WAREHOUSING FACILITIES IN URBAN SPACE: THE CHALLENGES OF "PROXIMITY LOGISTICS"

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ABSTRACT

Warehouses are returning to city centers in the US and Europe, reversing a decades-long trend. This radical change is due to the desire of many e-tailers to deliver as quickly as possible to consumers who have ordered products online, adopting the same-day delivery model. Various business cases, including Amazon's, demonstrate that the battle over lead times is becoming a key element in e-tailers' strategies. To win this battle, it is essential to establish warehousing facilities as close as possible to consumers. Over the next few years, this shift will lead to profound changes in urban planning and city management. The same-day delivery model is being approached from an operational research perspective, particularly in terms of optimizing the location of micro-fulfillment centers. The research note also highlights the managerial challenges posed by consumers' digital nomadism, alongside the importance of optimizing micro-fulfillment center locations through operational research.

***Keywords**: Amazon; e-tailers; France; lead times; micro-fulfillment centers; same-day delivery; urban logistics.*

บทคัดย่อ

สถานที่จัดเก็บสินค้าในทั้งสหรัฐอเมริกาและยุโรปได้กลับมาอยู่ใจกลางเมืองอีกครั้ง หลังจากที่ถูกย้ายออกไปไกลเป็นเวลาหลายทศวรรษ การเปลี่ยนแปลงอย่างรุนแรงนี้เป็นผลมาจากความต้องการของผู้ค้าปลีกออนไลน์หลายรายที่ต้องการส่งมอบสินค้าให้ผู้บริโภคที่สั่งซื้อสินค้าออนไลน์ได้อย่างรวดเร็วที่สุดเท่าที่จะเป็นไปได้ โดยใช้โมเดลการส่งมอบในวันเดียวกัน กรณีศึกษาต่าง ๆ รวมถึงของ Amazon แสดงให้เห็นว่าการแข่งขันเรื่องระยะเวลานำส่งกลายเป็นองค์ประกอบสำคัญในกลยุทธ์ที่ผู้ค้าปลีกออนไลน์ใช้ เพื่อชัยชนะในการแข่งขันนี้ จำเป็นต้องจัดตั้งสถานที่จัดเก็บสินค้าให้อยู่ใกล้กับผู้บริโภคมากที่สุด ในช่วงไม่กี่ปีข้างหน้านี้จะนำไปสู่การเปลี่ยนแปลงอย่างถ้วนทั่วในการวางผังเมืองและการจัดการเมือง โดยส่วนใหญ่แล้ว โมเดลการส่งมอบในวันเดียวกันถูกนำมาพิจารณาจากมุมมองการวิจัยเชิงปฏิบัติการ โดยเฉพาะในแง่ของการเพิ่มประสิทธิภาพการตั้งที่ตั้งของศูนย์การเติมเต็มขนาดเล็ก อย่างไรก็ตาม บันทึกการวิจัยนี้เน้นย้ำถึงความท้าทายด้านการบริหารจัดการที่เกิดจากการเดินทางแบบดิจิทัลของผู้บริโภค ซึ่งมีผลกระทบโดยตรงต่อการจัดการลอจิสติกส์ในเมือง

คำสำคัญ: Amazon; โลจิสติกส์ในเมือง; ผู้ค้าปลีกออนไลน์; ฝรั่งเศส; ระยะเวลานำส่ง; ศูนย์การเติมเต็มขนาดเล็ก; การส่งมอบในวันเดียวกัน

Received June 4, 2024; Revised June 18, 2024; Accepted June 20, 2024

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INTRODUCTION

While some observers consider that the recent failures of quick commerce in several European countries spell the death of the ultra-fast delivery model after an online order (Clogan, 2022; Paché, 2022), some initiatives underline that the game is far from lost. Companies such as Amazon and Walmart are setting up small urban warehouses (mini hubs) to deliver to their customers rapidly. Is the dominant framework of home delivery within 24 to 48 hours from regional mega-warehouses dying out?

Several current developments suggest that the answer is affirmative, with warehousing facilities gradually reclaiming urban spaces—such as former bankrupt small shops or underutilized parking garages. From an operational standpoint, we are witnessing the proliferation of dark stores and micro-fulfillment centers, even in residential areas, to deliver products ordered online within two or three hours, or even less. This exceptional responsiveness represents a significant disruption, the implications of which have yet to be fully explored.

Finally, a new model is emerging: distributed logistics in the heart of modern cities. This model breaks away from the old paradigm based on the massification or consolidation of flows in mega-warehouses located far from urban areas, often dozens of kilometers away. Research conducted in the mid-2010s—but still relevant today—on the French case indicates an average distance between a store and a warehouse of 200 kilometers for a convenience store and supermarket, is 230 kilometers for a hypermarket, and 400 kilometers for a freezer center (Bahoken *et al.*, 2016). The reason for this major disruption lies in a *battle over lead times* that is already prominent in the United States but could soon intensify in Europe. Emerging signals indicate that the ability of e-tailers to deliver within minutes to consumers obsessed with 'everything, right away' is becoming a sustainable competitive advantage. However, this advantage can only be fully realized with particularly efficient “proximity logistics” (or local logistics), exemplified by Amazon's rapid expansion of urban mini hubs in the United States.

In a stimulating article, Tchokogué *et al.* (2011) study the evolution of purchasing structures with reference to a *pendulum in action*. The concept underscores that periods of centralization in decision-making processes alternate with periods of decentralization, influenced by various internal and external environmental factors. This approach aims to highlight the drivers of change that significantly impact organizational structures. Similarly, the article applies this reasoning to the context of warehousing facilities, emphasizing the influence of new consumer demands on supply chain strategies. The investigation focuses on a subject that is beginning to be explored in the academic literature, but often concerned with strictly technical dimensions (Côté *et al.*, 2020; Wu *et al.*, 2023; Li *et al.*, 2024). Numerous studies in Operations Research (OR) explore the placement of urban mini hubs, the optimization of order-picking activities or the use of artificial intelligence for enhanced delivery planning, but without always referring to the societal shifts that have led to the rapid development of ultra-fast shipping.

This perspective forms the research focus of this paper: highlighting structural changes in retail logistics driven by new service expectations from an increasing number of consumers. Theoretical concepts from retail logistics management are therefore essential to identify the *pendulum* mentioned above. Two central theoretical dimensions emerge: on the one hand, the

quest for competitiveness based on lower costs, which requires a constant effort to massify flows in mega-warehouses; on the other hand, the desire to win the battle over lead times, which demands extreme responsiveness to orders placed online, and consequently the presence of "proximity logistics", with small-scale warehousing facilities. With these dimensions established, it is possible to better understand the foundations of the same-day delivery model, at the heart of a "managerial revolution".

To this end, the paper is structured as follows: firstly, we briefly examine flow massification, leading to a process of logistics sprawl, which is called into question by the battle over lead times, as indicated in the second section. The third section focuses on the same-day delivery model, which implies the implementation of micro-fulfillment centers. This is undoubtedly a universalist model, exemplified by its rapid adoption in France discussed in the fourth section, followed by a discussion of the societal and environmental issues associated with the implementation of "proximity logistics" in a fifth section.[1]

Box 1: Methodological Clarifications

Given the nascent stage of the same-day delivery model and the "paucity" of work linking logistical choices with consumer behavior, the paper is exploratory in nature. It relies exclusively on secondary data, sourced from the trade press articles and consulting reports, notably available online. Secondary data are a source of information that has been used for years in management research. With increasing ease of access, they represent a highly valuable tool for obtaining detailed data at low cost.

National-scale studies provide data that would have been challenging for individual researchers to gather independently. Moreover, the data are available over multiple periods and can provide insights into trends and changes over time. This is particularly true of Amazon, which is the subject of a large body of documentation, given that the company is at the forefront of ultra-fast shipping and the development of micro-fulfillment centers in the United States, and more recently in France.

FLOW MASSIFICATION

For nearly 50 years, the dominant logistical approach has been that of massification, with the idea that it is essential for companies to "see" bigger and bigger to reduce the unit costs of transporting their products, with a major impact on the explosion in land requirements, including negative impacts (McKinnon, 2009; Yang, 2019). With the seminal work of Porter (1980) four decades ago, it is no secret that this is one of the major options for pursuing a low-price policy based on a strategy of cost leadership. Large food and non-food retailers are no exception to this trend, with a systematic search for economies of scale in supply operations based on a "volume rationale." From this viewpoint, the implementation of central purchasing units on a continental—or even global—scale to negotiate more effectively with suppliers is well known, it is a movement mirrored in retail supply chains.

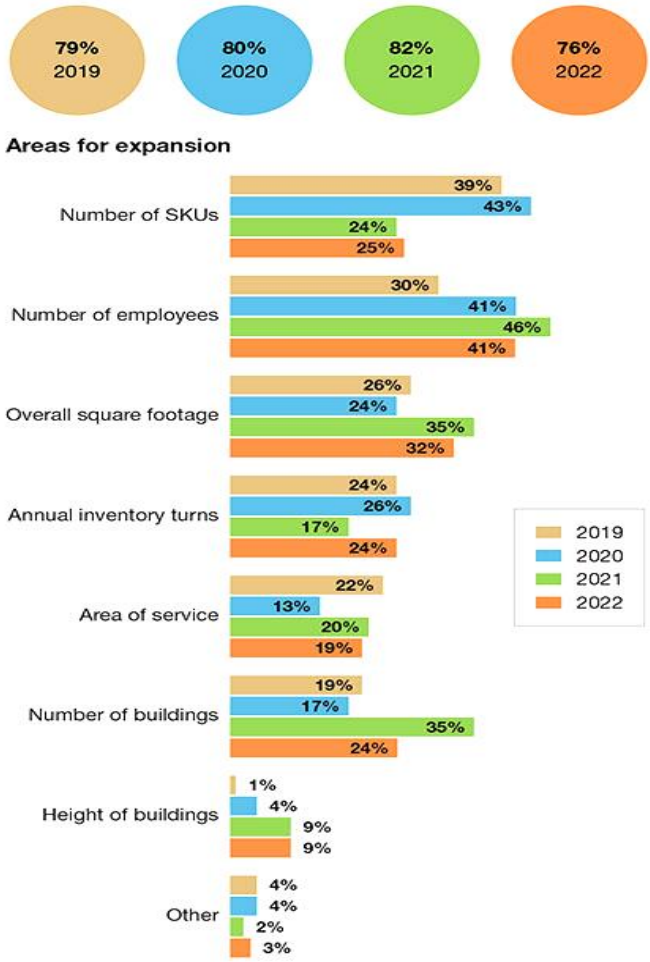
For evidence of this trend, one only needs to look at the evolution in the size of their warehouses stocking Fast-Moving Consumer Good (FMCG) before delivery to stores, with

I would like to thank the assistant editor, Ms. Pan Wit Yee, and anonymous reviewers of the *Journal of Supply Chain Management: Research & Practice* for taking the time and effort necessary to review the first draft of my paper. I sincerely valuable comments and suggestions, which helped me to improve many developments. I appreciate all valuable comments and suggestions, which helped me to improve many developments.

the multiplication of mega distribution centers from the 2000s onwards (Andreoli *et al.*, 2010). While in the 1980s, the idea of "logistical cathedrals" was evoked for 20,000 m^2 structures (Savy *et al.*, 1984), today it is a commonplace standard, as warehouses well more than 100,000 m^2 proliferate huge logistics parks dedicated to warehousing facilities, such as Garonor, north of Paris, following the model of 'logistics clusters' popularized in China (for a literature review on logistics parks, see Yang *et al.*, 2013). Unsurprisingly, in the world of large-scale retailing, the United States is home to the world's largest warehouses: 140,000 m^2 for Walmart in Arizona, 185,000 m^2 for Target in Georgia, 260,000 m^2 for Nike in Tennessee and even 335,000 m^2 for Amazon, again in Tennessee.

Figure 1 shows that distribution center expansion plans have been moving in the direction of gigantism for several years now, in terms of warehouse surface area, the number of Stock Keeping Units (SKU) stored and number of employees. France is far from being left behind, even if the country's geographical scale justifies smaller warehouses: in the Paris region, Amazon and Conforama (home furnishings) have a 145,000 m^2 warehouse for the former, and 180,000 m^2 for the latter, which is no mean feat. Kang (2020) uses the managerial image of the *sprawling warehouse* that gradually disconnects from urban life, pushing logistical activities out of sight.

Figure 1: Distribution Center Expansion Plans In The United States

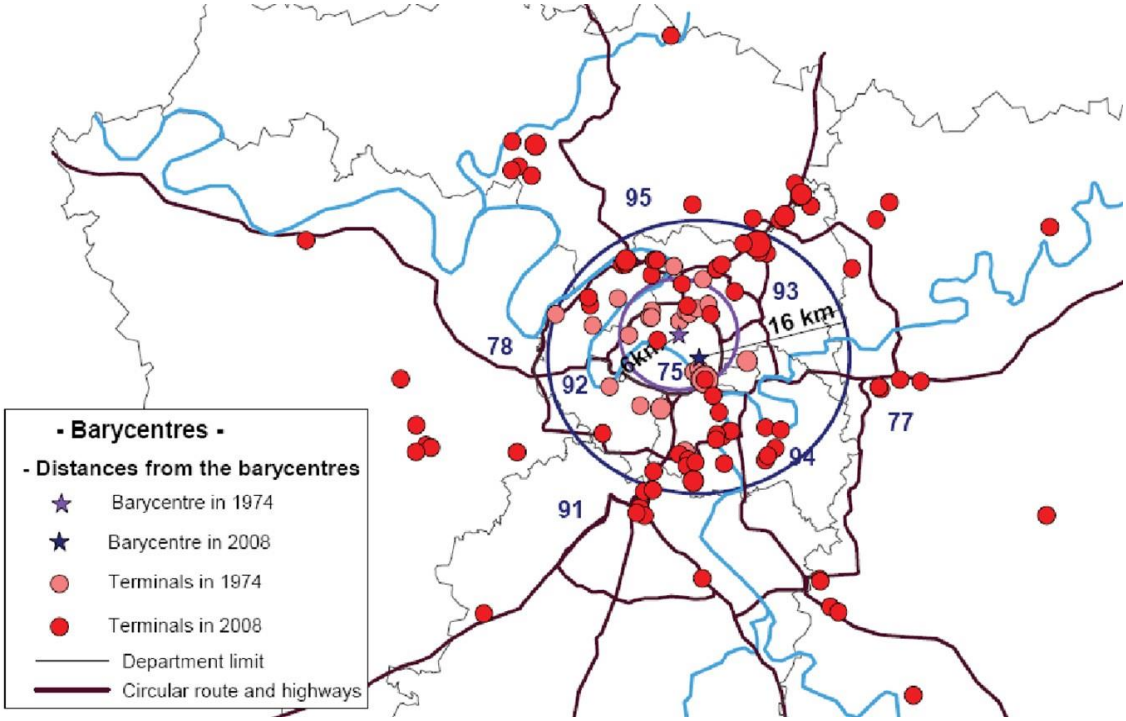


Source: Peerless Research Group, 2022.

Indeed, one prominent consequence of massification in terms of the spatial location of logistical activities is that warehousing activities are located far from cities, where the availability of large spaces is less costly. An academic only must travel along certain motorway corridors to see, here and there, peripheral zones dedicated to warehousing, from which deliveries are organized to urban areas. The phenomenon is well-documented by economic geography through the notion of logistics sprawl (Aljohani and Thompson, 2016; Charters-Gabanek *et al.*, 2024).

An abundance of literature offers a variety of maps highlighting the extent to which warehouses in various parts of the world are gradually moving away from the heart of cities. Figure 2 highlights the example of Paris, analyzed by Dablanc and Rakotonarivo (2010), and highlights the gradual move away from warehouses between 1974 and 2008 (the phenomenon has continued since). These warehouses are physically disconnected from the heart of the city, whereas history had left a legacy of logistical structures *embedded* in urban space to store essential goods.

Figure 2: Warehouses Moved Away From The Heart Of Paris Between 1974 And 2008



Source: Dablanc and Rakotonarivo (2010).

The most emblematic historical case is that of the famous *Compagnie des Entrepôts et Magasins Généraux de Paris*, whose primary mission was to provide a regular supply of agricultural produce and raw materials (wheat, flour, sugar, coal, etc.) to the inhabitants of the French capital. Memories of the "hunger revolts" of the 18th century remained vivid in the collective unconscious of a people always ready for violent street demonstrations, as France is wont to do, in the image of the insurrections during the Yellow Vests movement in 2018-2019 (Shultziner and Kornblit, 2020), which the world's media covered. By 1866, the *Compagnie des Entrepôts et Magasins Généraux de Paris* had built up a vast network of warehouses in numerous Parisian buildings, most of them located in the north of Paris, along the Canal

Saint-Denis and the Bassin de la Villette, in the immediate vicinity of river and rail links (Philipp, 2007). Put another way, this was a veritable logistical network that lasted until the 1950s, when it gave way to television studios (see Box 2).

Box 2: Back To The Future: Congested Logistics In The Heart Of Paris

In the second half of the 19th century, urbanization and industrialization led to the construction of factories in the suburbs of Paris. Supply capacities were increasing, and stock was needed. The north-eastern suburbs of the French capital offered undeniable advantages: an ideal location close to the main road network and vast tracts of available land, much cheaper than in the city center. In 1866, a Parisian entrepreneur, Georges Tom Hainguerlot, bought land near the Canal Saint-Denis.

The *Compagnie des Entrepôts et Magasins Généraux de Paris* took over the site and continued to expand it to construct its own storage buildings. By the 1950s, the site encompassed the entire area stretching along the edge of Paris, from Porte de La Villette to Porte de La Chapelle. It was connected to the northern and eastern rail networks, the industrial railway, and the Canal Saint-Denis. After de-industrialization, the warehouses remained unused for an extended period. A new wave began with the installation of audiovisual companies and television studios, followed by the new luxury-oriented Porte d'Aubervilliers district, especially with the "Chanel fashion factory" inaugurated in 2022.

Source: Adapted from https://eco.plainecommune.fr/ (Accessed April 6, 2024).

BATTLE OVER LEAD TIMES

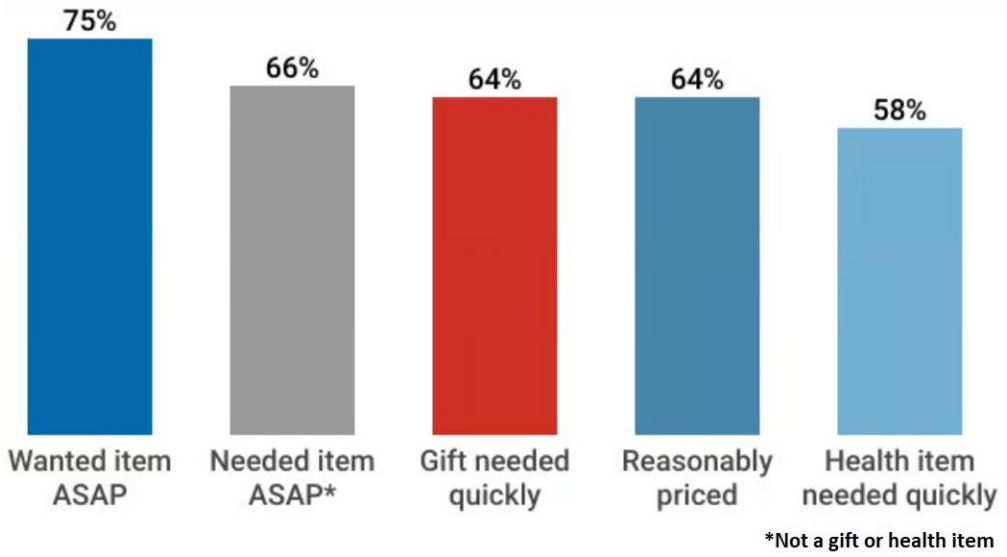
The world of commerce and logistics is obviously nothing like it was in the late 19th and mid-20th centuries. And yet, paradoxically, logistics—and especially the warehousing facilities of FMCG—are reinvesting city centers as they once did. The word "*paradox*" is not too strong, since for decades the managerial doxa was to consider that urban space was scarce and expensive, and should therefore be allocated primarily to commercial activities, and not to non-value-creating logistical activities. The rise of e-tailing is changing the rules of the game, even more so since the Covid-19 pandemic. As several researchers have pointed out, the urban consumer is no longer willing to go to a physical store to do his/her "ordinary shopping," whereas highly ergonomic websites make it easier to complete the purchase. It is no exaggeration to speak of a groundswell for generations Y and Z, adepts of new technologies and "digital nomadism" (Atanasova *et al.*, 2022), a generation for whom the smartphone is a key device enabling them to have the world at their fingertips, an original expression introduced by Lorenzi and Le Boucher (1979) at the beginning of the telematics revolution.

However, the growing number of online orders poses a major logistical problem in terms of delivery, especially when consumers reject pick-up point or click and collect solutions, necessitating them to travel to pick up products ordered online. As mentioned above, product warehousing has gradually been relocated to the outskirts of urban areas, or even dozens of kilometers away (see Figure 2), housed in increasingly larger mega-warehouses. Geographical remoteness combines with order-picking constraints to optimize the use of material and human resources. As the size of a warehouse increases, the volume to be processed mechanically increases, and the consolidation of flows becomes central. For instance, to minimize costly vehicle movements between cities—such as the 35 kilometers between Jade

and Luna in Aix-en-Provence and Léia in Marseille—online orders may need to be strategically grouped together during preparation. It is therefore logistical optimization at order preparation level that defines the level of service offered to customers, particularly in terms of delivery times (and time slots).

The fierce battle over lead times is reshuffling the deck in an increasingly speed-oriented context. Numerous studies in consumer behavior have noted a profound transformation in expectations, with a growing demand for near-instant access to products purchased online, particularly in major metropolises such as New York, Paris and London. According to a study conducted by the U.S. Postal Service Office in 2023, more than three-quarters of American consumers placing an order online and sensitive to noticeably short delivery times now want to receive packages *within three hours of ordering*. As shown in Figure 3, the speed of delivery execution expected by consumers applies just as much to products intended for personal use as to last-minute gifts, such as forgotten wedding anniversaries. Contrary to widespread belief that only a few specific items fall within the scope of ultra-fast shipping, digital nomads of generations Y and Z consider that instant access to the offer on a smartphone must be coupled with instant access to the tangible product purchased online.

Figure 3: Ultra-Fast Shipping Expectations In The United States



Source: U.S. Postal Service Office, 2023.

To capture digital nomads who prioritize near-instant product availability, various companies have launched a mad dash for extreme reactivity, while guaranteeing compliance with the ultra-fast delivery marketing promise made on the website (Fotouhi and Miller-Hooks, 2023). Many observers have followed with interest the initial "battles" with quick commerce and its marketing promise of 15-minute delivery after an online order in several European cities. In Europe, notably with the bankruptcy filings in 2023 of Turkish giant Getir in France, Italy, Portugal, and Spain (Khalaf, 2023), preceded by a succession of start-up failures, a hasty conclusion was drawn: quick commerce is dead on the battlefield of delay. Should we stop at these misadventures to consider that it is impossible to do better than deliver in 24 hours? This would be a main error of analysis, because delivering to a customer quickly could soon become a unique source of customer loyalty, provided that efficient "proximity logistics" is implemented (Bueldo Rai *et al.*, 2022).

"Proximity logistics" can be seen as the set of activities linked to the movement of products within a small territorial jurisdiction (Tongiani *et al.*, 2022), such as a city. This is an important topic for supply chain management research, since geographical distance mechanically lengthens delivery times, due to the limited speed of means of transport and the absence of a teleportation system. Although an experiment conducted at the University of Geneva in 2014 enabled the quantum teleportation of a photon over 25 kilometers, an application to parcels remains improbable for decades—or even centuries. The aim of "proximity logistics" is therefore to shorten the time between an online purchase and the availability of products for the consumer. This topic has given rise to several studies, which propose different logistical strategies to win the battle over lead times (Durand and Gonzalez-Feliu, 2012). The process has accelerated over the last ten years with the same-day delivery business model.

IS SAME-DAY DELIVERY ON THE WAY?

A managerial revolution is on the horizon in the context of "proximity logistics" and, as is often the case, the change is coming from the United States, under the aegis of the giant Amazon: e-tailers must be able to deliver an order in a few hours, rather than a few days. What has been going on for the past few years? Amazon is clearly looking to take on Walmart, the world's largest retailer, which has positioned itself on the same-day delivery market with Walmart+ and Express On-Demand Early Morning Delivery (see Box 3), in other words, deliveries a few hours/minutes after an online order (Weinstein *et al.*, 2022).

Walmart aims to leverage its vast network of physical stores to pull off this logistical "*coup*," and positioning the Walmart+ service as a direct response to Amazon Prime, priced less than the latter (though requiring a larger basket to qualify for free delivery). In response, Amazon's same-day delivery is a major area of development for the coming years and justifies massive investment in urban storage and order-picking centers, known as *micro-fulfillment centers*.

Box 3: A New Same-Day Delivery Service From Walmart

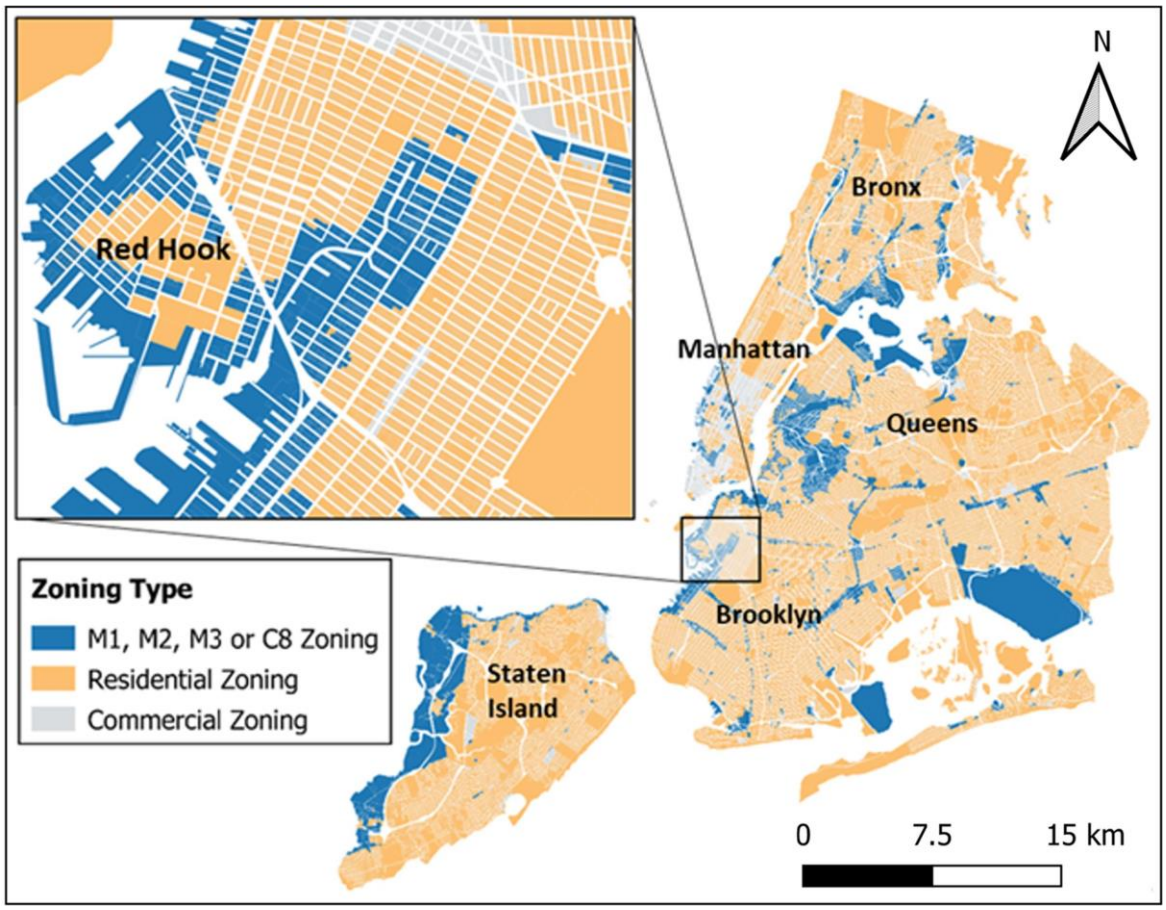
In March 2024, Walmart launched an early delivery service aimed at delivering products to customers' doors on demand in as little as 30 minutes, starting at 6 a.m. The new Express On-Demand Early Morning Delivery expands efforts that began with store curbside delivery in 2013 and subsequently added doorstep and InHome delivery options, according to the company. "Starting at 6 a.m., earlier than ever before, customers can enjoy the convenience of on-demand delivery," the company said in a statement. "With hundreds of thousands of items available in-store and hundreds of millions more online, customers can easily get what they need during the early-morning hours from fashion to furniture and beyond in as soon as 30 minutes."

Walmart's new delivery option is aimed at meeting the start-of-the-day needs of customers. Some examples cited: (1) The household that runs out of formula or diapers and needs them quickly in the morning; (2) The worker who finds last-minute needs while preparing to leave for the job; or (3) Appliance needs when those used in the daily routine break down by surprise.

Source: Adapted from *Transport Topics*, March 13, 2024.

The aim of a micro-fulfillment center is to bring products closer to the end consumer, and thus speed up delivery of the products ordered[2]. Figure 4, which refers to the case of New York, shows that areas zoned for warehousing facilities are located as close as possible to residential areas. The micro-fulfillment center as urban mini hub prepares many orders containing a small number of items, as is often the case with online sales (Alessandro *et al.*, 2022). The emergence of micro-fulfillment centers has coincided with the boom in e-tailing, which has transformed consumer behaviors, including China (Xiao *et al.*, 2021). In addition to the great complexity of order management, consumers now demand ever-faster delivery, leading to massive automation of both storage and order-picking tasks. For instance, data analytics and artificial intelligence can be used to predict the quantity of orders based on historical data, to speed up parcel assembly (Adulyasak *et al.*, 2024). The gamble based on the application of technology in warehouses makes it possible to boost operations, improve stock management, reduce errors, and eliminate additional logistical costs.

Figure 4: Warehousing Facilities Zoning In New York (2021)



Source: Buldeo Rai *et al.* (2022).

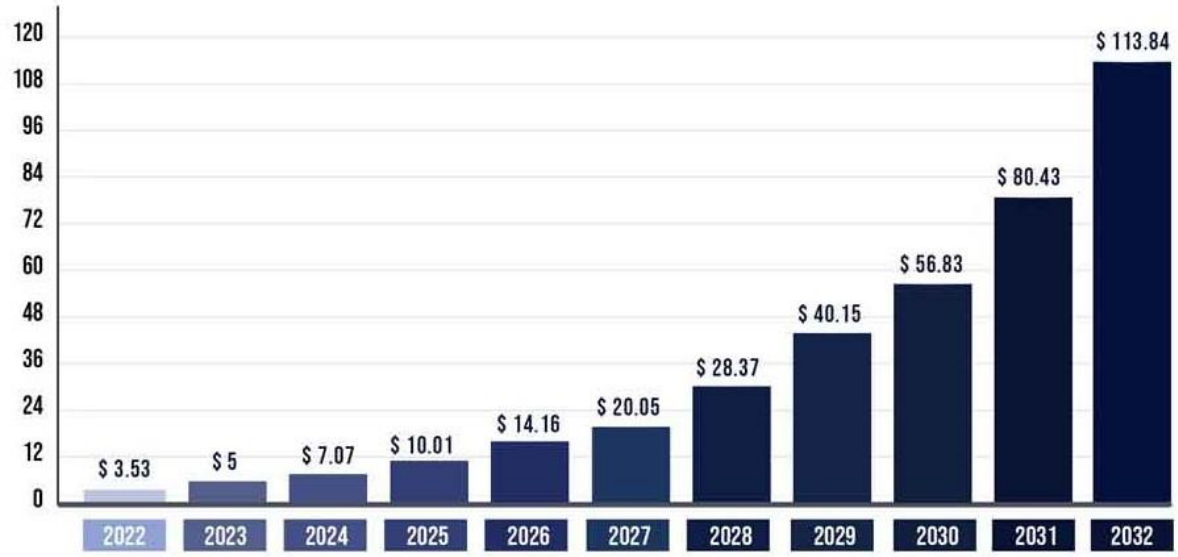
In the medium term, the company plans to build no less than 1,000 to 1,500 such centers in North American large cities (Soper, 2020), leading Amazon to undertake massive urban expansion to reduce delivery times, while guaranteeing a low level of errors in order

[2] One of the main differences between micro-fulfillment centers and traditional fulfillment centers concerns product handling. In a traditional fulfillment center, employees handle the distribution of pallets, whereas in a micro-fulfillment center, employees handle individual products.

preparation, a key factor in ensuring high customer satisfaction (Zhang and Smutkupt, 2021). This is a reversal of the old logistics strategy based on the presence of gigantic distribution centers in tax-advantaged States, since the United States is based on vastly different tax policies depending on the geographical area (the most high-profile case being Delaware, which has tax haven status). As early as February 2020, Amazon Prime customers in Philadelphia (Pennsylvania), Phoenix (Arizona), Orlando (Florida) and Dallas (Texas) were able to order from a list of around 100,000 of the most popular items and receive them in just a few hours: before 6 p.m. for orders placed that morning; before 1 p.m. for orders placed the night before. Expansion has continued ever since, and by 2023 at least 90 urban areas will be covered by same-day delivery, with plans to double this number by the end of 2025.

Micro-fulfillment centers are therefore essential if same-day delivery is to be a winning strategy. As shown in Figure 5, this will undoubtedly be one of the most dynamic retail logistics markets by 2032. However, it poses several problems that can hinder its development. On one hand, they require substantial investment, especially for solutions with a high level of automation, while the volumes handled are lower than those of regional mega-warehouses. On the other hand, territorial coverage relies on location decisions that depend directly on population density, which can vary over time, for example with the mass departure of families from the city to the surrounding countryside. The risk is that inventory management between the nodes of the logistics network—in other words, between micro-fulfillment centers—may depend on socio-economic changes that are sometimes difficult to anticipate. This instability is much less pronounced in the case of regional mega-warehouses set up to supply stores belonging to distribution networks that are either perennial or transforming at a slow pace. However, Amazon's expansionist micro-fulfillment center strategy clearly indicates that same-day delivery is a logistical choice that should not be underestimated.

Figure 5: Micro-Fulfillment Market Size From 2022 To 2032
(In Billion US Dollars)



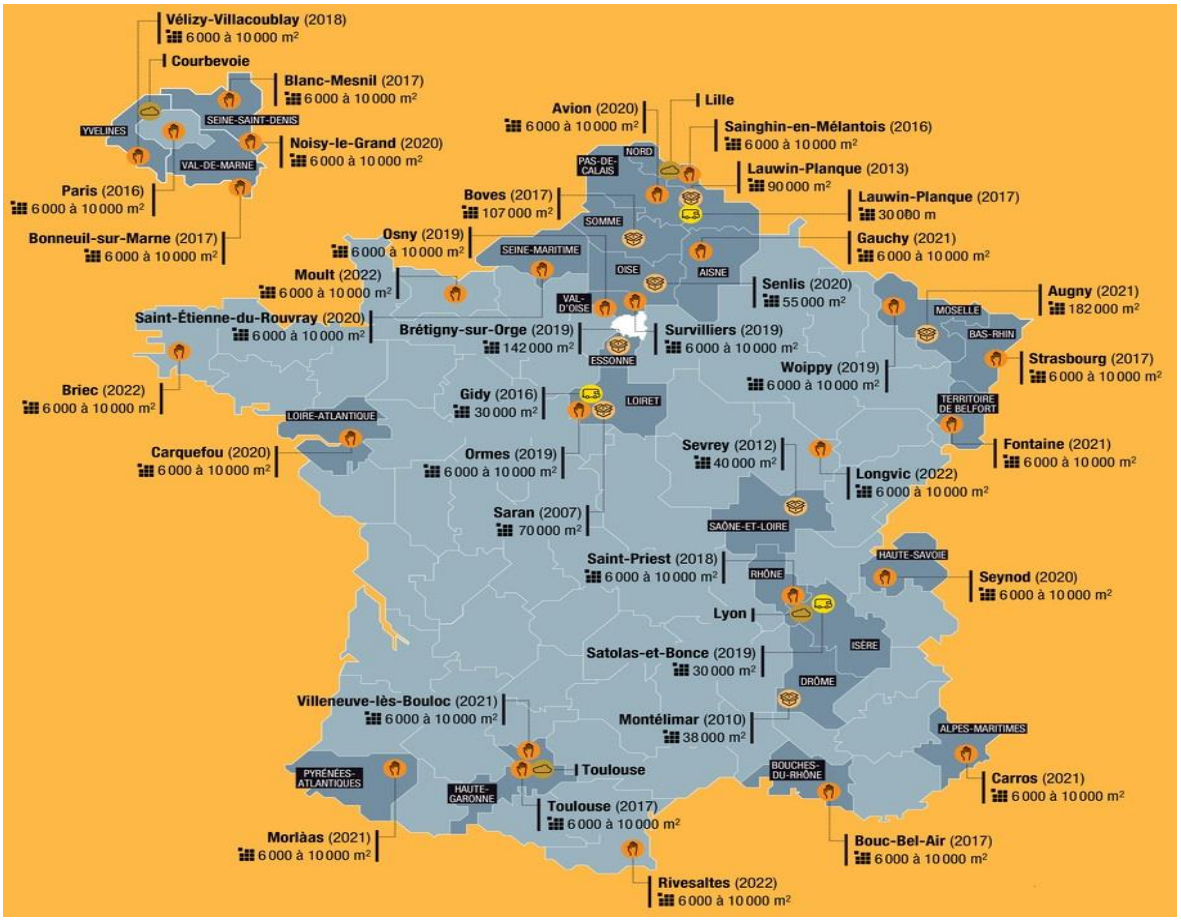
Source: Precedence Research Consulting, 2023.

DOES THE "FRENCH EXCEPTION" STILL EXIST?

The temptation to assert that the United States is not France is undoubtedly based on cultural, economic, and societal differences. In the same way, the topography of old European cities has nothing in common with the topography of North American large cities (Strano *et al.*, 2013), for example, with the presence of city centers that attract the population, where North America's affluent classes want to live in quiet suburbs far from urban congestion and crime. In short, it would be a case of pointing out that the same-day delivery model may not be in the habits of a French consumer who cultivates a certain *nonchalance*[3] and is inclined to look primarily for low prices in times of high inflation, rather than ultra-fast delivery. After all, did quick commerce not falter in France after initially sparking hopes of a new e-tailing model that had succeeded elsewhere, in Asia for example?

Nevertheless, despite Amazon's substantial investment in logistics centers in France since 2007, some of them which are monumental (see Figure 6), the American giant is also developing small warehouses in major cities, importing the strategy deployed in the United States (Guerrero *et al.*, 2022).

Figure 6: Amazon Warehousing Facilities In France (2022)



Source: Adapted from *L'Usine Nouvelle*, January 26, 2022.

[3] Sansot (1998) offers a sociological analysis of "French wisdom," which can be recognized by the desire not to be rushed by time, to let bodies and souls breathe through strolling and rest.

The most remarkable case is certainly Paris, where 25 micro-fulfillment centers have been opened since 2016. However, provincial cities are also partaking, such as Nice in the south of France and Belfort in the east. Admittedly, the marketing argument put forward is to make the French capital the first European city to have decarbonized deliveries, in keeping with its tourist image—and being aligned with the environmental positioning of the 2024 Olympic Games; the plan is to extend its green strategy to the whole of France soon (see Box 4). It must be said that two-thirds of Amazon's deliveries in Paris *intra-muros* emit no CO_2, thanks to the use of electric vehicles (Guillet, 2021).

If Amazon is thus seeking to assert its *sustainability leadership* in the e-tailing universe, to quote Orr and Jadhav (2018), its logistics strategy remains above all associated with the battle of lead times and the obsession with an extreme level of responsiveness, two main drivers of the "pendulum in action" in the words of Tchokogué *et al.* (2011). Who could doubt that the logistics mesh here corresponds to Amazon's desire and will—for proximity management as seen in the United States (see Figure 4)?

Box 4: Does Amazon Go Greener And Greener?

Amazon aims to extend its clean mobility strategy to several cities in France, with the aim of achieving net zero emissions for all its activities by 2040, ten years earlier than the target set by the 2015 Paris Agreements. This is already the case in Annecy, Savoie, where 100% of deliveries are made using carbon-neutral transport solutions.

This commitment is part of its global "Shipment Zero" program, which strives to achieve carbon neutrality for all deliveries. "This takes into account the distribution centers in which orders are prepared, the packaging materials, as well as the means of transport used to deliver our customers to the address of their choice," Amazon states. To achieve this, the company is seeking to reduce delivery distances by increasing the number of urban centers.

Source: Adapted from *Téma*, March 16, 2023.

Obviously, Amazon's micro-fulfillment centers are based on a "calibration" and organization that have nothing in common with the massive warehouses shown in Figure 3. On the contrary, as indicated, they stock only FMCG, those most in demand by customers in urban areas (De Silva *et al.*, 2020). These include frozen foods, high-tech products, pet supplies, toys, and aperitifs. Nothing to do with garden furnishings or household appliances, whose low turnover and size justify processing in mega-warehouses.

From these micro-fulfillment centers, deliveries are organized in less than two hours for Amazon Prime members (the minimum basket size is 20 euros, and delivery is charged at 3.90 euros, but free if the basket exceeds 60 euros). Delivery in less than 1 hour is available for certain zip codes in provincial cities, at a cost of 7.99 euros (May 2024 data). In short, Amazon's business model is clearly focused on winning the battle of time in a hyper-competitive market. More broadly, the company's two-decade history highlights a strategy of locating warehousing facilities to improve access to consumer markets (Rodrigue, 2020).

DISCUSSION AND CONCLUSION

The Amazon case, widely discussed in the article, is certainly not unique. On the contrary, the company tends to position itself as the *avant-garde* leader of a new "proximity logistics"

model that inspires other large retailers, and even an academic like Rouquet (2019) who, in a humorous tone, does not hesitate to suggest transforming Notre-Dame de Paris into an urban warehouse. Over the past year, Picard Surgelés (frozen foods) has embarked on an ambitious investment program as part of an innovative supply chain plan. As France's market leader, the company is clearly a forerunner in logistics, since its first warehouse was built in 1976, at a time when the dominant model was still that of direct delivery to stores from manufacturers' factories. However, Picard Surgelés is now developing a network of micro-fulfillment centers of 500 to 600 m^2, with priority given to several high-potential French cities such as Bordeaux, Paris, and Lyons. The primary objective is to ensure deliveries within a maximum of three hours of an online order, albeit with a reduced product assortment. It is with the utmost interest that we must examine these current developments.

The resurgence of warehousing facilities in the city is undoubtedly a sign of a major economic and societal transformation, the full extent of which has yet to be realized. In a detailed forward-looking analysis, the World Economic Forum (2020) underlines that in Europe, same-day delivery accounts for just 5% of all deliveries following online orders. Readers of this article might therefore think that the phenomenon mentioned is no more than confetti-sized. Such an error of analysis could prove dramatic, as the Covid-19 pandemic has underlined the extent to which "everything, right away" has become a commonplace behavior. Same-day delivery within a few hours of placing an order online could very quickly become a standard of service quality, and under these conditions, the micro-fulfillment center is likely to become a *structural component* of the city of tomorrow. There are numerous implications for new urban freight developments, as highlighted by Alho *et al.* (2023).

Among the most significant implications, the question of the disputed use of public space is undoubtedly the most critical. While the same-day delivery model relies on low-pollution, low-noise delivery vehicles, they unfortunately "consume" a significant proportion of public space, creating a nuisance for other users. In their study of quick commerce in Paris, Buldeo Rai *et al.* (2023) point out that, on average, 12 vehicles occupy on-street parking spaces, and the consumption of available space in the city will be even more significant when the companies involved in same-day delivery make massive use of vans to manage the growing flow of products. It is therefore to be feared that conflicts over the use of public space will become increasingly intense in the years to come. Yet, good management of public space is an imperative prerequisite for implementing policies aimed at energy efficiency, equitable accessibility, nuisance control and quality of life.

In short, the highly probable development is likely to have significant implications for urban planning and city management. Indeed, the proliferation of micro-fulfillment centers is influencing residents, particularly in terms of traffic congestions and environmental degradation (Paché, 2022). To find the most effective solutions that safeguard the living environment, all urban logistics stakeholders need to be involved in city planning, whether private stakeholders (e-tailers, wholesalers, logistics service providers, etc.) or public stakeholders (local authorities, residents' associations, environmental activists, etc.). As Sharma and Singh (2023) emphasize, only a collective and shared vision of the place of warehousing facilities in urban planning can maintain a livable city, fostering the harmonious development of commercial, recreational, and logistical activities. The challenge over the next few years is immense, and as such needs to be analyzed in depth by researchers in supply chain management.

It would indeed be detrimental to overlook the fact that the ultra-fast shipping of the same-day delivery model has extremely negative environmental and societal impacts. To supply the micro-fulfillment centers, the model tends to rely on polluting modes of transport, such as road haulage, and journeys made by vehicles that are not always fully loaded, which greatly increases CO_2 emissions per package (Son and Kwon, 2024). Added to this is a possible second visit, and therefore additional pollution, in the event of the customer's absence from home, for example following a missed appointment. In response, the decarbonization of transport is now at the heart of the debate, as the Amazon case illustrates.

Cyclo-logistics is gaining attention as an environmentally friendly means of transport. It relies on lightweight electric vehicles, known as cargo bikes, enabling delivery personnel to transport more products, and more easily, than with a traditional bicycle. Cargo bikes can carry up to three times their own weight, with capacities ranging from 40 to 250 kg. What is more, they are smaller and more maneuverable than standard delivery trucks. By contrast, a diesel delivery vehicle emits nearly 19 tons of carbon dioxide per year, whereas cyclo-logistics produces no direct greenhouse gas emissions.

Besides its negative environmental impact, ultra-fast shipping puts a great deal of pressure on delivery personnel, who must meet tight delivery deadlines, resulting in high speeds and high accident rates. Payment by task, combined with remuneration that has tended to decline over the years, notably through the reduction of bonuses, encourages delivery drivers to go faster and faster on their rounds. According to a survey conducted in Paris in 2021, almost 30% of delivery personnel questioned had been involved in a road accident in the months preceding the survey, 47% of which had required a trip to a hospital emergency department (Dablanc *et al.*, 2021). Other users of public spaces are also at risk, as delivery personnel sometimes driving against the flow of traffic or on sidewalks, resulting in increased pedestrians accidents. The human toll of same-day delivery raises ethical issues that have not been sufficiently addressed, even though some pioneering work has been done on the subject (Richardson *et al.*, 2020).

From this viewpoint, political action is undoubtedly needed to limit excesses:

- Regarding national regulations, the protection of delivery personnel must be part of a powerful labor law that strictly defines the way in which deliveries will be planned, according to constraints linked to urban topography (such as extensive urban sprawl and accessibility criteria to residential areas). It is thus possible to imagine the organization of rounds being legally defined to avoid excessively short travel times between two recipients, forcing delivery personnel to take ill-considered risks.

- In terms of local regulations, authorities will have to impose the pooling of resources, for example at the level of micro-fulfillment centers, to avoid the multiplication of warehousing facilities which, as mentioned above, are the source of traffic congestions and environmental degradation. Pooling practices in urban logistics are common in many European cities for delivering to small shops, despite occasional setbacks (see Box 5), and a comparable approach is no doubt conceivable for same-day delivery, even if technical adaptations will be required.

For these recommendations to be relevant, it is essential to explore consumer behavior in depth, particularly in terms of the trade-off between immediacy of access to products and the search for variety. Variety-seeking is a trend that has been widely studied in marketing; it consists in an individual's sensitivity to diversity in the choice of services or products offered

by a company (Kahn, 1995). As McAlister and Pessemier (1982) underlined, this diversity is an important source of stimulation, which has an impact on the level of satisfaction felt.

Box 5: Implementation Of The Pooling Model: A Long And Winding Road

In Europe, local authorities have been experimenting with the pooling model since the late 1990s in cities like Paris, La Rochelle, Saint-Etienne, and Annecy in France, and in other cities such as Bristol, Charleroi, Modena, and Vicenza. According to a 2022 report by the French Senate, the results have been mixed. In La Rochelle and Saint-Etienne, the experiments were abandoned, primarily due insufficient support from transport professionals, the complexity of the IT developments required to consolidate product flows, and the costs incurred by an additional transshipment. The pooling model therefore faces major implementation difficulties but remains potentially virtuous. Beyond demonstrating the viability of this model, the most decisive challenge will be to move from experimentation to widespread use, to significantly reduce logistics-related flows and CO_2 emissions.

Source: Adapted from *Les Synthèses de l'Auran*, December 2023.

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However, the same-day delivery model automatically reduces the variety of product assortments with the presence of strong logistical constraints (item storage, order preparation, etc.). The question is to what extent a low product assortment variety is considered acceptable by consumers, in exchange for ultra-fast delivery, bearing in mind that it is not certain that speed is more important than strict compliance with a time slot announced by the e-tailer (Amorim *et al.*, 2024). It is highly likely that purchasing contexts have an impact on people's decision-making processes, and from this viewpoint, it is vital to analyze them to guarantee the performance of e-tailers' logistical choices.

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