferential location for logistics activities (Hesse, 2008). In parallel to the existing dominant dynamic of logistics sprawl, an important trend of location of logistics activities in city centers can be observed. This trend is primarily discussed in specialist publications on logistics and freight, but it is also a topic in academic literature (Browne and al, 2005; Cherret and al, 2012; Dizain and al, 2012; Quak and al, 2012). The return of logistics activities to the center of cities shows the importance of these locations. These two conflicting dynamics (spatial sprawl vs. return to the city center) also lead us to take an interest in the factors that determine the location of logistics activities. The literature covers these factors well enough for all logistics activities (Mérenne-Shoumaker, 2008; Cidell, 2012; Dablanc, 2014) but they have rarely been analyzed for a particular segment of the industry. What we would like to show in particular is the non-homogeneous nature of logistics activities. Raimbault and al. (2012) have differentiated logistics activities in the Paris Region (between what they call the parcel industry, distribution centers and inland ports). They underlined differences in the location of activities, which translates into a difficult implementation of public policies to regulate logistics sprawl. The aim of this paper, therefore, is to go further into this research, especially on the case of the parcel industry. We will compare it with the location of Other Logistics Activities (referenced as OLA). Because of data availability (see part 2), the analysis is for one year only (2013). Therefore, we can't study the sprawl of these activities. But, in our opinion, this paper can contribute to the general reflection on logistics sprawl.

The aim of this paper is to compare the location of the parcel industry with other logistics activities in the Paris region, called Ile-de-France. In part 1, we review the existing literature on the factors that determine the location of logistics activities, and we attempt to analyze the specificities of the parcel transportation industry. In part 2, we show the difference of location in the parcel industry and other logistics activities. Finally, in part 3, we provide a partial explanation for this difference: a spatial hysteresis of the big players of the parcel industry, and the emergence of innovative logistics solutions.

2. The case of the parcel transportation industry in the location of logistics activities: specificities of the sector

2.1. The location of logistics activities: a state of the art

Several factors for explaining the location of logistics activities in a global context of sprawl in metropolitan areas are already identified by the existing literature (Hesse and Rodrigue, 2004; Mérenne-Schoumaker, 2011). Amongst those factors, there is in particular the importance of proximity to transport infrastructure, and more specifically to road infrastructure. The Parisian metropolis is very well-connected by multiple highways that connect the center of the agglomeration to the periphery. Terminals and freight villages tend to be located along those road corridors.

One other obvious and essential factor is the availability of land and its cost. In recent years, logistics activities have tended to require bigger and bigger buildings. This means that they need a lot of land. According to a study published by the Council of real estate business (CBRE, 2013), "XXL warehouses" (more than 50,000 square meters) represented in 2013 over 14% of European demand. During the years 2010 and 2011, they accounted for just 5 to 6% of demand. The evolution toward bigger warehouses can be attributed to several factors: higher integration of operations, better pooling of logistical flows, and the rise of e-commerce. Given this dependency on land availability and cost, and given the fact that logistics activities have low profitability per square meter, terminals and freight villages tend to be located in places where the land is available and cheap. It means they are more likely to be located in peripheral areas than in the dense center of the agglomeration, where the competition with other activities is much fiercer.

Another important factor is access to a consumer market and a low-skilled job market. Metropolitan areas contain most of the customers. Logistics companies can increase the size of their production while minimizing the distance to the consumer. This is especially true in our case study, because the Paris agglomeration contains the highest concentration of economic activities in Europe. The Paris Region, Ile-de-France, represents a third of the French GDP and a very high diversity of economic activities (retail industry, small shops, tertiary establishments...) and consumption patterns, as is specific to metropolitan areas. Proximity to the agglomeration is therefore advantageous (Polese and Shearmur, 2005). Entering the agglomeration is considered a breakdown in supply-chain continuity, and of the continuity of the linear relationship between cost and distance, associated with the inevitable transshipment of goods. Pooled flows in large vehicles have great difficulty entering the dense agglomeration, because of the narrow

streets, and the competition of other road users. To this, we can add another difficulty for freight vehicles, namely parking in dense urban areas during their deliveries (Beziat, 2015). Transport operators would rather transship their cargo inside an intermediary warehouse, from heavy trucks to light vehicles, which are better adapted to driving and parking in dense urban centers. In Ile-de-France, over 60% of weekly deliveries and pickups are taken on by light vehicles (3.5 tons or less)*. Transshipment represents an additional cost, which must be integrated in the total cost of the supply-chain. In order to lower this cost, the choice of an optimal location is made by finding a balance between the cost of land and the cost of the transport operations.

Finally, a key factor is the part played by public stakeholders, both as regulators and facilitators. The demand for freight is mainly located in dense urban areas, already very constrained by cities' morphology. It means that freight contributes to problems of road congestion and air pollution in cities. Public stakeholders are increasingly aware of these problems and have to take public health considerations into account. They also aim to reduce the nuisance caused by freight (noise, vibrations, congestion...). This has led city planners to actually care about freight, and to try to regulate it. In the case of Paris, strong political objectives led to the signing of the Paris Delivery Charter in 2006 (Browne and Ripert, 2009), followed by a new Charter signed in 2013. Since then, new regulations have been created or altered. There has also been a lot of thinking on the subject of low emission zones (Dablanç and Montenon, 2015). Logistics activities are generally associated with this nuisance and for this reason they often have trouble finding space in urban areas. Once again, this leads logistics activities to locate in the periphery rather than in the agglomeration. Meanwhile, regulations can accentuate the constraints on freight delivery in cities and influence the entire supply-chain.

2.2. Evolutions of the parcel industry and the emergence of an “urban parcel industry”

“Logistics activities” are often defined as all the intermediary activities between the production and the consumption of goods. The parcel industry, in particular, is a specific segment of goods transport. According to the French Statistics Institute (INSEE), it is considered as “the collection of multiple parcels weighing less than three tons on docks, in order to consolidate loads that can be transported and be broken up in smaller packages at the distribution center, and be delivered directly from there”. This broad definition omits several elements that describe the parcel industry. Firstly, there is a time constraint: the transport has to be on short notice, sometimes less than 24 hours for express services. Secondly, it functions as a network of cross-dock terminals and agencies inter-connected by freight transport operators (sometimes own-account, sometimes by subcontracting). Finally, it spans a very wide range of operations (Harnay-Reme et al., 2014), from transport operations (pickup or delivery rounds), to handling and sorting operations (consolidation and deconsolidation, preparing orders, organizing the tour...).

The parcel industry has undergone massive change in the last few years (Moati, 2011): the completion of national networks, the creation of European networks, the development of express services... One of the main sources of evolution is the change in consumer practices, with the development of e-commerce and the advent of the single-parcel. The parcel industry has to meet more complex logistical needs in a very constrained urban environment (Hesse, 2002; Visser and Lazendorf, 2004; Weltevreden and Rotem-Mindali, 2009; Morganti et al.). “The new buying habits are accompanied with a new logistical demand. While it is still difficult to measure the effect of e-commerce on the evolution of delivered volumes, numerous authors agree to point out that this new practice has consequences in terms of intra-urban mobility of goods (in tons-kilometers)” (Ducret, 2012).

These mutations are currently happening and they are drawing a new map of service providers and consumers. They create a very specific sector which could be described as an “urban parcel industry”. It's interesting to study the factors explaining the location of logistics activities for the specific sector of the parcel industry. The parcel industry is adapted to urban density: its activities don't require a lot of space compared to other logistics activities, since it mostly deals with small parcels. The parcel industry, especially when it deals with single parcels or light

* This is a result from the Urban Freight Survey which took place in the Paris Region between 2010 and 2013. It was conducted by the Laboratory of Transport Economics and financed by Ile-de-France, the DRIEA (Ile-de-France Regional Department for Equipment and Planning) and ADEME (the French Agency for the environment). Source: ETMV 2011-2012 – RIF-DRIEA/DGITM-ADEME.

parcels, can use smaller terminals, fit for dense urban centers. One other specificity is the fact that the parcel industry relies very heavily on subcontracting to lower the cost of the last mile (Harnay-Reme, Cruz, Dabanc, 2014). In an agglomeration such as Paris, parcel industry operators can rely on a significant market of subcontractors, and can actually play off the competition to lower prices. Another factor is that the market for the parcel industry is almost exclusively tertiary businesses and home deliveries. So the market is almost entirely contained in the densely populated agglomeration (Andriankaja, 2014). Contrary to other sectors of logistics activities, there are no suburban hypermarkets or big peripheral factories to deliver. For all these reasons, it stands to reason that parcel industry establishments should be more concentrated in the city center than other logistics activities.

There are a lot of players in the parcel industry business. In Ile-de-France, we count about twelve parcel industry companies of national scope, about three hundred companies of regional scale (many of them subcontractors) and several thousand small subcontracting transporters, who own between one and five vehicles (Andriankaja, 2014, Dupeyron, 2000). It is interesting to note that the rise of this sector is happening in the context of sprawl. We know specifically that there was considerable sprawl of the parcel industry between 1975 and 2010 (Dabanc and Andriankaja, 2012), and that there was a sprawl of all logistics activities between 2000 and 2012 (Heitz and Dabanc, 2015). This means that there is deconcentration and spatial reorganization of logistics activities in the periphery of cities. In part 2, we analyze the difference of location of the parcel industry, and Other Logistics Activities (OLA). Unfortunately, the analysis is only at one date (2013), but it will show the end result of the process: namely whether the parcel industry has really sprawled that much compared to OLA.

3. The location of logistics establishments according to their type of activity: a study of the Paris Metropolitan area

3.1. Data collection and treatment: the challenge of measuring the location of logistics establishments and distinguishing the parcel industry

In order to measure the location of logistics activities, we used a database containing all the establishments of the Paris administrative region, Ile-de-France. The source for the list of establishments is the Altare database, which uses a data retrieval from the French Register of establishments (called SIRENE), published every year by the French Statistics Institute (INSEE). The database is only available for 2013, so a diachronic analysis was impossible. This database contains key information for our study: the name of the company owning the establishment; the type of activity of an establishment, in the form of a NAF code (equivalent to the NACE code for the European Union, or NAICS code for the United States), a classification of activities into 732 subclasses; the number of employees; the address of the establishment. This allows us to geocode the establishments precisely, using a GIS system. About 3% of establishments couldn't be geocoded at the address level. They have been geocoded at the center of gravity of the municipality. This is not an important problem because the municipalities are very small in France. There are 1,300 municipalities in Ile-de-France alone. Therefore, establishments geocoded at the center of gravity of municipalities will not be very far from their real location.

While the use of this database seems very well suited to the purpose of this paper, it requires in reality a lot of work to make it usable. The SIRENE file, from which Altare originates, contains many flaws, which are obstacles in the way of a precise estimation of the number and location of establishments. For this reason, the final number of logistics establishments, obtained with our methodology, can only be an estimation of the total number of logistics establishments in the Paris Region.

The first step is to extract all of the logistics establishments from the database. In order to do this, we used the NAF codes in table 1 below. The use of the NAF code is an obstacle in our methodology. Upon creation, every economic establishment in France has to administratively declare its NAF code. Also, INSEE (the French Statistics Institute) updates part of its file every year. So there are several problems: first of all, it is not unreasonable to doubt the precision of the initial statement by the establishment (there are 732 classes and some of them overlap). Also, at this level of detail, an establishment can change its activity type and it may not be updated by INSEE. For example, an establishment of "long-distance freight transportation by road" (49.41A) can become an establishment of "proximity freight transportation by road" (49.41B).

Table 1. Naf codes used for the primary extraction of logistics establishments.

Naf code	Description
49.41A	Long-distance freight transportation by road
49.41B	Proximity freight transportation by road
52.10A	Refrigerated storing
52.10B	Non-refrigerated storing
52.21Z	Auxiliary services for land transportation
52.22Z	Auxiliary services for waterway transportations
52.23Z	Auxiliary services for air transportations
52.24A	Port handling
52.24B	Non-port handling
52.29A	Parcel industry, express freight
52.29B	Chartering and transport organization
53.20Z	Other mailing and postal activities

Also, some companies do their own-account logistics and transport activities. Some of them will fill in the NAF code of their main activity, even for their logistics establishment. It would be necessary, in order to be all-inclusive, to retrieve logistics establishments from the wholesalers or large retailers. Note however that several companies are very thorough when filling out their papers: it's possible to find several well-known brands (in the retailing industry especially) when browsing the names of the logistics establishments. Note also that some NAF codes pertain to passenger transportation as well as freight transportation, especially auxiliary services for land, air and waterway transportation (52.21Z, 52.22Z and 52.23Z). Lastly, several establishments, especially those located in the tertiary center of the agglomeration, are actually head offices of large transport and logistics companies. So they are not really logistics establishments.

Therefore, a careless use of the Altarès Database invariably leads to skewed results. Some establishments, which are noted as logistics establishments, have no logistics activities whatsoever. And within logistics establishments, it's not unreasonable to doubt whether the NAF code is relevant to inform us as to the exact activity of the establishment (which would allow us to distinguish between the parcel industry and other logistics activities). After we extract the 10,000 logistics establishments, using the NAF codes in table 1, a number of filters have to be put in place to estimate their number more precisely.

For establishments noted as having logistics activities, but that in reality do not (such as company headquarters, or passenger transportation establishments), several filters are put in place to eliminate them from the database. Firstly, a detailed overview of the names of the establishments allows us to eliminate many of them: this works particularly well for passenger transportation activities (their name often contains reference to taxis, air travel or public transports). The most important work is to gather information through the observation of satellite photographs of the addresses noted in the Altarès database. Sometimes, observation of street photographs is also useful in order to validate or invalidate observations from satellite photographs.[†] According to us, this methodology is the simplest way of determining which establishments contain logistics activities. In total, about 7,500 establishments are removed from the Altarès database, either on the basis of their name or their address.

The other problem is to be able to determine which logistics establishments are a part of the parcel industry, since, as we said before, the NAF codes don't necessarily reflect the exact nature of an establishment. In the remaining 2,500 establishments, only 100 of them are explicitly part of the parcel industry (52.29A and 53.20Z). In order to identify more of these establishments from the parcel industry, we need to find out directly from the companies. We

[†] Quite simply, the observation of satellite photos was done by using Google Maps, and the street photographs were obtained through Google Streetview.

conducted a survey[‡] with the thirteen biggest parcel industry companies identified in the existing literature and operating in the Paris Region (Dupeyron, 2000; Adrianakaja, 2014): Chronopost, Ciblex, Coliposte, Dascher, DHL, Mory Ducros[§], Exapaq, FedEx, Gefco, Geodis, GLS, Heppner, Kuehne Nagel, Schenker, TNT, UPS and Ziegler. We used these names to find the phone number and address of their agencies in a phone book. Then, we conducted phone surveys with the persons in charge of these agencies, to validate the fact that they were really a part of the parcel industry. Using this methodology, we are able to identify with complete certainty over 200 establishments in the Paris region. Then, using the name of the establishments and the NAF codes 52.29A and 53.20Z, we were able to identify almost 150 extra establishments, notably within the parcel industry's smaller networks of pick up points: Colis Privé, Relais Colis, Mondial Relay...

3.2. Differences in the location of the parcel industry and other logistics activities

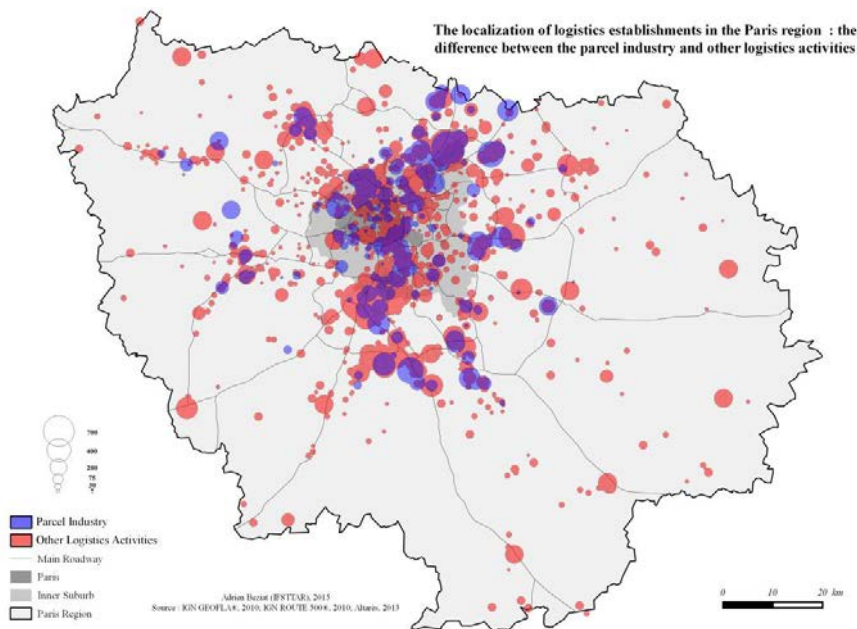


Fig. 1. Location of logistics establishments in the Paris Region: difference between the parcel industry and other logistics activities

We have identified about 350 establishments belonging to the parcel industry. This allows us to compare the location of these establishments with the location of about 2,000 other logistics establishments.

Fig. 1 shows the location of logistics activities in the Paris region, whether they are part of the parcel industry or OLA. Firstly, it shows a high concentration of logistics establishments inside the agglomeration, around several important nodal infrastructures: Rungis international wholesale market, CDG and Orly airports, waterway ports (most notably Gennevilliers). It also shows the great importance of main roadway junctions. It is interesting to note that inside the agglomeration, the location of the parcel industry and OLA is very similar. The differences are minor. The parcel industry is very concentrated around the Charles de Gaulle airport in Roissy (north-east of Paris), while the highest concentration of OLA is around Rungis wholesale Market (south of Paris). The presence of very big parcel industry establishments in the suburbs very close to Paris is also remarkable, while other logistics establishments are of more modest size.

[‡] This survey was conducted by phone by Marie Hegron and Adeline Heitz between May 1st 2014 and July 1st 2014.

[§] Our survey was administered before the evolutions of the Mory-Ducros company.

Of course, the biggest difference between the two is outside the dense agglomeration of Paris. Most parcel industry establishments can be found inside a circle which corresponds to the “Francilienne” (the third concentric ring road around Paris). Beyond this line, the overwhelming majority of logistics activities are not part of the parcel industry anymore. This means that OLAs are much more dispersed inside the metropolis than the parcel industry. This is confirmed by Fig. 2 below, which shows the average dispersion from the center of gravity of the establishments. The ellipsis is weighted by the number of employees of each establishment.

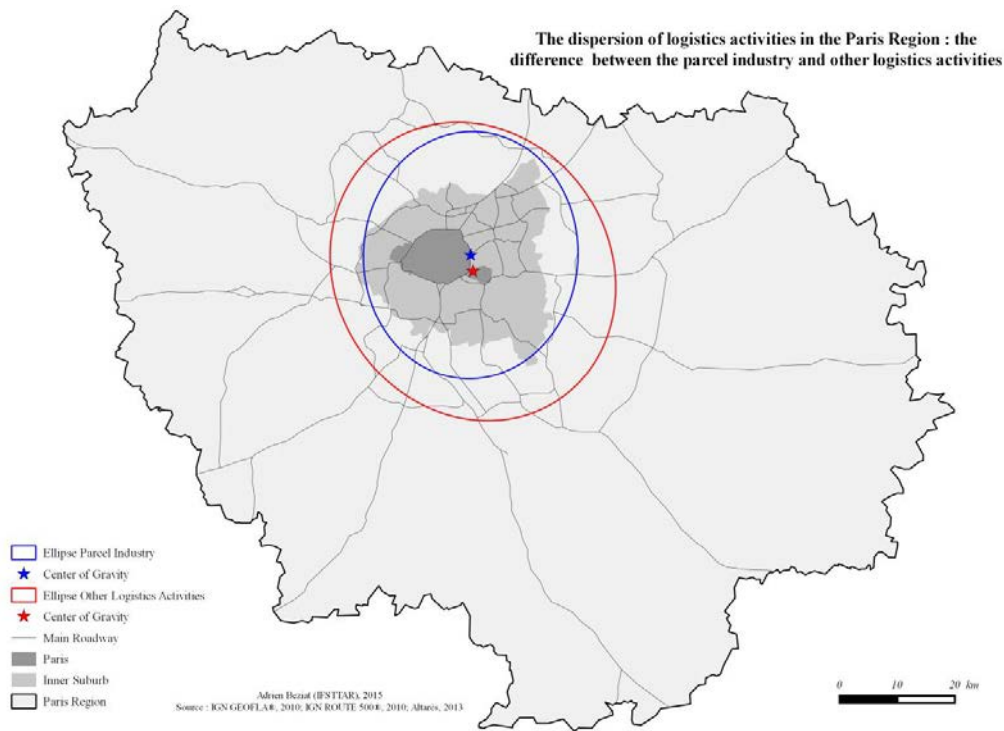


Fig. 2. The dispersion of logistics activities in the Paris Region: the difference between the parcel industry and other logistics activities

The difference between the two ellipses is striking. The parcel industry establishments are less dispersed than other logistics activities, by a very wide margin. The ellipse for the parcel industry is a bit more oriented towards the north, because these activities are very polarized by Charles de Gaulle airport in Roissy. Otherwise, the dispersion of other logistics activities is much more important towards the west, and even more towards the south and the east. This shows that our assumption was basically correct. It means that even though it had been sprawling between 1975 and 2010 (Dablanc and Adriankaja, 2010), the parcel industry is still nowhere near as dispersed as OLA.

4. The more central location of the parcel industry: between spatial hysteresis and logistical innovations

4.1. The weight of history and the territorial deployment of parcel industry companies: the emergence of a “spatial hysteresis”

As we observed in Section 2, establishments in the parcel industry are less dispersed than those in OLA, and they are more concentrated in the dense area of the metropolitan region. If the parcel industry’s sprawl is a long term tendency in the Parisian metropolitan area, as Dablanc and Adriankaja demonstrated (2010), we can see that it

remains relatively limited in spatial terms. Some establishments still remain in the heart of the city, while others are actively trying to relocate themselves there. In this section, we study the history of the major stakeholders of the parcel industry, and in particular how they built their cross-dock terminal network, which is a major determinant of their location strategies.** This historical factor, which explains why these companies have come to own valuable real estate in the city center, is not often tackled by the existing literature. One of the main reasons why the urban parcel industry is still located in the dense urban centers is that it relies on a network of cross-dock terminal which was inherited. Although the landscape of stakeholders in the parcel industry has evolved, there is a relative permanence in the location of their establishments.

According to Ducret (2012), there are two types of stakeholders in the urban parcel industry. Some are historical operators, such as La Poste (the French postal service) and its subsidiary companies (Coliposte and Chronopost). The second very important descendant is SNCF Geodis. SNCF is the historical semi-public French rail operator, and it has done road freight transport, through SNCF Geodis, for a long time. It has two subsidiary companies which specialize in the parcel industry (Geodis Calberson and Ciblex). Both are historical operators: they rely on a tradition of being a part of the parcel industry, and more importantly on a pre-existing network of cross-dock terminals and infrastructure which they can use for their business (Andrianakaja, 2014). As, in the past, they were the dominant force on the market, they generally had access to better location, near the urban center. Also, until the 1960's, the parcel industry was located in freight stations in the city center (Beyer 1999). They are now seeking to get closer to the motorway and major metropolitan area networks (airports) in the periphery (Rodrigue, 2004; Hesse, 2004; Woudsma et al, 2007).

The second type of stakeholders, we call integrating operators. In the 1990s, the face of the parcel industry changed considerably, with the arrival of several major operators (Artous and Salini, 1997), generally foreign companies, which arrived later on the parcel industry market. Most are global companies, and household names: UPS, TNT, FedEx, DHL, GLS, Ziegler... Integrated operators entered the urban parcel industry market through partnerships or through purchases of smaller regional companies. For example, FedEx bought the network of French national operator Tatex in 2010. Similarly, Ziegler bought Trans Service and Chatel in 2001. Today, historical operators are contributing to the integration of smaller networks: La Poste bought a company called Exapaq in 2006, a national network founded in 1995. These moves underline two evolutions: the line between historical operators and integrating operators is blurring, as historical operators start to behave like integrating operators. It also shows the competitiveness of the parcel industry market. As a result, the parcel industry's landscape is changing very rapidly.

When looking at Fig. 3 and the spatial distribution of the terminals of historical operators, we observe that their dispersion is much less than those of the integrating operators who recently bought into the market. The inherited real estate gives them an advantage over newcomers, as they have privileged positions in the center of the agglomeration. Of course, both the historical operators and the integrating operators have benefited from building terminals in the suburbs, and the deployment of a new real estate devoted to logistics in the periphery (CDAT, 2006; Raimbault, 2014), that increases their spatial coverage of the region. Through the sector's evolution, parcel industry companies have developed a network of terminals that can function in the Parisian metropolis (Harnay-Reme, Cruz, Dabanc, 2014).

** This historical analysis was part of the work by Marie Hegron and Adeline Heitz during the survey of the thirteen major parcel industry companies, between May 1st 2014 and July 1st 2014.

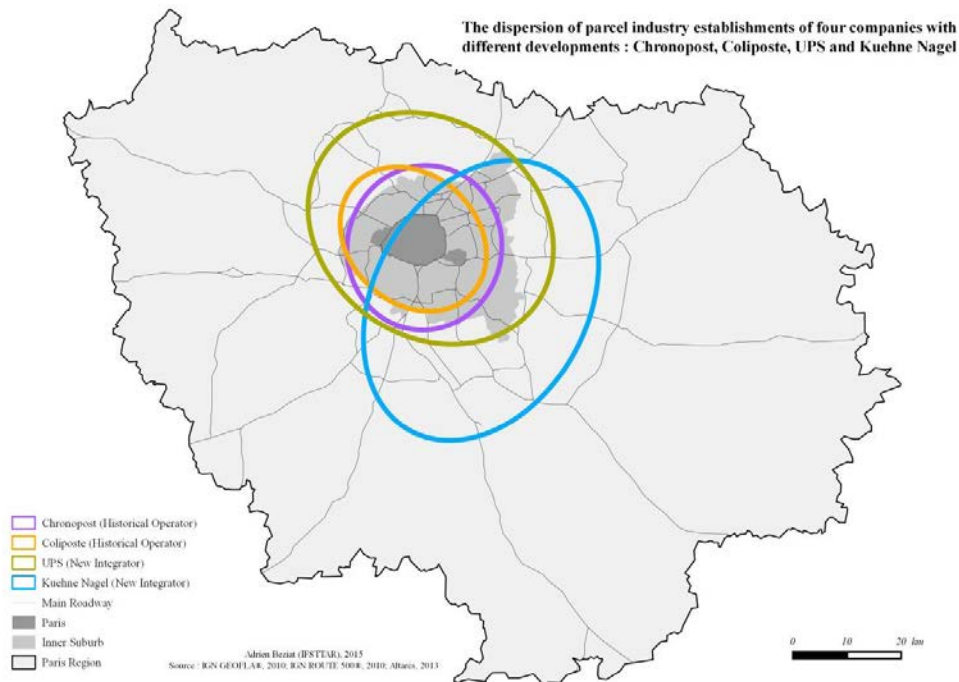


Fig. 3. The comparison between several parcel industry companies' networks: the lesser dispersion of "historical operators" (Chronopost, Coliposte) vs. the high dispersion of "integrating operators" (UPS, Kuehne Nagel)

There is a significant difference between segments of the urban parcel industry. We can posit a new factor of location of logistics activities, which is crucial in the case of the parcel industry: the history of its implantation. Companies that have been in the market for a long time enjoy a network of cross-dock terminals and terminals localized in the dense urban center. Companies that arrived later to the market have more difficulty establishing themselves in the same areas, simply because the real estate opportunities are not there anymore. Therefore, they will use other strategies, and call on other networks to cover the last mile, for examples using a cheaper subcontractor (Ducret, 2013).

Despite important changes within the parcel industry during the last thirty years, most operators have managed to adapt: they leaned on real estate that they preserved, or that they acquired, while developing a new network at the periphery of the suburbs. We can therefore observe a certain spatial permanence of these activities in the agglomeration, despite the fact that they are sprawling. We name "hysteresis" a "retardation of an effect when the forces acting upon a system are changed". We know that there is sprawl in the parcel industry, but at the same time there is a resistance to sprawl, which is due to the history of the stakeholders of the parcel industry. As we showed in part 2, the parcel industry is much less dispersed than OLA. We can say that there is a "spatial hysteresis" of the parcel industry, which limits its sprawl in the Parisian metropolis.

4.2. The rise of new transportation supply for the last mile: an opportunity for the parcel industry to return to city centers

In many European cities, and notably in Paris, we note the emergence of transport operators specialized in delivering the end consumer in city centers. Urban goods transport is a very fragmented and competitive market (Harnay-Reme, Cruz, Dablanc, 2014), with very little room for new stakeholders, except very small ones (Dablanc, 2007). The existing literature already lists a very large number of innovations in urban goods transport, involving cargo-cycles, barges, or electric vehicles. These spatial innovations supply a new market, sustainable goods

transport, which is presented as a virtuous alternative, respectful of the environment and public health. This very specific supply of transport only concerns the last mile in very dense urban environments. The center of the agglomeration is thus a laboratory for new ways of moving goods. These new alternative transport modes are very well suited to the highly complex networks and very narrow spaces of European urban centers. Whether it's bikes or electric vehicles, they can't cover great distances, so they have to focus on a very concentrated and dense customer catchment area. These new stakeholders contribute to the concentration of the parcel industry in the center of the city. This movement is generally analyzed as being an opposite to the sprawl of activities, and as a "return to the city center" for logistics activities.

When we looked at the main parcel industry companies of the Ile-de-France region, the historical operators and the integrating operators alike were interested in outsourcing the last mile to these new businesses. The last mile happens to be the part of the supply chain which is the most likely to be subcontracted (Harnay-Reme, Cruz, Dablanc, 2014). Amongst the subcontractors, there is a specialized branch, whose market niche is green and/or alternative means of transportation. These small companies are often experimental, and are still looking for a competitive and profitable business plan. Several studies (Maes, 2014) show that very often these businesses are not yet cost-effective nor are they competitive against other modes of transportation, especially trucks. While they may not be competitive right now, these initiatives may later prove profitable, given increasingly stringent municipal regulations of vehicles. These new transporters could soon benefit from a regulatory framework favorable to the development of alternative solutions. Some are expecting these new regulations, which would make them more competitive on the market than traditional transportation, and even lobbying for them. For the purpose of this paper, we have studied three cases in particular, through qualitative interviews with managers of these companies^{††}. These are transport operators who offer a parcel delivery service in Paris, using bikes and/or a barge, and more importantly, cross-docking platforms inside Paris. These companies have built their marketing strategy on alternative and sustainable mobility for the last mile.

From 2011 to 2013, the company Vert Chez Vous^{‡‡} experimented with deliveries from barges. Vert Chez Vous is not a subcontractor. It has two major shareholders: Labatut Transport and Tendron, both large French transport companies aiming to offer a sustainable urban goods transport service in Paris. They had a cross-dock terminal in the Tolbiac river port (in the South-East of Paris), where clients deposited parcels. These were then loaded in the barges, along with a fleet of electric-assisted cargo-cycles. Parcels were consolidated according to their destination and loaded onto the cargo-cycles on the barge. Then, the cargo-cycles were deposited on various river cross-dock terminals (cross-dock terminal "Henri IV" in the center of Paris, cross-dock terminals "Gros Cailloux" and "Grenelle" in the West of Paris...), to deliver clients in nearby districts. Each cargo-cycle could deliver 18 cubic meters of freight per day (in several tours). Distribution by barge was deemed too expensive, especially because the boat was not well-suited to the loading and unloading of the cargo-cycles to the cross-dock terminals. There were also maintenance problems with the cargo-cycles. Today, Vert Chez Vous is re-thinking its development and its network. It has acquired a 12,000 square meter cross-dock terminal in the city of Pantin, adjacent to Paris in the North East. Parcel consolidation is done here. Then, the parcels are delivered using electric trucks in Paris. The company considers the deliveries using the barge and the cargo-cycles as experimentation, a prototype for future improvement.

The company The Green Link runs on a very different and much simpler principle. It offers a delivery service in Paris, using cargo-cycles and electric vehicles, from three small terminals called "green hubs" located in the 10th district (center of Paris), 13th district (South-East of Paris) and 16th district (West of Paris). This company is a subcontractor for companies such as TNT and FedEx. Flows are optimized by an information system which processes flows in real time, following the routes of the delivery drivers.

This kind of innovative solution is not only for small companies. Household brands of the parcel industry are also trying to invent new solutions for deliveries in the city center. For example, Chronopost has opened its own cross-

^{††} Interviews were conducted with Vert Chez Vous and The Green Link in September of 2014. Chronoposte's Beaugrenelle cross-docking platform was visited twice: in October 2013 and April 2014.

^{‡‡} The name "Vert Chez Vous" is a pun in the French language. "Vers chez vous" (vers with a -s), which pronounces the same, means "near your home". Vert (with a -t) is the French word for Green.

dock platform in Beaugrenelle, an abandoned parking in the 8th district of Paris (the West of the city center). In this case, they distribute parcels themselves, while still relying heavily on subcontractors, who work from the platform. This delivery system illustrates a new strategy: the deployment of relatively large cross-dock platforms in the city center in order to have a better coverage of this zone. This location allows Chronoposte to use electric vehicles (although not exclusively) and to have a better control of the last-mile of the supply-chain by consolidating and deconsolidating inside the zone of the deliveries. Nevertheless, this strategy causes a lot of problems. Subcontractors have a very hard time accessing the Beaugrenelle platform: it is located in a very expensive neighborhood, in the center of Paris, while subcontractors generally live far away in the suburbs. They have to be there very early because they have to use the on-site fleet of vehicles instead of their own. Also, this kind of delivery system is very costly (because of the real estate and the respect of the very strict architectural regulations of the neighborhood). Despite all these problems, this strategy demonstrates the interest for parcel industry establishments to be located in the city-center. This kind of platform, in the heart of a very expansive neighborhood in Paris, demands important resources and capacity for investment from the company. It requires the intervention of the municipality, with subventions and the bending of architectural regulations. Therefore, this initiative also illustrates the capacity for public intervention and the emergence of the planning of logistics activities (a process that started in 2006 with the Delivery Charter) in the city of Paris.

Through those three *modi operandi*, we get a glimpse of the diversity of innovations in the parcel industry in urban centers, where the return of such activities implies the development of innovative systems taking into account the constraints of urban space to deliver freight. Since these initiatives are also supposed to be sustainable, there are additional difficulties. It is the capacity to connect with the main freight transportation networks (generally through subcontracting), and the ability to ensure low range deliveries in a very constrained and dense urban center, that make these initiatives spatial innovations. The trend to localize the parcel industry in the dense urban center is amplified by these innovative solutions, which are currently multiplying. However, the question remains whether these solutions are profitable and thence, economically sustainable. As the Vert Chez Vous experiment shows, it's still too early to tell, because these initiatives are at the prototype stage. But they will probably be a part of the parcel industry eco-system when it comes to subcontracting the last mile in very dense urban centers.

5. Conclusion

The literature shows that logistics activities are sprawling in metropolitan areas. We identified various sectors, and looked especially at the parcel industry. Our study shows that the location of the different logistics sectors is not homogeneous. There is a sizable difference between the dispersion of the parcel industry and the dispersion of other logistics activities. It means that although we know about the importance of the parcel industry's sprawl (Dabanc and Adrianakaja, 2010), the dispersion of the parcel industry is still inferior to the dispersion of other logistics activities.

This sector's proximity to the agglomeration is due to other factors that determine the location of logistics establishments, and explains why the parcel industry is less dispersed than other activities. In this study, we posit two factors which can explain the location of logistics activities. On the one hand, we studied how the history and legacy of the parcel industry helps to explain the location of logistics establishments. Historical operators are less dispersed than operators who bought into the market much later, and didn't have access to an ample supply of well-placed terminals in the dense center of the agglomeration. On the other hand, the literature shows that most of the parcel industry activity is actually subcontracted to smaller businesses that offer services matching the morphological and regulatory context of dense urban centers. We show that innovative solutions are a trend in the city of Paris, encouraged by the municipality. These innovative solutions are currently multiplying, although they still represent a marginal market share. The small subcontractors operating in Paris are struggling to survive, and they often experiment with innovative solutions, until they find the right combination to be competitive in a very difficult market. These innovative companies also contribute to making the parcel industry less dispersed than other logistics activities.

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References

- Adriankaja, D., 2014. Le desserrement logistique, quelle responsabilité dans l'augmentation des émissions de CO2 des activités de messagerie ? PhD dissertation, University of Paris-East, Paris, 2014, 279p. Non published.
- Artous A., Salini P., 1997. *Comprendre l'industrialisation du transport routier, une modernisation contradictoire*, Editions Liaisons, 196p.
- Beyer A., 1999. Géographie des réseaux de transport. Morphologies et dynamiques territoriales des services de messagerie. PhD dissertation, University of Paris XII, 1999, 619p.
- Beziat, A., 2015. Parking for Freight Vehicles in Dense Urban Centers: Issue of Delivery Areas in Paris, Proceedings of the 94th Transportation Research Board Annual Meeting. Washington D.C., USA, paper #15-2078.
- Bowen, J., 2012. A spatial analysis of FedEx and UPS: hubs and spokes, and network structure. *Journal of Transport of Geography* 24, 419-431.
- Browne, M., Sweet M., Woodburn A., Allen, J., 2005. Urban freight consolidation centers. Transport studies Group, University of Westminster, London.
- CDAT, 2006. Secrétariat général, du Ministère des Transports de l'Équipement du Tourisme et de la Mer, direction des affaires économiques et internationales, Dossiers du CDAT, Logistique, entrepôts, Immobilier d'entreprise 2002-2006, Décembre 2006.
- Cherret, T., Allen, J., McLeod, F., Maynard, S., Hickford, A., Browne, M., 2012. Understanding urban freight activity – key issues for freight planning, *Journal of Transport Geography* 24, 22 – 32.
- Dablanc, L., Andriankaja, D., 2010. The impacts of logistics sprawl : How does the location of parcel transport terminals affect the efficiency of goods movements in Paris and what can we do about it ?, *Procedia Social and Behavioral Sciences* 2, 6087-6096, The Sixth International Conference on City Logistics.
- Dablanc, L., 2014. Logistics Sprawl and Urban Freight Planning Issues in a Major Gateway City - The Case of Los Angeles. In J. Gonzalez-Feliu, F. Semet, and J.L. Routhier (eds.) *"Sustainable Urban Logistics: Concepts, Methods and Information Systems"*, Springer, 2014, pp. 49-69.
- Dablanc L., Montanon A., 2015. Impacts of environmental access restrictions on freight delivery activities The example of Low Emission Zones in Europe , Proceedings of the 94th Transportation Research Board Annual Meeting. Washington D.C., USA, paper #15-2827.
- Ducet, R., 2012. Livraison de colis et logistique urbaine : quelles recompositions de la messagerie en milieu urbain ? *Revue Française de Gestion Industrielle* 31 (3), 29-48.
- Dupeyron, M., 2000. La messagerie, une activité en mutation, Notes de synthèse du SES, Juillet-Août 2000, Temis, documentation Ministère du développement durable.
- Guerois, M. and R. Le Goix, 2000. La multipolarité dans les espaces métropolitains. In Mattei, M.F. and D. Pumain. In *« Données Urbaines 3 »*. Anthropos / Villes, Paris, 2000, 235-249.
- Harnay-Rème P., Cruz C., Dablanc L., 2014. La sous-traitance de la messagerie urbaine : logiques économiques et rapports de dépendance, to be published in *Socio-Economie du travail*, Novembre 2014.
- Heitz A., Dablanc L., 2015. Logistics Spatial Patterns in Paris: The Rise of The Paris Basin as a Logistics Megaregion, Proceedings of the 94th Transportation Research Board Annual Meeting. Washington D.C., USA, paper #15-4649.
- Hesse, M., 2002. Shipping news: the implications of electronic commerce for logistics and freight transport. *Ressources, Conservation and Recycling*, 36(3), 211-240.
- Hesse M., 2004. Land for logistics: locational dynamics, real estate markets and political regulation of regional distribution complexes, *Tijdschrift voor Economische en Sociale Geografie* (95)2, 162-173.
- Hesse, M., 2008. *"The city as a terminal: The urban context of logistics and freight transport"*. Ed. Ashgate, Aldersho, 300p.
- Hesse, M., Rodrigue J-P., 2004. The transport geography of logistics and freight distribution. *Journal of Transport Geography* 12, 171-184.
- Jacobs, J., 1961. *"The Death and Life of Great American Cities"*, New York, Random House, 480p.
- Maes, J., 2015. Welfare Economic Evaluation of Urban Freight Distribution Concept with Cargo Cycles, Proceedings of the 94th Transportation Research Board Annual Meeting. Washington D.C., USA, paper #15-4817.
- Merenne-Schoumaker, B., 2011. "La localisation des industries, Enjeux et dynamiques", Rennes, Presse Universitaire de Rennes, 263p.
- O'Sullivan, A., 2006. *"Urban economics"*, Boston: McGraw-Hill/Irwin, 432 p.
- Polèse, M. et Shearmur, R., 2005. *"Économie urbaine et régionale : Introduction à la géographie économique"*, Paris : Economica, 438 p.
- PIPAME, 2009. La logistique en France: indicateurs territoriaux, Septembre 2009, Étude prospective (Pôle interministériel de prospective et d'anticipation des mutations économiques – PIPAME).
- Quak H., Bolm S., Posthumus B., Bruening M., 2012. Innovative solutions for City Logistics, Demonstration and viability results, Association for European Transport and Contributors, 2012.
- Raimbault N., Douet M., Frémont A., 2010. Les plates-formes logistiques : entre fluidité et fixité. 4 pages, Programme de recherche FLUIDE, Agence Nationale de la Recherche, INRETS, ERA, FRET.

- Raimbault N., Adrianakaja D., Paffoni E., 2012. Understanding the diversity of logistics facilities in the Paris Region. *Procedia – Social and Behavioral Sciences*, 39, 543-555.
- Raimbault N., Bahoken F., 2014. Quelles places pour les activités logistiques dans la métropole parisienne? *Territoire en Mouvement*, Vol. 23-24.
- Savy, M., X. Liu, 2009. La plate-forme logistique, objet exemplaire d'aménagement urbain. Presentation at Premières journées du pôle Ville du PRES University Paris-Est, Marne-la-Vallée, France, 20 January 2009.
- SOeS, 2010. Enquête entrepôts, ministère, observation et enquête, 2010.
- Strale, M., 2013. La logistique : localisation des activités et impacts territoriaux. PhD Dissertation, University of Brussels, Belgium, 312p.
- Visser E.J., Lanzendorf M., 2004. Mobility and accessibility effects of b2c e-commerce: a literature review, *Tijdschrift voor Economische en Sociale Geografie*, 95(2), 189-205.
- Weltevreden J.W.J., Rotem-Mindali O., 2009. Mobility effects of B2C and C2C e-commerce in the Netherlands: a quantitative assessment. *Journal of Transport Geography*, 17(2), 83-92.