Horizontal collaboration in the last mile distribution: Gauging managerial response to disruption and abnormal demand

Journal:	*Benchmarking: an International Journal*
Manuscript ID	BIJ-06-2021-0328.R2
Manuscript Type:	Original Article
Keywords:	Online Grocery Market, Resource Pooling, Coopetition, COVID-19 pandemic

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Abstract

Purpose: Last mile distribution is a crucial element of any supply chain network, and its complexity has challenged established practices and frameworks in the management literature. This is particularly evident when demand surges, as with recent lockdowns due to the COVID-19 pandemic and subsequent demand for home delivery services. Given the importance of this critical component, this study recommends horizontal collaboration as a possible solution for retailers seeking to improve the quality of their services.

Design/methodology/approach: This study addresses the question of whether horizontal collaboration should be considered for faster and greener distribution of groceries ordered online. Using the UK and Greek markets that differ in terms of online grocery penetration, distribution network structure and delivery times, the study discusses how the effectiveness of pooling resources can create positive spillover effects for consumers, businesses, and society.

Findings: Despite their differences, both markets indicate the need for horizontal collaboration in the highly topical issue of last mile delivery.

Originality/value: Taking a theoretical and practical view in cases of disruption and constant pressure in last mile delivery, horizontal collaboration supports retailers to coordinate routes, increase fleet and vehicle utilisation, reduce traffic and carbon emissions while improving customer satisfaction.

Keywords:

Online Grocery Market; Resource Pooling; Coopetition; COVID-19 pandemic

1. Introduction

Last mile delivery is the final step of the purchasing process in the retail supply chain (Lim *et al.*, 2018) and includes the delivery of purchased goods to end-customer's preferable points (Ishfaq *et al.*, 2016). Several providers offer delivery services that vary based on the type of industry and the size of the delivered items (Peinkofer *et al.*, 2020). The challenging nature of last mile delivery has evolved to a critical element for the retail industry (Hubner *et al.*, 2016); it is the key driver of customer satisfaction, while it remains costly and complicated and accounts for up to 50% of total supply chain costs (Kuhn and Sternbeck, 2013). A recent survey on 2,870 consumers in five countries, along with discussions with leading entrepreneurs and industry experts, revealed the scale of the last-mile delivery challenge caused by rising consumer expectations for faster and more frequent deliveries and the need for a holistic strategy to meet them (Capgemini, 2019). The use of human-powered delivery vehicles and dispersed demand make delivery a costly part of the process, which has led researchers to look for solutions to reduce congestion, environmental damage, and adverse health impacts in urban areas (Schwerdfeger and Boysen, 2020).

Advances in technology have undoubtedly impacted the demand for last mile delivery services as consumers increasingly choose this option for their purchases. After the COVID-19 pandemic, this steady growth turned into a sudden increase in demand for certain goods, mainly groceries, disrupting the last mile ecosystem (Deloitte, 2020). Social distancing and lockdown measures imposed by most governments led to an explosion in demand for food and increased the complexity of existing last mile delivery challenges due to the increase in orders from home (Deloitte, 2020; Ketchen and Craighead, 2020). Businesses faced significant challenges in managing the COVID-19 pandemic impact (Institute of Supply Chain Management, 2021). Well-known practices such as self-collection via parcel lockers were not easily implemented, and delivery to consumers' homes became the norm (Srinivasa and Maratheb, 2021).

Major retailers have been unable to meet increased demand under their existing operating model, leading to massive delays in-home delivery services. An indicative example from the UK market was the case of panic buying where major retailers such as Tesco, Sainsbury's, and Ocado faced extensive queues up to 15,000 customers (Daily Mail, 2021). These retailers had been forced to restrict the purchase of certain items such as pasta, disinfectant gels, toilet paper, etc. (The Financial Times, 2020). They offered home delivery services with more than two weeks' notice, resulting in low and poor customer satisfaction. In the Greek market, major retailers such as MyMarket and AB Vasilopoulos of Delhaize Group delivered orders up to three weeks as no delivery slots were available (Ethnos, 2020).

Undeniably, the pandemic has uncovered new, more demanding requirements for last mile logistics processes worldwide and has vastly accelerated the penetration of online grocery shopping. In the post-COVID-19 pandemic era, customers are likely to continue ordering groceries online (McKinsey and Company, 2020). Recent research has provided new solutions to the growing demand for last mile delivery to urban areas. For Schwerdfeger and Boysen (2020), one solution could be to optimise the locations of mobile parcel lockers in last mile distribution. Deng *et al.* (2021) took a different view proposing a consolidator who can make urban last mile delivery economically, socially, and environmentally sustainable. Pooling resources has motivated the research of Muñoz-Villamizar *et al.* (2021) presenting a methodology for measuring and evaluating the impact of extended delivery slots to diverse pooling strategies. In their review article, Montoya-Torres *et al.* (2021) identified collaboration along with technology adoption and knowledge creation as key issues to be discussed during the COVID-19 pandemic.

Grounded on the idea of resource pooling, we argue that horizontal collaboration can be applied for faster and greener delivery of the online grocery shopping. One example of such collaboration was the partnership between Morrisons and Ocado in the UK. Ocado's e-commerce and fulfilment technology and infrastructure have powered Morrisons' online delivery channel since 2013, providing end-to-end value-added solutions. A recent example in continental Europe is Migros and Coop's initiative in the Swiss grocery sector (20Minuten, 2021), which involves collaboration between competitors. The idea is to reorganise freight transport by creating "city hubs" in the larger cities, from which goods are transported to other "hubs" and then forwarded to the end customers. Depending on which vehicle is available or best suited; delivery vans, rollers, or cargo bikes are used even if they belong to a competitor. These examples can influence more practitioners to adopt collaborative practices regarding urban last mile delivery. With the perennial question of supply chain effectiveness, merging theoretical principles with management practice could help inform last mile delivery decision-making over operational issues. The retailers should see collaboration even with competitors as an enriching opportunity and rethink their last mile logistics process to achieve effective delivery with lower financial and environmental costs.

We contend that a cooperative model can coordinate decisions relative to urban last mile distribution networks to eliminate overlapping routes and increase vehicle utilisation while improving customer service levels. To achieve this, we leverage insights gained from two markets with different levels of maturity in the online grocery industry and the results of previous studies. We identify the characteristics of urban last mile distribution in these markets and argue about the potential effectiveness of last mile collaboration strategies.

To this end, this paper is organised as follows: Section 2 reviews the current state of affairs and highlights the importance of the online grocery sector worldwide. We discuss key themes in the literature relevant to the last mile delivery and highlight the importance of horizontal collaboration as a best practice for online retailers seeking to offer green and cost-effective delivery in unpredictable times. In Section 3, we discuss online grocery in two markets with different penetration and size, but with characteristics of urban concentration, and argue about the effectiveness of last mile collaboration strategies. In Section 4, we summarise the findings from the two markets, while limitations and implications are also discussed.

2. Background and Related Work

2.1 The online grocery sector and last mile logistics

The online grocery sector began as a niche but has evolved significantly. The global online grocery market size was valued at USD 189.81 billion in 2019 and is projected to register a Compound Annual Growth Rate (CAGR) of 24.8% by 2027 (Grand View Research, 2020)[1]. This growth can be attributed to the proliferation of internet services, shift in consumer needs towards convenience, and the increasing number of smartphone users. In addition, there is the rapid growth of the internet infrastructure in India and China and the initiatives taken by the governments there to promote digitisation and e-commerce in their respective countries. However, the demand for online groceries has increased during the pandemic, putting unprecedented pressure on retailers' e-commerce operations. An October 2020 Chicory survey found that there are now 18% more users of online groceries than there were before the COVID-19 pandemic (Businesswire.com 2020).

That said, it is worth examining how consumers will behave and how retailers will respond to the next normal. A portion of consumers who chose to purchase groceries online during the pandemic will continue to do so (McKinsey and Company, 2020). Thus, the online sales market will continue to grow faster than before the pandemic crisis, and retailers will need to adjust their offerings while trying to ensure the profitability of their business. The ability to fulfil and distribute online orders plays a critical role in ensuring business profitability (Bhattacharjya *et al.*, 2016). It is one of the most costly activities for retailers, especially in the grocery market with low-value products dominating distribution schedules (Yang and Strauss,

[1] Grand View Research (2020). Online Grocery Market Size Worth $1.1 Trillion By 2027. Available online from: https://www.grandviewresearch.com/press-release/global-online-grocery-market. (Last Access Date: November 2021).

2017). Moreover, failure to meet customer delivery expectations can lead to dissatisfaction, negative customer reviews, and consequently a loss of market share (Birch-Jensen *et al.*, 2020).

Online grocery is characterised by highly volatile demand for low-margin products (Arunraj and Ahrens, 2015), perishability, sensitivity of food and beverage storage conditions, and the "necessity" of the customer's presence at the time of delivery (Pan *et al.*, 2017). To overcome these challenges, the development of effective and flexible distribution models is required without compromising the profitability of retailers. Various alternative last mile models can be developed, considering parameters such as delivery method: home delivery, click & collect (Milioti *et al.*, 2020), delivery area and returns policy (Hubner *et al.*, 2016). Innovative but viable last mile solutions such as parcel lockers, pick-up points, crowdsourcing logistics, drones, delivery robots, and dynamic pricing should be explored, as they may lead to a differentiation between retailers in terms of the novel solutions they adopt for management (Ha *et al.*, 2018; Mangiaracina *et al.*, 2019).

The development of last mile distribution to reduce operational and environmental costs without compromising service quality is particularly acute. This is more intense in urban areas where online shopping is higher and the road network is more complex, exacerbating undesirable consequences such as low utilisation of facilities (Farahani *et al.*, 2013). Lim *et al.* (2018) shed light on the relationship between a set of contingency variables and the operational characteristics of last mile distribution configuration (push-centric, pull-centric, and hybrid system) via a set of structural variables such as consumers' geographic density, demand volume, response time to orders, and product availability, variety, and margin captured in the form of a design framework. Janjevic and Winkenbach (2020) distinguished urban last mile e-commerce distribution strategies in mature and emerging markets by highlighting the variables that affect network design choices. Based on the evidence from market developments and practices, we highlight three aspects that retailers should consider: i) dealing with demand volatility; ii) integrating pick-up and delivery points; and iii) addressing environmental considerations in urban last mile distribution.

Dealing with fluctuations in demand can be done by allowing retailers to manage demand to decide which delivery requests to accept or reject (Cleophas and Ehmke, 2014). Accepting or rejecting a delivery slot has led to new models that consider dynamic pricing policies for delivery slots to influence demand for online grocery stores. This allows orders from neighbouring areas to be consolidated to improve overall distribution performance (Yang and Strauss, 2017). Another aspect of the current distribution model for online groceries is the use of delivery passes, i.e., paying an upfront fee but no delivery charges for online grocery

orders during a specified period of time. Belavina *et al.* (2017) presented a model in which retailers offer two home delivery alternatives, a per-delivery fee or an annual pass, and examined both financial and environmental performance in terms of carbon emissions. Under this approach, there are economic and environmental benefits for online retailers. However, this approach leads to a different business model where retailers restrict the day and time window for delivery to a specific area. This practice is not easy to implement when large retailers offer flexible delivery services to their customers where they can choose both the day and time of delivery.

Environmental aspects have become key aspects of supply chain management (Dubey *et al*., 2017) as well as freight transport research in recent years, highlighting the need to include relevant variables in distribution models (Bektas *et al*., 2018; Koc *et al*., 2016;). Edwards *et al.* (2010) studied the carbon intensity of last mile deliveries and found that neither home delivery nor conventional shopping had an absolute CO2 advantage. In the same stream of research, Shao *et al*. (2016) investigated the relationship between distribution strategies and traffic congestion and found that individuals' optimal decisions and socially optimal decisionsre are not aligned, which in turn leads to inefficiencies in the system. Regarding the integration of pick-up and delivery points, interestingly, Janjevic *et al.* (2019) presented a methodology for their integration in the design of multi-echelon distribution networks and apply it to a real-life case study of last mile distribution by a large Brazilian e-commerce provider.

2.2 Collaboration in distribution activities

In the last two decades, both practitioners and scholars have paid much attention to improving distribution systems through collaboration, coining the term collaborative distribution and recognising it as one of the future trends in transportation and logistics (Aloui *et al*., 2021; Speranza, 2018). Collaborative distribution can take a vertical form, which focuses on the beneficial vertical relationships between actors within a supply chain (Shah and Singh, 2021); or a horizontal form, which focuses on the joint competition between two or more actors operating at the same level, regardless of whether they are rivals or have different sizes (Mason *et al*., 2007). Manufacturers and retailers have been working together for years using vertical cooperation not only in distribution but also in inventory management, forecasting and replenishment processes. Horizontal collaboration and coopetition have attracted a lot of interest, but their application in the market is still limited (Basso *et al*., 2019).

The case of competitive retailers allying through resource pooling is not new. The first research paper dealing with collaboration in the food market was presented by Bengtsson and Kock

(2000), who studied the Swedish brewing industry and the Finnish dairy industry. They suggested that different companies far from the consumer collaborate on the "invisible" logistical side by using common packaging standards and return channels, while they compete close to the consumer by using different marketing practices to increase their market share. Similarly, Kotzab and Teller (2003) studied the Austrian grocery industry using a coopetition model that allowed participants to improve profitability by sharing information through electronic data interchange and building businesses with value-added partnerships such as logistics packaging standards. Both studies reported gains for all participants, demonstrating the existence of win-win situations under a coopetition model.

Another interesting study was conducted in the French food market and focused on collaborative logistics activities between different supply chain tiers (Ballot and Fontane, 2010). The focus of this study was on stem-mile logistics, finding that potential pooling of demand can lead to at least 25% CO2 emission savings, but the economic benefits were not considered. In addition to the above research efforts, a decision support system for cooperative transportation planning by manufacturers in the German food industry using multi-agent systems and considering outsourcing options for logistics operations was investigated (Sprenger and Monch, 2014). The potential benefits of and barriers to logistics collaboration were presented by several studies (see Basso *et al*., 2019; Pan *et al*., 2019; Sanchez Rodrigues, *et al*., 2015). Hingley *et al*. (2011) explored these aspects for food retailers in an exploratory qualitative study based on semi-structured interviews. Collaboration can eliminate overlapping routes and increase vehicle utilisation while maintaining customer service levels (Aktas *et al.*, 2020). Several previous studies in the literature examined logistics collaboration (Alftan *et al*., 2015; Hingley *et al*., 2011), but did not comprehensively consider last mile collaboration for grocery retailers.

Recent research in the online grocery market has found that retailers using private delivery fleets and dedicated fulfilment centres face higher costs, mainly due to low utilisation of facilities (Aktas *et al*., 2020). This can be interpreted as different retailers serving the same neighbourhood at the same pick-up times. Other consequences include traffic congestion, fatal accidents, noise pollution, and environmental impacts from vehicle emissions (World Economic Forum, 2020). Given these negative repercussions and the impact of the pandemic disruption, it makes sense for online retailers to look beyond their organisational boundaries and seek ways to adopt collaborative practices to reduce the economic and environmental costs of home delivery services.

Recent evidence confirms this new trend by describing how retailers have already started to collaborate to achieve efficiencies in the upstream supply chain (Retail Gazette, 2018). The impact of collaboration in terms of reducing operating costs and creating environmental benefits has been discussed in the literature (Van Loo *et al*., 2015). Other academic studies have examined the efficiencies that can be achieved when orders are bundled or picked at the fulfilment centre or "dark store"prior to the last mile delivery (e.g., Boyer *et al*., 2009). Another study developed a decision support system for online grocery shopping logistics (Al-Nawayseh *et al.,* 2013) and found that the time element has a critical impact on delivery alternatives (home delivery, delivery point, and pickup point). Zissis *et al.* (2018a) suggested the concept of micro-hub as an intermediate level between fulfilment centres and end-user locations. Micro-hubs are shared cross-docking facilities that can be used by competing retailers and reduce distances by up to 10% when two retailers work together. The main drawbacks of this approach are the investment required for shared micro-hubs and the difficulty of establishing such facilities in urban areas.

In this context, most studies that address the benefits of collaboration also point to the problems of coordination and managerial friction that can arise when bundled operations are coordinated. The implementation of collaboration is much easier today than it was a few years ago due to the availability of technological tools for real-time information sharing (Agarwal and Narayana, 2020) and the ability to obtain high-quality solutions to complex optimisation problems in short computational time. Technological advances can improve collaboration among the different actors in supply chains, regardless of the location from which the loading takes place. Software that includes intelligent routing algorithms, coordinated picking, allocation of flexible time windows, and end-to-end communication with the customer (e.g., through GPS tracking) is now easier to implement given the increasing availability and standardisation of platforms and wearable devices (Android, iOS).

Concluding, horizontal collaboration may be an option for retailers who want to compete in a greener supply chain and achieve efficiencies through shared services. However, it would be difficult, if not unrealistic, to expect a collaboration between retailers without some form of information sharing (Kumar and Pugazhendhi, 2012). Competition is minimised, but not eliminated, as retailers still compete on business aspects such as prices and product quality and seek to increase their market shares. We examine two markets with different penetration rates in the adoption of online grocery stores to illustrate our view of the importance of horizontal cooperation among competitors.

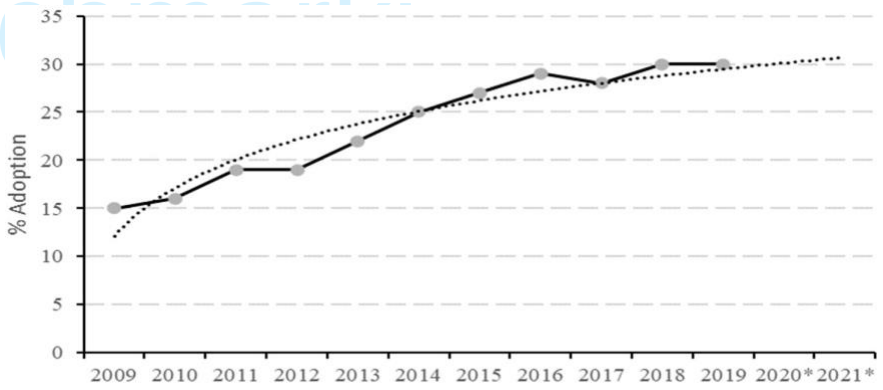
3. Methodology

To explain the benefits of different configurations for supply chain collaboration as identified in the literature, we consider two different markets where patterns of collaboration are affected by different stages in the adoption curve for last mile pre-pandemic delivery. We chose these two markets because the UK online grocery market is a mature and efficient market where major retailers have established delivery services in 90% of UK urban areas, while retailers such as Ocado have considered a fully online model based on efficient warehousing and picking operations. On the other hand, Greece is a nascent market where much of the grocery retailing is done by independent retailers. For these two markets, which on the one hand have similar concentration patterns in terms of population, but on the other hand, have completely different stages of online grocery adoption and a different number of players, last mile distribution network configuration and forthcoming urban regulation, there are different configurations of supply chain collaboration, that we discuss in the following sections.

3.1 The UK online grocery market

The UK online grocery market is the fastest growing shopping channel (both in value and growth) and the second largest in the world (in revenue) behind China. In 2020, the market was worth around £22.3 billion. It is characterised by fierce competition; four major retailers (Tesco, Asda, Ocado and Sainsbury's) serve 69% of the total online market. Tesco is the market leader with a market share of 30%, followed by Sainsbury's (17%), Asda (12%), Ocado (10%) (Mintel 2021). There is no doubt that the COVID-19 pandemic has increased the size of the online grocery market as it has accelerated the transition to online shopping, contrary to previous predictions (see Figure 1). Tesco was the first retailer in the UK to fulfil one million online grocery orders in one week[2]. However, the growth potential has been held back by capacity constraints in distribution. The market increased by 75.2% in total sales in 2020, reflecting the impact of the COVID-19 pandemic (Mintel 2021). It is worth highlighting that the online grocery market has shown average annual growth of 12% in recent years before the pandemic (Mintel 2021). The same report mentioned that the size of the UK online grocery market is worth 11.4 % of the total grocery market; a significant milestone as this is the first time the online market has exceeded the 10% threshold of the total market.

[2] https://www.globenewswire.com/en/news-release/2020/11/18/2129514/28124/en/UK-Online-Grocery-Market-Analysis-by-Quarter-2017-2020-Tesco-the-First-Retailer-in-the-UK-to-Fulfill-1M-Online-Grocery-Orders-in-a-Week-due-to-the-Impetus-from-COVID-19.html (Last Access Date: November 2021).



Dotted line provides forecast for 2020 and 2021 (in asterisks) calculated before the pandemic. Source: Eurostat ICT usage survey – representing households and individuals

Figure 1: Adoption rate of online shopping in the UK (pre-Brexit).

The estimates for the future of the UK online grocery market are optimistic: it is expected to account for more than 15% of the total market and will continue to grow in the post-COVID-19 pandemic era due to changing customer behaviours and habits (Deloitte, 2020). Nevertheless, it is reasonable to question the effectiveness of the existing last mile strategy, which relies on retailers' own resources. Each retailer operates on an individual basis with its own distribution network, fleet, and drivers to meet demand (Zissis *et al.*, 2017). Therefore, retailers determine the optimal routes to deliver orders based on their customers' time preferences. This practice leads to the need to solve separate optimisation problems regarding optimal routes, which increases last mile costs and limits the capacity of the distribution (Koc *et al.*, 2016).

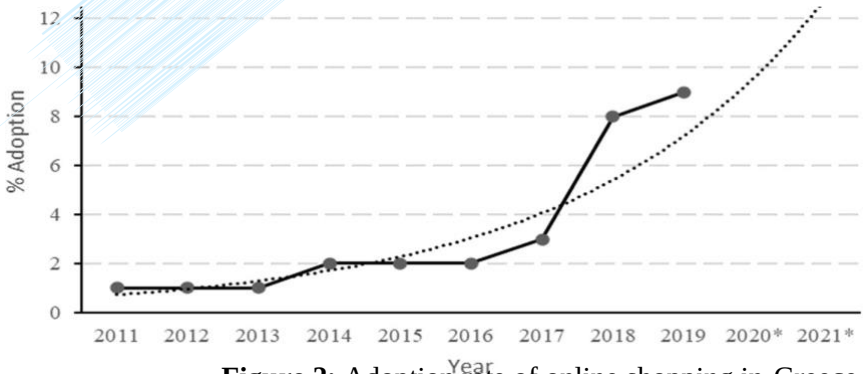
Under the existing business model in the UK, retailers appear to be aware of, or even comfortable with, costly last mile delivery services. Considering that the profit margin in the grocery market is tiny, online activities and related home delivery services lead to financial losses (Aktas *et al.*, 2020). Almost all major UK online grocery retailers have incorporated dynamic pricing practices into their delivery charge strategies to mitigate demand volatility and reduce both the economic and environmental costs of home delivery services. This approach has seen significant improvements of up to 10% cost reduction (Yang and Strauss, 2017). However, this is not sufficient as the average cost per home delivery remains high compared to the fees (maximum £7) charged by UK retailers for these services (Zissis *et al.*, 2018a), rendering the existing operation unsustainable.

UK retailers have been unwilling to change their strategy and join forces with their competitors to achieve economic and environmental benefits. It is of particular importance for retailers to deliver their customers' orders using vehicles that carry the company's logo and whose drivers wear the brand's emblem. Grocery retailers believe that this is one of the most

fundamental parts of their promotional campaign to build strong customer relationships and support their online channel with the resources of their traditional channel. However, the recent pandemic highlights that the existing distribution network has significant limitations when it comes to home delivery services. The business will not be *"business as usual"* and retailers will need to transform the way they operate as they cope with the uncertainties of the COVID-19 crisis (De Smet *et al.*, 2021). Horizontal collaboration with their competitors could be a solution to redesign the online distribution channel and focus on optimising last mile delivery processes.

3.2 The Greek online grocery market

The Greek online grocery market is nascent with several retailers trying to lead and dominate this extremely competitive sector. According to official Eurostat data (see Figure 2), the market penetration of online grocery in Greece was only 10%, with an exponential growth trend before the closures triggered by the COVID-19 pandemic. At the current state of the Greek market, the share is distributed among 30 retailers offering online grocery deliveries in different parts of the country, using their brick-and-mortar stores as a base for picking deliveries. In terms of market size, it amounted to €46.7M in 2019 from €34.1M in 2018; recording an average annual growth of 40% before the pandemic (Convert Group, 2019). The following year it reached €163.3M (Convert Group, 2020), presenting an impressive growth of 262%, indicating the immaturity of the Greek online market prior to the pandemic. An interesting finding underpinning the exponential growth of online grocery is that consumers in Greece searched for *"online supermarket*" on Google twice as often in March 2020 than in the whole year (Convert Group, 2020).



Dotted line provides forecast for 2020 and 2021 (in asterisks) calculated before the pandemic. Source: Eurostat ICT usage survey – representing households and individuals

Figure 2: Adoption rate of online shopping in Greece.

Due to the booming demand during the pandemic, new players have also entered the Greek food market with an online presence only (and no physical stores). The existing business

model is that Greek grocery retailers offer customers a 3-hour window for delivery of their orders, while they are trying to reduce this to a 2-hour window to improve customer satisfaction and gain a competitive advantage in this new market. Compared to the UK market, grocery retailers offer a 1-hour delivery window, which means Greece lags behind the UK in terms of last mile delivery service level. The Greek online grocery market is still in its infancy, and many traditional retailers are not yet familiar with the concept of offering quality last mile delivery services in the post-COVID-19 era. In an immature market, online grocery retailers seek to redesign and reshape existing home delivery operating and business models to reduce operational and environmental costs and increase the capacity of their distribution network to spur further growth in this promising sector. In our view, there is a great opportunity for Greek food retailers to benefit from the growth of the online sector and to follow global trends. Horizontal collaboration with their competitors could open up optimisation opportunities for last mile delivery.

4. Discussion and Conclusions

This study highlights the role of horizontal collaboration in the last mile delivery process. This role was further supported by the two real-world examples in the previous section. We discussed that collaboration in last mile delivery in both markets could bring benefits to all players in the supply chain as well as to the environment in terms of emissions regardless of the penetration of online grocery delivery. This is due to the reduction in total distance travelled, which can be achieved either by reducing the routes required to cover the delivery schedule or by consolidating demand (Zissis *et al*., 2018b). This not only increases distribution capacity, but also creates the opportunity to deliver to hard-to-reach areas in cities (e.g. city centres, pedestrianised areas, etc.). Given the existing "*winner takes it all*" approach, where delivery service and availability have become the most important factor in a customer's purchase decision in cases such as the pandemic, consolidating resources to improve fulfilment service can also provide a better basis for competition. In this regard, it is also important for policymakers to encourage such practices from both an environmental and sustainability perspective and a competition perspective.

In nascent markets such as the Greek one, this may lead to higher uptake as more consumers trust the online services and are therefore more willing to order groceries online; a practice that had low penetration rates a few years ago (see Figure 2) and has become a necessity for the majority of the population due to the COVID-19 pandemic restrictions. In developed markets such as the UK, where consumer uptake is high (see Figure 1), collaboration

brings cost savings and environmental impact - an issue of increasing importance given the environmental impact of online grocery delivery. Both markets, however, illustrate the importance of coordination in the high-octane practice of last mile delivery, looking at the grocery market in two different markets with different levels of penetration but similar characteristics in terms of urban concentration.

4.1. Implications for research

Collaboration between retailers and suppliers is nothing new in the supply chain and management literature. The Efficient Consumer Response initiative is the best example of how retailers and suppliers can work together to replenish inventory. However, the case of last mile delivery is both a new practice and a challenge, as highlighted in the previous sections. Grocery shoppers purchase online to save time and effort (Singh and Soderlund 2020). From the customer's perspective, this study considers last mile delivery as an additional requirement for customer satisfaction. The experience of all other online elements such as website layout, ease of navigation and product information is therefore enhanced by on-time delivery. However, the proposed last mile collaboration is based on the principle of fair competition as retailers remain independent in the upstream logistics processes. Future research should therefore focus on *coopetition*, where rival retailers share a common distribution network, diverting the advantage of a vertically integrated delivery service to a centralised system.

4.2. Managerial implications

According to a recent report (World Economic Forum, 2020), the demand for last mile deliveries is growing rapidly and is expected to increase by 78% globally by 2030. It also recommended adopting a range of technologies and supply chain measures that reduce congestion, emissions, and delivery costs and contribute positively to the three P's - People, Planet and Profit. We have argued in this paper that collaboration at a horizontal level, even between rival retailers, either nationally or in challenging urban and rural areas, can overcome the challenges of last mile delivery for both consumers and the retailers involved.

Coordinating last mile delivery is one of the most challenging supply chain and operations management tasks. Achieving efficiencies in quality of service and cost indicators such as average cost per order requires investments that represent significant risk given the often unpredictable surges in demand. These investment costs can become even higher when considering the service plans associated with maintaining and operating a large fleet of green vans for a delivery fleet. Given the impact of the COVID-19 pandemic and the convenience of

many consumers to purchase items they do not wish to buy offline in bulk, this will set the trend in the coming years that will require a significant management response.

4.3. Limitations and concluding remarks

The analysis underscores the importance of immediate management interventions to address disruptions, and the cases serve only a comparative purpose. Further long-term results need to be evaluated in a more precise empirical framework. While the management literature has long explored how alliances are formed between institutions that aim to capture a market for a common goal, the ideas presented here require a different perspective on management thinking and, in particular, the formation of alliances to build a common infrastructure (delivery service capacity).

The lessons learned from the pandemic outbreak show that developing enduring strategies is extremely important. The growing body of research seeks to understand how exogenous shocks such as the COVID-19 pandemic can lead to business failure (Amankwah-Amoah *et al.*, 2021). Sharma *et al.* (2020) analysed Twitter data from 100 NASDAQ firms and found that firms worldwide need new sustainable supply chain strategies that collaborate with multiple stakeholders to manage future exogenous shocks such as the pandemic disruption. In line with these arguments, Anker (2021) argued that the pandemic experience has shown that supply chains are vulnerable to major global public health incidents. The supply chains of the future will not be destabilised by the human factor, but by the *unknown-unknowns* such as natural phenomena whose occurrence is beyond management control (Anker, 2021).

Finally, we reiterate the arguments of Ketchen and Craighea (2020) that *"supply chain agility was front and centre during the COVID-19 pandemic"*. It is likely that there will be similar shocks in the future and awareness of their impact should be raised. The pandemic has brought home to scientists and practitioners the need for coordination and collaboration in strategic decision-making. Quoting Einstein, the same authors argued that "*in the midst of every crisis lies a great opportunity*." Brick-and-mortar retailers must seize the opportunity to collaborate and innovate with the right mix of technologies to further enhance their relationship with consumers. This is particularly important given their long-term position of being squeezed by e-commerce giants (e.g., Amazon) who can create a more efficient cost base for bundling grocery deliveries within their existing order fulfilment operations.

References:

Agarwal, U.A., & Narayana, S.A. (2020). Impact of relational communication on buyer–supplier relationship satisfaction: role of trust and commitment. *Benchmarking: An International Journal*, 27(8), 2459-2496.

Aktas, E., Bourlakis, M., & Zissis, D. (2020). Collaboration in the last mile: evidence from grocery deliveries. *International Journal of Logistics Research and Applications*, 24(3), 227-241.

Al-Nawayseh, M., Alnabhan, M., Al-Debei, M., & Balachandran, W. (2013). An adaptive decision support system for last mile logistics in E-commerce: a study on online grocery shopping. *International Journal of Decision Support System Technology*, 5(1), 40-65.

Alftan, A., Kaipia, R., Loikkanen, L., & Spens, K. (2015). Centralised grocery supply chain planning: improved exception management. *International Journal of Physical Distribution & Logistics Management*, 45(3), 237-259.

Aloui, A., Hamani, N., Derrouiche, R., & Delahoche, L. (2021). Systematic literature review on collaborative sustainable transportation: Overview, analysis and perspectives. *Transportation Research Interdisciplinary Perspectives*, *9*, 100291.

Amankwah-Amoah, J., Khan, Z., & Wood. G. (2021). COVID-19 and business failures: The paradoxes of experience, scale, and scope for theory and practice. *European Management Journal*, 39(2), 179-184.

Anker, T. B. (2021). At the boundary: Post-COVID agenda for business and management research in Europe and beyond. *European Management Journal*, 39(2), 171-178.

Arunraj, N., & Ahrens, D. (2015). A hybrid seasonal autoregressive integrated moving average and quantile regression for daily food sales forecasting. *International Journal of Production Economics*, 170, 321-335.

Ballot, E., & Fontane, F. (2010). Reducing transportation CO_2 emissions through pooling of supply networks: Perspectives from a case study in French retail chains. *Production Planning and Control*, 21(6), 640-650.

Basso, F., D'Amours, S., Rönnqvist, M., & Weintraub, A. (2019). A survey on obstacles and difficulties of practical implementation of horizontal collaboration in logistics. *International Transactions in Operational Research*, 26(3), 775-793.

Bektas, T., Ehmke, J., Psaraftis, H., & Puchinger, J. (2018). The Role of Operational Research in Green Freight Transportation. *European Journal of Operational Research*, 274(3), 807-823.

Belavina, E., Girotra, K., & Kabra, A. (2017). Online grocery retail: Revenue models and environmental impact. *Management Science*, 63(6), 1781-1799.

Bengtsson, M., & Kock, S. (2000). Coopetition in business networks – to cooperate and compete simultaneously. *Industrial Marketing Management*, 29, 411-426.

Bhattacharjya, J., Ellison, A., & Tripathi, S. (2016). An exploration of logistics-related customer service provision on Twitter: The case of e-retailers. *International Journal of Physical Distribution and Logistics Management*, 46(6/7), 659-680.

Birch-Jensen, A., Gremyr, I., & Halldorsson, A. (2020). Digitally connected services: Improvements through customer-initiated feedback, *European Management Journal,* 38(5), 814-825.

Businesswire Chicory. (2020). Survey Reveals There Are 18% More Online Grocery Users Now Compared to Pre-COVID-19, Exceeding Levels During the Height of the Pandemic https://www.businesswire.com/news/home/20201026005097/en/Chicory-Survey-Reveals-There-Are-18-More-Online-Grocery-Users-Now-Compared-to-Pre-COVID-19-Exceeding-Levels-During-the-Height-of-the-Pandemic (accessed 25 October 2020).

Boyer, K., Prud'homme, A., & Chung, W. (2009). The last mile challenge: evaluating the effects of customer density and delivery window patterns. *Journal of business logistics*, 30(1), 185-201.

Capgemini, (2019). The last mile delivery challenge. https://www.capgemini.com/research/the-last-mile-delivery-challenge/ (accessed 15 October 2021).

Cleophas, C., & Ehmke, J. (2014). When are deliveries profitable? Considering or- der value and transport capacity in demand fulfillment for last-mile deliveries in metropolitan areas. *Business and Information Systems Engineering*, 6 (3), 153-163.

Convert Group. (2019). Greek eGrocery 2019. https://convertgroup.com/insight/greek-online-grocery-2019/ (accessed 10 October 2021).

Convert Group. (2020). Greek eGrocery 2020. https://convertgroup.com/insight/greek-egrocery-2020/ (accessed 10 October 2021).

Daily Mail. (2021). Sainsburys-Tesco-Ocado-sites-struggle-panic-buying-strain https://www.dailymail.co.uk/news/article-9113907/Sainsburys-Tesco-Ocado-sites-struggle-panic-buying-strain.html?fbclid=IwAR2NpyVkxupQp4LoJzntr26WeV1Bkm3V2pAnI1UeWfxMSVNwtOmxay6HdK8. (accessed 28 October 2021).

Deloitte. (2020). *Last Mile Delivery after Covid 19: A World of things to solve*. file:///E:/Downloads/gx-last-mile-customer-delivery-after-covid-19%20(2).pdf (Accessed 4 October 2021).

Deng, Q., Fang, X., Lim, Y.F. (2021). Urban Consolidation Center or Peer-to-Peer Platform? The Solution to Urban Last-Mile Delivery. *Production and Operations Management, 30*(4), 997-1013

De Smet, A., Gagnon, C., & Mygatt, E. (2021). Organizing for the future: Nine keys to becoming a future-ready company. McKinsey & Company.

Dubey, R., Gunasekaran, A., & Papadopoulos, T. (2017). Green supply chain management: theoretical framework and further research directions. *Benchmarking: An International Journal*, 24(1), 184-218.

Edwards, J., McKinnon, A., & Cullinane, S. (2010). Comparative analysis of the carbon footprints of conventional and online retailing: A "last mile" perspective. *International Journal of Physical Distribution and Logistics Management*, 40(1/2), 103-123.

Ethnos. (2020). Huge delays on the online groceries home deliveries. https://www.ethnos.gr/oikonomia/97983_terasties-oi-kathysteriseis-stis-paradoseis-apo-ta-ilektronika-katastimata (accessed 22 October 2021).

Farahani, R., Miandoabchi, E., Szeto, W., & Rashidi, H. (2013). A review of urban transportation network design problems. *European Journal of Operational Research*, 229(2), 281-302.

Globenewswire. (2020). Global Online Grocery Shopping Industry Report 2020. https://www.globenewswire.com/news-release/2020/09/07/2089547/0/en/Global-Online-Grocery-Shopping-Industry-Report-2020-The-U-S-Accounts-for-Over-28-8-of-the-Global-Market.html. (accessed 22 October 2021).

Ha, Q.M., Deville, Y., Pham, Q.D., & Ha, M.H. (2018). On the min-cost Traveling Salesman Problem with Drone. *Transportation Research Part C: Emerging Technologies*, 86, 597-621.

Hingley, M., Lindgreen, A., Grant, D., & Kane, C. (2011). Using fourth-party logistics management to improve horizontal collaboration among grocery retailers. *Supply Chain Management: An International Journal*, 16(5), 316-327.

Hubner, A., Kuhn, H., & Wollenburg, J. (2016). Last Mile Fulfilment and Distribution in Omni-Channel Grocery Retailing: A Strategic Planning Framework. *International Journal of Retail and Distribution Management*, 44(3), 228-247.

Institute of Supply Chain Management. (2021). Institute of Supply Chain Management Survey: https://www.instituteforsupplymanagement.org/news/NewsRoomDetail.cfm?ItemNumber=31175&SSO=1 (accessed 25 October 2021).

Ishfaq, R., Defee, C.C., Gibson, B. J., & Raja, U. (2016). Realignment of the Physical Distribution Process in Omni-Channel Fulfillment. *International Journal of Physical Distribution and Logistics Management.* 46(6/7), 543-61.

Janjevic, M., M. Winkenbach, and D. Merchαn. (2019). Integrating Collection-and-Delivery Points in the Strategic Design of Urban Last-Mile e-Commerce Distribution Networks. *Transportation Research Part E: Logistics and Transportation Review*, 131: 37-67.

Janjevic, M., & Winkenbach, M. (2020). Characterizing urban last-mile distribution strategies in mature and emerging e-commerce markets. *Transportation Research Part A: Policy and Practice*, 133, 164-196.

Ketchen Jr., D. J., & Craighead, C.W. (2020). Research at the Intersection of Entrepreneurship, Supply Chain Management, and Strategic Management: Opportunities Highlighted by COVID-19. *Journal of Management*, 46(8), 1330-1341.

Koc, C., Bektas, T., Jabali, O., & Laporte, G. (2016). The impact of depot location, fleet composition and routing on emissions in city logistics. *Transportation Research Part B: Methodological*, 84, 81-102.

Kotzab, H., & Teller, C. (2003). Value-adding partnerships and co-opetition models in the grocery industry. *International Journal of Physical Distribution & Logistics Management*, 33(3), 268-281.

Kuhn, H., & Sternbeck, M.G. (2013). Integrative retail logistics: An exploratory study, *Operations Management Research*, 6(1-2), 2-18.

Kumar, R., & Pugazhendhi, S. (2012). Information sharing in supply chains: An overview. *Procedia Engineering*, 38, 2147-2154.

Lim, S.F.W., Jin, X., & Srai, J.S. (2018). Consumer-driven e-commerce: a literature review, design framework, and research agenda on last-mile logistics models. *International Journal of Physical Distribution and Logistics Management*, 48(3), 308-332.

Mangiaracina, R., Perego, A., Seghezzi, A., & Tumino, A. (2019). Innovative solutions to increase last-mile delivery efficiency in B2C e-commerce: a literature review. *International Journal of Physical Distribution and Logistics Management*, 49(9), 901-920.

Mason, R., Lalwani, C., & Boughton, R. (2007). Combining Vertical and Horizontal Collaboration for Transport Optimisation. *Supply Chain Management: An International Journal*, 12, 187-199.

McKinsey and Company. (2020). How European shoppers will buy groceries in the next normal: https://www.mckinsey.com/industries/retail/%20our-insights/how-european-shoppers-will-buy-groceries-in-the-next-normal (accessed 25 October 2021).

Milioti, C., Pramatari, K., & Zampou, E. (2020). Choice of pre-vailing delivery methods in e-grocery: a stated preference ranking experiment. *International Journal of Retail & Distribution Management*, 49(2), 281-298.

Mintel. (2021). UK Online Grocery Retailing Market Report 2021, https://store.mintel.com/report/uk-online-grocery-retailing-market-report (accessed 2 October 2021).

Montoya-Torres, J. R., Muñoz-Villamizar, A., Mejia-Argueta, C. (2021). Mapping research in logistics and supply chain management during COVID-19 pandemic. *International Journal of Logistics Research and Applications*, In press.

Muñoz-Villamizar, A., Velázquez-Martínez, J.C., Mejía-Argueta, C., Gámez-Pérez, K., (2021). The impact of shipment consolidation strategies for green home delivery: a case study in a Mexican retail company. *International Journal of Production Research*, In press.

Pan, S., Giannikas, V., Han, Y., Grover-Silva, E. and Qiao, B. (2017). Using customer-related data to enhance e-grocery home delivery. *Industrial Management and Data Systems*, 117 (9), 1917-1933.

Pan, S., Trentesaux, D., Ballot, E., & Huang, G. Q. (2019). Horizontal collaborative transport: Survey of solutions and practical implementation issues. *International Journal of Production Research, 57, 5340-5361.*

Peinkofer, S.T., Schwieterman, M. A., & Miller, J.W. (2020). Last-Mile Delivery in the Motor-Carrier Industry: A Panel Data Investigation Using Discrete Time Event History Analysis. *Transportation Journal.* 59(2), 129-164.

Retail Gazette. (2018). What is behind the surge of collaborations in retail? Retail Gazette: https://www.retailgazette.co.uk/blog /2018/07/comment-understanding-the-surge-of-collaborative-relationships-in-uk-retail/ (accessed 22 October 2020).

Sanchez Rodrigues, V., Harris, I., & Mason, R. (2015). Horizontal logistics collaboration for enhanced supply chain performance: An international retail perspective. *Supply Chain Management*, 20(6), 631-647.

Schwerdfeger, S., & Boysen, N. (2020). Optimizing the changing locations of mobile parcel lockers in last-mile distribution. *European Journal of Operational Research*, 285(3), 1077-1094.

Shah, B. and Singh, G. (2021), "Can collaborative buffering strategies reduce distribution costs while improving product returns?: A case of an Asian e-retailer", *Benchmarking: An International Journal*, 28(9), 2808-2834.

Shao, J., Yang, H., Xing, X., & Yang, L. (2016). E-commerce and traffic congestion: An economic and policy analysis. *Transportation Research Part B: Methodological*, 83, 91-103.

Sharma, A., Adhikary, A., & Borah., S.B. (2020) Covid-19′s impact on supply chain decisions: Strategic insights from nasdaq 100 firms using twitter data. *Journal of Business Research*, 117, 443-449.

Singh, R., & Soderlund, M. (2020). Extending the experience construct: an examination of online grocery shopping, *European Journal of Marketing*, 54(10), 2419-2446.

Speranza, M.G. (2018). Trends in transportation and logistics. *European Journal of Operational Research*, *264*(3), 830-836.

Sprenger, R., & Monch, L. (2014). A decision support system for cooperative transportation planning: Design, implementation, and performance assessment. *Expert Systems with Applications*, 41 (11), 5125-5138.

Srinivasa, S. S., & Maratheb, R. R. (2021). Moving towards "mobile warehouse": Last-mile logistics during COVID-19 and beyond. *Transportation Research Interdisciplinary Perspectives*. 10 100339.

The Financial Times. (2020). Supermarkets take measures to control panic buying. https://www.ft.com/content/737a9a24-68ea-11ea-a3c9-1fe6fedcca75 (accessed 18 October 2020).

Van Loon, P., Deketele, L., Dewaele, J., McKinnon, A., & Rutherford, C. (2015). A comparative analysis of carbon emissions from online retailing of fast moving consumer goods. *Journal of Cleaner Production*, 106, 478-486.

World Economic Forum. (2020). The Future of the Last-Mile Ecosystem. https://www.weforum.org/reports/the-future-of-the-last-mile-ecosystem (accessed 18 April 2020).

Yang, X., & Strauss, A. (2017). An approximate dynamic programming approach to attended home delivery management. *European Journal of Operational Research*, 263, 935-945.

Zissis, D., Aktas, E., & Bourlakis, M. (2017). A New Process Model for Urban Transport of Food in the U.K. *Transportation Research Procedia*, 22, 588-597.

Zissis, D., Aktas, E., & Bourlakis, M. (2018a). Collaboration in urban distribution of online grocery orders. *The International Journal of Logistics Management*, 29 (1), 1196-1214.

Zissis, D., Saharidis, G., Aktas, E., & Ioannou, G. (2018b). Emission reduction via supply chain coordination. *Transportation Research Part D: Transport and Environment*, 62, 36-46.

20Minuten. (2021). Union of Migros and Coop wants to reduce traffic in Swiss cities. https://www.20min.ch/story/union-von-migros-und-co-will-verkehr-in-schweizer-staedten-reduzieren-606917879386?fbclid=IwAR2jfuDop_u-PLa16YPOY7pKa8RTSPoLf53PNI6dfC_hr5uMm0FQc8qHPCQ (accessed 5 October 2021).