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The Postal and Delivery Contribution in Hard Times

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The Postal and Delivery Contribution in Hard Times

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Preface and Acknowledgments

This book collects the contributions presented during the 29th Conference on Postal and Delivery Economics, jointly organized by the Florence School of Regulation – Communications and Media (FSR C&M) at the European University Institute and the Center for Research in Regulated Industries (CRRI) at the Rutgers Business School. As it was for the 28th edition, the event took place fully online.

Over 2.5 days, the postal and delivery community discussed almost 30 original papers. Unsurprisingly, an important topic was the short- and long-term effects of the Covid-19 pandemic on the postal sector, with an emphasis on its performance as an essential service during this period of worldwide distress. Several papers investigated, from both an economic and regulatory perspective, the unstoppable growth of e-commerce and its implications for delivery, solutions for the "last mile," and associated challenges in terms of sustainability. Among the traditional topics for postal and delivery sectors, the Conference hosted discussions about competitive dynamics in the sector, business strategies of postal operators, and the definition and funding of Universal Service Obligation.

The Conference was made possible by the contribution of generous supporters. We would like to thank them not only for their financial support but also for joining the organizing committee and providing, along with others, intellectual contributions, advice, and encouragement: Bruno Basalisco, Claire Borsenberger, Mateusz Cholodecki, Alberta Corona, Stefano Gori, Annegret Groebel, Philip Groves, John Hearn, Adam Houck, Sandro Mendonça, Soterios Soteri, Stephen Brogan, Peter Dunn, and Felix Gottschalk.

This year's Conference benefited greatly from the efforts of the Conferences Unit of the Robert Schuman Centre for Advanced Studies and, in particular, Elisabetta Spagnoli and the team of the FSR C&M. We are very grateful to Chiara Carrozza, FSR C&M Coordinator, for her support during the editing process for this book.

Most of all, this year, we thank all authors and participants of the Conference. For the second year in a row, it was not possible to hold the Conference in the usual residential format. The difficult circumstances have not affected the will of the

postal and delivery community of scholars and professionals to exchange ideas and reflect together on the evolution of the sector, and this book is proof of this.

The usual disclaimers are applicable. In particular, the views expressed reflect the views of the authors and are not necessarily those of the editors or supporters.

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Chapter 1
The Rise of e-Commerce Platforms in the Parcel Delivery Markets

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1   Introduction

In recent years, the growth of e-commerce has fundamentally changed parcel markets. While most economic sectors in the global economy have suffered a severe downturn caused by the ongoing COVID-19 pandemic, the pandemic has boosted the growth of e-commerce. For retailers, marketplaces, postal and parcel organizations, the challenge is how to respond to these increased requirements for e-commerce when business and delivery infrastructures are under pressure due to demand that is being driven by new consumer behaviors and preferences. Consumers increasingly require more express deliveries, easy package return, order tracking, multiple delivery attempts, *ad hoc* services, etc. These activities require significant changes, especially in last mile delivery (Castillo et al., 2018), and increasingly complex and expensive reorganizations to serve urban areas (Beckers & Verhetsel, 2021).

While postal and parcel operators appear to be under pressure to deliver these new and better services, it is not they who only face challenges. Online retailers, and particularly marketplaces, face constraints on the expansion of their traditional ways of doing business, especially regarding to cross-border delivery (Ecommerce Europe, 2021). For this reason, retailers and marketplaces are taking measures to secure new market capacity and to lower their overall transportation costs. One form of response to these difficulties is that major players in the e-commerce sector have started entering the delivery market.

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This chapter concentrates on the relationship between the evolution of e-commerce and the restructuring of the parcel delivery markets in Europe. It tells the story of the open competition between three kinds of main actors: leading e-commerce companies, delivery operators and traditional postal incumbents.

Following this introduction, the chapter is divided into four parts. Section 2 presents the evolution of e-commerce markets. Section 3 discusses the different market configurations of the parcel delivery markets in Europe. Section 4 presents four case studies: two relating to the entry of global e-commerce platforms (Italy and the United Kingdom) and two to national operators that are still leading in the e-commerce market (the Netherlands and Poland). Section 5 concludes, comparing the cases presented and providing suggestions for further research.

2   The Boom in e-Commerce: e-Retailers, Global and Local Marketplaces

Online marketplaces have experienced remarkable growth during recent years, with an acceleration since the outbreak of the pandemic. This growth has affected not only the well-known global or multinational players, such as Amazon, eBay, Zalando[1] and, more recently, AliExpress (a subsidiary of Alibaba),[2] but also some European or national players. For example, in the Netherlands, the two most relevant e-commerce platforms are national players.[3] In Poland, Allegro leads the market, with a turnover slightly below one billion euro, whereas, in Belgium, the Dutch e-commerce platform, Bol.com, may be considered the leader, with a turnover of approximately EUR 400 million. In the largest European countries, Germany, France, Italy, the UK and Spain, global companies, such as Amazon or eBay, prevail,[4] but even in some of these countries there are relevant local players, such as Otto in Germany (Amazon is the market leader, with revenue of more than EUR 10 billion, Otto follows with a turnover slightly below EUR 3.5 billion), or Cdiscount in France (with revenues of around EUR 2 billion below Amazon's EUR 5 billion).

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[1] Zalando, originally created in Germany, is now present in 17 European markets, and for this reason is included among the multinational e-commerce platforms. Amazon showed a European online turnover of around EUR 32 billion in 2019, followed by Otto, with 6.9 billion, and Zalando, with 6.4. eBay, which adopts a different business model, does not appear in this ranking, however, it is still considered one of the most relevant e-commerce platforms in Europe (European E-commerce report, 2019).

[2] The Alibaba Group, founded in 1999, was initially a B2B e-commerce portal that aimed to connect Chinese companies with foreigner buyers. AliExpress, founded in 2010, is the overseas e-commerce platform of Alibaba, and in 2018 it reached around 150 million overseas buyers.

[3] Bol.com and Coolblue, with a turnover of EUR 2.2 and 1.1 billion, respectively. This is a value three times larger than the online turnover for the Netherlands of the three multinational operators cited in the text.

[4] In all these countries, Amazon is the leading online marketplace, followed by eBay (except for Spain, where AliExpress is second), while Zalando is third in most of these countries (PostNord, 2020).

A recent study (Lehdonvirta et al., 2020), which focused on the role of local and global digital intermediaries in the retail sector, has identified three broad clusters in relation to market configurations. The first includes the five biggest European retail markets – the UK, Germany, France, Italy, and Spain – where the retail sector is highly "platformized" and is dominated by the global players. The second group is formed by countries in which local e-commerce companies lead the market: Poland and the Netherlands are examples. In this group, there are medium-sized retail markets. While still attractive to global leaders, they have markets big enough to allow for the development of local platforms. Finally, a third group includes those countries where the retail e-market has not yet developed to a significant degree and thus is characterized essentially by the presence of small local players.

The variety of configurations in relation to e-commerce markets, and the role of global versus local platforms, may have some intuitive explanations: the dimension of the market (previously mentioned), the preference for shopping locally and in one's own language (this seems to explain the case of Poland, according to PostNord (2020), and of some northern European countries), low internet penetration or mistrust in shopping online (in this respect all the European markets are catching up, but some, particularly from Eastern Europe, still lag behind).[5] A final reason may be fragmentation of regional logistics.

Besides the above explanations, one element that is certainly relevant to this study is that the delivery phase is becoming increasingly crucial for online retailers. This is not only because delivery is in itself a growing and promising sector, but mainly, as suggested by several studies, because timely, trustworthy delivery is one of the major factors that determines the consumers' choice of one e-commerce platform over another. In practice, in online retail markets' competition, the delivery factor sometime emerges as being even more relevant than the price of the products (MH & L, 2016; Kovač et al., 2017).

3 Different Delivery Markets' Configurations across Europe

In recent years, the parcel delivery market has shown a tremendous growth in volumes and revenues (Mazarenau, 2019; ERGP, 2020). The increase is largely due to the rise of e-commerce and to the Covid-19 pandemic, which have accelerated this trend globally, particularly in respect of the B2C and C2X categories.[6] The acceleration is even more evident in those countries that were less digitalized, or that had a low presence of fast delivery, and where, for these reasons, e-commerce was weak before the pandemic (Valarezo et al., 2018).

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[5] See the Digital Economy and Society Index (DESI) elaborated by the European Commission (2020).

[6] The parcel delivery market is often divided into three main categories: business to business (B2B); business to consumer (B2C); and consumer to X (C2X, where the X means both other consumers, package return, etc.). The common definition of the parcel delivery market usually excludes documents, mail, and freight or packages over a certain weight (usually around 40 kg).

The development of e-commerce has had an important and positive effect on postal operators that were experiencing a decline in their markets' revenues. This general European trend is shown by contrasting the decline in the numbers of letters sent in 2019 (average of – 2.6%), and the growth in the numbers of parcels (+5.6%), which produced EUR 39 billion in total revenues.

Behind these general trends, parcel delivery markets are widely diversified across Europe (Parcu et al., 2018). Differences are attributed to various reasons. For example, Eccles and Kuipers (2006) pointed to national regulations and the different timelines of the liberalization[7] and implementation of the EU postal directives into the local, national regimes in European countries. According to Jaag (2015), the level of digitalization of a country, which favors the development of e-commerce, strongly affects the parcel delivery market, stimulating both volume and competition.[8] Other local characteristics also play a role, as the dimension of the internal market, the concentration of the population in large cities, or the strength of the incumbent (often the ex-monopolist), all contribute to different market configurations across Europe (Vantomme, 2014; Jaag, 2014).

Despite the relevance of these characteristics, another pertinent difference among European countries may be related to the typology of the e-commerce operators who are present in the market (global versus national) and to their interest in expanding their activities in the delivery markets. Until recently, most of these e-commerce platforms provided only logistic and storage services and left delivery to national, regional, and local players. They are starting to show greater interest in parcel delivery as a promising new opportunity to integrate their supply chain and as a strategic asset for controlling delivery (Sidak, 2017). In any case, the entry of e-commerce platforms into the delivery market is affecting the market structure and the evolution of its competitive configuration. However, until now, relatively little space has been devoted to the study of the role of e-commerce platforms in the logistics and delivery section of the supply chain (Finger et al., 2014; Gori & Parcu, 2018; Alimonti et al., 2020), and to its effects on markets' competition (Borsenberger, 2016; Borsenberger et al., 2018).

More recently some regulatory authorities have started to monitor the role of e-commerce platforms in the delivery market. According to AGCOM (2020), in Italy e-commerce platforms – Amazon, for example – are entering the parcel delivery market mostly through the use of medium and small size operators who, given the strong influence that multinational platforms may exert, can be considered to be

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[7] Ultimately, it was the third Postal Directive 2008/6/EC that set the timetable for full market opening, thus putting an end to exclusive rights in the letter segment.

[8] However, the situation in the last few years, and particularly since the outbreak of Covid-19, is becoming more balanced across Europe, since countries that were lagging behind are catching up with internet penetration and e-commerce use.

"dominated" by the platform.[9] AGCOM attributes directly to Amazon market power over the delivery of parcels done through third parties (small postal operators). In addition, AGCOM claimed, that in the future, Amazon may become the only operator that is able to take advantage of the growth of e-commerce, and thus, inevitably, reduce the competition in the market, and the quality of services. More recently, the Italian Competition Authority (AGCM) severely fined Amazon for EUR 1.128 billion for abuse of dominance.[10] The Authority found Amazon guilty of harming competing operators in logistics services. In addition to the fine, the Authority imposed behavioral measures to Amazon with the intent to restore competitive conditions in the market (AGCM, 2021).

Following a similar approach, the Spanish CNMC (2020) identified the activity of two Amazon-owned companies as "postal activity" and subjected them to compliance with the requirements of the Postal Law. In Spain, the discussion is focused on the intensity of control that Amazon has over its parcel delivery service and the fact that Amazon also offers these services to third parties.

The entry of e-commerce operators into parcel delivery is not only a European phenomenon. A few years ago, the U.S. Postal Service started to address the problem. After it identified a risk from the strategic opportunities that might be caused by large e-commerce platforms entering the parcel delivery market, the Office of the Inspector General (OIG) of the U.S. Postal Service asked Professor Panzar (2017) to carry out an analysis. The report discussed the issue through a theoretical model, indicating that the postal operators should set a price that exceeds its unit cost, but is both lower than their competitors' prices and low enough to discourage large retailers from self-delivery. Other scholars suggest that this view does not account for many other possible strategic actions by e-commerce platforms and the possible harm to consumers that may result (Sidak, 2017); a discussion about the pricing of competitive postal products in this context is contained in (Brennan, 2020).

It is therefore crucial for postal operators to understand platforms' market strategies with respect to the delivery phase, given also that different platforms appear to behave very differently. This is certainly the case for the two main e-commerce platforms: Amazon and eBay. The former, a clear leader in the B2C segment, has shown since the late nineties a strong interest in delivery, defining it as crucial since the early 2000s, as evidenced by the "Amazon Prime" project (Hahn et al., 2018).[11] On the contrary, eBay, the leader in C2C, was less interested in delivery services, and started to offer its own delivery services only in the last few years (Heller, 2019).

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[9] Following AGCOM (2020), the e-commerce national B2C parcel market has been divided into *express* and *deferred* parcels' delivery, where the latter includes parcels that are delivered in 3–5 days. AGCOM identified Amazon as the first operator in the *deferred* market and the second operator in the *express* market.

[10] This is by far the highest fine imposed by AGCM in its 30 years history. Amazon immediately announced that it will appeal the decision.

[11] Amazon Prime was launched in February 2005 with an initial price for eligible purchases of 79$ for free two-day shipping in the US. (Yurieff, 2018).

To explore cooperation, competition and more general interactions between postal operators and e-commerce platforms in the delivery markets, the next sections will present few case-studies. The choice of the countries studied is based on the presence of a national or global e-commerce platform as a market leader, and on the analyses that emerged from previous research (Lehdonvirta et al., 2020; Parcu et al., forthcoming). The UK, the first country Amazon entered in Europe, and Italy represent the first group of cases, characterized by a big national retail market and the leading position as a global e-commerce platform in the market. The second group of cases, which includes Poland and the Netherlands, present medium-sized national markets where national platforms presently dominate the e-commerce market.

4   Case Studies

4.1   Italy

Among the biggest retail markets in Europe, Italy has only a modest e-commerce market, with online shopping accounting for just 6.5% of overall retail sales. However, the trend is one of rapid growth, due to the rising use of smartphones for shopping and to the effect of the pandemic. In fact, the Italian market has grown at a double-digit rate since 2017. The value of the purchases of Italian e-consumers increased almost twofold between 2015 and 2020: the value of online purchases amounted to EUR 16.6 billion in 2015 and reached EUR 31.6 billion in 2019, before slightly decreasing to EUR 30.5 billion in 2020.[12]

According to the data published by Statista in 2021,[13] Amazon is leading the Italian e-commerce market, with the e-commerce net sales generated in Italy of USD 2.9 billion in 2019, followed by Zalando.it with USD 0.5 billion. Third and fourth places are taken by Apple.com, with revenues of USD 0.4 billion, and Shein. com with USD 0.3 billion. The most used marketplaces, according to market research that was conducted by Casaleggio Associati (2021), are Amazon (38%), eBay (21%), Facebook Marketplace (13%), ePRICE (3%), Alibaba (2%), and Zalando (2%). Amazon is the clear leader in the market, and between June 2019 and 2020 it sold 60 million products from Italian retailers (compared to 45 million in the previous period).

The rapid development of e-commerce in Italy has led to a remarkable growth in both parcels' revenues and volumes (AGCOM, 2021a). In terms of the revenues of the postal services from March 2020 to March 2021, a strong increase of 25.5% is due to an increase of almost 42% in the revenues that come from parcel delivery services, particularly in the domestic market.

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[12]All the data are retrieved from https://www.statista.com/map/europe/italy/e-commerce

[13]https://www.statista.com/forecasts/871153/italy-top-online-stores-italy-ecommercedb

The parcel delivery market in Italy seems to present very low barriers to entry.[14] The number of operators has constantly grown, having risen to more than 3.000 companies in 2020.[15] This feature of the Italian market has been defined by AGCOM (2017, Annual Report) as being somehow "anomalous" compared to other European markets. However, the same authority (2021b, p. 89) underlines that the number of operators who are able to compete, at the "end-to-end" level, with the incumbent, is exiguous. AGCOM has argued that for a postal network to be considered as an alternative to Poste Italiane, it is necessary for a large aggregation of operators that are active on smaller scales but can be linked by contracts of *franchising* or *partnership*. This "hub and spoke" market configuration has prompted AGCOM to carefully monitor its evolution and dynamic.

AGCOM analyses of the sector focused on the 27 companies with the highest revenues which, according to the inquiry made by the Authority, are connected to more than 800 local operators who cooperate closely with them in several phases of the delivery process. Among the 27 companies, some are present, either exclusively or primarily, in national deliveries (e.g., Amazon, BRT, Citypost, GLS, Nexive, SDA and TNT), while others mainly deliver cross-border parcels (e.g., Asendia, UPS, Schenker and FedEx). Some of the operators entered the market just after the recent takeoff of e-commerce and are specialized in last mile delivery (e.g., Milkman, a successful start-up that was launched in 2015). At present, Amazon Italia Transport, which has been officially included among postal operators since 2018, is the only vertically integrated online platform and it is also one of the main customers of many of the postal operators.[16]

It has been recognized that the Italian parcel delivery market has a relatively low level of concentration (Parcu et al., Forthcoming): all the operators have shares that are below 20%, and Poste Italiane (which includes the controlled SDA) is the second operator, following BRT. In recent years, the market share of Amazon Italia Transport has grown significantly (+4.3% in the period March 2020-March, 2021, see Fig. 1.1), and the company is now the third operator, with a market share very close to the first two. The market integration in the delivery of the stronger of the e-commerce global platforms in Italy is now a reality.

It is interesting, in this respect, that the number of the so-called Pick-Up Drop-off points (PUDOs) of the alternative operators has registered constant growth, reaching in 2020 more than 50% (from 14% in 2014) of the total number of PUDOs in the country. In conclusion, the Italian delivery market, despite its excessive fragmentation, can be regarded as being quite dynamic and competitive.

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[14] Companies have to submit a request for a qualification to the Ministry of Development (MISE) and pay a low fee of about EUR 3000.

[15] https://www.mise.gov.it/images/stories/documenti/elenco-operatori-postali-21-02-2020.pdf

[16] In 2018, Poste Italiane signed a pluriannual contract with Amazon for parcel delivery and, according to the data disclosed by AGCOM (2019), Amazon is at present the first customer, in terms of turnover, of the Poste Italiane Group.

Fig. 1.1 Shares of parcel delivery service operators (those that are not included in the US). (Source: AGCOM, 2021a, p. 17)

Source: AGCOM 2021a, p. 17

4.2   The UK

The UK parcel market witnessed high growth due to the increasing popularity of e-commerce, which increased by 20% in the period 2017–2019 (Statista, 2020).[17] With 48.6 million consumers, and 95% of the population aged 15–79 shopping online, and with an average spending per person estimated at EUR 1020, the UK, together with Germany, has the strongest e-commerce market in Europe. Leadership in this market is firmly in the hands of Amazon, which, with a total sales amount of EUR 20 billion in 2020 (Amazon, 2020),[18] has roughly 30% of the share of online sales, followed by eBay (9.8%), Sainsbury's (4.6%) and Tesco (4.5%).

While the traditional strength of the Royal Mail remains unabated, two particular trends have invigorated the competition in the UK parcel market in recent years. Firstly, the number of retailers that have started to offer their own delivery services has grown. For example, after the launch of its own delivery service, Amazon was able to capture 3% of the UK parcel market in just one month. Secondly, in-store collection and delivery services have both grown significantly. Furthermore, as parcel carriers continue to invest in new capacity, the pricing pressure increases. According to the Royal Mail's estimate, there is presently an approximate 25% overcapacity in the UK parcel market (Royal Mail, 2020).

In 2019–2020, Ofcom continued to collect revenue and volume data from the major parcel operators in the UK, which include: the Royal Mail Group (including

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[17] Starting from slightly different markets definitions other statistics suggest an increase of approximately 20–25% in the period (PosteNord, 2020).

[18] The total revenues reported in the Annual report il even larger, reaching $26.5 billion in 2020, but this amount includes Prime membership fees, advertising revenues and web services that are not relevant to this study.
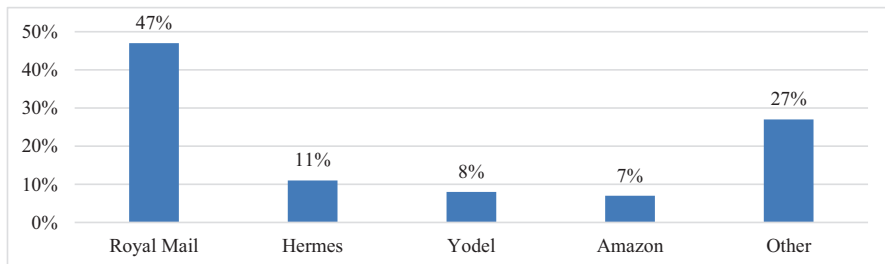
Source: Statista Dossier Postal Services in the United Kingdom.

Fig. 1.2 Distribution of the courier parcel market in the United Kingdom (UK) in 2017, by company. (Source: Statista Dossier Postal Services in the United Kingdom)

Parcelforce Worldwide); Hermes; Yodel; Amazon Logistics (encompassing both Amazon Marketplace and Amazon Retail); DHL International and DHL Parcel UK; DPD Group; DX; FedEx and TNT UK (a subsidiary of FedEx); the Alternative Parcels Company; Tuffnells and UPS (Fig. 1.2).

During the last year, due also to COVID-19, the parcel delivery volumes and revenues grew tremendously, in particular for the incumbent USP. According to its report, Royal Mail volumes grew by approximately 35%, and revenues by 20% (Royal Mail, 2020). Despite the belief that the increased demand for e-commerce, to which postal operators responded with substantial investment,[19] will not change even after the end of the Covid-19 pandemic, operators are concerned about the future of parcel delivery, and their voiced concern is due particularly to Amazon's entrance into B2C parcel delivery.

> Amazon is an increasingly important player in B2C market dynamics and continues to expand its parcel delivery capability. As a large online retailer, Amazon uses multiple carriers to deliver its own retail products, as well as the goods of third-party sellers on the Amazon Marketplace who use its Fulfilment by Amazon (FBA) service. The FBA service provides warehouse storage, customer services and product delivery. Amazon also has its own delivery network – Amazon Logistics. Amazon uses Amazon Logistics to carry parcels sold on the Amazon website, either by Amazon Retail or third-party FBA sellers. In addition, Amazon has recently launched Amazon Shipping in the UK, whereby Amazon has begun to collect parcels from some retailers' own premises for delivery. Ofcom (2020).

To conclude, the UK parcel market has been affected by rapid changes and the recent entry of Amazon into delivery is clearly one of the most significant. Nonetheless, despite the concerns that are related to the future of the industry and connected to the entry of this leading e-commerce platform into parcel delivery, the traditional position of the Royal Mail presently remains strong. New investments

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[19]According to Ofcom (2020), due to Covid-19, all the main parcel operators responded to the increased demand by creating new jobs and increasing their investments. Hermes announced that it would recruit 10,500 new employees, DPD 6000, Yodel 2950 and Royal Mail 33,000 temporary workers for specific periods.

and recruitment, as well as several mergers among the other parcel operators, are all elements of an attempt to respond to this market confrontation.

4.3   The Netherlands

The Netherlands is among the top countries in Europe in terms of purchasing online retail. Even if, in absolute terms, it finds itself in a position that is below the leading markets of UK, France, Germany and Spain, it stands out due to its rapid expansion in recent years.

The online retail industry in the Netherlands is largely dominated by domestic companies: Bol.com; the electronics retailer Coolblue and the fashion store Wehkamp, with major e-commerce global platforms Amazon and Zalando also being in the top six (see Fig. 1.3).

Bol.com and Coolblue, the leaders in the Dutch e-commerce market (Gelici, 2020), present a business model that resembles certain features of Amazon in the USA. Bol was established in 1999 and started off by selling books, CDs, and DVDs, but quickly evolved into a full marketplace, widening its product range to cover a large variety of niches. In 2018, Bol had a turnover of EUR 1.64 billion, making it the biggest online retailer in the market. The popular marketplace, Coolblue, was created in 2000, and three separate online shops were finally merged into the
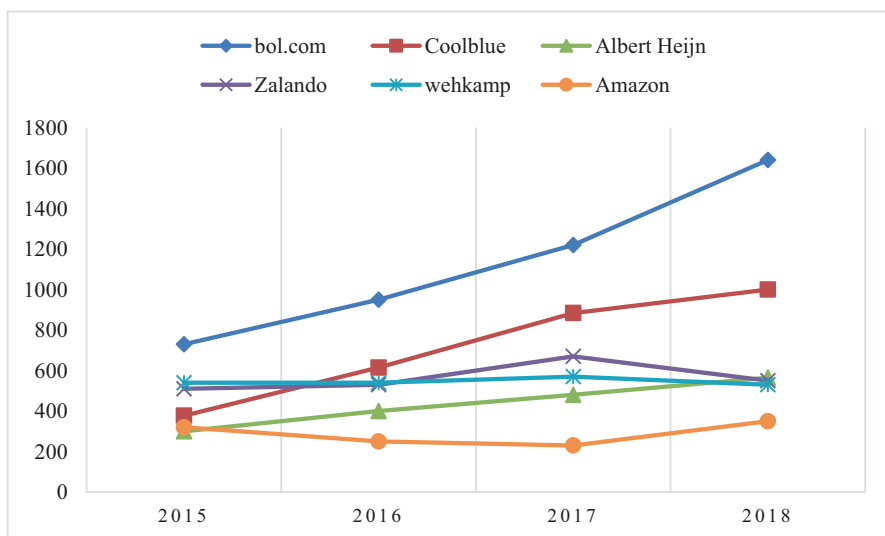
Source: Statista's data

Fig. 1.3 Leading online retailers in the Netherlands 2015–2018 (revenues; million euros). (Source: Statista's data)

Coolblue.nl domain in 2018. The company is focused on building "end-to-end" solutions for its customers. It launched its own van delivery service, CoolblueDelivers, in 2016, and further expanded its delivery modalities in 2018 by introducing CoolblueBikes.

The E-commerce platform, Zalando has been active in the Netherlands since 2010, while Amazon was not active in the country for years, since it was using only a partially translated version of its international websites to reach Dutch consumers. Only in March 2020 Amazon launched Amazon.nl, and its reach has since increased steadily, even if the leadership of the two cited local marketplaces is still unquestioned.[20]

The peculiarity of the e-commerce market's configuration in the Netherlands can be explained as the combination of several factors. These include the high percentage of people who access the Internet on mobile devices, which has boosted mobile commerce; the consumers' strong preference for shopping domestically and in Dutch language; an online payment space that is dominated by the domestic brand IDEAL, which was developed and launched by Dutch banks in 2005, in a country that is known for its relatively low use of credit cards as a payment method (PostNord, 2020). Fast delivery – a legacy of the country's reputation for world-class delivery and logistics – is also a key component of the Dutch e-commerce culture, which makes the quick fulfilment of orders essential for e-commerce companies (Morgan, 2019).

The delivery market is much less dynamic than the e-commerce market. There are six large parcel carriers in the country, which, in 2020, managed a total of 778 million parcels, of which 586 million were delivered to a Dutch address (ACM, 2021). In domestic parcel delivery, B2C represents 74% of the total volumes and recorded an increase of 37.8% if compared to 2019; while the B2B segment demonstrated a lower increase of 13.3% in the same period. A strong increase was also registered in the C2X segment (38.6%), which, however, represents only 4% of the domestic parcels volumes. PostNL remains the largest carrier of domestic parcels and, in 2020, its market share was 55–60%, both in terms of volume and revenue. After the leader, DHL Parcel as in previous years has the second largest market share, 30–35% in 2020 based on both volume and turnover. All the other companies follow at a considerable distance: DPD, GLS UPS and TNT (the smallest carrier) all have market shares in the interval 0–5%.

It is worth mentioning that the Netherlands is actually becoming a laboratory for experimenting with alternatives modalities in last mile delivery.[21] One of the main reasons is the high costs of this phase, due to the wages of the delivery personnel, which account for up to 50% of the costs per parcel, and which are growing quickly, partially due to the scarcity of personnel on the labor market.

Moreover, environmental regulations are destined to have an increasing effect on delivery costs. Large cities, like Utrecht and Amsterdam, have declared a complete

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[20] https://ecommercenews.eu/amazon-doubles-reach-in-the-netherlands/

[21] https://www.brand-experts.com/brand-distribution/last-mile-innovation/

ban on combustion engines for inner city delivery vans from 2025. This means that logistics service providers will need to change their fleets to more expensive electric delivery vans and/or to delivery bikes. The leaders of Dutch e-commerce are anyway increasing their investments into the last mile. Amazon has recently announced that it will open its own delivery station in the Schiphol area, and it will start working with small and medium-sized independent local delivery companies, in addition to its existing carrier partners: DHL and PostNL.[22]

In conclusion, the parcel market in the Netherlands remains highly concentrated, and e-commerce platforms still don't have a significant presence in the delivery phase.

4.4 Poland

With respect to e-commerce, the largest marketplace in Poland is the domestic platform Allegro, established in 1999, which has around 40% of market share. According to Ecommerce-news.eu, Allegro has also become popular in other countries. With its 194 million monthly visitors, it is currently the tenth most visited marketplace in the world. In October 2020, Allegro was listed on the Warsaw Stock Exchange, becoming the largest IPO in Poland's history. In the Prospectus for its IPO offering, Allegro (2020) stated: "*Merchants are able to take advantage of a smart logistic network that is simple to use and that provides a range of delivery options, while benefiting from more competitive delivery costs through the [Allegro] Group's umbrella agreements with key logistics players, including, among others, InPost, DPD, UPS and the Polish state postal service (Poczta Polska)*." Moreover, "*the Group is focused on delivering the [user] experience primarily through an "asset-light" model that is achieved through investments in technology and solutions that support 3P merchants, rather than through investing in the "asset-heavy" inventory and infrastructure parts of the e-commerce value chain*" (p. 109).

Other relevant marketplaces in Poland, albeit with a limited presence so far, are AliExpress (which belongs to the Chinese Alibaba), Zalando and Amazon, which launched its fully Polish version only on March 2, 2021.[23] Amazon has a limited presence not only in Poland but in general in the emerging Eastern European e-commerce markets, which in comparison to their Western European counterparts (Germany, Italy or UK) are much smaller. However, considering the rapid growth these markets have recorded in recent years, and the opportunity for further expansion that they present, they could become attractive for investment by global platforms in the coming years.

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[22] http://www.citylogistics.info/business/amazon-opening-a-regional-urban-parcel-hub-in-amsterdam-region/

[23] Until recently, Amazon has served its customers in Poland through its German website.

In 2020, the sum of the revenues from postal services in Poland increased by 14% in comparison to 2019. It was the fourth consecutive year in which growth in the postal market exceeded that of the Polish economy. This growth has mostly been driven by the increase in the revenues from courier services, which in turn has been caused by the growing volumes of e-commerce transactions and shipments. In 2020, courier shipments accounted for nearly 34% of postal services, in terms of volume, but as much as nearly 59% in terms of value (UKE, 2021).

As of December 31, 2020, Poland had 291 postal operators, including Polish Post (Poczta Polska) the designed provider of universal service. However, as noted by the Polish postal and telecom regulatory authority, UKE (2021), only 138 of the 290 alternative operators had actually been active in the market (as not all registered operators actually undertake postal activities). A gradual increase in the number of registered alternative postal operators was observed in the period 2012–2014. However, since then, the number has remained stable, varying from 267 in 2012 to 290 in 2020. Alternative operators provide services in three segments of the postal sector: courier services, services falling within the scope of the universal services, and other postal services.

Altogether, in the courier services segment, which is the area in which competition has developed the most, operate 89 postal companies, including Poczta Polska.[24] Moreover, courier services contribute the most to the overall value of the Polish postal market. Despite higher prices, in Poland couriers remain the preferred shipment option for e-commerce transactions (rather than the traditional postal package services). The seven largest operators offering courier services together accounted for 96.6% of market volume, and 93.9%, of market revenues. These operators include three global players (DHL, UPS and FedEx/TNT), two companies that are owned by European posts DPD (French Post) and GLS (British Post), a domestic courier with foreign capital (InPost) and the national postal incumbent (Poczta Polska). In 2018, the French-owned DPD led in the courier market with a 25% market share, followed by the German DHL with approximately 20% of the market share. The domestic operator Poczta Polska and the American UPS both controlled 15% of the market, they were followed by InPost and GLS (Royal Mail). Since 2018, the leadership in the market has changed as, in 2020, InPost[25] moved to the top of the list, pushing DPD into second position. GLS jumped to the third position,

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[24] Although, in recent years, courier companies have benefited from the dynamically developing demand for their services, declining unemployment (which in 2019 decreased to 3.3%, in comparison to the EU-average of 6.3%) and the correlated pressure for wage increases, resulted in a marked increase in the costs of running courier activities in Poland. Arguably, despite large scale operations and very high operational efficiency, Polish operators have found it difficult to achieve high profitability.

[25] In 2021, Inpost also acquired Mondial Relay, a major French logistics company, thus expanding its international presence.

while UPS and Poczta Polska have become, respectively, the fourth and fifth players in the market (UKE, 2021).[26]

The late arrival of global e-commerce platforms in Poland explains their complete absence in the parcel delivery activity that, at present, is provided solely by the traditional couriers.

5   Conclusion

While the preferred e-commerce channel for European enterprises is still proprietary websites and apps rather than marketplaces, the latter have experienced a remarkable growth in recent years, further accelerated by the outbreak of the pandemic. The growth is related not only to the well-known global or multinational players, but also to several European and local companies.

Parcel delivery is increasingly crucial for all these companies: often customers by their choices value timely delivery even more than the products' prices. E-commerce platforms are responding by entering the delivery markets, thus increasing the pressure on couriers and the traditional postal operator. This dynamic has raised the attention of postal regulatory authorities (in the US, Italy, and Spain), that have started to monitor their role in the delivery markets. More recently, the Italian Competition Authority has fined Amazon EUR 1.128 and imposed behavioral measures in the attempt to restore more competitive conditions in the market.

Our analysis confirms the great dynamism of the parcel delivery markets following the e-commerce boom. At present, there is no clear correspondence between the configurations of the e-commerce markets and the delivery markets. Context-specific factors seem to push online marketplaces to tailor their industrial strategies to seize the opportunities available in each country. However, a few general indications may be derived from the evidence collected in this chapter.

Global marketplaces, primarily Amazon, are increasingly embracing vertical integration, establishing themselves as logistic operators, even in countries where their position in the e-commerce market is still limited, as in the Netherlands. On the other hand, local online marketplaces seem to be relatively less interested in the delivery phase, despite some light investment that has been made by the Dutch champions into the last mile. The choice as to whether marketplaces opt for asset-heavy or asset-light models of delivery is determined by a variety of factors. For instance, in the Netherlands and in Poland, a relevant variable appears to be the cost of labor, as delivery is a labor-intensive business, and these two countries have among the lowest unemployment rates in Europe.

Concerning the role of traditional postal operators in parcel delivery, the situation appears to be diversified. In the Netherlands, the leadership of PostNL in the

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[26] With respect to the relatively weak position of Poczta Polska in the courier segment, it must be noted that Poland was one of the last EU countries to fully liberalize its postal market (2013).

delivery market is uncontested, and also in the UK Royal Mail's position appears to still be strong. In Italy, Poste Italiane competes in an apparently dynamic market,[27] while the incumbent postal Polish operator in its country is not even among the top four providers of parcels' delivery. National regulations relating to the universal service providers probably also play a role in explaining the different positions that are occupied by the postal incumbents in the parcel markets. In this respect, the revision of the Postal Directive may lead to changes in the regulatory framework, which, in turn, may have consequences for the configuration of these markets.

The last historical player in parcels' delivery, the couriers, who are traditionally more active in the express and international delivery of parcels, find themselves in a difficult position. This is confirmed by the decline in the market capitalizations of many of the largest companies in this segment, as they are contemporaneously facing competition from powerful new entrants, being e-commerce platforms or incumbent postal operators, and recovering from the disruptive effect of the pandemic on their international logistic chains.

The continuing explosion of e-commerce, with the new increasing competition/co-operation unfolding between global platforms and traditional postal operators, the strenuous resistance of local platforms and large couriers, are all elements that will characterize the future of parcel delivery in Europe and beyond and will certainly constitute an interesting topic for analysis and research in future years.

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[27] But AGCM mega-fine to Amazon cited above unavoidably cast doubts on this assessment.

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Chapter 2
Parcel Locker Stations: The Future of e-Commerce Delivery?

Antonia Niederprüm and Willem van Lienden

1 Introduction

Diverging trends in letter and parcel volumes (including small packages containing merchandise) are driving the transformation of national postal operators into more parcel-oriented services. Some national postal operators have distanced themselves from the daily delivery of letters to all households by switching to alternate-day (or even less frequent) delivery models. In contrast, quality of parcel delivery (particularly B2C) has improved with next-day delivery as the new standard in many countries. The European Regulators Group for Postal Services (ERGP) reported that, since 2015, the total number of parcels has increased from 5.07 billion to 7.15 billion, or by 9.2% p.a. on average, while letter post volume declined by 5.3% p.a. across the ERGP member countries (2015–2019).[1] The COVID-19 pandemic and resulting lockdowns have further boosted e-commerce sales as well as the number of online shoppers. Eurostat reports that in the European Union (EU-27) the share of individuals with online purchases during the last 12 months increased from 60%

[1] ERGP (2020b), p. 41.

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to 65% between 2019 and 2020.[2] This jump in online purchases resulted in growing B2C parcel volumes for national postal operators as well as parcel and express carriers in 2020.

Many national postal operators (universal service providers) reported significant increases in parcel volumes: e.g. Deutsche Post DHL ('DPDHL') reported a 15% increase in 2020[3]; PostNL's parcel volume increased by 19%[4]; La Poste (colissimo),[5] Royal Mail,[6] and Austrian Post[7] achieved growth rates between 28% and 30%; PostNord Sweden reported an increase of 23%; and PostNord Denmark had a growth rate of 37%.[8] The European parcel carriers DPD and GLS reported significant increases in their parcel volumes: 26% at GLS[9] and 24% at DPD; both reported an increase in the share of B2C parcels, GLS to 57% (+12 percentage points compared to the previous period) and DPD to 55% (+10 percentage points).[10]

The effects of the pandemic accelerated growth in parcel volumes. The shift to B2C parcel deliveries by several years and revealed significant capacity constraints in the last mile. Expansion in home deliveries became limited due to driver shortages and is extremely costly due to a significant rate of unsuccessful first-time delivery attempts. Consequently, parcel and postal operators have been extending delivery (and return) options for parcels by increasing the number of alternative pick-up and drop-off points. Postal outlets and parcel shops are increasingly complemented by parcel locker stations (or automatic parcel machines (APMs)). These trends are also confirmed by statistics on 'postal establishments' and parcel lockers collected by the ERGP (European Regulator Group for Postal Services) for a selection of European countries. Between 2015 and 2019, their number increased by 16% to nearly 180,000 outlets driven by the increasing number of parcel shops.[11] The number of parcel locker stations even increased by 57% within 1 year from 19,344 (2018) to 30,338 (2019).[12] However, the developments resulted in densities that vary considerably among European countries (Fig. 2.1).

Figure 2.1 shows that in 2020 the density of parcel locker stations varied considerably among 26 European countries from more than five stations per 10,000 inhabitants in Estonia to less than one station in more than two-thirds of the countries (starting with Germany). The density of postal outlets/parcel shops is considerably

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[2] Based on Eurostat, until 2019 [isoc_ec_ibuy] and 2020 [ISOC_EC_IB20].

[3] Deutsche Post DHL (2021), p. 14.

[4] PostNL (2020) and PostNL (2021).

[5] Le Groupe La Poste (2021).

[6] Royal Mail Group (2021).

[7] Austrian Post (2021).

[8] PostNord (2021a), p. 7–8.

[9] Royal Mail Group (2021).

[10] Le Groupe La Poste (2020, 2021).

[11] ERGP (2020b), p. 60.

[12] Ibid, p. 72.
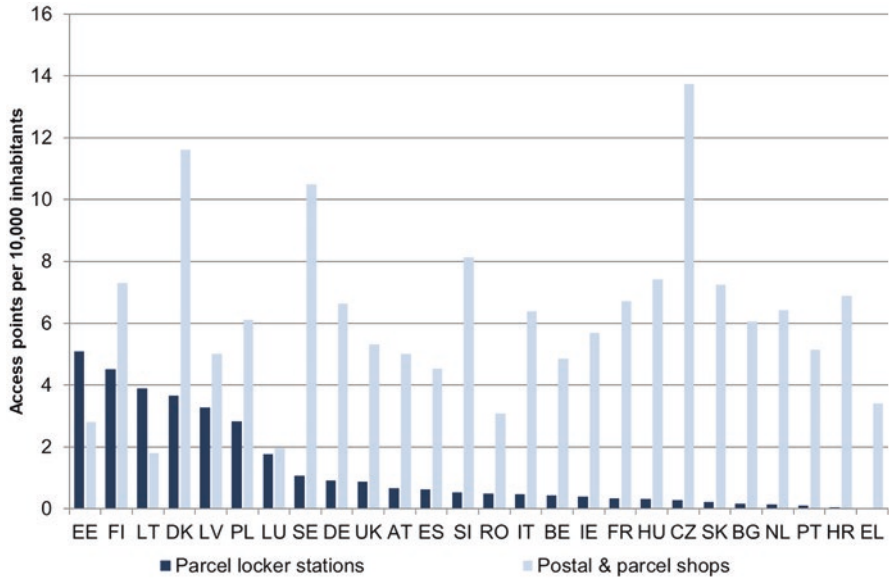
Fig. 2.1 Density of access points per 10,000 inhabitants by country (2020). (Source: Own research from publications of operators and market studies of national regulatory authorities, complemented by Last Mile Experts (2021)). Notes: AT Austria, BE Belgium, BG Bulgaria, CZ Czechia, DE Germany, DK Denmark, EE Estonia, EL Greece, ES Spain, FI Finland, FR France, HR Croatia, HU Hungary, IE Ireland, LT Lithuania, LU Luxembourg, LV Latvia, NL Netherlands, PL Poland, PT Portugal, RO Romania, SE Sweden, SK Slovakia, SE Sweden, UK United Kingdom

higher (see Fig. 2.1). We estimate that in 2020 the ratio 'parcel locker station per postal outlet/parcel shop' was around 1:7 on average.

During 2020, the networks of postal outlets and parcel shops were partly hit by the closure of stationary retail shops during the lockdowns in respective countries.[13] Alongside social-distancing requirements, the lockdowns apparently led to the increasing attractiveness of parcel locker stations as an alternative to home or parcel shop deliveries in 2020. This was followed by announcements of parcel carriers and national postal operators that indicated that the number of parcel locker stations will be expanded in the coming years.

DPDHL planned to double the number of parcel locker stations ('DHL Packstationen') to 12,500 by 2023.[14] Polish InPost increased the number of parcel locker stations by more than 2500 in 2020 and plans to expand the total number to 14,500–15,500 locker stations by the end of 2021.[15] The Norwegian postal operator, Posten, plans to roll out 3000 parcel locker stations at 1000 locations during 2021.[16]

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[13] See ERGP (2020a), p. 12–13.

[14] Deutsche Post DHL (2020).

[15] InPost (2021a), p. 139.

[16] Posten (2020).

PostNord Sweden tested SwipBox parcel locker stations in Stockholm and decided to roll out 2500 of the parcel locker stations in 2021.[17] Finnish Posti has massively raised the number of parcel locker stations in 2020 and announced the expansion of its parcel locker network from 2150 to 4000 over the next 2 years.[18] DPDgroup announced that they plan to increase the number of parcel locker stations to 30,000 in Europe.[19] For 2020, they reportedly provided access to a total of around 1600 parcel locker stations in France, Denmark, Finland, the Baltic countries, Portugal and Spain.[20]

This paper explores the potential reasons for this variety and discusses the role of parcel locker stations in e-commerce delivery. The emphasis falls on deliveries to parcel locker stations (or APMs) that are accessible to the public, either indoor (in shops or malls) or outdoor.[21] The paper aims to identify challenges and key drivers for the development of APM networks based on case studies for a selection of countries (Sect. 2). It analyses typical business models (Sect. 3) and discusses the economic reasons for the dominance of exclusively operated APM networks (Sect. 4). The paper provides an in-depth economic analysis on the operation of parcel locker networks and complements the publications of Zurel et al. (2018) and Rozman (2020) who provided a regulatory analysis of this topic. Section 5 concludes.

2   Country Cases

To better understand the drivers for the development of parcel locker networks we selected five countries based on their national characteristics; four countries with high-density networks (Estonia, Finland, Denmark and Poland) and Germany, that shows a relatively low density of such stations despite DPDHL being the first operator to launch parcel locker stations 20 years ago.

2.1   *Estonia: Competition Between Three Closed APM Networks*

Figure 2.2 presents the number of parcel shops and parcel locker stations per 10,000 inhabitants, in total and for each of the major providers in Estonia. On the right-hand side, it shows the usage of different delivery options by Estonian online

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[17] PostNord (2021b).

[18] Posti (2021a).

[19] Geopost DPDgroup (2021a), including Russia.

[20] Geopost DPDgroup (2021b), excluding Russia (with in total 3394 parcel locker stations).

[21] We are aware that APMs can and will often be used for sending pre-paid parcels (especially returns). In this paper we put the emphasis on the delivery function of APMs.

buyers. Estonia has the densest network of parcel locker stations by population in Europe, consisting of three competitive parcel carriers operating their own network of parcel locker stations, including Omniva (the national postal operator of Estonia), Itella (subsidiary of Finland's Posti), and DPD Estonia. DHL Express also has an independent network in Estonia, but on a much smaller scale compared to the afore-mentioned players. Omniva[22] and Itella started operating parcel locker stations around 10 years ago in 2011 and 2010 respectively while DPD started in 2016. The individual parcel locker networks are operated exclusively by their respective carri-ers, with each carrier additionally operating their own networks of parcel shops. Estonia is the only country where the density of parcel shops is smaller than the density of parcel locker stations (see the left-hand side of Fig. 2.2). So far, parcel locker stations are mainly placed at high-traffic locations and in bigger cities. Press releases of the major operators suggest that the networks are continually being expanded and moving closer to the people. This year, Omniva started a network expansion project to establish parcel locker stations in smaller cities and villages in collaboration with local governments and communities.[23]

Parcel lockers are reportedly the most used delivery method by Estonian online shoppers, even more used than home delivery or delivery to parcel shops (see the right-hand side of Fig. 2.2). This may be largely due to parcel locker delivery being the fastest and most affordable delivery option, and many online merchants offer free delivery to parcel lockers for orders above a certain value threshold. For exam-ple, the listed prices for Omniva deliveries to parcel lockers are between 30% and 40% cheaper compared to home deliveries, depending on the parcel size.[24] The delivery to parcel locker stations is even cheaper than delivery to post offices or parcel shops reflecting the intense competition in this segment. Furthermore, online

Fig. 2.2 Estonia: Density of parcel shops and parcel locker stations and online buyers' usage of delivery options. (**a**) Access points per 10,000 inhabitants in Estonia (2020). (**b**) Used delivery options in Estonia (2019). (**a** Source: Own research. **b** Source: Based on Geopost DPDgroup (2021c))

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[22] Formerly Eesti Post.

[23] Omniva (2021).

[24] WIK calculation based on price lists of Eesti Post.

merchants offer their customers a choice of their preferred carriers, thereby allow-
ing them to choose the parcel locker station that is most convenient to them.

2.2   Finland – Posti Have Boosted the Number and the Usage of Parcel Locker Stations Within Five Years

Figure 2.3 presents on the left-hand side the number of parcel shops and parcel
locker stations per 10,000 inhabitants, in total and for each of the major providers of
parcel lockers. On the right-hand side, it shows the preferred delivery options of
Finnish online buyers in 2016 and 2020. Finland has the second-densest network of
parcel locker stations in relation to its population size in Europe. The majority of
parcel lockers are operated by Posti (the national postal operator) as part of an
exclusive network alongside its parcel shops and post offices. In 2010, Posti started
with the implementation of screen-controlled parcel locker stations and promoted
the expansion of the network as an element of their transformation strategy in 2017[25]
(thereby switching to battery-driven smart locks with IoT technology). Since 2018,
smaller players started to launch parcel locker stations, e.g. Pakettipiste and
Smartmile both implementing a carrier-agnostic approach. This has enabled Posti's
competitors, including Matkahuolto, DB Schenker, and PostNord, to offer parcel
locker services and not only rely on parcel shops and home deliveries. PostNord
recently announced that they will establish their own stations in Finland in metro-
politan areas.[26] Therefore, Finland presents an interesting case where parcel lockers
are increasingly becoming the preferred delivery method with opportunities arising
for other parcel carriers to compete with the incumbent national postal operator in
this specific segment.

Fig. 2.3 Finland: Density of parcel shops and parcel locker stations and online buyers' preference
for delivery options. (**a**) Access points per 10,000 inhabitants in Finland (2020). (**b**) Preferred
delivery options in Finland. (**a** Source: Own research. **b** Source: Based on PostNord (2016a, 2020))

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[25] Posti (2017).

[26] PostNord (2021b).

Finland has developed a strong culture of using parcel shops/parcel lockers over time, with it becoming the preferred method of delivery compared to home delivery (see the right-hand side of Fig. 2.3). This may partly be due to the convenience of having parcel shops and parcel lockers available at large retail chains (i.e., mainly indoors), e.g. K-group, R-Kioski, and S-group stores – parcel shops and parcel lockers are often in the same location, allowing recipients freedom to choose their preferred delivery method. Moreover, retail stores in Finland typically have long business hours and some are even open 24/7, allowing recipients plenty of flexibility to collect their parcels. Posti recently announced that it successfully tested the use of outdoor parcel locker stations under the extreme weather conditions in Finland, and plan to roll out more of them in areas where they do not receive space for indoor parcel lockers.[27]

Another contributing factor to the preference for parcel shop/parcel locker delivery stems from the price incentives with discounts between 22% and 35% offered (by Posti) compared to home delivery, depending on the size and weight of a parcel. Similarly, price lists published by Matkahuolto indicated that delivery to parcel shops/parcel lockers are offered at discounted prices ranging between 34% and 49% cheaper than home delivery depending on the parcel size and type of collection point. From this evidence, it is clear that there are strong price incentives in Finland to promote the use of parcel shops and/or parcel lockers as delivery options, while the decision between the two pick-up options is more driven by the online shoppers' preferences.

2.3   Denmark – The Largest Carrier-Agnostic Network of Parcel Locker Stations in Europe

On the left-hand side, Fig. 2.4 shows the number of parcel shops and parcel locker stations per 10,000 inhabitants in Denmark, in total and for each of the major providers of parcel lockers. The preferred delivery options of Danish online buyers are shown on the right-hand side. The national postal operator (Post Danmark respectively PostNord Denmark) started offering parcel locker stations as delivery option more than 10 years ago, in 2008. SwipBox, a supplier and operator of parcel locker stations, implemented a carrier-agnostic open network of parcel locker stations in 2015 that was used by Bring, DHL Express, and TNT Express at that time. In 2019, PostNord teamed up with SwipBox forming a joint venture (Nordic Infrastructure) to provide a carrier-agnostic APM network (Nærboks). This presented a unique case for such collaboration in the Nordic countries, since national postal operators usually operate an exclusive and independent network. The aim was to reach a larger share of the population by bringing parcel lockers closer to consumers and making parcel delivery and collection more convenient and environmentally sustainable. In
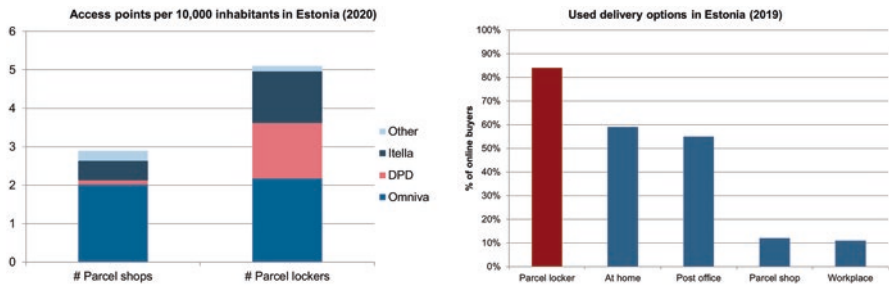
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[27] Posti (2021b).

Fig. 2.4 Denmark: Density of parcel shops and parcel locker stations and online buyers' preference for delivery options. (**a**) Access points per 10,000 inhabitants in Denmark (2020) (**b**) Preferred delivery options in Denmark. (**a** Source: Own research. **b** Source: Based on PostNord (2016a, 2020))

this model, the financial risks in expanding the parcel locker network were shared between PostNord and SwipBox. It presented an asset-light approach to PostNord, whereas SwipBox gained access to the customer base of an important parcel delivery partner and thus increased parcel volume. As of June 2021, PostNord bought out SwipBox's share of Nordic Infrastructure, making the postal operator the sole owner of the Nærboks parcel locker network.[28]

Following the buyout of SwipBox's share of Nordic Infrastructure by Post Nord, it appears that the Nærboks parcel lockers will continue to be operated as a carrier-agnostic network. So far, smaller competitors (by volume) like DHL Express and Bring (owned by Posten Norge) have already joined the network. It is worth noting that the main competitors in B2C parcel deliveries, GLS Denmark and DAO, neither participate in the Nærboks open parcel locker network nor operate their own parcel locker networks.

In Denmark, deliveries to parcel shops and parcel lockers are relatively popular alternatives to home delivery (see right-hand side of Fig. 2.4). These delivery options are incentivized by prices being cheaper compared to home delivery, approximately 20–30% cheaper for parcels depending on weight and size (based on price lists of GLS Denmark and PostNord). A recent consumer survey revealed that Danish online shoppers select delivery to parcel locker stations, to the home or to the workplace because of convenience considerations while delivery to parcel shops is more driven by the low price.[29]

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[28] PostNord (2021b).

[29] FDIH (2020).

2.4   Poland – InPost Operates the Largest Number of Parcel Locker Stations in Europe

Figure 2.5 presents on the left-hand side the number of parcel shops and parcel locker stations per 10,000 inhabitants, in total and for each of the major providers of parcel lockers. On the right-hand side, it shows the preferred delivery options of Polish online buyers in 2016 and 2020. The B2C parcel delivery market in Poland is unique in the sense that the market is one of the most competitive in Europe. InPost is a first mover as the first parcel operator implementing APMs in 2008. Today, InPost boasts with a network consisting of the largest number of parcel locker stations in Europe and plans to further expand its network not only in Poland but also internationally, following its IPO in January 2021.[30] InPost parcel locker stations make up the vast majority in Poland and the closed network is used to serve online merchants that have an agreement with InPost – the largest online market-place in Poland, Allegro, has a seven-year framework agreement as of November 2020 – for the delivery of parcels to parcel locker stations.[31] In contrast, other B2C parcel carriers, such as DPD Poland, GLS Poland, DHL, UPS, and FedEx, mainly deliver to parcel shops and to the home. Other than InPost, Poczta Polska operates a small-scale carrier-agnostic network of parcel lockers (in cooperation with SwipBox) that is also used by DHL Parcel and DPD Poland.

While home delivery remains to be the most preferred delivery method among Polish online shoppers, there appears to be a substantial shift of preference towards parcel lockers. InPost estimated that at the end of 2020 approximately 35% of B2C parcels were delivered to parcel locker stations in Poland.[32] The shift away from home delivery may also be due to the price of deliveries to parcel shops being the
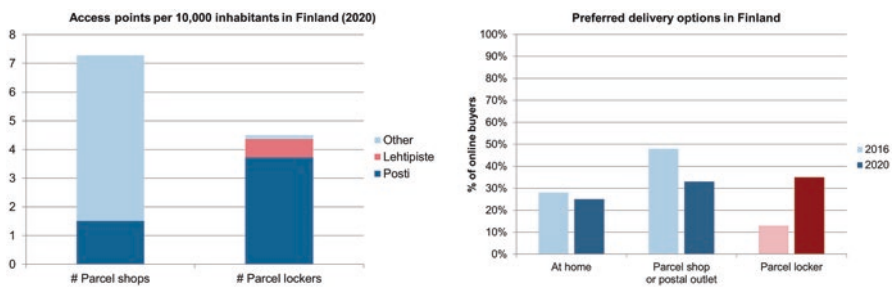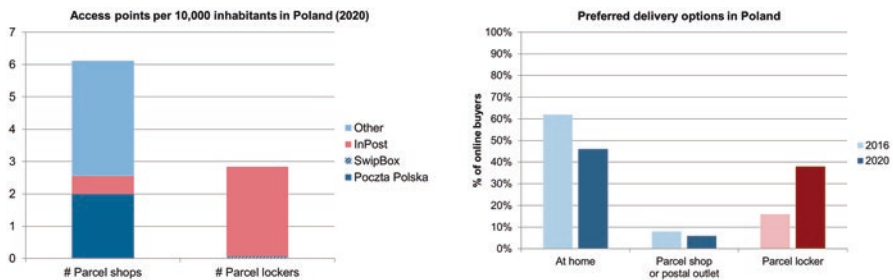

Fig. 2.5 Poland: Density of parcel shops and parcel locker stations and online buyers' preference for delivery options. (**a**) Access points per 10,000 inhabitants in Poland (2020). (**b**) Preferred delivery options in Poland. (**a** Source: Own research. **b** Source: Based on PostNord (2016b, 2020))

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[30] InPost (2021b).

[31] InPost (2021a).

[32] Inpost (2021a).

most affordable, followed by parcel lockers, at approximately 20–30% cheaper compared to home delivery. Furthermore, online merchants and marketplaces offer lower delivery fees to buyers if they choose items to be delivered to parcel lockers or parcel shops, e.g. the subscription model Allegro Smart! of the largest Polish online marketplace.

In 2021, there have been reports of the development of new market entrants in the parcel locker/shop market. The gas station chain, Orlen, has announced that it plans to launch a service called Orlen Paczka in September 2021 that will consist of parcel lockers and already existing collection points.[33] This appears to follow the termination of the agreement Orlen had with Poczta Polska in the same month, suggesting that the latter could lose some of its parcel delivery points. Furthermore, Allegro also announced that it will be looking to launch its own parcel locker network (1500 stations by end of 2021 in cooperation with Modern Expo) in addition to the parcel lockers it uses for its Smart! parcels in agreement with InPost.[34] These developments imply that competition in this specific segment may increase in the next years. In light of increasing competition, InPost is expanding its APM network to smaller cities and aims for reaching between 15,500 and 16,000 stations by the end of 2021.[35] Similar to Finland, it shows that investments in additional APMs appear attractive in a country where a significant share of people is already familiar with the usage of parcel locker stations.

2.5   Germany – Still Low But Growing Usage of Parcel Locker Stations by German Online Shoppers

Figure 2.6 shows the number of parcel shops and parcel locker stations per 10,000 inhabitants in Germany, in total and for each of the major providers of parcel locker stations. The preferred delivery options of German online buyers are presented on the right-hand side. One of the first parcel locker networks in Europe was introduced by DPDHL in Europe in 2003 and has grown into one of the largest such networks, by number of parcel locker stations, but by far not the densest network. DPDHL's nationwide parcel locker network does not allow access to other parcel carriers – seen as a competitive advantage – aiming to increase its own delivery capacity in the last mile (in addition to home delivery and parcel shops), to reduce delivery costs and to better meet the needs of online shoppers by providing more flexible delivery options.[36] Established in 2003, the number of DPDHL's stations had slowly grown to 3700 until beginning 2019. As part of the 'Strategy 2025' launched in 2019, DPDHL announced to nearly double the number of machines

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[33] WH (2021).

[34] Allegro (2021).

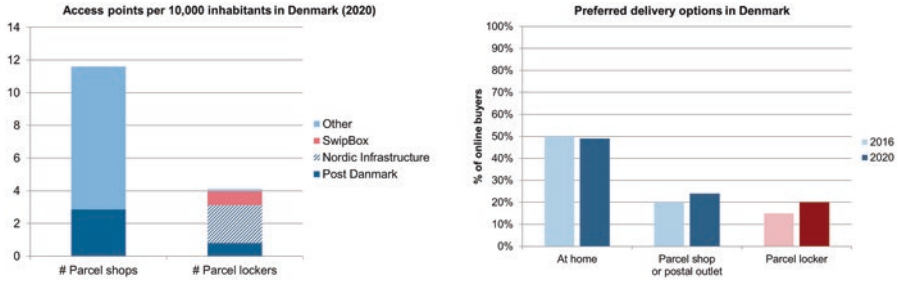[35] InPost (2021c).

[36] DPDHL (2019), p. 66.
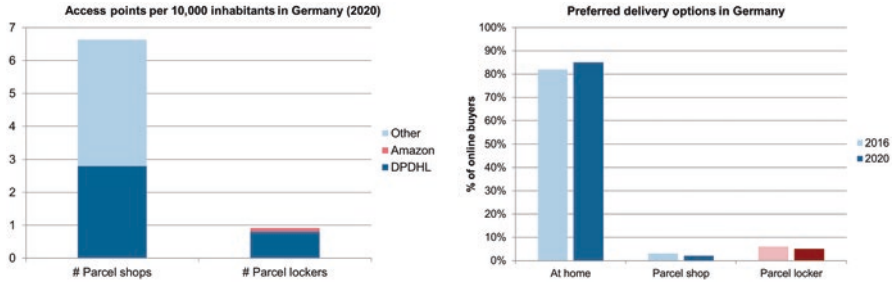
Fig. 2.6 Germany: Density of parcel shops and parcel locker stations and online buyers' preference for delivery options. (**a**) Access points per 10,000 inhabitants in Germany (2020). (**b**) Preferred delivery options in Germany. (**a** Source: Own research. **b** Source: Based on PostNord (2016b, 2020))

(7000) by the end of 2021. In light of the e-commerce boom in 2020, DPDHL decided to further expand the APM network to 8500 stations by 2021 and more than 12,000 stations by 2023. DPDHL is also testing the use of a screenless, app-controlled parcel locker station that shall form around one-third of the 2023 APM network.[37]

Competition in B2C parcel deliveries is quite fierce regarding home deliveries provided by other prominent players such as Hermes, DPD, GLS and UPS. None of these operators have installed their own parcel lockers. At this stage, the only viable parcel locker alternative to DHL, Packstation, is provided by Amazon Logistics. They introduced their own exclusive network of parcel lockers in 2016, but is mainly only found in large cities.

In Germany, home delivery is still by far the most used and preferred parcel delivery method mainly due to its convenience (see Fig. 2.6). Furthermore, DPDHL does not offer any price incentives to customers for delivery to either parcel shops or parcel lockers, but remains competitive in their prices for home delivery. In contrast, other parcel carriers offer small discounts on delivery to parcel shops compared to home delivery, ranging between 4% and 15% depending on the size of the parcel.[38] Moreover, driven by large online marketplaces like Amazon and Zalando, German online shoppers generally expect free delivery of online orders. The evidence suggests that convenience and affinity to digital solutions (indicated by the age group of online shoppers using parcel locker stations) are the main reasons for the selection of the delivery option.

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[37] DPDHL (2020).

[38] WIK calculation based on 2021 price lists for retail customers of DPD Germany, Hermes and GLS Germany.

3 Parcel Locker Networks Are Operated by Various Types of Organizations

Among the most notable parcel locker network operators are national postal operators (usually universal service providers), e.g. DPDHL, Posti (Finland),[39] and Omniva (Estonia),[40] that have an advantage of an existing nationwide network for collecting and delivering letters and parcels. Parcel operators have also been successful in deploying parcel locker networks, for example, DPD in the Baltics and Lehtipiste/Pakettipiste in Finland, but they are generally less present than national postal operators in this field. Parcel locker networks operated by postal and parcel operators are mostly regarded as supplementary to home and parcel shop deliveries, which give them a competitive advantage by being able to offer more delivery choices to their customers. A major challenge (among others) faced by postal operators and parcel carriers are legacy problems with their existing IT platforms. These were originally developed to support their internal operations and less to improve customer service (senders and recipients). However, there have been developments in IT platforms with emerging e-commerce having encouraged operators like Posti and DPDHL to set up dedicated digital strategies that put customers, senders (notably e-retailers) and recipients (online buyers), to the forefront of their efforts.

Parcel locker suppliers such as SwipBox or InPost also operate their own parcel locker networks as stand-alone businesses in cooperation with local carriers. They are responsible for managing the daily operations through their software solutions that are tailored for a specific parcel locker network. Their incentives differ from traditional postal and parcel operators by finding innovative solutions that suit customers' (senders and recipients) needs, and not only providing a supplementary delivery service. These companies are more technology-based and have developed their own software solutions for operating a parcel locker network, thereby placing themselves in a much better position than postal / parcel operators. However, it is more common for parcel locker suppliers to sell or lease their parcel lockers to national postal operators or parcel carriers, and continue to offer hardware and software support relating to managing and operating the network. InPost presents a unique case because they started as a main competitor of Polish Post in the letter market and only later entered the parcel market. The company was a 'first mover' in the segment of parcel locker deliveries and was quite successful in attracting online shops and, most importantly, the online marketplace Allegro as contract partners. In contrast to SwipBox, InPost built up their own logistics network to collect and deliver parcels either to parcel locker stations or at home.

Online marketplaces like Amazon have also deployed and operate their own parcel locker networks in certain countries (mainly in large cities in Austria, Germany, France, Italy, Spain, and the UK) as part of its last mile operations (Amazon

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[39] Posti also operates a parcel locker network under its Itella brand in the Baltic countries.

[40] While Omniva (Eesti Post) is the universal service provider in Estonia, it also operates its parcel locker network in Lithuania and Latvia.

Logistics). Similarly, Allegro in Poland are planning to roll out their own parcel locker network, thereby providing additional delivery options for parcels that do not fall under the agreement with InPost for the delivery of Allegro Smart! parcels to parcel lockers.[41]

Finally, technology start-ups have emerged and entered the segment of parcel locker deliveries, like Smartmile in Finland. Another example outside the presented countries is Swedish Instabox.[42] In contrast to national postal operators and parcel carriers, these companies do not have to tackle any legacies faced by traditional postal and parcel operators. Instead, their focus is on reaching agreements with retailers and online merchants, or partnerships with parcel carriers, ensuring that they have sufficient parcel volumes that are being moved through the parcel locker network. This is a crucial requirement for start-up APM operators in order to cover their significant investment costs. Additionally, they are able to provide the necessary IT solutions for smooth integration with online merchants' and parcel carriers' existing systems and to encourage the use of their APMs as a delivery option.

4 Most Parcel Locker Networks Are Exclusively Used by the Operator

In the majority of European countries where APMs are being used as a delivery option, these networks tend to be exclusively used by a single operator ('closed' network). Open parcel locker networks are still in the minority and rather the exception to the rule as illustrated by the evidence from the countries selected for our case studies (Fig. 2.7).

APM networks of significant size are mostly operated by a carrier, either by national postal operators, e.g. Omniva, Posti or DPDHL, or by parcel operators, e.g. InPost in Poland, DPD in the Baltics or Lehtipiste in Finland. Denmark is a unique case where the APM network, Nærboks, was found by a joint venture between SwipBox and PostNord Denmark in 2019. However, the acquisition of SwipBox' shares by PostNord shows a change in PostNord's strategy with regard to the role of parcel locker stations in their delivery mix. So far, it appears that the network remains open for other carriers. However, as noted above, the biggest competitors in the Danish B2C parcel segment, GLS and DAO, have not joined this network.

There are very few examples of other countries where open parcel locker networks are present. Open parcel locker networks are typically developed and operated by start-ups or suppliers that basically rely on a stand-alone business model,

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[41] See Allegro (2021).

[42] Instabox operates one of the quickest growing APM networks in Europe. PTS (2021) estimates that the market share in the B2C parcel delivery segment was between 3% and 5% in 2020. The company operates a closed APM network and was quite successful in winning many Swedish online shops as customers, see Digital (2021). Their business model has some similarity to InPost in Poland.

Fig. 2.7 Open versus closed parcel locker stations in selected countries (2020). (Source: Own research)
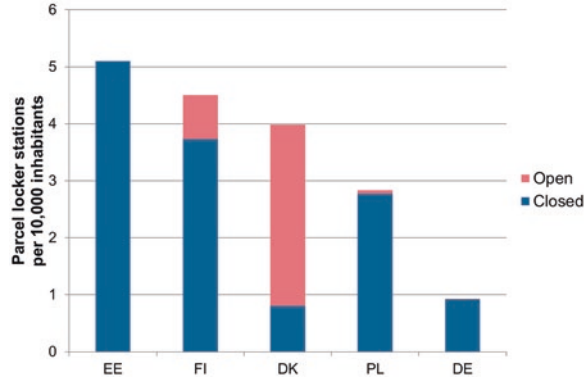
e.g. SwipBox (Poland), InPost (Italy and UK), and Smartmile (Finland). This decision involves a rather high-risk investment and may even include speculation that a large carrier or a large online merchant would eventually acquire the network. Whether a national postal operator or parcel/express operator participates in an open parcel locker network seemingly occurs where they do not have a sufficiently large customer base and thus not enough volume (e.g. Poczta Polska in Poland, Lehtipiste in Finland) and / or do not take the financial risk to invest in establishing their own parcel locker network. That there are only few examples of open APM networks, especially from independent providers, can also be explained by the cost structure of an APM network.

Launching a network of parcel locker stations requires significant investments and time. Capital, operating and other costs of such a network are largely fixed, i.e., independent from parcel volume (see Fig. 2.8). The identification of appropriate sites with high user frequency, investments to develop a smoothly running IT ecosystem and to purchase and install parcel locker stations, and promotional campaigns to increase awareness are necessary steps to establish a reasonably dense network. Operating costs include rental costs, connection charges and maintenance costs. The country examples highlighted that the densest parcel locker networks were launched more than 10 years ago. Postal and parcel operators with well-established networks of parcel shops and postal outlets have a competitive advantage in identifying appropriate sites. Firstly, they can install a parcel locker station in or near parcel shops/postal outlets, and secondly, they already have experience in finding appropriate sites and negotiating with potential site owners.

The additional average cost per parcel[43] born by an APM network largely depends on the capacity of the network in relation to the number of parcels delivered through

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[43] The additional cost does not include the cost for delivering parcels to APMs. We assume that the time needed for the drop-off process should be largely comparable to the time needed for handing over a parcel to a person (home delivery) or to a parcel shop owner. It should be noted, that the potential bundling effect depends on the number of lockers per station (i.e. the maximum number of parcels that can be delivered to one locker). The more lockers per station there are, the higher the potential bundling effect (and thus the lower the average delivery cost per parcel).
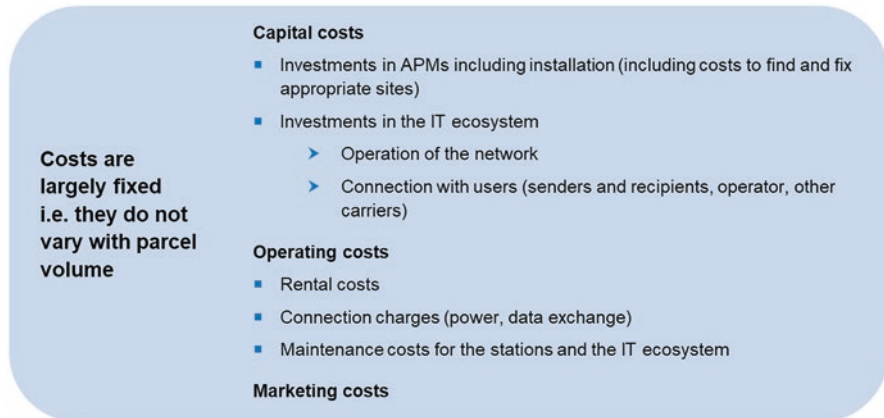
Fig. 2.8 Cost elements for APMs

the network (utilisation rate).[44] The total capacity of an APM network (per year) is the product of the average number of lockers per station, the total number of stations, the number of delivery days per year and the number of deliveries per day (i.e. how often a carrier drops off parcels at the APM per day), and the implicit assumption that recipients pick up their parcels within one day. The utilization rate of an APM network is the ratio of total parcels delivered to lockers and network capacity. The higher the utilization rate, the lower the average cost per parcel delivered. Figure 2.9 illustrates this relation and highlights the impact of parcel volume and utilization rate on the average cost per parcel resulting from the operation of an APM network. The assumptions are summarized in the upper part of Fig. 2.9 and the development of average costs per parcel is presented in the diagram.

This illustration highlights the importance of parcel volume in relation to the size of the APM network (the utilization rate) and provides an idea about the additional average cost per parcel delivered to a parcel locker. Therefore, it is not surprising that APMs are primarily placed in urban, densely-populated areas and at places with high user frequency. The average cost per parcel is a benchmark to assess the competitiveness of parcel locker delivery with alternative delivery options (home delivery with low drop-off rates and delivery to parcel shops). In this example the average cost per parcel of 1 € would be reached at an average utilization rate of 30% (in this example nine million parcels per year delivered to 100 thousand lockers on 6 days per week). The average cost should be at least the same level as the transaction fee for dropping off a parcel at a partner shop or equal the cost saved by foregoing home delivery. This example highlights only one aspect, although an important one, for the financial viability of an APM network. However, the investment decision also depends on other aspects including, for example, using APMs for collection

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[44] The utilisation rate is a key performance indicator (KPI) for APM networks, see InPost (2021a).

Capacity of the APM network		Capex and Opex per APM	
# Parcel locker stations	1.000	∅ Capex	30.000 €
∅ Lockers per station	100	Depreciation period	10 years
Delivery days / year	300	∅ Opex / year	6.000 €
Deliveries per day	1	Cost per station / year	**9.000 €**
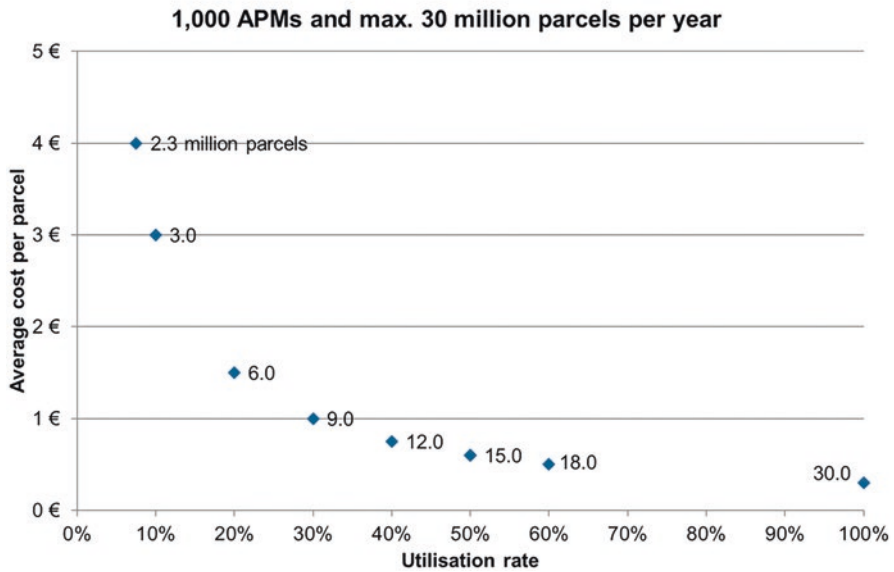
Fig. 2.9 Illustrative example: Relationship between utilization rate and average cost per parcel. Notes: The Capex include investment costs in parcel locker stations (tangible and intangible assets, i.e. hard- and software). The depreciation period implies that the cost of capital corresponds to 10% which appears reasonable given the financial risk

services as well as capacity buffer, or the role of APMs as a potential unique selling point to attract users (senders and recipients).

Open APM networks follow different pricing strategies which are dependent on its business model, especially whether the operator provides its own logistics. For APM networks which rely either on one or multiple third-party parcel carriers for the delivery of parcels, the carriers, or local and online retailers, typically pay either a fee per locker or a subscription fee to the operator/supplier of the APM network or a combination of subscription rate and fee per locker. The fee per locker is usually based on the actual number of lockers used for making deliveries, comparable to pay-as-you-go, and the price is likely to be higher compared to a subscription fee (usually combined with a longer contract period). Subscription fees are typically monthly or annual fees that determine a fixed number of lockers that can be used by a specific carrier or retailer over the contract period. In some cases, it may be possible to extend the number of lockers available to a carrier or retailer, when required,

usually on a fee-per-parcel basis.[45] Similar payment models are most likely employed by open APM network operators, with their own logistics operations, that share their network with other parcel carriers, e.g., InPost (UK and Italy) and Lehtipiste (Finland). Moreover, some costs may be transferred to recipients by means of delivery fees to APMs and/or penalty fees for not collecting parcels within a predetermined timeframe.[46]

Alternatively, national postal operators or large parcel carriers buy APMs outright from suppliers for a one-off purchasing fee and independently operate the APM network in addition to their other delivery services. Even in these cases there may be a subscription fee paid to the APM supplier for software and hardware support, and maintenance services. The cost of the APM network then has to be covered by the operator through cost-savings by avoiding home delivery, and hence depends heavily on large volumes being delivered via APMs. Generally, the identified pricing strategies of operators that offer a mix of delivery options reflect some of the cost-savings between home delivery and (bundled) delivery to pick-up points (with the exception of DPDHL). A lower price incentivizes online shops to actively offer cheaper delivery options in the check-out process which could further promote the usage of parcel locker stations by online shoppers especially in combination with a convenient way to select an appropriate APM in the check-out process (e.g. by clicking on a map).

From this perspective, it appears quite challenging to operate an APM network on a stand-alone basis without logistics operations. Therefore, it is not surprising that many APM networks are operated by large carriers and online merchants who already have a broad customer base and who are able to apply a mixed calculation in combination with other delivery and logistics services. Moreover, operators with a significant stake in the B2C delivery segment basically have no incentive to voluntarily share their APM network with competing carriers as long as they have enough volume delivered through APMs to achieve financially acceptable utilization rates. They consider their ability to offer online retailers and online buyers a mix of different delivery options and the flexibility to redirect parcels to alternative delivery locations as a competitive advantage. From an operational point of view, parcel locker stations help reduce delivery costs and provide easy-accessible spare capacity to handle peak demand when facing transport and labor shortages for home

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[45] Quadient (2021), p. 101, provides an example of the different payment models they implement. They offer both a purchase model and a rental model of their APMs, and distinguish the share of revenue that the subscription services generate under each model.

[46] In China, HiveBox operates an open APM network with around 264.000 stations (including the locker stations they acquired from China Post) in more than 100 cities. Since April 2020, recipients have to pay a charge to use a locker if they fail to pick up parcels from their lockers within 12 hours (see Lee (2021)). After protests they adapted the payment schedule and offer a membership program with a monthly fee and free-of-charge usage of their locker stations. Non-members have to pick-up their parcels within 18 hours before being charged (see Doddle Blog (2021)). One major difference between the usage of Chinese and European APM networks is that in China carriers use APMs as a fall-back delivery option for failed home delivery while in Europe the online shopper / recipient usually decides whether an order shall be delivered to an APM.

delivery and limited storage capacities in partner outlets. Finally, from an environmental point of view, parcel locker stations are an opportunity to reduce the operator's carbon footprint in the last mile.[47] In this regards, open APM networks are more likely to succeed in situations where the operator is not able to attract enough parcel volume in a short period of time to cover its costs.

From the existing research,[48] it appears quite clear that APM networks cannot reasonably be considered as an essential facility that may justify regulatory action in order to enforce access to an existing APM network exclusively used by one operator. The main arguments are (1) that the delivery to parcel lockers can be substituted for delivery to parcel shops or home delivery (thus it is not essential for delivery) and (2) that mandatory access may hinder innovations and technological progress in this field. The five country cases illustrate that different market players have emerged and these players are not necessarily identical with national postal operators or parcel carriers with significant market shares.

The Estonian example shows that competition among exclusively used parcel locker networks is feasible. Online shops provide the choice to their customers by having contracts with each of the operators. There are additional indications that e-retailers and consumers generally benefit from this competition in terms of lower prices (cost savings are reflected in the price structure) and improved quality of service. In Finland and Poland, there are operators that already have a big stake in the delivery to parcel locker stations. Both, Posti and InPost operate dense networks of parcel locker stations (that they are going to further expand) and have achieved extremely high levels of user acceptance and utilisation rates. Even though Posti has a significant market share in the Finnish parcel market, especially for B2C deliveries, there is emerging competition with open networks of parcel locker stations established by a smaller competitor Lehtipiste and by a start-up Smartmile. In Poland, it appears that competition emerges from the online marketplace Allegro (major customer of InPost and the most important online marketplace in Poland) and Orlen, a major provider of parcel shops (in gas stations and Ruch kiosks). Both announced plans to establish APMs in Poland.

5   Conclusions

Overall, parcel locker stations are a useful and increasingly well-accepted complement to existing delivery options especially in densely populated areas. Experiences have shown that the successful implementation of an APM network requires several years of significant investments and a dedicated digital and marketing strategy of the respective operators. Moreover, the affordability and convenience of parcel

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[47] The environmental impact of parcel locker deliveries (e.g. in combination with a broader city logistics concept) is another important topic that is not discussed in this paper.

[48] See AGCOM (2020) and Rozman (2020).

lockers to carriers, retailers and recipients are key factors to the success of an APM network. The acceptance of parcel locker stations can be promoted by price incentives for e-retailers and by a high level of convenience for consumers (easy access and simple handling). We expect that with volume growth and increasing capacity bottlenecks in the last mile, APM networks will become more common especially in countries where people are already used to pick-up parcels from parcel shops and postal outlets.

The switch from parcel shop delivery to APM delivery is much easier than the switch from home delivery to APM delivery (given that the delivery speed is the same). In the first case the recipient's effort is basically the same while in the second case it implies additional effort from the recipient to get the parcel. If this extra effort is not remunerated with lower delivery costs and/or better quality of service, the switch merely depends on the recipients' delivery preferences and digital affinity. Finally, we expect that open APM networks remain an exception even though open networks benefit participating carriers and retailers in that they are able to offer APMs as an alternative delivery method without requiring significant investment in an APM network of their own.

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Chapter 3
Regulation: Quo Vadis? Revisited

John Hearn

1 Introduction

Economic Regulation of "Postal Services" was introduced within the European Union (EU) following the adoption of the first Postal Services Directive (PSD)[1] on 15 December 1997. The PSD had two objectives. The first was to ensure the gradual and controlled liberalization of the European postal services market. The second was to address concerns that in a fully liberalized market the services offered on an economic basis would not meet the needs of users or guarantee them fair and non-discriminatory treatment.

Twenty years later in a paper[2] presented at the Barcelona conference I concluded that both objectives had been met and that if sector-specific regulation of postal services did not exist there would be little justification to impose it now; competition law and consumer protection legislation would be sufficient to protect users. In the same paper I predicted that regulation would probably experience a protracted winding-down process.

An evaluation of the PSD was included in the European Commission's Work Programme for 2020. The evaluation process and the subsequent application report (COM(2021)) are briefly considered in Sect. 2. The issues which have arisen are

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[1] Directive 97/67/EC of the European Parliament and of the Council of 15 December 1997 on common rules for the development of the internal market of Community postal services and the improvement of quality of service.

[2] Regulation. Quo Vadis? (Hearn 2018).

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discussed in subsequent sections. One of the most fundamental issues is to clarify what exactly are postal services (Sect. 3). Section 4 considers whether there is a distinct "market" for the provision of such services; or whether these services operate as part of broader communication and freight markets. The regulatory framework and its future scope are addressed in Sect. 5. Conclusions are set out in Sect. 6.

2   Evaluation of the Postal Services Directive 2020–2021

The Commission's 2015 application report (COM(2015)) on the regulatory framework recognized that significant change had taken place but made no specific proposals for reform. However evaluation of the PSD was included in the Commission's Work Programme for 2020.

The Commission launched a public consultation on 13 July 2020. The consultation closed on 9 November 2020. On 22 December 2020 the Commission published a factual summary of the responses to the consultation (Ares (2020f) 7896722). Unfortunately, most probably due to the Covid pandemic, the number of responses was disappointing. The number of responses from operators (21[3]), trade unions (9) and regulators (11) was insufficient to give the Commission a comprehensive understanding of specific issues in each member state and the number of responses from users of postal services (67)[4] was unusually low. Further there was a clear geographical bias in the responses – more than a quarter of the responses came from Poland,[5] almost half came from four countries[6,7] and there were no responses at all from four countries.[8] Only 20 organizations complemented their response to the online questionnaire with a detailed submission. The poor response was more significant because of a divergence between the positions of the regulators and those of the postal operators and other stakeholders who did participate.

The regulators called for "a fundamental approach ("greenfield approach") rather than a mere revision of the existing framework" and suggested reorienting "the focus of the regulatory framework from the universal service provision to a proper functioning of the postal market and of competition". The regulators also suggested that consumer protection legislation should be revised to include specific or additional provisions for the postal sector or for different categories of postal users. See ERGP (2019).

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[3] Of which only 18 were universal service providers.

[4] 45 individual consumers, 7 commercial undertakings, 13 business associations and 2 consumer organizations.

[5] 31 out of 119 or 26%.

[6] Poland, Germany, Italy and France – 57 out of 119 or 49%.

[7] 15 of the responses (12.6%) are attributed to Belgium but it is presumed that this includes responses from associations representing stakeholders throughout the EU.

[8] Bulgaria, Lithuania, Romania and Slovenia

The Commission's approach was to assess whether the Postal Services Directive had achieved its objectives, whether it was still fit for purpose and met the present and future needs of postal users and operators. This incremental approach was broadly supported by the postal operators and other stakeholders.

The Commission's Communication on Better Regulation[9] foresees that newly introduced administrative burdens will be offset by relieving people and businesses of equivalent burdens in the same policy area. This commitment imposes a significant restraint on the Commission's ability to expand the scope of postal regulation.

External events, particularly the Covid-19 pandemic, delayed the project. The application report (COM (2021)) was ultimately published on 8 November 2021. It did not make any specific proposals to amend the regulatory framework. Rather it proposed to continue to engage with Member States and other stakeholders "to further explore potential adaptation in the future". The next application report is not due to be submitted until 2025,[10] by which time a new Commission will be in place.

3   What Exactly Are Postal Services?

An underlying theme that emerged from the responses to the Commission's consultation is the lack of clarity about definitions and the scope of postal services. The Commission's summary report recognized that:

> "…. the application of definitions is not uniform across all Member States and this can lead to unequal regulatory and market conditions. ... In particular, they [regulators] state that the definitions of "postal service" and of "postal provider" are not clear and do not reflect the developments in the postal market since the adoption of the Directive (Ares (2020f) 7896722).0

It is not just regulators that take this position. For example, Ecommerce Europe[11] and the EEA/EFTA[12] take a similar position. Even the Advocates General of the CJEU[13] have criticized the drafting quality of the PSD. In his opinion on DHL Express (Austria) Advocate General Mengozzi commented:

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[9] Communication from the Commission to the European Parliament, the Council, the European and Social Committee and the Committee of the Regions Better Regulation: Joining forces to make better laws. 29 April 2021.

[10] Article 23 of the PSD requires an application report to be submitted every 4 years.

[11] Ecommerce Europe "strongly believes … it is of utmost importance to have clarity in terms of definitions. In fact, there is currently a lack of harmonization of terms and definitions of postal products and services, which led to legal fragmentation across the EU and consequent legal uncertainty for businesses." Public consultation reply 9 November 2020

[12] "The current definitions of a postal item in the Directive entail various aspects that require further clarification. … In the EEA EFTA States' view, the future framework should set a clear scope for the postal sector, specifically identifying the services, markets and products that fall within its scope so there is no uncertainty about who and what is included within the scope. This also includes clear definitions, which ensure a unified understanding of the framework." EEA Ref. 20-4571

[13] Court of Justice of the European Union.

22. I willingly concede to the appellant in the main proceedings that Article 9 of Directive 97/67 is a provision of poor drafting quality and the interpretation of which, focusing on its wording, gives rise to confusion. To my mind … the wording of Article 9 of Directive 97/67 is not — by any stretch of the imagination — drafted in such a manner as to facilitate its immediate comprehension.[14]

The application report (COM (2021)) dismissed these concerns:

The current definitions have remained unchanged since the adoption of the Postal Services Directive in 1997. There have been repeated claims that the lack of harmonization of terms and definitions of postal products and services has led not only to legal fragmentation and legal uncertainty but also to incoherencies with other EU regulatory frameworks, which use the same terms but with a different meaning. **…**

None of the above has resulted in any measurable problems from the perspective of postal service providers. Moreover, stakeholders have not been able to demonstrate an actual negative impact on postal providers and users. Available evidence has not indicated that any lack of clarity has caused any relevant internal market problems or barriers to entry for postal service providers.[15]

In the author's opinion there is no ambiguity as to the scope of postal services for the purposes of the current PSD. The confusion appears to arise not because there is ambiguity in the definition but because some interested parties wish to expand the scope of regulation. So what exactly is a postal service?

Following the postal reforms of the mid-nineteenth Century and the foundation of the Universal Postal Union (UPU) in 1874 postal services were invariably provided by the state and were protected by a monopoly which was defined in law. Since the 1970's the pace of business and commerce has increased, necessitating faster services than those offered by the state-owned postal administrations. Private companies – "Couriers" – began to offer services to meet these needs. In general, these companies sought to circumvent the national monopolies by differentiating their services from "postal services". As Hearn (2018) noted, the judgment in the "Corbeau" case distinguished between the traditional postal services and the more innovative and customer focused products that were emerging.[16]

3.1   PSD Provisions

The PSD contains a definition of "postal services":

services involving the **clearance**, sorting, transport and **distribution**[17] of **postal items** [emphasis added]

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[14] Case C-2/15, EU:C:2016:880

[15] COM (2021) p.10

[16] Case C-320/91 Paul Corbeau 19 May 1993, [1993] ECR 1–2563.

[17] The term "distribution" was introduced by the 2008 amending Directive. The original PSD used the term "delivery".

Even at face value, this definition leaves much to be desired. The three terms highlighted are separately defined in the PSD causing circularity and complexity. More fundamentally it is unclear whether all four features, clearance, sorting, transport and distribution, have to be present or whether any one feature is sufficient for a service to be considered a postal service.[18] Article 9 of the PSD further complicates matters because its provisions require postal services to be classified as being (i) part of the universal service,[19] (ii) a service within the scope of the universal service[20] or (iii) a service which falls outside the scope of the universal service.[21]

3.2 CJEU Decisions

Not surprisingly there have been a number of cases in which the CJEU has been called upon to consider whether particular obligations attach to particular classes of postal service provider – see Box 3.1.

Box 3.1
CJEU CASES INVOLVING DEFINITION OF POSTAL SERVICE
   DHL International (formerly Express Line NV) Judgment of 13 October 2011 (C-148/10, EU:C:2011:654)
   Court held that there was a requirement for an external procedure for dealing with complaints as provided for in Article 19 of the PSD.
   The service provider argued that it was not a postal service provider because it did not provide all four features set out in the definition of postal services in the PSD, but this point was not even considered by the Court.
   DHL Express (Austria) Judgment of 16 November 2016 (C-2/15, EU:C:2016:880).
   Court held that the service provider was obliged to contribute to the financing of the national regulatory authority responsible for the sector, in the light of Article 9(2) of Directive 97/67.

(continued)

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[18] Recital 17 to Directive 2008/6/EC advised inter alia that "Transport alone should not be considered as a postal service." But Advocate General Campos Sánchez-Bordona in Confetra (Joined Cases C-259/16 and C-260/16, EU:C:2018:370) observed that this "legislative technique (a sentence hidden in a recital) is not the best and perhaps there would have been more clarity if the criterion had been included in the enacting terms of Directive 97/67".

[19] Provided by the universal service provider.

[20] A service similar to the universal service but provided by a provider other than the universal service provider.

[21] See comments of Advocate General Mengozzi in DHL Express (Austria) referenced above.

Box 3.1 (continued)

__Ilves Jakelu__ Judgment of 15 June 2017 (C-368/15, EU:C:2017:462).

The Court held the provision of services which do not fall within the scope of the universal service may be subjected only to the issuing of a general authorisation.

__Confetra__ Judgment of 31 May 2018 (Joined Cases C-259/16 and C-260/16, EU:C:2018:370)

The Court decided that "haulage, freight-forwarding and express mail undertakings" providing services involving the "**clearance, sorting, transport and distribution of __postal items__**", except where their business is limited to the transport of postal items, are postal service providers.

It also decided that legislation requiring such undertakings to hold a general authorization for the provision of postal services must be justified by one of the essential requirements set out in Article 2(19) of the PSD and has due regard for the principle of proportionality The undertakings could also be required to contribute to a compensation fund to finance provision of the universal service, "where, **from a user's perspective** [emphasis added], those services may be regarded as falling within the scope of the universal service as they display inter-changeability to a sufficient degree with the universal service".

3.3   The Unanswered Question

Although the CJEU has decided that postal services are services involving the "clearance, sorting, transport and distribution of **__postal items__**", except where their business is limited to the transport of postal items, the debate is far from over. There is one point that the CJEU has not been asked to consider in detail, namely what is a "postal item". This is the key to distinguishing between what is a postal service and what is not.

The PSD defines "postal item" as:

an item addressed in the final form in which it is to be carried by a postal service provider. In addition to items of correspondence, such items also include for instance books, catalogues, newspapers, periodicals and postal parcels containing merchandise with or without commercial value.

They key word is "addressed". It is necessary to look at the definition of item of correspondence[22] to ascribe a meaning to this, specifically:

[An item] "to be conveyed and delivered at the address indicated by the sender on the item itself or on its wrapping".

Or indeed the definition of distribution:

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[22] Article 2(7) PSD.

the process from sorting at the distribution centre to delivery of postal items to their addressees.

In other words, it is clear that the provider of a service for postal items must have legal obligations to both the sender and addressee.[23] This is confirmed by Article 19 of the PSD:

Member States shall ensure that transparent, simple and inexpensive procedures are made available by all postal service providers for dealing with **postal users'**[24] complaints, particularly in cases involving loss, theft, damage ….

It should also be noted that postal services are Services of General Economic Interest (SGEI). The CJEU has made important interventions regarding the definition of SGEI which are helpful in defining "postal service". See Box 3.2 for a summary of the key points in the defining case, BUPA.

Box 3.2

CJEU decision (T-289/03 British United Provident Association Ltd (BUPA), BUPA Insurance Ltd and BUPA Ireland Ltd v Commission of the European Communities [2008] ECR II-81.):

Key features of SGEI / universal service:

– it should meet the essential needs of all users;
– it should be provided by a licensed undertaking;
– **it should offer the specified services to every user requesting them and to contract, on consistent conditions, without being able to reject the other contracting party**;
– the nature of the services is not prescribed and does not have to be provided through the entire territory or be of use to the whole population;
– **there must be transparency as to tariffs and terms and conditions.**
– **Uniform tariffs are the norm (i.e. prices are fixed and not subject to individual negotiation) and rates, conditions and quality standards should be as similar as possible for all users**.

The three highlighted points are vital in distinguishing between postal services and other services.

The PSD provisions encompass the traditional postal services for items of correspondence (letter post), and postal items (parcels) containing merchandise sent by one individual (natural person) to another.[25]

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[23] This is of course consistent with the unique public law characteristics of the services provided by the former state-owned postal administrations. See Hearn (2017, 2018, 2020, 2021) for a more detailed discussion.

[24] Article 2(17) of the PSD defines "User" as "any natural or legal person benefiting from postal service provision as a sender or an addressee".

[25] For example a gift on a family occasion.

When parcels containing merchandise are being sent from a seller to a buyer as part of a contract of sale for goods or services, the PSD provisions conflict with the law of contract and commercial practice. In this regard it should be noted that the EU legally intervenes in such contracts between sellers of goods and services and buyers who are "consumers". It has enacted the Unfair Contract Terms Directive to prevent a dominant seller imposing terms on the buyer. In the case of e-commerce and other forms of distance selling, it has enacted the Consumer Rights Directive (2011), under which the risk of loss or damage passes to the consumer only when he is in physical possession of the goods. Taken with other provisions this means the carrier must have sole legal responsibility to the sender,[26] a point made by Ecommerce Europe in its submission to the EU Commission:

> In our view, as far as the end consumer is concerned, the contractual relationship in an e-commerce transaction should remain focused on the one between the seller and the consumer. Consumers buying goods online do not have a contract with the postal service provider, as this is taken care of by the seller itself.[27]

In short the services provided to enable sellers of goods to deliver parcels to their customers are distinguishable from postal services by the absence of any obligation to the buyer by the carrier, and the "negotiable" terms under which such services are provided to the seller.

3.4 Quo Vadis?

The CJEU has decided that services involving the "**clearance, sorting, transport and distribution of <u>postal items</u>**" are postal services, except where the operators' business is limited to the transport of postal items. There is no ambiguity as to the scope of postal services but it is true that the drafting leaves much to be desired. A definition of postal services which encompasses the same scope as the current PSD but is confined to a single sentence and uses simpler language might look something like:

> Services provided on transparent non-negotiable tariffs and terms and conditions for the acceptance of postal items from senders for delivery to the addressee as shown on the envelope or wrapping of the item

Confusion arises not because there is ambiguity in the definition but because some interested parties wish to expand the scope of regulation. Cases brought to the CJEU include claims that an undertaking should contribute to the costs of the National Regulatory Authority (NRA) or to a compensation fund set up to finance the postal universal service. In the latter regard it is interesting to note the submission from News Media Europe:

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[26] See Hearn (2017, 2018) for a fuller discussion on these points.

[27] Public consultation reply 9 November 2020.

a competent European regulator 2016 started requiring that news publishers contribute to the operational costs of the incumbent national postal operator, based on the alleged inclusion of news publishers and their newspapers distribution activities fall within the scope of the definition for postal services in the Directive. (Ares (2020b) 6554009)

The financing of the postal universal service and whether the existing definition of the scope of postal services should be widened is considered in Sect. 5.

4 Is There a Distinct Market for Postal Services?

There was an assumption underlying the PSD that the gradual and controlled liberalization of European postal service provision would allow a fully competitive market for postal services to develop. So far as postal services for item of correspondence are concerned, Hearn (2018) observed that there was little direct competition in the provision of letter delivery services, but that technological developments had stimulated indirect competition, with the traditional postal services losing the competitive battle.

Developments since then have copper-fastened these conclusions. Two undertakings that had ambitions to provide end-to-end competition for letters, Inpost in Poland and Whistl (TNT) in the UK, have abandoned their plans. WiK (2021) reported that "In 2018, 17 out of 32 USPs had market shares above 95%, only 4 out of 32 USPs had market shares below 80%." It also observed that "although there are a large numbers [sic] of competing postal operators active in European letter markets, they are mostly very small and operate on a local level." Competition in the form of Downstream Access[28] exists in some countries such as France, the UK, the Netherlands, Spain and Germany – see WiK (2021). This type of competition is not feasible in those countries where the upstream costs as a percentage of total costs are relatively low, due to the size of the country and/or the efficiency of the service provider.

There are three hypotheses to explain why a fully competitive market for postal services has not been realized. The first is that universal service providers have successfully leveraged market dominance to discourage competition. The second is that the shrinking size of the market has rendered market entry unattractive to new entrants. The third is that that the traditional postal service providers compete in the wider communications or freight markets, rather than operating in a distinct market for postal services.

The first two hypotheses cannot be supported. Le Groupe La Poste, the French universal service provider, makes the point in its submission:

The small number of players in the letter post market is not due to any lack of competition or potential barriers to entry or anti-competitive practices by the

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[28] I.e. competitors collect postal items from senders, sort and transport them to an access point for delivery, such as the universal service provider's distribution center.

incumbent operators, but rather to a lack of demand and the gradual disappearance of this market as a result of developments in information and communication technologies. In this context, postal operators in charge of Universal service should not be considered as the only operator on the market, but as the last ones. (Ares (2020a) 6475438).

A consensus is emerging that postal services compete in the wider Communications or Freight markets. Copenhagen Economics (2018) points out that postal prices are disciplined by factors such as electronic communication, alternative advertising media, alternative delivery networks, and the universal service obligation. Amongst these, the competitive pressure from e-substitution is a constraining factor on demand for postal services and the postal operators' conduct. This position is supported by a decision of the Netherland Court of Appeal (see Box 3.3) and academic texts such as Gori and Parcu (2020).

Box 3.3

Netherland Court of Appeal, Trade and Industry Appeals Tribunal

Case Number 17/1385, 17/1387, 17/1389 and 17/1390

PostNL NV, Sandd BV, Intrapost BV and Van Straaten Post BV v
Netherlands Authority for Consumers and Markets (ACM)

ACM imposed access and tariff obligations on PostNL because of its dominant position on the market for 24-hour business mail. ACM only included physical (and not digital) mail in its market analysis, which is of essential importance for the question of whether PostNL is dominant. PostNL's competitive position would look very different if the market also consisted of digital mail.

ACM based its market definition on the characteristics of physical mail, which are quite different from digital mail. Digital mail is considerably cheaper and faster. PostNL countered this with an economic test (the so-called SSNIP test), which gave an indication that digital mail belongs to the same market. The result of that test means that ACM fell short in its proof that digital mail falls outside the market for 24-hour business mail.

The Court decided that the market analysis decision does not stand, and it annulled the decision. It canceled the obligations imposed on PostNL by ACM's decision.

The position with regard to the delivery of packets and parcels is more nuanced. The extent to which there is competition and the traditional postal operators' share of the market depends very much on the definition of postal parcel services.

Most of the published studies include services for the delivery of e-commerce goods dispatched by a seller to the buyer, but in accordance with the specified terms of contract specified in the Consumer Rights Directive (2011). On this basis the market is very competitive. Using the PSD definition of postal services discussed

above, however, competition is likely to be extremely limited and the traditional operators will have a significant market share.

I would argue that most of the activities of the major multi-national parcel and freight companies fall outside the current PSD scope of postal services, in that they contract only with the sender,[29] negotiate the terms of the contract and carry items of greater weight and volume if required. It should be noted, however, that many of these companies offer specific services targeted at private individuals using a network of collection points in retail convenience stores, such as GLS Parcel Shops, DPD Pickup Shops, UPS Access Points, DHL Parcel Shops. Even if these services are not technically postal services, in that there is no contractual obligation to the receiver and that the carrier has a lien of the goods during transit, the reality is that from a sender's perspective, these services fall within the scope of postal service as they display inter-changeability to a sufficient degree with the traditional services. But including these specific consumer orientated services within the scope of "postal services" is unlikely to dislodge the traditional postal service providers from their dominant position.

5 The Regulatory Framework and Its Future Scope

The current PSD intervenes in the provision of postal services in a number of ways:

(a) It controls who can provide postal services through a system of authorization procedures, including individual licenses, in order to guarantee compliance with essential requirements including confidentiality of correspondence. (Article 9)

(b) It requires Member States to ensure provision of a universal service of specified features (Article 3) subject to tariff principles including affordable and cost oriented pricing (article 12) accounting separation between regulated services and other activities (Article 14), quality of service standards (articles 16–18) and transparent, simple and inexpensive procedures for dealing with postal users' complaints, including a system of reimbursement and/or compensation (Article 19).

(c) It gives Member States flexibility in how they provide and finance their universal service provision based on the principles of transparency, non-discrimination and proportionality, including market provision, designation, public procurement, and use of a compensation fund or government funding (Articles 4 and 7).

The detailed provisions of the PSD are different for the three categories of universal service, services which fall within the scope of the universal service, and services which fall outside the scope of the universal service.

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[29] Or in rare circumstances the receiver – "receiver pays".

When considering if and how these provisions should be adapted to current conditions, a number of significant issues need to be considered.

5.1   Authorization Procedures

As considered in Sect. 3, the Advocate General Mengozzi of the CJEU has opined that the Court would have to undertake a complete overhaul of Article 9 as it is not drafted in such a manner as to facilitate its immediate comprehension. In any event, the evolution of postal service provision requires a simplification of the authorization procedures. ERGP (2019) observed:

> … it must be guaranteed that the market entry regime, e.g. by a general authorization, ensures the promotion of competition. As such, the regulations in this field should be defined in a way that the entry of new competitors is ensured through simple procedures which do not create an excessive burden which might constitute a market access barrier.

The new European Electronic Communications Code[30] provides an ideal template for a simplification of the authorization procedures.

5.2   Universal Service Provision

The concern being addressed by the original PSD was that the removal of exclusive rights (i.e. the postal monopoly) would expose the traditional postal service providers to direct competition which might render them uneconomic. In the event there has been no significant market entry but there has been a significant and continuing decline in mail volumes, driven by technological development and indirect competition. The requirement on Member States to ensure the provision of a universal service is still crucial to ensure users have access to affordable postal services.

In each Member State it is likely that there is, and will be for the foreseeable future, only one undertaking capable of providing the universal service – the state-owned (or former state owned) postal company. It is important that the conditions under which universal services are entrusted are based on the principles of transparency, non-discrimination and proportionality. Automatic designation, either in legislation or by an NRA, is undesirable. A formal process which allows potential competitors to put forward proposals is desirable. But the most important point is that there should be a "contract" setting out what services should be provided and how these should be financed.

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[30] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code Articles 12 to 16.

5.3 Universal Service Obligations

The existing obligations set out in the PSD relating to pricing, accounting separation, quality of service standards and complaints procedures are *prima facie* still required. There will however need to be a different emphasis. For example, with regard to pricing the initial concerns would have been that the USP would engage in below cost selling to keep out competition. Now the concern must be that the economic price will not be "affordable".

Accounting separation will become even more important. USPs provide all sorts of services outside the scope of postal services, including those for e-commerce sellers in competition with freight and parcel delivery undertakings. The Lewiatan Confederation (Poland) (Ares (2020d) 6555179) had significant concerns about cross-subsidization and other market abuses, including:

(a) Increasing the price of universal services while reducing the prices of services falling outside the scope of universal services;
(b) Increasing the cost base by shifting the volume of services from universal to those falling outside the scope of universal;
(c) Increasing privileges of designated operators generating high revenues and profits.

Of course, it is not just about ensuring that there is a proper system of accounting separation but also ensuring that the goodwill generated from operating the universal service is not leveraged to compete unfairly on other markets.

5.4 Financing the Universal Service

The dominant position of the USPs in the provision of postal services makes it extremely difficult to find a practical way of financing the universal service. While the hope is that the USP might provide universal service on an economic basis, the likelihood is that as volumes decline further the cost-oriented price will exceed the "affordable" price. A tax on postal service provision, such as a contribution to a compensation fund, will inevitably fall on postal service users, making the service more expensive. There are therefore only two practical options.

The first is to reduce costs by modifying the service provided. The Commission's application report (COM (2021)) recognizes that 11 Member States have relied on derogations allowed by the Postal Services Directive to reduce the features and scope of the universal service obligation. Initiatives reported include a reduced frequency of delivery, fewer products and in larger countries a switch from air to ground transportation.

The second is state financing or as PostEurop puts it:

> Where USO revenues do not or cannot cover the cost of the service, public resources should refund the universal service provider. (Ares (2020e), 6582553)

The challenge will be to ensure that such funding is not used to compete unfairly on other markets.

5.5   *The Scope of the Revised Regulation*

As discussed in Sect. 3 the scope of postal services is quite limited. The CJEU has decided it is services involving the "**clearance, sorting, transport and distribution of __postal items__**". When the PSD was first enacted, it was generally accepted that while some USPs provided parcel services it was only the most basic type of such service, those without any value added features, which were to be the subject of regulation. Parcel services were never within the scope of the postal monopoly and some European Countries, notably France, Belgium and Spain did not provide postal parcel services until near the end of the twentieth Century.[31]

It is only in more recent times that there has been debate about whether to include services, demonstrably different from the traditional postal services, provided by freight and parcel carriers, within the scope of postal regulation. There appears to be four main drivers for this:

1. The emergence of e-commerce and its need for a cost effective and efficient means of fulfillment.
2. The entry of USPs into this fulfillment market in their own name and home territory, and the acquisition/development of global or regional networks, for example DHL, owned by Deutsche Post; GLS owned by Royal Mail; DPD owned by Le Groupe la Poste (France).
3. The European Commission's goal of building a single European market.
4. The need to identify sources of funding to cover the costs of universal service obligations.

ERGP (2019) was somewhat equivocal as to what is or is not a postal service:

> The expectation being that the postal sector will increasingly centre on the delivery of goods, there will also be cause to determine the demarcation between transport services in general and postal services in particular. To this end, it will be necessary to identify the characteristics distinguishing the postal sector from the transport sector …

Many other submissions are unequivocal. For example, PostEurop:

> The parcel delivery sector is very competitive with strong pressure on prices and a constant drive for innovation. … in more and more countries, e-retailers or platforms are developing their own delivery solutions. Therefore, there is no justification for regulating the parcels sector beyond general competition rules. (Ares (2020e) 6582553).

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[31] International postal parcels were delivered by the railway companies in these countries – see Post Office Guide Volume II Irish Department of Posts and Telegraphs, Dublin 1971.

The Finish Government took a similar view:

> Finland is not in favour of additional regulation in the postal market or especially in the parcel market. Instead, regulation in the parcel market should be based on the EU's general competition rules. (Ares (2020c) 6554053).

Ecommerce Europe's position has been considered in Sect. 3, but in this context it has stated:

> Any unjustified extension of the definition [of postal services] would have unintended, and potentially negative, consequences for the e-commerce sector, for end consumers and for e-merchants including many SMEs…[32]

La Poste (France) is on the same side of the argument:

> The development of e-commerce has led to strong growth in the parcel delivery market. However, there is no justification for regulating this market:
> … From a competition point of view, there are no studies or facts today to support the idea of any market failure on the supply side of the market for parcels delivery to individuals that could justify the implementation of regulatory measures and specific obligations… (Ares (2020a), 6475438).

There is also a practical issue as highlighted in ERGP (2020) – where should the demarcation line between postal services and other services be drawn? Is the delivery of take-away food by Deliveroo or Just Eat a potential postal service? Is delivery of groceries by a supermarket a postal service? Is the delivery of a spare part from a regional distribution center to a garage a postal service? This list may be endless.

In summary only the most basic type of parcel service, provided under non-negotiable contracts, is currently the subject of regulation. There is no economic reason to extend regulation to include the fulfillment services used by sellers of goods by ecommerce and no support for the proposition by either the carriers or their customers.[33]

5.6   Subsidiarity/Flexibility

The principle of subsidiarity is at the heart of the European regulatory process. There appears to be a remarkable consensus between the various stakeholders in this regard. The position of La Poste (France) is typical of the submissions made to the Commission:

> La Poste is of the opinion that the level of flexibility offered by the Directive in its implementation has to be preserved in order to guarantee the existing balance between, on the one hand, harmonization and subsidiarity and, on the other hand, satisfaction of demand and economic sustainability for the supplier. (Ares (2020a), 6475438).

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[32] Public consultation reply 9 November 2020.

[33] Cholodecki (2021) explores the case for a new legal definition of postal services.

6 Conclusions

The PSD had two objectives. The first was to ensure the gradual and controlled liberalization of the European postal services market. The second was to address concerns that in a fully liberalized market the services offered on an economic basis would not meet the needs of users or guarantee them fair and non-discriminatory treatment. Both objectives have been met. As foreseen by Hearn (2018), a formal evaluation of the PSD was included in the Commission's Work Programme for 2020.

One of the most fundamental issues is what exactly are postal services? As discussed in Sect. 3 the current definition is quite narrow. According to the CJEU it is services involving the "clearance, sorting, transport and distribution of postal items", except where their business is limited to the transport of postal items. A more inclusive definition would be "Services provided on transparent non-negotiable tariffs and terms and conditions for the acceptance of postal items from senders for delivery to the addressee as shown on the envelope or wrapping of the item". There is no support to extend this definition to encompass fulfillment services provided to sellers of goods by ecommerce.

The original PSD envisaged state intervention if the services offered on an economic basis did not meet the needs of users or guarantee them fair and non-discriminatory treatment. It is now clear that it is the diminishing volume of postal items, driven by intense competition from electronic competitors in the communications market, which is the biggest threat to the provision of universal postal services. The current regulatory framework to ensure this must be retained, albeit with simplification of the licensing / authorization requirements and a new way of financing universal service provision. Will these reforms have to wait for the next application report, not due until 2025?

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Chapter 4
"Is Postal Service a Natural Monopoly?": A 30-Year Retrospective on Panzar's Seminal Paper

Victor Glass, Antonio Nicita, and Stefano Gori

1   Introduction

Three seminal papers have shaped the postal sector in the past two centuries, the first by Sir Rowland Hill in 1837 (Hill, 1837), which introduced the penny post, a uniform rate paid by senders for mail delivery. Previously charges were based on distance and paid by the receiver. The second seminal paper, by Ronald Coase 1939 (Coase, 1939) addressed issues raised by Hill a century earlier. Under political pressure to support uniform postal rates, Hill withdrew his plan for secondary distribution at cost-based rates and backed uniform rates even though he believed uniform rates made little sense for basic public services such as railroad transportation. Hill also questioned whether the post is a natural monopoly. He thought competition would lower delivery costs. He felt his position would run into difficulties because the Post Office was forced by the government to deliver mail in certain districts at a loss. Coase (1939) pointed out that "an agitation to remove the Post Office monopoly was not likely to get Government support" and that this might have induced Hill to reach a sort of compromise in its reform. In Coase's view, the monopoly condition, coupled with uniform pricing, might generate inefficiencies and undesirable losses, leading to cross-subsidies to villages, and thus a "usage tax" on customers in towns. The relationship between the geographical dimension of Postal Service monopoly, the nature and extent of universal service and cross-subsidies among areas with different density in population, the interdependence between primary and secondary distribution designs are crucial to the definition of postal service as a natural monopoly.

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The third paper, written by John Panzar, 30 years ago (Panzar, 1991), precisely focuses on these issues. Panzar readdressed the cost/price and universal obligation topics raised by Hill and Coase and tried to understand how the postal network had evolved in the 50 years since Coase's analysis. Specifically, Panzar's paper "Is Postal Service a Natural Monopoly" (1991), questioned whether the postal service is technologically a natural monopoly. He concluded that indeed it is, based on simple logic. Nonetheless, he suggested that empirical analysis, such as international comparisons, would be helpful to answer the question, but they were not available to him. He did not envision growing competition for package delivery in the last mile.

In this chapter, we examine Panzar's conclusions, 30 years later. We draw on empirical data drawn from the US and major European postal markets to see how the postal sector has evolved. We use this information to see if his logical conclusion that the postal sector is a natural monopoly still holds.

The paper is organized in five sections. After this introduction, the second summarizes the main findings from Panzar's paper and other papers from the last decade that address the issue of natural monopoly. The third section addresses the emerging factors in the US and Europe that have dramatically changed the postal sector since the Panzar's paper was published. The fourth section summarizes our observations and discusses whether we believe Panzar's conclusions remain valid or if instead a new approach to understanding the delivery market would be more accurate. In the final section we propose an ongoing research agenda to respond to rapidly evolving market conditions.

2   Panzar's Seminal Paper and Reactions to It

Microeconomics textbooks analyze extensively the issue of monopolies. While the Pareto efficient amount of output in a competitive market is achieved when price equals marginal cost, a monopolist achieves its desired output level by setting marginal revenue, below price, equal to marginal cost. Because its price is typically above marginal cost, a monopolist produces "too little" output from a societal point of view. This outcome leads to allocative inefficiency, as consumers of the service with a willingness to pay equal to or greater than marginal cost but below the monopolist's price will not be served, generating the well-known dead weight loss. In some cases, even a monopolist would earn negative profits from operations and thus decide to exit the business. A more typical case that leads to monopolization is when a company's marginal cost curve is below its average cost curve. In this case, pricing at marginal cost is economically unprofitable. This is the typical case defined in university textbooks as a "natural monopoly" and this case can often refer to public utilities (Varian, 2010, p.451–454). In order to solve the above market failure, a regulator will allow prices to be enough above marginal cost to give the regulated monopoly the ability to earn a fair rate of return on its investments.

In Panzar (1991) the author considered the possibility that the Postal Service is a sector which is structurally characterized by conditions leading to a natural monopoly. After a comparison with the telecommunication sector and a qualitative assessment of economies of scope and economies of scale present in in the industry, he reached the conclusion that indeed it is a natural monopoly, despite being difficult to prove empirically. No potential competitor had sought to enter the market despite uniform prices being prescribed for political reasons, which would suggest profit opportunities in low-cost areas were not large enough to attract cream-skimmers. By contrast, in his view, cross-subsidies in the telecommunications industry led MCI to enter the long-distance market because AT&T was directed to raise long distance rates to subsidize local service.[1] Panzar did not believe empirical studies of economies of scale based on an incumbent regulated monopolist such as AT&T would yield meaningful results about the cost structure of potential entrants. Panzar thought that a cross-section of firms' cost structures would yield far more accurate estimates of economies of scale and scope, but the data did not exist for basic network services. Despite the lack of empirical evidence, he firmly believed the postal service was a natural monopoly because it is cheaper to deliver local and national mail together than to deliver them separately. He felt that having two or more mail carriers delivering to the same box would be inefficient. Similarly, it would be inefficient to have more than one company sorting mail.

Panzar distinguished the postal network from other network industries such as telecommunications networks, electric power, and transportation networks in observing that the bulk of postal costs are labor costs, whereas, in the other industries, the bulk are equipment costs, with much of the capital investment is in motor vehicles and general-purpose buildings. Second, the equipment used by the post service is not industry specific. Postal trucks can be used by other industries, so they do not generate sunk costs, which suggests market contestability is more likely because potential competitors face less risk in entering the market if they can use equipment in alternative businesses. Therefore, competition is workable if a competitor such as UPS could find a product niche that uses equipment in novel ways. In UPS's case, it shipped parcels on airways with excess capacity and shipped overnight (Panzar, 1991, p.224–225).

Four years later, in another seminal paper entitled "Unnatural Monopoly," Estrin and de Meza (1995) investigated the merits of statutory monopoly as a mean of preventing wasteful market fragmentation. In their model the authors allow all firms to adjust price and output after entry (Estrin & de Meza, 1995, p.472). They utilized a simple quantity-setting Nash game to understand whether a public firm can repel entry (Estrin & de Meza, 1995, p.474). Without having to resort to a cream-skimming argument, the authors point out that laissez-faire cannot guarantee that a single firm will produce all output if substantial economies of scale exist in the market (Estrin & de Meza, 1995, p.474). Their main finding was that in case of

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[1] MCI's entry was aided by the development of microwave technology during World War II. Arguably, this new technology reduced economies of scale for delivery of long distance communications. See Temin and Golombos (1987), pp. 50–53.

economies of scale, e.g., in postal services, an average-cost pricing public firm would find it difficult to repel entry. Even when the profits of the entrant are included in social welfare, statutory monopoly accomplished by restrictions on entry may be justified (Estrin & de Meza, 1995, p.484). This paradox justifies the title of the paper of "Unnatural Monopoly".

In 2003, during the 10th Conference on Postal and Delivery Economics organized in Toledo, Spain by the Center for Research and Regulated Industries, a paper was presented based on the intuition from Panzar. Gori et al. (2003) analyzed nineteenth and twentieth century myths of the postal sector. From that analysis it emerged that, as Panzar underlined, the economic importance of unbundling access and usage costs. The current pricing arrangement does not have a separate price for postal delivery service (Panzar, 1991, p.225). Gori et al., (2003, p.11) found that delivery is the costliest component of the whole value chain and that in the 1990s on average in OECD countries represented 65% of total postal costs. One possible explanation for the lack of an access charge is that the Universal Service Obligation (USO) in postal services is not focused on maximizing the use of the service, but on granting the right to every citizen to freely receive mail and to set affordable prices such that nobody is excluded from its use (Gori et al., 2003, p.5). If an entrant into postal service had to meet this USO requirement, it would absorb large losses without an access charge. They labelled the postal USO a "Public Network Good," linked to the ubiquity of postal delivery (similarly to public security -police and conventional military forces), that: (1) are provided by networks, (2) incur high fixed costs (recurrent but not sunk like in other network industries), (3) are labor intensive (in many countries highly unionized), (4) are able to stimulate positive externalities and (5) disallow *de jure* any exclusion of single consumers (Gori et al., 2003, p.20).

3   How Has Last Mile Evolved in the US and Europe?

The emerging factors that have dramatically changed the postal sector since the 1991 paper was published need to be addressed to understand to see if Panzar's reasoning remains valid after 30 years. The dramatic drop in postal volumes, the growth of competing parcel networks stimulated by B2C e-commerce, the evolution of the nature of parcels and the growth of value-added services in this sector (e.g., same day delivery) have been very disruptive factors and have had an impact on postal operators. As we will show, the decline in mail volumes reinforces the notion of a natural monopoly for mail.

In the US, since 2006 total mail volume has fallen by 39% and the mail volumes are less than in 1984 even though the population has grown from 236 million to 331 million people. Due to a rapidly growing population delivery points are growing more than a million per year. In 2006 there were 5.6 daily pieces of mail per delivery point, in 2020 three and in 2030 the estimate is 1.7 (WSJ, 2021). The USPS is meant to be self-sufficient, but its losses since 2007 have reached nearly

$90 billion (WSJ, 2021, p.16). The COVID pandemic has exacerbated these downward trends and will probably have a lasting effect. The issue is whether the earnings losses from the decline in mail volumes will be offset by the growth in parcels. Even though the conventional view is that the complete offset will not take place there is also who believes that without the health care funding problem, (Anderson et al., 2019) more freedom in its pricing policy and the growth in parcels, the postal service is now or could turn profitable (e.g., Johnson, 2017 updated on 2021). While potential profitability has little to do with Panzar's contention, it does raise the issue that if Panzar is correct, whether a support fund is necessary. The available evidence from Europe suggests that these reforms are unlikely to make the Postal Service profitable in the long term.

The USPS responded to these earnings challenges by presenting in March 2021 a ten-year plan that included a series of initiatives and proposals to improve its financial sustainability. Initiatives mainly linked to the health care plan, with greater pricing flexibility and improvements in the transportation of mail (USPS, 2021, p.6), but it still would keep the 6-day delivery system for mail and intends to try to maintain growth on the parcel side.

Due to the difficult financial situation, both houses of Congress are now moving to reform the USPS. The Postal Reform Act of 2021 being discussed would address the healthcare bailout and the issue of maintaining an integrated network for the delivery of mail and parcels (H.R. 3076). On the latter, the 2006 Postal Accountability and Enhancement Act specified that mail should not be used to subsidize packages (H.R. 6407). Today the debate is on the opportunity to eliminate cost and pricing distinctions between mail (a service that only USPS can legally provide) and packages, a service for which there are many delivery options (Steidler, 2021). Steidler's suggests that the mail and parcels are becoming separate markets segments with different competitive dynamics.

Table 4.1 documents that letter volumes in Europe, have decreased dramatically, but not at the same rate, across the major markets. This is mainly due to the variations across countries of e-substitution linked to new digital solutions for the transmission of legal, tax and administrative documents.

Recently, Parcu et al. (2021) have carried out an analysis on last mile delivery in the main European markets. They concluded that the exit from the letter delivery of Whistl in the UK and the mergers in the Netherlands and Italy indicated the fragility

Table 4.1 Mail volume decrease 2012–19

Spain	−5%
Germany	−6%
UK	−23%
France	−39%
Italy	−42%
The Netherlands	−58%

Source: EU DG Growth Report

of existing equilibria in a rapidly declining mail industry. Competitors are exiting the mail business. In contrast, the competitive dynamics in parcel markets remains more heterogeneous across the different countries. For parcels, the growth of e-commerce justifies further investments and innovation, making entry economically attractive (Parcu et al., 2021, p.14).

End-to-end (E2E) competition in mail is diminishing almost everywhere, leading to marked consolidations. A decade ago, in Germany, the Netherlands and Italy there were E2E competitive national networks, and the same was true 15 years ago in the UK. The common trend in these countries is that service ends up being provided by the national postal network (guaranteeing some sort of access regimes in all six major markets, in some case through downstream access while in others with a system incentivizing consolidators), some small mail local networks and many parcel networks. Moreover, economies of scope between mail and parcels seem to exist only in the small e-commerce standard parcels which often go through the mail network. These parcels are mainly generated outside the EU and are the lower end of the international e-commerce market which by the way will be heavily impacted by the new EU directive on VAT and small value consignments.

Extending the analysis from the US to G7 countries plus the Netherlands, Spain, and the BRIC countries, we see that the great majority of mail volumes in the world are delivered by one postal network (McKinsey, 2019; UPU, 2020; Researchmarkets. com, 2021). Multiple firms delivering larger parcels and providing courier express are seen everywhere, even in China and India and Brazil. We observe the growth of several parcel networks and in some cases of platforms developing their own delivery networks.

4   Is Postal Service Still a Natural Monopoly?

Panzar based his belief that postal service is a natural monopoly on a simple example. He assumed one type of mail class with two service types: local mail delivery and national mail delivery. His conclusion was that one delivery system lowers delivery cost for both mail types. The setting today is much more complex because of the growth in parcel delivery. The lack of competition for mail delivery suggests that Panzar's observation for mail remains intact. Parcels and mail are increasingly evolving as differentiated products because, for example, customers now expect same day delivery of parcels. Perhaps Adam Smith's idea that workers with general skills – farmer, toolmaker, blacksmith – would be replaced by specialized workers operating within distinct industries is taking place in postal delivery.

The recent Postal Service marketing plan *Delivering for America* (USPS, 2021) suggests that specialization is crowding out economies of scope. The plan points out that operations and infrastructure are increasingly misaligned because of the relative growth of package delivery (USPS, 2021, p.9). In 2020, package delivery needs tested the Postal Service's processing and transport capacity (USPS, 2021, p.10), while mail infrastructure such as sorting machines were operating at only 50%

capacity (USPS, 2021, p.11). The Postal Service plans to introduce new package sorting machines and larger capacity trucks to accommodate package growth (USPS, 2021, p.11). Besides faster delivery requirements for packages than mail, package mailers, particularly businesses, require more support services. In response, the Postal Service is bundling B2C services through USPS Connect (USPS, 2021, p.21). This type of service suggests a specialized workforce devoted to packages.

Taken as a whole, the USPS's marketing plan indicates that mail and parcels are evolving into two separate markets. Given that mail is a declining market with increasing costs, it will remain a monopoly because it is unprofitable to serve even by one company constrained by price ceilings for its mail products.

In Europe, the evolution into two separate markets is also taking place. Recent research on competition in the postal sector, using secondary data of the main postal operators, reached a conclusion that there are three possible clusters of mail markets. The first cluster is characterized by high concentration and low fragmentation, the second cluster with moderate concentration and fragmentation and the third one with high fragmentation (small local mailers) and lower concentration (Parcu et al., 2021, p.5). At the same time in all these clusters there is a vibrant and dynamic competitive environment concerning parcels. Hence, a growing divergence between the business models of these segments is observed.

4.1 The Universal Service Dilemma

The evidence from Europe suggests that mail is a natural monopoly, especially when saddled with universal service obligations. One of the main differences between Telecommunication and Postal services is that all citizens need to have a postal address. They are automatically connected free of charge to the postal network as soon as they are born and registered and do not need to pay any fee for it, whereas connection to utilities and other network industries is on a voluntary basis and implies the payment of a subscription fee.[2]

Despite the progressive opening of the market and changes in users' preferences, it emerges, even more after the Covid 19 crisis, that it is fundamental to preserve the unity of a seamless universal service network to ensure accessibility, efficiency, and sustainability of the postal sector, granting a minimum set of services to all citizens within the whole national territory regardless of their geographical location or factors such as income, age, level of digitization, etc. Otherwise, there would be the risk that citizens living in disadvantaged areas (such as mountain, island, remote or sparsely populated areas), suburban areas as well as the less well off, elderly, disabled or people with low digital skills or without internet access may no longer be able to use the postal services that would be too expensive because of the high costs that transport, sorting and, above all, delivery would require. In other words, the

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[2] Please see Brennen (2021) for more information on subscription fees.

universal service obligations remain as a strong political goal, which makes competitive entry unlikely.

In addition, as Universal Service is crucial for economic and social cohesion, considering the increasing burden on the provider, also due to the dramatic and persistent drop in mail volumes (accelerated by the pandemic), the regulatory framework both in the US and in Europe will have to unequivocally reaffirm the principle of full compensation of the net cost (which will tend to increase as volumes decrease) of universal postal obligations with national funding and general taxation.

All these influences may suggest that in comparison to the mail sector, the parcel market is becoming a distinct market with its own requirements. If true, economies of scope between mail and parcels may be disappearing. Paradoxically, diminishing mail volumes would suggest that a monopoly for mail service may be most efficient for last mile delivery. In addition, due to the death spiral anticipated by Crew and Kleindorfer (2006) 15 years ago, mail delivery is becoming less commercially viable, making it a losing business proposition but remains socially important hence the natural monopoly should be the delivery of mail only not parcels and courier express.[3]

5   Conclusion

Panzar claimed that logically the Postal Service is a natural monopoly even though if may be difficult to prove empirically. Competitive entry was not considered by Panzar a strong indicator that conditions for a natural monopoly exist because prices for regulated services are often prescribed for political reasons. He firmly believed the postal service was a natural monopoly because it is cheaper to deliver local and national mail together than to deliver them separately. He felt that having two or more mail carriers delivering to the same box would be inefficient.

His conclusions seem to remain valid. Diminishing mail volumes enhances the whole issue of economies of scale not allowing for more than one national network (this is the case already in the US, but it is increasingly true for major European markets). Furthermore, the progressive disappearance of the economies of scope between mail and parcels, due to value added services linked to e-commerce, suggest that mail should be viewed more and more as a standalone service.

Compared to the early 1990s, the economics of postal delivery today is much more complex. Parcels and mail are differentiated products and becoming increasingly so because customers now expect, for example, same day delivery of parcels

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[3] Crew and Kleindorfer (2006) defined the "death spiral" as whether increasing postal rates, in the presence of volume declines, would so reduce the volume of postal service that it would reduce the solvency of a postal operator even farther. Brennan and Crew (2016) developed a demand elasticity condition for when raising prices will not be able to ensure solvency.

and delivery of parcels with non-standard sizes. An evolving process of specialization is likely taking place.

If the observed diverging trends for parcels and mail continues, they could lead to a full death spiral of mail sector. Letter delivery could become more like the unsustainable (from a financial point of view) unnatural monopoly as discussed by Estrin and Meza. This is probably true in the US but could extend also to Europe leading to a final consolidation in the last mile in Europe in the mail segment.

Mail appears to be a natural monopoly also because of its universal service requirement, which arguably contributes to make it a definitely unprofitable business. Further research should be carried out to assess how long this unsustainable financial burden will be tolerated based on the concept that postal operators are the carriers of last resort together with the principle that postal addresses and postal delivery are a right from birth. Will the Public Network Good characteristics of the last mile still hold in the future? Will the public opinion in 10 years' time think that it is crucial for a country that there is the possibility of being reached through the postal network by the community and being informed of the basic but fundamental events of a democratic country, for example an election as recently confirmed by the surge of the vote by mail in the US? In 10 years, we wonder whether the last mile in mail delivery will still be a natural monopoly and, even more, will universal delivery still be politically relevant.

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Chapter 5
The First Tests of the SGEI Framework in the Postal Sector: Takeaways from the Judgements in the Česká pošta and Post Danmark Cases

Alessandra Fratini and Marc Chovino

1   Introduction

On 15 October 2020, the General Court[1] ("GC" or "the Court") rejected the request to annul the European Commission's decision declaring that the public compensation granted to Česká pošta for the performance of its universal service obligation ("USO") for the period 2013–2017 is State aid compatible with the internal market, pursuant to Article 106(2) TFEU.[2] The decision had been challenged by První novinová společnost, the Czech Post's competitor, which had lodged a State aid complaint with the Commission in early 2016.

The GC upheld in full the Commission's decision. By thoroughly assessing each of the five pleas raised by the applicant, the Court cleared a number of procedural and substantial issues in the Commission's legal and economic analysis that had been untested thus far. It addressed the duration of the preliminary examination procedure and its relevance for the existence of serious difficulties and, in turn, of

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[1] General Court, judgment of 15 October 2020, case T-316/18, První novinová společnost v Commission, ECLI:EU:T:2020:489.

[2] C(2018) 753 final of 19 February 2018, State aid SA.45281 and State aid SA.44859.

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doubts that would justify initiating the in-depth investigation procedure laid down in Article 108(2) TFEU. The Court also stressed the exceptional character of additional requirements under §§51–52 SGEI Framework.

The Court further clarified that the Net Avoided Cost (NAC) methodology[3] is the reference method to assess the presence of overcompensation, and that a profitable operator in accounting terms could still be entitled to compensation for the USO under that methodology. The Court also said that nothing in the SGEI Framework prevents the proceeds from this compensation from being allocated to items other than the USO. When it comes to the implementation of the NAC, the GC appraised the Commission's findings as to the credibility of the counterfactual scenario provided by the Czech authorities and validated the approach of the Commission to verify the reliability of Czech Post's accounting system. The Court also confirmed the approach of the Commission with regard to the identification of the relevant intangible benefits generated by the discharge of the USO.

About 7 months later, sitting in the same chamber, the Court further elaborated on those findings in the case brought by ITD and Danske Fragtmænd against the Commission's decision[4] on State compensations granted to PostNord for the USO provision in Denmark.[5] The decision and the judgement concerned several measures in favor of Post Danmark (USO compensation, State guarantee, VAT exemption, capital increase). For what matters here, the GC upheld the Commission's assessment of the USO compensation and shed light on the credibility of the counterfactual scenario submitted by the Danish authorities, the relevant intangible benefits when calculating the NAC, efficiency incentives within the meaning of §§39–43 SGEI Framework and, most interestingly, the use of the USO compensation at issue for purposes other than the performance of the USO.

After a brief overview of the pleas brought against the two contested decisions (Sect. 2), we review both the legal assessment and the economic analysis of the Court in the two judgments (Sects. 3 and 4). The chapter concludes with a discussion of the implications of the judgments for the State aid assessment of USO financing in the future against the background of a growing litigation trend (Sect. 5).

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[3] See §25 SGEI Framework, "Under the net avoided cost methodology, the net cost necessary, or expected to be necessary, to discharge the public service obligations is calculated as the difference between the net cost for the provider of operating with the public service obligation and the net cost or profit for the same provider of operating without that obligation".

[4] C(2018) 3169 final of 28 May 2018, SA.47707 (2018/N).

[5] General Court, judgment of 5 May 2021, case T-561/18, ITD and Danske Fragtmænd v Commission, ECLI:EU:T:2021:240.

2   The Preliminary Examination and the Pleas Against the Contested Decisions

As a preliminary point, it is worth remembering that both decisions were adopted at the preliminary examination stage. As provided for in Article 108(3) TFEU and Article 4 of the procedural Regulation (Council, 2015), the preliminary examination stage is intended to enable the Commission to form an initial view on the aid plan notified to it: i.e., whether it constitutes aid and, in the affirmative, whether it raises serious doubts as to its compatibility with the internal market, which would require a detailed formal investigation. At the end of this preliminary phase, the Commission has to open the formal investigation procedure if it has serious doubts but can directly proceed with an approval of the measure through a "no objection" decision in the absence of such doubts.

During that preliminary examination procedure, interested parties, such as complainants, do not have a procedural right to submit comments. Therefore, where an unsuccessful complainant seeks the annulment of a decision not to raise objections, it essentially contests the fact that the decision was adopted without the Commission initiating the formal investigation procedure, thereby infringing its procedural rights. In such an action, that complainant may only invoke pleas capable of showing that the Commission had, or ought to have had, serious doubts as to the aid's compatibility with the internal market. That can be demonstrated by evidence relating to the conduct of the preliminary examination stage, the information that was available to the Commission during its preliminary investigation and the content of the contested decision.

Upon completion of that stage, the Commission found that the Czech and Danish measures did not raise any doubts as to their compatibility with the internal market and decided not to raise objections. In both cases, competitors had filed complaints with the Commission following notification (or pre-notification) of the measures. The unsuccessful complainants claimed that the Commission failed to initiate the formal investigation procedure under Article 108(2) TFEU, despite the (alleged) serious difficulties resulting from the duration of the procedure and the insufficient or incomplete nature of the Commission's examination. In the Czech case, the applicant raised five pleas in law, also alleging the Commission's failure to state reasons, manifest errors of assessment in connection with the calculation of the NAC, errors of law concerning the failure to take intangible benefits into account and to impose additional requirements to prevent trade being affected. In the Danish case, the applicants raised a single plea in law, seeking to establish the existence of serious difficulties that should have led the Commission to initiate the formal investigation procedure.

In the judgments, the GC clarified the notion of "serious difficulties" for the purpose of initiating a formal investigation and the relevance of the duration of the preliminary stage in that respect. In addition, the Court provided a comprehensive review of the application of the 2012 SGEI Framework to public compensations in the postal sector.

3   The Legal Assessment

The arguments that are most interesting in terms of legal reasoning are those that concern the notion of "serious difficulties", the possibility for the Commission to impose additional requirements under §§51–52 SGEI Framework, and the (non) relevance of economic efficiency for the compatibility assessment under Article 106(2) TFEU.

3.1   Notion of "Serious Difficulties" and Duration of the Investigation

With regard to "serious difficulties", the Court first reviewed the applicable case-law. It noted that it is an objective concept that must be sought both in the circumstances in which the contested decision was adopted and in its content, comparing the grounds of the decision with the information available to the Commission when the decision was taken. In addition, the GC reiterated that the Commission may engage in a dialogue with the notifying State or with third parties with a view to overcome, during the preliminary investigation, any difficulties encountered. That ability assumes that the Commission may adjust its position in accordance with the results of the dialogue in which it engages, without that adjustment having to be interpreted, *a priori*, as evidence of the existence of serious difficulties. It is only when those difficulties cannot be overcome that they are found to be serious and, as such, must lead the Commission to have doubts, thus prompting it to initiate the formal investigation procedure. In any case, it is for the applicant to prove the existence of doubts, with consistent evidence.

In the Czech case, the applicant claimed that the existence of serious difficulties resulted from the belated adoption of the decision and from the incomplete, insufficient examination of the facts in the case. For the applicants in the Danish case, the serious difficulties resulted from the duration of the procedure (3 months and 19 days, plus over 3 months of pre-notification) and the circumstances surrounding the preliminary examination.

When it comes to duration, Article 4(5) of the procedural Regulation provides for a 2-month period for the preliminary examination of a notification, which may be extended only by mutual consent or where such notification is incomplete and the Commission needs additional information for its assessment. In that respect, the Court rejected the applicants' claims in both cases and confirmed that the 2-month period is to begin on the day following receipt of a complete notification; it does not "*in any way*" run from the date, as in the two cases at stake, of a complaint lodged with the Commission.[6] In fact, EU law does not lay down a particular time limit for the completion of the procedure following the lodging of a complaint, with Article

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[6] Case T-316/18, p. 106.

12(1) of the procedural Regulation merely stating that the Commission "*shall examine without undue delay any complaint*".[7] The Code of Best Practices (2018), which is not legally binding, also merely provides that '*the Commission services endeavour to investigate a formal complaint within a non-binding time limit of 12 months from when they are registered*'. Similarly, while it can indicate that the Commission may have had doubts regarding the compatibility of the measure in question, the length of the procedure for the preliminary examination cannot in itself imply that the Commission was facing serious difficulties. Whether or not the duration is reasonable must be determined in relation to the specific circumstances of each case, namely "*its context, the various procedural stages to be followed by the Commission, the complexity of the case and its importance for the various parties involved*".

In the Czech case, the decision was adopted over 30 months after the first notification, over 23 months after the complaint, and over 22 months after the first pre-notification.[8] However, the Court acknowledged that the circumstances of the case explained and justified the "*admittedly particularly long duration*" of the examination, without that duration indicating in itself the existence of serious difficulties.[9] As a matter of fact, "*during the whole period between, on the one hand, the first notification, the complaint and the first pre-notification and, on the other hand, the second pre-notification and the formal notification*",[10] the Commission requested and obtained from the Czech authorities significant amendments to the proposed compensation (including the replacement of the initial compensation fund for 2013–2014 by a direct subsidy) and additional information essential to assessing its amended content. In other words, for the Court, any difficulty encountered by the Commission had been fully addressed at the time of adoption of the no objection decision.

Likewise, in the Danish case, the GC concluded that the fact that the duration of the preliminary examination stage was 1 month and 19 days longer than the prescribed two-month period did not constitute evidence of the existence of serious difficulties. Such a duration could "*easily be explained*" by the fact that the Commission examined, on top of the measure notified by the Danish authorities, four of the five measures in favor of Post Danmark referred to in ITD's complaint and the newly altered amount of the USO compensation, which the Danish authorities communicated 2 days before the expiry of the two-month deadline.[11]

In addition, the Court confirmed that the pre-notification phase is not, in principle, relevant for the purposes of assessing the existence of serious difficulties, as the existence of such difficulties is assessed in view of the preliminary examination

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[7] *Ibidem*, p. 60.

[8] The procedure had in fact involved a first notification (30 July 2015) of the proposed aid, that was then withdrawn by the Czech authorities on 29 April 2016; a subsequent first pre-notification on 29 April 2016, a second pre-notification on 28 July 2017 and a (final) notification on 18 December 2017.

[9] Case T-316/18, p. 120.

[10] *Ibidem,* p. 141.

[11] Case T-561/18, p. 63.

stage, which begins on the date of complete notification of the measure.[12] With reference to the judgment relied upon by ITD to the contrary,[13] the GC pointed out that it is only in specific circumstances that the Court held that the conduct of the pre-notification phase could constitute evidence of the existence of serious difficulties – which the applicants could not establish in the Danish case.[14]

It can be argued, as the applicants did, that extending pre-notification discussions with the Member State until all doubts are eliminated, so that the notified measure can be approved within the preliminary examination stage, is a misuse of the procedure that further affects the limited third parties' rights in State aid proceedings. However, the two judgments confirm that, under the current state of EU law, the early assessment stages of a State aid measure (i.e. the pre-notification stage and the preliminary examination stage) remain a bilateral, confidential exchange between the Commission and the notifying Member State. *Mutatis mutandis*, that appears to mirror the position of third parties in merger control proceedings, in particular in connection with commitments proposed and adopted in Phase I, where time constraints limit the scope of their rights. In addition, the Court has held that third parties do not have a right to lodge a formal complaint with the Commission for breach of commitments, nor can they force the Commission to take a formal decision on the complaint, which could then be challenged in court.[15]

3.2   Recourse to Additional Requirements

In the Czech case, the applicant also claimed that the Commission erred in law by authorizing the USO compensation without it being subject to conditions or commitments on the part of the Czech Republic with a view to mitigating the serious distortions of competition to which that measure gave rise. Under §§52–53 2012 SGEI Framework, in some exceptional circumstances, if serious competition distortions could remain unaddressed and the aid could affect trade to such an extent as would be contrary to the interest of the Union, the Commission shall examine whether such distortions can be mitigated by requiring conditions or requesting commitments from the Member State.

In addressing that plea, the Court first referred to §54 2012 SGEI Framework, which provides that '*serious competition distortions such as to be contrary to the interests of the Union are only expected to occur in exceptional circumstances*' and that '*the Commission will restrict its attention to those distortions where the aid has significant adverse effects on other Member States and the functioning of the*

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[12] General Court, judgment of 28 March 2012, Ryanair v Commission, case T-123/09, EU:T:2012:164, p. 168.

[13] General Court, judgment of 15 November 2018, T-793/14, Tempus Energy, EU:T:2018:790.

[14] Case T-561/18, p. 75.

[15] See General Court, judgment of 9 October 2018, case T-884/16, Multiconnect v Commission, EU:T:2018:665, p. 37.

internal market, for example, because they deny undertakings in important sectors of the economy the possibility to achieve the scale of operations necessary to operate efficiently'.[16] It then found that the circumstances in this case could not be regarded as exceptional within the meaning of §54, as compliance with the other conditions of the 2012 SGEI Framework appeared sufficient to mitigate distortions of competition. In particular, it was apparent from the contested decision that the Commission had checked sufficiently that any risk of overcompensation for the USO was prevented. In the absence of any particular distortion of competition, in the light of the *ex post* checks performed by the national regulatory authority, the Commission was under no obligation to impose conditions or commitments on the Czech Republic, as such conditions or commitments can be envisaged only where there are serious unaddressed distortions of competition.

The clear-cut position of the Court on this point, that exceptional circumstances must be present for the Commission to request additional requirements, may *de facto* allow the Commission a certain degree of discretion in assessing whether such exceptional circumstances are present and additional requirements necessary. That is likely to make it more difficult in the future for third parties to challenge successfully its decisions on that matter.

3.3   *Efficiency Incentives vs Costs of an Efficient Service Provider*

The applicants in the Post Danmark case had argued that the NAC calculation, which formed the basis for the USO compensation, breached §§39–43 SGEI Framework relating to efficiency incentives, amongst others, because it was not based on the costs of an efficient service provider. In their view, the USO compensation did not contain any efficiency incentives as Post Danmark was on the brink of bankruptcy and, as such, could not be regarded as an efficient service provider.

The Court dismissed that argument as being based on the confusion between efficiency incentives, which are required under §§39–43 SGEI Framework to seek to ensure that the provision of an SGEI provides efficiency gains while ensuring service quality, and the flawed idea that the NAC should be calculated on the basis of an efficient service provider.[17] In that respect, the Court explained that the question of the economic efficiency of the universal service provider ("*whether the level of compensation must be determined on the basis of an analysis of the costs that an efficient service provider would have incurred in performing the USO*") is not

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[16] Case T-316/18, p. 327.

[17] Case T-561/18, p. 164.

relevant when assessing the compatibility of the aid under Article 106(2) TFEU,[18] because that would lead, ultimately, to requiring that SGEIs always be provided under normal market conditions. If such a requirement were accepted, the application of competition rules might obstruct the performance, in law or in fact, of the particular tasks assigned to undertakings entrusted with the operation of services of general economic interest, which Article 106(2) is specifically intended to prevent.[19]

On that point, the Court's reasoning echoed the one in *Viasat*, which acknowledged that Article 106(2) seeks to prevent that the operator responsible for the SGEI benefits from funding which exceeds the net costs of the public service.[20] As the Court noted, it follows that the question as to whether an undertaking responsible for a SGEI may fulfil its public service obligations at a lower cost is irrelevant for the purpose of assessing the compatibility of the State funding of that service in the light of the EU State aid rules. In other words, the costs of an SGEI to be taken into account when applying Article 106(2) are the actual costs of the service as they are, and not as they could have been or ought to be, based on calculation criteria founded on the example of a typical well run and adequately equipped undertaking.

4   Economic Analysis

4.1   *Credibility of the Counterfactual Scenario*

In both cases, the applicants criticized the counterfactual scenario presented by the national authorities and the future aid beneficiary. In the Czech Post case, the applicant criticized the counterfactual scenario submitted by the Czech Republic, which entailed a significant downsize of the postal network, considering that Czech Post would never consider such a downsizing, which would allegedly lead to the loss of significant market shares in particular as regards the delivery of e-commerce goods. In the Post Danmark case, the applicants criticized the Commission for accepting the counterfactual scenario submitted by the Danish authorities even though that scenario included the discontinuation of certain activities, which, according to them, would probably have been pursued by Post Danmark in the absence of the USO.

Both lines of arguments are comparable in the sense that both applicants argued that the proposed counterfactual scenarios were not reliable because they would not correspond to the optimal strategy of the postal operators absent the USO. Both

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[18] Article 106(2): "Undertakings entrusted with the operation of services of general economic interest (…) shall be subject to the rules contained in the Treaties, in particular to the rules on competition, in so far as the application of such rules does not obstruct the performance, in law or in fact, of the particular tasks assigned to them. The development of trade must not be affected to such an extent as would be contrary to the interests of the Union".

[19] *Ibidem*, p. 165.

[20] Case T-125/12, Viasat Broadcasting UK v Commission, EU:T:2015:687, pp. 87–88.

applicants considered that Czech Post or Post Danmark could increase their profits by keeping some activities that they had discarded in the counterfactual scenario presented. However, requiring a truly optimal scenario as a precondition for the NAC would put the bar very high for the Member State, the concerned postal operator and the Commission. Indeed, by definition, the counterfactual scenario is hypothetical and different assumptions could be made which could lead to different optimal scenarios.

More importantly, a truly optimal scenario could be extremely complex or even impossible in practice to determine, as all dimensions of the activity of the postal operator would need to be optimized: the range and territorial scope of the services delivered, as well as the prices and conditions of delivery of these services. An optimal strategy could require first the determination of an optimal set of services, and then for each service of this set, the optimal combinations of conditions of delivery, prices and territorial coverage, which could be very numerous: a given service could be optimally delivered under certain conditions and at a certain price in a certain territorial area and optimally delivered in a different way (e.g. different frequency, timing, …) or at a different price in a different area (or even not delivered at all in certain areas). Very often the economic data that would be necessary to assess the impact of these complex optimizations is unavailable (taking notably into account that there are no real occurrences of USO providers stopping USO delivery) and in the absence of such data, the truly optimal counterfactual scenario can be neither determined nor properly evaluated.

For these reasons, counterfactual scenarios presented by Member States in Commission decisions can always be considered suboptimal. Only specific features of the activity of the postal operator are modified in the counterfactual scenario (e.g., only territorial coverage or only range of services), while other features remain untouched. Even the features that are modified may also not be truly optimal in the counterfactual scenarios, and the Commission does not claim in its decisions that counterfactual scenarios are optimal.

Against this background, it can be argued that a suboptimal counterfactual scenario is not an issue in itself in light of the objective of the NAC calculation, which is to avoid over-compensation. Indeed, a sub-optimal counterfactual scenario, if properly quantified, should normally lead to a lower NAC under the assumption that the performances of the factual scenario are independent of the aid (in other terms, that the aid beneficiary does not adjust its efficiency level when delivering the USO to increase the amount of aid). Such an adjusted compensation could not overcompensate the beneficiary and would therefore remain proportionate and minimize distortions of competition.

In both cases, the Court rejected the applicants' claims, taking into account the specific situation at hand. However, the Court also made some general statements, which seem to recognize that an optimal scenario is unreasonable to request and that Member States keep some discretion in the design of the counterfactual scenario:

> [I]t follows from paragraphs 21 to 23 of the SGEI Framework, that the Member States […] have a certain margin of discretion in choosing the data relevant to calculating the NAC and that, where such a calculation is based on provisional data, the Commission is to review its

plausibility and ensure that it does not exceed what is necessary to cover the net cost of performing the public service, taking into account a reasonable profit.[21]

The Court seems also to accept the argument that a suboptimal scenario should lead to under-compensation:

> Next, as the Commission points out, the inclusion of profitable activities in the counterfactual scenario would have had the effect of increasing Post Danmark's profits in such a scenario and thus of increasing the difference, necessary for calculating the NAC, between the revenue derived from the USO and that which Post Danmark would have generated in the absence of the USO. Therefore, if the counterfactual scenario had included the continuation of other profitable activities, the possibility that the NAC calculation would have resulted in over-compensation would have been reduced, as would, consequently, the risk of the compensation at issue being incompatible with the internal market.[22]

The pragmatic approach of the Court on this issue is certainly important for the very feasibility of the NAC approach since, as explained above, requiring a truly optimal scenario may constitute a very significant hurdle for the implementation of the NAC methodology in a reasonable amount of time.

4.2   Reliability of the USP's Accounting System

In the two cases, the applicants considered that the Commission committed a manifest error of assessment by finding that respectively Czech Post's and Post Danmark's accounting and cost allocation systems allowed for an allocation of costs and revenues between activities with a sufficient level of adequacy to ensure a correct separation of accounts.

The quality of the cost accounting of a postal operator is important in the Commission's assessment of the compatibility of USO compensations for the following reasons. First, a correct separation of accounts between USO and non-USO services is required by the 2012 SGEI Framework for undertakings also carrying out activities outside the scope of the USO.[23] Then, a correct separation of accounts is necessary for compliance with the Transparency Directive,[24] which is also required by the 2012 SGEI Framework. Finally, the NAC calculation usually uses the accounting data to a significant extent. Indeed, the counterfactual scenario generally entails a reduction of the scope of the service provision of the USO provider absent the USO,[25] and to estimate the costs saved by the USP absent the USO, it is

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[21] Case T-561/18, p. 114.

[22] Case T-561/18, p. 123.

[23] §§44–46 2012 SGEI Framework.

[24] §18 2012 SGEI Framework.

[25] Notifications of USO compensations have so far concerned incumbents that have always delivered the USO and not postal operators that would start delivering it.

customary to rely upon the accounting data. Should the accounting data be flawed, then the NAC calculations would also be unreliable.

At the same time, it would be difficult in practice for the Commission to review in all details the cost accounting system of each postal operator within the period of a State aid assessment, and such review may also conflict with the competences of the national regulator. Such a detailed assessment is not present in the Commission decisions regarding Czech Post and Post Danmark. The Commission relied to some extent on regulatory controls at the national level to ensure a sufficient quality of the cost accounting of the two operators.

In light of this, it is particularly interesting to note that the Court rejected the claims in both cases. In the Czech Post case, the Court notably pointed out that "*from an accounting point of view, the Commission cannot be criticised for not having carried out a more detailed examination of the measure at issue and for relying on the accounts submitted, since those accounts showed separately the costs and revenue relating to the activities connected with the USO and those relating to other activities, in accordance with an allocation key approved by the national regulatory authority and subject to annual review by an independent auditor.*"[26] It then confirmed in the Post Danmark case "*that the appropriateness of the accounting allocation of common costs is supported by the fact noted by the Commission in paragraph 197 of the contested decision, that Post Danmark's accounts had been subject to regular audits by a State-authorised public accountant and the national regulatory authority*".[27]

The Court seems to accept that the Commission can rely on the regulatory review at national level when verifying the quality of the cost accounting of the postal operator and does not need *a priori* to engage in a detailed assessment, which would raise a number of practical difficulties.

4.3 Identification of the Relevant Intangible Benefits

In both cases, the applicants disagreed with the treatment of intangible benefits by the Commission. In the Czech Post case, the applicant criticized the Commission for only considering certain intangible benefits (enhancement of brand value, exclusive sale of postage stamps and philately items, enhanced advertising effect and benefit from VAT exemption) and for ignoring others (existence of a dense network and ubiquity of the USO provider). In the Post Danmark case, the applicants also criticized the Commission for only considering certain intangible benefits (enhanced advertising effect from intellectual property and benefit from VAT exemption) and for ignoring others (enhancement of Post Danmark's reputation and Post Danmark's

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[26] Case T-316/18, p. 198.

[27] Case T-561/18, p. 294.

ubiquity). It is interesting that the Commission came to different conclusions as regards intangibles in the two cases.

The claims of the applicants raise the difficult question of the treatment of intangibles in the NAC calculation. That issue is delicate because on the one hand there is a clear requirement in the 2012 SGEI Framework[28] and in the Postal Services Directive[29] to take into account intangibles in the calculation of the NAC, but none of these two texts actually identifies the intangibles to take into account and even less gives hints on how to calculate the value of these intangibles.

A definition can be found in a net cost study prepared for the Commission (Frontier Economics, 2013): "*a benefit is classified as 'intangible' when a universal service provider's performance and cost accounting, and its calculation of the net cost of the universal service obligation does not (fully) reflect the impact on revenues and cost that result from the existence of this benefit. The definition is relevant insofar as the identification of such benefits becomes necessary only if they are not already included it the universal service provider's net cost calculation.*" However, such a definition, which is by no means legally binding, is also sufficiently generic to leave open the choice if an intangible benefit may or may not have to be considered depending on the specificities of the case and of the NAC calculation.

Against this background, in several State aid decisions, the Commission has referred to a list of typical intangible benefits, which include economies of scale and scope, advertising effects from intellectual property, demand effects due to the VAT exemption, universal coverage advantages, bargaining power and better customer acquisition. This list is consistent with the typical intangibles identified in the net cost study above.[30]

The NAC calculations approved by the Commission then typically include some of these intangibles but never all of them. This can be seen as a consequence of the fact that the definition of intangibles is not an absolute one but needs to be tailored to the NAC calculations and to the specific situation of the postal operator. Moreover, the absence of a legally prescribed approach to identify and estimate intangible benefits unavoidably translates into some degree of discretion for Member States and postal operators in their NAC calculations.

This case-by-case approach of the Commission, and the existence of a certain margin of appreciation for Member States, seem to be confirmed by the judgments. In the Czech case, the Court acknowledged that there was no ubiquity benefit to Czech Post, because its competitors also had an extensive network covering the whole country without having the USO.[31] With regard to the Denmark case, it found no ubiquity benefit to Post Danmark. Purchasers of postal services such as distributors of catalogues, magazines and newspapers were fully prepared to select

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[28] §25 2012 SGEI Framework.

[29] Part B of Annex I to Directive 2008/6/EC of 20 February 2008 amending Directive 97/67/EC with regard to the full accomplishment of the internal market of Community postal services, OJ L 52, 27.2.2008, p.3.

[30] *Ibidem*, p. 110.

[31] Case T-316/18, p. 312.

distributors not offering universal territorial coverage.[32] In addition, Post Danmark would keep an extensive network even in absence of the USO[33] (albeit for rather different reasons than for Czech Post).

Even if the Commission had accepted a positive impact of the USO on the brand value of Czech Post and such positive effect could possibly exist for other postal operators such as French La Poste,[34] the Commission could also rightly conclude that Post Danmark's reputation was not enhanced by the USO, taking into account the strong negative impact of e-substitution on the provision of letter mail services in Denmark and the resulting financial difficulties for Post Danmark.[35] The pragmatic position of the Court on the issue of intangibles, and in particular the acceptance of a case-by-case approach, seems very consistent with the relative imprecision of the legal framework on that issue.

4.4 Allocation of Proceeds from the Compensation to Items Other Than the USO

In the Czech case, the applicant submitted that the Commission did not examine the statement by the Czech Prime Minister that '*the compensation in favour of Czech Post for 2013 and 2014 has as [its] real objective not the compensation of losses, but rather to enable wage increases in the future*'.[36] In the Post Danmark case, the applicants claimed that the Commission erred in law in finding that the USO compensation was compatible with the internal market, on the basis of the SGEI Framework, while expressly authorizing that such compensation be used not for the discharge of the USO but to pay the costs arising from the dismissal of former civil servants.

These claims touch at an essential point. §15 of the previous SGEI Framework (2005) clearly stipulated: "In any event, compensation must be actually used for the operation of the service of general economic interest concerned. Public service compensation granted for the operation of a service of general economic interest, but actually used to operate on other markets is not justified, and consequently constitutes incompatible State aid. The undertaking receiving public service compensation may, however, enjoy a reasonable profit". Such a position appeared consistent with the use of the accounting method for the calculation of the net cost of the USO.

Indeed, under the accounting method, it was understood that the aid granted aimed at funding the USO, i.e., at covering the expenses of the USO (labor costs, costs of assets needed for the delivery of the USO, overheads, …) to the extent that

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[32] Case T-561/18, p. 155.

[33] *Ibidem*, p. 157.

[34] *Ibidem*, p. 146.

[35] *Ibidem*, p. 142.

[36] Case T-316/18, p. 181.

these costs were not sufficiently covered by revenues. The aid was therefore necessary for the delivery of the service apart perhaps for the reasonable profit, if one were granted, which came on top of such funding needs of the USO and could then be used for any purpose. Under that approach, it would then be normally not possible that the USP could earmark or use the USO compensation, apart possibly from that to cover a reasonable profit, for another purpose than the USO, as the USP had normally to cover a funding gap for the delivery of the USO greater or equal to the compensation received.

Against this background, it must be noted that the NAC methodology, contrary to the net accounting one, is not related to the actual net costs of the USO in accounting terms, but to the foregone profit of the USP due to the constraints imposed by the delivery of the USO. The change of methodology also entails a change in the very nature of the compensation. While the compensation under the accounting method aimed at covering a funding need of a given set of services, the compensation under the NAC methodology aims at compensating the USP for a profit lost, at company level, due to the existence of the USO constraints.

Since the USO compensation under the NAC methodology does not aim at funding the USO but simply at compensating the USP, no particular constraint can be attached to the use of the funds granted to the USP, as long as they remain lower or equal to the NAC. In fact, even a profitable operator in accounting terms, which would therefore not have funding needs for the delivery of the USO, could still receive USO compensations under the NAC methodology. This certainly explains why there is no corresponding provision for §5 2005 SGEI Framework in the 2012 SGEI Framework.

The Court rejected the claims of the applicants in both cases and clearly accepted that USO compensations can be used for any purpose. In the Czech case, the Court notably indicated that: "*As regards the second statement at issue, which refers to the allocation of the compensation to wage increases, it must be stated that there is nothing in the 2012 SGEI Framework to prevent the proceeds of the compensation from being allocated to items other than the USO, since that is a management decision of the operator*".[37]

It further confirmed this in the Danish case: "*Accordingly, an assessment by the Commission as to whether public service compensation is compatible with the internal market consists in verifying, irrespective of whether the corresponding amount is actually allocated to it, whether such a public service exists and imposes a net cost on the undertaking responsible for providing it. That conclusion is supported by the fact that public service compensation may take into account a reasonable profit and, therefore, exceed the strict amount of the net costs of the public service. That applies all the more in the case of postal services since the first paragraph of Part C of Annex I to Directive 97/67 provides that 'recovery or financing of any net costs of universal service obligations may require designated universal service providers to be compensated for the services that they provide under*

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[37] Case T-316/18, p. 187.

non-commercial conditions'. The expression <u>'recovery or financing'</u> used in that provision excludes any requirement that the transfer of funds corresponding to compensation for the universal service actually be used for the performance of such a service. Consequently, the fact that the sum granted by way of the compensation at issue may be used for a purpose other than the USO does not in itself demonstrate that the Commission encountered serious difficulties in assessing the compatibility of such a measure" (emphasis added).[38]

The reference to the terms "*recovery or financing*" in the Postal Services Directive, which introduced the NAC used in the 2012 SGEI Framework and which is stressed by the Court, touches upon the nature of the compensation under the NAC methodology, which differs from USO compensations granted under the accounting methodology.

5 Conclusions

The two judgments bring significant legal certainty for the State aid assessment of USO financing in the future. As illustrated in the paragraphs above, a number of specific issues of compliance with the 2012 SGEI Framework that were untested this far – in particular on the implementation of the NAC methodology – have been reviewed by the GC for the first time. In this respect, even if the position of the Court is not final pending an appeal,[39] the judgements are a welcome development for all the relevant stakeholders (Commission, granting Member States, beneficiaries and third parties alike).

It cannot be ignored that the judgments were delivered in a context of growing tensions between USPs and competitors, against the background of trends that are contributing to the rapidly changing postal and delivery industry. Indeed, the strong impact of e-substitution and changing user needs has led postal incumbents, which were traditionally and primarily active in the letter mail business, to restructure and diversify their activities, even if they remain entrusted with the USO. Such diversification, notably in the parcel and logistic sectors, is triggering increased attention, and complaints, from players active in these fields, coming to face a financially strengthened State aid recipient. In this context, the confirmation by the Court that the USO compensation "*may be used for a purpose other than the USO*"[40] could shed a helpful light for USPs engaged in this process of restructuring and diversification.

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[38] Case T-561/18, p. 170–173.

[39] The T-561/18 judgment has been appealed before the Court of Justice (case C-442/21P).

[40] *Ibidem*, p. 173.

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Chapter 6
Universal Service Vs. Targeted Measures towards Vulnerable People: How to Address Postal Users' Needs?

Claire Borsenberger and Marine Lefort

1 Introduction

In March 2021, the European Commission published a study by WIK Consult (WIK Consult, 2021) aiming to identify the current needs of business and private postal users. WIK Consult noticed that when discussing the future use of postal services, regulators and consumer associations are sometimes concerned about "vulnerable postal users" within the EU. Until now, except for free services for blind and partially sighted people, the regulation of the postal sector has been driven by the principles of universality, non-discrimination, and equity. In other sectors, targeted measures have been implemented in order to protect some group of users considered as "vulnerable". This chapter deals with the pros and the cons of a "mean-tested" or targeted program, sometimes viewed as a way to mitigate the challenges faced by universal service providers and to limit the financial burden of USO.

Until now, except for free services for blind and partially sighted people, the regulation of the postal sector has been driven by the principles of universality, non-discrimination, and equity. All users have access to single-piece postal services with

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the same conditions wherever they live and whomever they are (private households, professionals, SMEs and so on). Through uniform tariffs, the universal service obligation (USO) is a kind of redistribution policy instrument between the poorest and the richest, between more and less costly to deliver areas, contributing to social and territorial cohesion (Cremer et al., 2008).

In other sectors, a different choice may have been made to benefit some group of users, considered as "vulnerable", through targeted measures aimed at protecting them. While the core businesses of the postal USO (universal access to letter mail sending services through the physical postal network and the receipt of letter mail at home every day) is challenged by the growth of electronic communications (email, SMS, social networks and so on), refocusing obligations to so-called "vulnerable" users (that is to say implementing a "mean-tested" or targeted program) is sometimes viewed as a way to mitigate the challenges faced by universal service providers and to limit the financial burden of USO.

This chapter deals with the pros and the cons of such a change in the way to better understand the societal role of postal operators. In Sect. 2, the notion of "vulnerable users" is defined based on a survey of the literature, and the measures taken to protect them in some utilities are presented. In Sect. 3, drawbacks of targeting postal regulation on this kind of users are described. Section 4 concludes.

2 Vulnerability and Vulnerable Users: Some Definitions and Quantification

2.1 A Concept Hard to Define

The term "vulnerable" is used in many fields, from psychology to retail, and can have different meanings. According to Cambridge or Collins online dictionaries, vulnerability is defined as "*the quality of being vulnerable*" and vulnerable as "*the fact of being weak and without protection, with the result to be easily hurt physically, emotionally, or mentally, to be influenced or attacked*".

Berhuet et al. (2019) found from a literature review of 16 articles in social sciences published between 2004 and 2016 that the notions of "fragility" and "vulnerability" are often used as perfect synonyms even though they are etymologically different. Originally used to define the loss of physical abilities linked to old age and the idea that some individuals are unable to give informed consent or are prone to coercion and abuse, today these words are also used to deal with the potential impact of a natural disaster on population and territories (Bouquet, 2018) or the economic shocks on small firms or systems failure (cyber security vulnerabilities). They recently have largely been used in connection with supply chain difficulties in providing some goods during the COVID-19 crisis.

Here we focus on the notion of the "vulnerable consumer". But even on this restricted scope of analysis, there exists no single, commonly accepted definition

(European Union, 2016) and the identification of so-called "vulnerable consumers" is perhaps even more complex. For instance, the British Competition and Markets Authority (CMA, 2019) defines consumer vulnerability in a broad sense, to refer to any situation in which an individual may be unable to engage effectively in a market. They further distinguish "market-specific vulnerability" and "vulnerability associated with personal characteristics".

Personal characteristics often associated with vulnerability are low income, disability, chronical illness, to be unemployed, old, and living in rural areas. Some characteristics are permanent (notably disability), others could reflect a transitory situation (like unemployment). Consequently, vulnerability must be considered as a dynamic concept that evolves over time and circumstances (Berhuet et al., 2019; European Commission, 2016; CMA, 2019).

"Market-specific vulnerability" is also a shape-shifting concept. As underlined by the European Commission (2016) "*consumers may move in and out of states of vulnerability and they may be vulnerable in respect of some categories of transaction but not others*" (p. xvii). It depends notably on the asymmetries of information between consumers and service providers. Ennuyer (2017) insists on the fact that "*vulnerability always occurs in a dynamic and in the interaction between the person and their environment in the broadest sense*" (p. 370).

Moreover, except for vulnerabilities related to permanent characteristics such as physical or cognitive impairments, vulnerability is related to the notions of risks and probability: vulnerability refers to an *ex ante* assessment of the likelihood of a potential negative outcome. It is an assessment of risk, rather than a reflection of a negative outcome that has occurred or will occur with certainty. If a person has a given gene, she is more likely than other people to develop a given disease; if a person has limited cognitive capabilities, she is more likely to be abused by ill-intended persons. Nevertheless, this bad experience may never arise: a person at risk of developing a given disease could stay in good health and never get sick and a person easily influenced could never meet malicious people. In these cases, it is not possible to be sure that a person will really suffer from her potential vulnerability. The uncertainties linked to the vulnerability state make the population who should be *ex ante* targeted as "vulnerable", potentially very large, in order to avoid the risk to exclude really negatively affected people (known *ex post* – after the negative outcome has occurred) from the benefits of the policy implemented in order to prevent the negative outcome occurrence.

2.2   The Most Common Types of Vulnerability

Berhuet et al. (2019) listed nine types of "fragility" or "vulnerability" often used to target public policies in France like monetary poverty; disease; disability; unemployment or job insecurity; poor housing etc. Globally, the authors estimated that two-thirds of the French population face at least one form of fragility. They showed

that interactions exist between these different forms of fragility, with cumulative effects. For example, half of French people with poor health (compared to people of the same age) also have a disability or chronic disease (54% against 27% in the general population). Poverty is often associated with employment or health problems, poor housing often combined with health, poverty or employment problems, etc.

Frontier Economics (2020) drew up a regional map of vulnerability in the UK by considering as vulnerable, individuals who (i) suffer from communication impairment (blind, partially sighted, deaf or mute people); (ii) require special medication, medical facilities or assistance, or who have chronic illnesses; (iii) suffer from mental health illnesses, developmental conditions or neurological disorders; (iv) suffer from movement restrictions; (v) have dependent children, aged 0–4; (vi) lack proficiency in English; and (vii) are over 65. The authors admitted that because of the interactions above, it was not possible to fully eliminate double counting, leading to an overestimation of the number of vulnerable individuals. They showed that despite a decrease over the period 2011–2018, about one in four British people fall into one of these vulnerability categories. They observed significant variations between regions: almost 30% of individuals in the South West of England are classed as vulnerable; in London and Scotland the median share is only 21.5%. The pensionable age group (more than 65 years old people) accounts for more than 70% of the total number of vulnerable people.

At the "silver society" ages, one may wonder if being 65 or more years old is really a handicap. According to Thomas (2019), the elderly living in developed countries are becoming less fragile and vulnerable over time.[1] Health progress, better daily living conditions, a high level of education acquired in childhood and often improved by professional practices, delay onset of disease.

That being said, we used similar criteria to approximate the number of potential vulnerable persons in France and in the EU: (i) individuals aged above 65; (ii) individuals receiving social benefits[2] (excluding social benefit for elderly people – in order to avoid double counting as far as possible) or at risk of poverty or social

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[1] At the EU level, on average, healthy life expectancy at birth (an indicator of disability-free life expectancy) has increased from 62.2 years in 2010 to 65.1 years in 2019 for women and from 61.3 years in 2010 to 64.2 years in 2019 for men. For women, healthy life expectancy at 65 has increased from 8.5 years to 10.4 years over the same period and for men from 8.4 to 10.2 years (Eurostat, 2021).

[2] Social benefits taking into account here are: "Revenu de solidarité active, "Prime d'activité" and "Allocation de solidarité spécifique".

exclusion[3]; (iii) disabled and dependent persons or individuals with self-perceived long-standing limitations in usual activities due to health problem; (iv) individuals with chronic illness; (iv) illiterate people and (v) individuals excluded from the digital society. Table 6.1 summarizes statistics for France and the EU.

As previously stated, adding figures would have no meaning, since a same individual could cumulate all different vulnerabilities and this way to count vulnerabilities is bound to over-estimate the proportion of people who would be effectively adversely affected by the market conditions.

In the postal sector, at the request of the European Commission, WIK Consult (2021) discussed and analyzed which potential users' groups might have a greater need for postal services in the future and may experience stronger negative outcomes if prices increase or service quality decreases, taking into account their socio-economic conditions or their capacity to switch to digital alternatives. Based on a stakeholder online survey, WIK Consult concluded that people (i) living in remote and rural areas (97.498 million people in the EU-28); (ii) with low income

Table 6.1 number of potentially vulnerable people in France and the EU according to various criteria

	France		EU	
	Million	% of the population	Million	% of the population
People aged above 65	13.7	20.5	92	20.6
People receiving social benefits or at risk of poverty or social exclusion	12.54	18.6	125.2	28.0
Disabled, dependent people and people with chronic illness or with self-perceived long-standing limitations in usual activities due to health problem	15.7	23.4	120.5	26.8
Illiterate people	2.5	3.7	75.0	16.8
Digitally excluded people	11.1	16.5	138.6	31.0

Sources: For France: Insee, Drees, Assurance maladie, Caisse Nationale de Solidarité pour l'Autonomie, ANLCI. For EU: Eurostat and final report of the EU High level group experts on literacy 2012 for illiteracy

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[3] The poverty and risk of social exclusion indicator created by Eurostat is a combination of three sub-indicators:

– Risk of poverty measures the percentage of people living in a household whose disposable income in the previous year is below 60% of the national median income;
– Severe material deprivation measures the percentage of people reporting in the EU-SILC survey that they cannot financially afford four of the following nine items: (i) paying rent or utility bills, (ii) keeping the home adequately heated, (iii) meeting unexpected expenses, (iv) eating meat, fish or a protein equivalent every other day, (v) going on holiday away from home for one week a year, (vi) buying a car, (vii) buying a washing machine, (viii) buying a television, or (ix) paying for a telephone connection;
– Living in a very low work intensity household measures the percentage of people living in a household whose members aged 18–59 have worked less than 20% of their potential working time (corresponding to full-time work throughout the year) in the past year.

(118 million people); (iii) suffering from a lack of digital skills (12% of all individuals have never used the internet, i.e. 61.56 million people, plus 25% of individuals using the internet have low overall digital skills, i.e. 112.86 million people); or (iv) from mobility problem (74 million disabled and 105 million people over 65 years), may be more dependent to postal services.

2.3   Examples of Measures Aiming to Protect Vulnerable Users in Utilities

Despite all the difficulties to identify who is vulnerable, in some sectors providing essential goods, public authorities or regulators have made the choice to define such a category of users and taken specific measures to protect them. For example, in the UK, four regulators –Ofwat in the water sector, Ofgem in the energy sector, Ofcom in the communications sector and the Financial Conduct Authority in financial sector – have in their regulatory statutes the requirement to consider the needs of specific vulnerable groups, particularly those who are disabled, elderly, have low incomes or live in rural areas.

Various measures have been implemented in order to guarantee access to these utilities, at affordable price and to avoid indebtedness situation. For example, all British energy suppliers must record vulnerable consumers in a Priority Services Register. An individual who believe he is vulnerable can contact his energy supplier and, if he is recognized as such, could benefit from specific services as assistance with billing, priority support during interruptions, and maintaining connection. In France, low-income households[4] may benefit from "chèque énergie", annual State aid to pay energy bills or to finance energy works to renovate home.

In the telecoms sector, similar measures exist to protect vulnerable people. In particular, the affordability issue of telecoms services is strongly scrutinized by regulators. In a study on the affordability of telecoms services, Ofcom (2020b) showed that over last years, in the UK, like in many OECD countries, broadband and mobile customers are getting better services (internet speeds have risen significantly) for less money: on average, households' expenditure on telecoms has been going down. Moreover, some broadband providers, such as BT, KCOM and Virgin Media, offer lower tariffs to help customers on low incomes. In France too, the internet and telecommunication service providers have special offers dedicated to

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[4] To benefit from the "chèque énergie", the household must have a fiscal revenue less than €10,800 per consumption unit (1 individual corresponds to 1 consumption unit, 1 individual more corresponds to 0.5 consumption unit and over 2 persons, each additional individual corresponds to 0.3 consumption unit). The amount of the "chèque" varies between €48 and €277 according to the fiscal revenue.

low-income households; they can also benefit from social tariffs (a discount) on their fixed telephone subscription.[5]

Examples of targeted measures exist also in the health or banking sectors. In France, low-income people have access to the "couverture médicale universelle"; foreigners in irregular situation have access to a specific medical State aid and financially vulnerable customers (legally defined) could benefit from a specific "client fragile" offer provided by all banks.

The British and French examples cited above are not isolated cases. Almost all EU Member States have implemented policies aiming to protect vulnerable users/consumers through financial or non-financial support measures (European Commission, 2016).

3   Should We Replace the Universality Principle by Specific Measures Targeting Vulnerable Users in the Postal Sector?

The digitalization of our societies questions the balance between the social costs and benefits of keeping some universal service obligations (USO) defined 30 years ago in the postal sector. In particular, the obligations to collect and deliver at home letter mail at least 5 days a week, sometimes in D + 1, throughout the whole territory and to maintain a huge physical presence through a dense network of postal points of contact generate growing costs while the volume of mail is falling and the footprint in post offices is shrinking.

In this context, the idea to reduce the financial burden induced by USO by restricting its scope to a smaller group of beneficiaries has been implicitly invoked (Copenhagen Economics, 2019). This is not a desirable solution for several reasons detailed below.

3.1   Targeted Measures Generally Fail to Meet Their Targets

Many studies show that the targeted policies described above are often ineffective. A rather low proportion of the potential beneficiaries follows the administrative procedures necessary for them to benefit from the financial aid or reduced tariffs they are entitled to receive. For instance, in France in 2018, between 32% and 44% of people who could benefit from the "couverture médicale universelle", did not request it (DREES, 2020). The Cour des Comptes, in its report on the State budget

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[5] The persons eligible for social tariffs are: (i) the recipients of active solidarity income (RSA) and whose annual household resources do not exceed a threshold defined by the law, (ii) people who receive the specific solidarity allowance (ASS) or those who receive the allowance for disabled adults (AAH), (iii) war invalids. They could benefit from a tariff reduction of € 6.49 € per month for a subscription to a fixed telephone service offer.

in 2018, estimated than 25% of the potential beneficiaries of the "chèque énergie" did not request it (Cour des Comptes, 2019).

In the study on the affordability of telecoms services already mentioned, Ofcom (2020b) argued that relatively few customers have taken up the options offered by service providers to low-income people. In France, while 3.7 million people could benefit from the social tariff for their fixed telephone subscription, only 55,600 subscribers had requested it (i.e., 1.5% of beneficiaries) in December 2018 (Arcep, 2020).

In the housing sector, Simon (2000) estimated that in France, 5% of the total number of recipients did not request the financial aid they could have. In the UK, the Ministry of Labour found that between 16 and 22% of potential beneficiaries of housing allowances do not request it for the year 2009–2010 (Bozio & Parraud, 2021). Last but not least, studies in the USA, England, Canada and France showed that between 30% and 50% of eligible unemployed individuals did not claim their benefits (Blasco & Fontaine, 2010).

Several reasons explain the high rate of non-use of these various rights, including a lack of confidence in the institutions, a lack of knowledge of the mechanisms, and the complexity of the procedures. Moreover, beneficiaries of such schemes are sometimes victims of discriminatory practices (Défenseur des droits, 2014). Sometimes, beneficiaries exclude themselves: even if they have access to health care assistance systems, they do not use their rights and forgo treatment because of fear of being stigmatized or refused. In France, some beneficiaries of "couverture médicale universelle" say they feel shame and guilt, even if they have not experienced discrimination (Beltran & Revil, 2019). In a study conducted in Geneva on social benefits (Lucas & Ludwig, 2019), some respondents expressed their fear to be stigmatized, especially men who are afraid of no longer being able to play the role they see themselves as playing - the main provider of the family income.

All these examples show that systems that target people who could be considered as vulnerable could leave out some of the targeted people, generate negative effects (stigmatization) and even benefit to non-targeted people (see for instance, Cremer et al., 2021 on the issue of long-term care issue). These failures are well-known in the literature on means-tested programs and on the famous "redistribution paradox"[6] (Korpi & Palme, 1998). This is why in France, besides specific measures targeting "clients fragiles" in the banking sector, the State has supported La Banque Postale's SGEI ("mission d'accessibilité bancaire") offering free basic banking services based on the "Livret A" of La Banque Postale. This product is a universal quasi-bank account. It is perceived as non-stigmatizing and is effectively used by

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[6] The paradox of redistribution theory supports universalism versus targeted programs. According to Walter Korpi and Joakim Palme, *"the more we target benefits at the poor (…), the less likely we are to reduce poverty and inequality"*. In other words, welfare states that relied more on universal than on targeted programs, are more redistributive. An explanation of this apparent paradox lies in the political support of such programs: even though targeted programs may be more redistributive per unit of expenditure, universalism aligns the preferences of low and middle classes, reduces administrative burdens and increases take-up rates, leading to bigger, more egalitarian welfare states.

vulnerable people for basic banking operations. (Non-vulnerable people use it as a saving account.) This policy is a sort of "targeting within universalism" policy: after securing universal coverage through the Livret A of La Banque Postale and the "mission d'accessibilité bancaire", another measures target the "clients fragiles".

3.2   Affordability Is Not a Real Issue in the Postal Sector and the Implementation of "Social Tariffs" Would Not Be Justified

If in theory, affordability (defined by Kessides et al. (2009) as the ability to purchase a necessary quantity of a product[7] or level of a service without suffering undue financial hardship) is a crucial issue for ensuring access to essential services to low-income people, it is not critical in the postal sector (Borsenberger et al., 2012; Borsenberger, 2018). Affordability is much more crucial in sectors like health, housing, water, energy or telecoms, justifying specific measures targeting low income people, for two main reasons.

First of all, access to food, water, energy, medical care and housing clearly responds to vital needs; postal services not, for the majority of the population. Secondly, the share of households' consumption budget[8] devoted to postal services (purchase of stamps, pre-paid envelops, parcels, and so on) through European countries in rather low. The average amount spent on postal services in EU-27 was €13 in 2015, corresponding to 0.05% of average annual households' consumption expenditure according to the Eurostat Household Budget Surveys.[9] Even if no affordable limit has been defined regarding expenditure made on postal services, contrary to practices existing in housing, energy or health sector, one could consider such budget share "reasonable", compared to other utilities.[10] Moreover, on average, the

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[7] The World Bank's International Benchmark on Water Utilities (IBNET), for example, requires utilities to estimate the cost of consuming 6 m³ of (piped) water. This quantity of water is assumed to be the lifeline amount for an average household. Any consumption above that minimum level is assumed to be excess to their minimum needs and is therefore a discretionary decision for the household to make, based on their needs and their willingness to pay for additional water (United Nations Children's Fund and the World Health Organization, 2021).

[8] This is a traditional proxy indicator for affordability that seeks to determine what percentage of income would it be reasonable to expect a (poor) household to pay.

[9] 2015 is the last year available for the HBS.

[10] In the housing sector, typically, a part of the gross annual income devoted to mortgage payment (principal and interest) higher than 30% or 35% is considered as unaffordable. In the energy sector, the UK government considers that households are in fuel poverty if they are left with a residual income below the official poverty line when they spend the required amount to heat their home. For water supply, the affordability thresholds (defined as a proportion of annual income) defined by the United Nations Development Program, the World Bank, the OECD, the European Commission or the African Development Bank, vary between 3% and 5% (United Nations Children's Fund (UNICEF) and the World Health Organization, 2021).

budget devoted to postal services both in absolute and in relative terms (percentage of expenditure) has decreased between 2005 and 2015. This trend has likely continued since then, following the fall in mail volume sent by households, despite postal price increases observed in most of European countries.

3.3   Accessibility to Postal Services in Rural Areas Is Presumably Less Critical than Access to More Vital Services

In the public consultation on the Postal Service Directive led by the European Commission in 2020, some stakeholders underlined the importance of access to postal services for some citizens living in remote areas.[11] However, in our view, access to postal services for people living in rural or remote areas is probably not one of their most crucial worries. Access to "vital"[12] or more "essential" needs should deserve more attention and require more "global" measures related to urban planning and purchasing power (for instance, in order to support rural inhabitants' stronger dependency to cars[13] as illustrated by the French "yellow vests protest" in 2018).[14]

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[11] For the CESI "in many EU countries, and especially in rural areas and in demographic spheres away from digital infrastructure, the postal services are often still the determining means of communication and are therefore indispensable for the social cohesion of the society". For E-commerce Europe, "Postal carriers keep [rural communities] connected to the global economy, allowing these communities to participate and thrive from a distance".

[12] Regarding access to health services, a French study conducted in 2021 by the main association of majors found that 96% of urban inhabitants have access to emergency services in less than 30 minutes, compared to only 79% of rural inhabitants (https://www.francebleu.fr/infos/sante-sciences/96-des-urbains-ont-acces-aux-urgences-en-moins-de-30-minutes-contre-seulement-79-des-ruraux-1615385402).

[13] In France in 2019, 79.5% of trips was made by car in rural areas against 58.8% in cities between 100,000 and 2 million inhabitants (Jacquin, 2021). For the densest cities, the median time to access to everyday life services (access to shops, schools, health services, and so on) is less than 3.5 minutes but in the less dense cities, the median time is around 10 minutes (Insee, 2016).

[14] The movement was initially motivated by rising crude oil and fuel prices, a high cost of living, and economic inequality; it claims that a disproportionate burden of taxation in France was falling on the working and middle classes especially in rural and peri-urban areas.

3.4   Restricting the Scope of the Universal Service to Vulnerable Users Will Not Significantly Reduce Its Cost

Letter mail and parcel delivery are activities with significant fixed costs, such that economies of scale lead to reductions in unit costs as volumes increase. By restricting the scope of the universal postal service to only customers considered to be vulnerable, these economies of scale effects would be weakened, leading to a higher unit cost of the universal service per user and per service.

Even if the obligation to provide a given service were restricted to vulnerable customers, the universal service provider is likely to be constrained to keep a national infrastructure since potential vulnerable users are distributed over the whole territory – in rural areas but also in urban ones since urban inhabitants could also be touched by other kinds of vulnerabilities like poverty. In addition, such targeted measures would incur additional costs, in particular to ensure financial support is correctly allocated to vulnerable users. These costs would be incurred by the necessary identification of vulnerable users and control to exclude non-targeted people to the benefit of the program.

3.5   Relaxing Some Obligations While Preserving the Universal Dimension of Postal SIEG Would Be Probably More Efficient

Some features of the USO defined 30 years ago should be relaxed either because they do not respond to current societal needs or because they appear to be more of a convenient feature than an essential need. For instance, even if "home delivery" remains the mostly preferred delivery option for letters for many postal users who generally disagree with any proposals to reduce accessibility, like using "community letter boxes"[15] (BIPT, 2017; ANACOM, 2017; WIK Consult, 2021), in some countries, consumers consider as acceptable alternative delivery locations for parcels additional to home delivery. For instance, in the Baltic countries and Poland, lockers play an important role as delivery location for e-commerce parcels, while in the Nordic countries (notably Sweden) the standard delivery location for parcels is the nearest postal outlet (WIK Consult, 2019). It seems that choices regarding delivery location of postal items strongly depend, among other factors, on the availability of various options.

More alternatives to home delivery of letter mail exist. In particular, several postal operators propose digitalized mail solutions: the U.S. Postal Service launched a program called "Informed Delivery" in 2017 that allows customers to digitally

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[15] Community letter boxes are centrally situated letter boxes (e.g., in the center of a village) where individuals and businesses have to collect their postal items.

preview their mail; in 2019, Deutsche Post launched a pilot allowing customers to opt to have their mail "e-scanned" (meaning their mail will be opened and scanned before it is sent to them online).

In this context, one may wonder if home delivery of letter mail meets really a societal need or simply a facility offered for convenience to users for who the value is not reflected in prices. One may also wonder if access to postal services in front of the door is more "essential" than home delivery of food or medicines that are vital goods but not considered as SGEI.

Whether frequency of mail delivery is essential is also questionable. Do we really need 5 or 6 days a week delivery for paper letter mail while the volume of instantaneous email and messages delivered through social network and SMS continue to grow? According to a recent Ofcom (2020a) study, in the UK, reducing the letters service from 6 to 5 days a week would still meet the needs of 97% of residential and SME users (instead of 98% of residential users and 97% of SMEs) and replacing First Class with a single class service offering a two-day delivery speed would not have a large impact on users' acceptability of the service.

It is undeniable that in each country, part of the population remains disconnected from the internet or is excluded from the digital society (due to a lack of infrastructure or skills). As explained by Borsenberger et al. (2020), digital exclusion is a curse. However, the societal benefits of the inclusion of those individuals to the digital society would be much higher than trying to compensate shortcomings of digital developments by putting obligations on postal operators. Maintaining postal USO is not the right solution to bridge the digital divide in terms of a long-term perspective. It would be more relevant to put in place comprehensive strategies addressing overall broadband coverage, digital skills, and universal access.

4   Conclusion

Facing the decrease in mail volume and postal outlets' footprint, questions around the postal users' needs are arising. The idea to replace universal service obligations by targeted measures towards "vulnerable users" which would remain more dependent on postal services and may be more affected by changes in universal service obligations, has been invoked in the political debate.

We argue that putting specific targeted measures to address postal needs of low income, elderly or people living in rural areas, could be counterproductive. Due to the protean nature of vulnerability as a concept, difficulties in identifying *ex ante* vulnerable users and the high rate of non-take up of targeted programs in other sectors, such a policy for posts could fail to protect vulnerable users. Furthermore, it would not necessarily reduce the financial burden incurred by postal operators in charge of due to the features of the postal delivery activity cost function.

Counteracting vulnerability requires tackling the root of vulnerability when it is possible; not implementing last resort measures. Meanwhile, a policy based on a universality principle seems to be a better solution to protect consumers who may

be at one time or another in their life "vulnerable". Nevertheless, this does not avoid the requirement to think about the kind of universal services our societies need both today and in a near future, to evaluate their costs and benefits in order to make informed trade-offs between economic efficiency, sustainability, and wider social challenges relating to economic resilience and inclusivity in the post Covid-19 new normal environment.

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Chapter 7
Retention Ratios in Retail Networks and Their Application to Post Offices

Matthias Hafner, Lory Iunius, and Urs Trinkner

1 Introduction

Diversion ratios indicate the fraction of demand that is "diverted" to another company (see e.g., Conlon & Mortimer, 2018). By analogy, we define retention ratios as the fraction of demand of a particular store or product that is "retained" within a company (for the concept, see e.g., Haans & Gijsbrechts, 2010). In case of a post office closure, retention ratios express how much of the sales in the closed post offices are retained in the remaining post offices. Both retention ratios and diversion ratios are, although defined differently, closely linked to elasticity of demand relative to changes in prices and/or quality.

Retention ratios are of importance for strategic business decisions and in calculating the net cost of universal service obligations. Diversion ratios are of particular relevance in antitrust cases, e.g., in case of mergers. For the application to post office closures, retention and diversion ratios can be measured empirically based on internal demand data or consumer surveys, including discrete choice experiments. So far, little is known about their magnitude in the postal industry. Buser et al. (2008) estimated the impact of post office closures on overall letter mail demand to

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be zero, indicating a retention ratio of 1, but did not present results for other services such as financial transactions.

Hence, despite its considerable importance, there is a clear lack of research on diversion and retention ratios in the postal sector. In our paper, we contribute to the literature in three ways. We provide a review of the relevant literature on diversion and retention ratios for post office and retail networks as well as in merger cases. We identify existing estimates such as from Haans and Gijsbrechts (2010) and relevant factors that drive the results. We then qualitatively limit possible ranges of retention ratios of post office closures. We validate our results by comparing empirical volume effects in Swiss Post's restructured retail network between 2013 and 2019.

The paper is structured as follows. Sect. 2 presents the literature review. In Sect. 3, we derive ranges of possible retention ratios. We validate our results with data from Swiss Post in Sect. 4. We conclude in Sect. 5.

2   Review of the Literature and Definition of the Retention Ratio

Our measures of retention ratios are inspired by the literature on diversion ratios. Diversion ratios have been widely used in measuring the degree of substitutability between products or firms. They play an important role in competition cases. A higher diversion ratio between two firms indicates that they are close competitors. Shapiro (1995) initiated this concept and proposed using diversion ratios to evaluate horizontal mergers with differentiated products. Antitrust authorities, however, are not the only group that estimate effects of changes in supply. Firms, for example, may use a similar concept to estimate the fraction of sales retained after price adjustments, product assortment adjustments or store closures (see e.g., Haans & Gijsbrechts, 2010). Whereas antitrust authorities mainly focus how sales from one company are diverted to another company, firms are thus also interested in how they are retained within the same entity, i.e., how much of its sales are captured by its other own products or how much is retained in the remaining own network.

Theoretically, diversion ratios can be derived from elasticities. Hausman et al. (2011), for example, show that diversion ratios that stem from price increases can be derived from own and cross-prices elasticities. The diversion ratio can be written as the ratio of cross- and own-price elasticities multiplied by the ratio of unit sales of two products.[1] In our experience, cross- and own-price elasticities are often difficult to estimate.

Alternatively, diversion ratios can be directly estimated using other methods. The first is an econometric approach, where the diversion ratio is derived from various

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[1]The diversion ratio from product 1 to product 2 is the cross-price elasticity of product 2 (with respect to the price of product 1) divided by the own price elasticity of product 1 multiplied by the ratio of unit sales of product 2 divided by the unit sales of product 1 (see also Conlon & Mortimer, 2018).

demand system estimations (e.g., Cheung, 2016). This approach can be used in cases where detailed price and quantity data can be collected, which is, for instance, valid for store scanner data. Examples of antitrust cases where this approach was adopted are the Volvo/Scania and Kimberley-Clark/Scott mergers. In the second experimental approach, the diversion ratio is derived from observed substitution patterns when some products are removed, either by natural or designed experiments (e.g., Conlon & Mortimer, 2013). In addition, diversion ratios can be calculated from answers of consumer surveys. Antitrust authorities often apply this method in merger cases (e.g., Valletti & Zenger, 2021). Finally, diversion ratios can also be inferred purely from historical market shares (e.g., Rossi et al., 2019) or estimated based on data collected during the course of business.

In antitrust, diversion ratios are often estimated for the case of price increases. For example, Edwards (2013) discussed the merger case KLM/Martinair. The two airlines offered direct flights from Amsterdam to several destinations in the Caribbean. The European Commission conducted a survey over 1000 passengers that asked whether they would switch to another destination in response to a 5–10% price increase and if yes, where. To show which other destinations the marginal passenger would switch to, diversion ratios were calculated for each route, and they ranged between 13% and 34%. Based on our review of the decision, we assume that 10% of passengers refrained from travelling in response to the price increase. Thus, the diversion ratio to its own amounted to approximately 56–77%.[2] A similar case was the Ryanair/Aer Lingus merger case. The European Commission used diversion ratio evidence (not publicly published), which, in addition to other relevant proofs, led the Commission to prevent the merger.

In the postal industry, Carslake et al. (2018) developed a merger simulation tool based on diversion ratios, prices/quantities and marginal costs. They assumed diversion ratios ranging from 15% to 85% between the postal incumbent and two rival operators. No further justification was given regarding this assumption.

By analogy to diversion ratios, retention ratios describe the fraction of demand of a particular store or product that is retained within the company. They are of particular interest when it comes to the post office network because a significant fraction of post offices has been closed around the globe in the past decades. The drop coincides with increasing competition through electronic substitutes and the opening of postal markets to competition.

Like diversion ratios, retention ratios can be derived from elasticities. The retention ratio with regard to own prices can be written as one minus the own-price elasticity multiplied by the change in price.[3] This means that for retention ratios, cross-price elasticities are not of importance as we do not ask how much of lost volumes are diverted to competitors. Technically, the sum of retention ratio and

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[2] Rough estimate based on survey in European Commission, Case M.5141: KLM/MARTINAIR.

[3] $Retention\ Ratio = 1 - \varepsilon * \dfrac{\Delta P}{P}$.

diversion ratios will in general be smaller than one, with the difference to one representing lost volumes that are not recovered by competitors.

Since we are primarily interested in post office closures, we will review retention ratios to post office network size. These are calculated based on the change in network size instead of the change in price. Related to post offices closures, only little research on retention ratios exists. Buser et al. (2008) analyzed the impact of post office closures on overall mail volumes in Switzerland based on quarterly data between 1980 and 2006. They find no significant effect of post office closures on overall mail volumes, implying a retention ratio of essentially 100% to other own post offices or other means within the postal operator to collect letters. As a consequence, they argue that the decline of overall mail volumes is driven by the rise of electronic substitutes ("e-substitution", see e.g., Trinkner & Grossmann, 2006). They did not investigate effects on other products such as parcels or financial services.

For the retail industry in more general, Haans and Gijsbrechts (2010) analyzed the effect of store closures on retail chain revenue based on a consumer survey. Store closures can be a part of downsizing strategies and often occur after acquisitions, strategy changes, or mergers. They apply nested multinomial logit models (see e.g., Berry, 1994) and tobit models on collected retail store data. Their empirical analysis revealed that only 58% of the respondents switch to a competing store or abandon their trip if their first-choice outlet is closed. This means that on average, the retention ratio to own retail stores amounted to approximately 42% in terms of customers (ranging between 15% and 63%) and 56% in terms of revenues (ranging between 18% and 71%). Therefore, recovered sales after a store closure may be significant.

Ellickson et al. (2020) investigated competition between retailers of different formats based on empirical data. Using a nested-logit model, they found that consumers are only willing to travel a short distance for groceries and that this willingness declines quickly with income. Similarly, Singh et al. (2010) analyzed the response to store openings of competitors. More precisely, they study the impact of Wal-Mart's entry on consumer purchase behavior. Results show that the incumbent supermarket lost 17% of its sales, following Wal-Mart's entry. Nevertheless, Ellickson et al. (2020) show that for selected store types, in particular club stores that require a membership, some consumers are willing to travel significantly farther. This is in line with other research (see e.g., Ailawadi et al., 2008) that show significant consumer loyalty toward chains.

To sum up, diversion and retention ratios can be obtained based on different approaches. They can be calculated empirically from an approximated demand system, estimated experientially, based on data collected during the course of business, or observed from consumer survey data. The choice of the best method relies on what kind of information is available. A summary of the reported diversion and retention ratios to own substitutes is provided in Table 7.1.

Table 7.1 Derived diversion and retention ratios in different industries

Authors	Industry type	Type of ratio	Value
Carslake et al. (2018)	Post	Diversion ratio	15–85% (assumed)
Rossi et al. (2019)	Hospital	Diversion ratio	Majority of cases <40%
Edwards (2013)	Airline	Diversion ratio	56–77%
Buser et al. (2008)	Post/letter mail	Retention ratio	100%
Haans & Gijsbrechts (2010)	Retail	Retention ratio	42% (15–71%)

3 Ranges for Retention Ratios for Financial Transactions in Post Offices

The literature discussed in Sect. 2 is not always fully applicable to post office closures. We therefore qualitatively limit possible ranges of retention ratios for post offices and agencies in the sense of retained volumes to other post offices or agencies after their closures. Retention ratios are determined by different parameters, which primarily depend on customers' alternatives after a post office closure. These alternatives differ for each product category and also depend on whether the post office is closed without replacement or converted into an agency (e.g., a third-party retail store provides some services of the post offices).

Table 7.2 shows, for the main product categories available in Swiss Post's post offices, the primary alternatives and summarizes our assessment for volume losses in case of post office closures and conversions. Note, that a large loss of volumes means that only few sales can be retained from the closed office to the rest of the network.

For *standard letters*, when other mail drops are available, i.e., post offices are not necessary from a sender's perspective. At the same time, there are no direct competitors in the C2C market segment, likely leading to a very high retention ratio both for post office closures and conversions, motivating the results of Buser et al. (2008). For *parcels and registered mail*, we expect a low impact for post office closures since consumers have alternative postal access points available such as parcel stations. In case of post office conversions, we expect a very low impact (if any), as agencies also accept parcels. *Third party products*, however, are not sold any longer after a post office closure. Since for those products many competitive alternatives are available, their volume drop will be significant. Financial services are divided into two categories. *Opening an account and investment advice* does not require a dense network, as the importance of the matter increases the willingness of customers to travel longer distances. Also, such services are requested only very rarely. This is also confirmed by large Swiss banks such as UBS and Credit Suisse, the latter with only about 100 remaining branches in Switzerland. For more frequent *cash transactions*, the effect is not straightforward.

In the following, we will therefore elaborate on cash transactions. As Haans and Gijsbrechts (2010) found, consumers can react to a post office closure in various ways: they can stop consuming the requested services at all, switch to another post

Table 7.2 Main product categories in Swiss post offices and their substitutes in case of a post office closure/conversion

Product category	Alternatives of Swiss Post to the local post office	Alternatives of competitors	Expected volume drop of post office closure	Expected volume drop of post office conversion to agency
Standard letters	Mail drops, myPost24, other post offices and agencies	(None for C2C)	Very low, if any	Very low, if any
Parcels, registered mail	myPost24, other post offices and agencies	Collection points of competitors	Low	Very low, if any
Third-party products (e.g. mobile phones)	Own online shop, other post offices	Other online shops, other retailers	High	High
Account opening and investment advice	Own bank branches, other post offices	Financial service providers	Rather low	Rather low
Cash transactions (deposit, cash payment, cash payout)	Other post offices, ATM, selected other agencies; also online and mobile banking	Bank branches, ATM, online banking, Google Pay etc.,	Moderate (reasoning see below)	Moderate (reasoning see below)

office, switch to competing services of a competitor (e.g., a bank branch) or switch to other (own) postal products (e.g. online banking). Which options customers choose depends on the distance between the closed office and the described options and how similar the service is in comparison to alternatives. Thus, main drivers of diversion ratios are (1) the distance to other post offices, (2) the number and similarity of competing products and (3) the distance to them as well as (4) the number and the similarity of other postal alternatives (and their distance). We will discuss these drivers and their impact on diversion rates briefly in the following. Where appropriate, we conduct a comparison to the situation in the retail market.

Distance to other post offices. The longer the distance between post offices, the larger the cost to travel to another post office in case of a closure and thus the lower the retention ratio. Moreover, distance also decreases the willingness of customers to spend on goods and services (Haans & Gijsbrechts, 2010), also resulting in a lower retention ratio. Thus, *ceteris paribus*, the less dense the post office network, the lower will be the retention ratio to other post offices. In countries where the density of the post office network is part of the universal service obligation (USO), the retention ratio is expected to be larger. In comparison to the retail market, it will be lower where post office networks are less dense.

Competing products. The likelihood that a consumer switches to a competitor increases as more similar and more competing alternatives exist. Thus, competition decreases the retention ratio. For cash transactions, direct competition stems from bank branches. However, their services are usually only offered to their own customers with an existing bank account. Thus, cash transactions at bank branches are

restricted and not substitutable for everyone (or only with high switching costs of opening or changing a bank account). The opposite holds for the retail sector, with intense competition between the outlets. On average, we therefore expect a higher retention ratio for post offices than for retail outlets.

Distance to competing offices. Not only distances to other post offices matter but also distances to offices of competing products. The longer the distance to the next possible access point of competing products, the higher the retention ratio. Thus, distance to other post offices must be considered in relation to the distance to bank branches. In many countries the density of bank branches is significantly lower than the one of post office networks, thus increasing the retention ratio. Note that this effect is expected to increase over time where banks plan to close even more branches in relative terms.

Other postal services. Alternative access points such as own ATMs, online and mobile banking solutions affect retention ratios in a similar way than competing products. However, revenues that are diverted to them are not lost from the perspective of the postal service provider. They may absorb some of the revenues that would have otherwise been lost to competitors and thus increase the retention ratio. In comparison to retailers, postal service providers can offer various alternatives that reduce volume losses (bidirectional ATMs, online and mobile solutions). We therefore expect a higher retention ration in comparison to the retail sector.

As discussed, several drivers affect retention ratios to own offices. In comparison to retail markets results vary for post offices: The drivers *competing products, distance to competing offices* and *other postal services* indicate that the retention ratio is rather high, the driver *distance to other post offices* that it is lower than in the retail sector in countries where post office networks are less dense. Compared to the retail market with a range for diversion ratios between 15% and 70% (Haans & Gijsbrechts, 2010, Table 7.1), we expect therefore a value for cash transactions toward the upper boundary in countries with a high density of post office networks.

The density of the postal network depending on whether there exist binding USOs. If the USO includes requirements for network density, the post office network is likely to be denser than most bank branch networks, resulting in higher retention ratios. In this case, we assume the retention ratio to be located in the upper half of the possible range. Note however, that the network density of the post office network is usually still lower than in the retail sector. Thus, we assume it to be between 45% and 65%. Without a USO, we expect a lower post office density and thus a significantly lower retention ratio. Without a USO however, it is expected that POs offer more efficient alternative access points. These might capture some of the lost revenues and put upward pressure on retention ratios. Overall, we expect a retention ratio for an unregulated post office network between 25% and 45% for cash payments. Figure 7.1 summarizes our expectations.
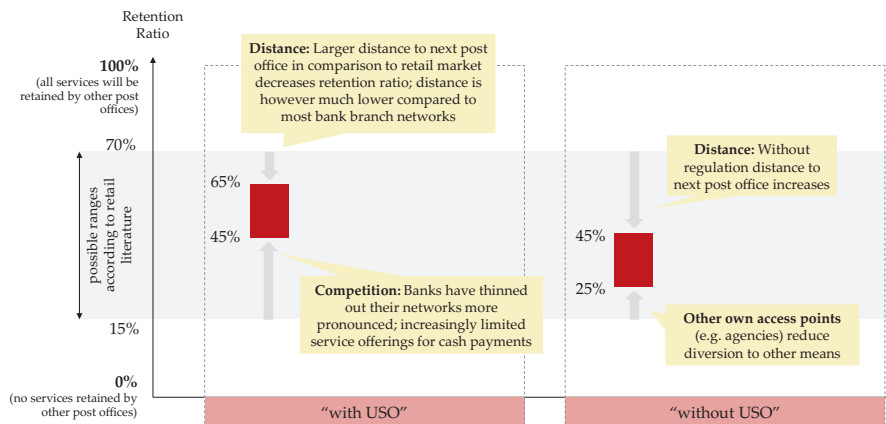
Fig. 7.1 Possible ranges for retention ratios of cash transactions

4 Validation with Swiss Data

The "with USO" case above is now validated with data of the Swiss post office network from 2013 and 2019. At the end of 2013, Swiss Post was running 1658 Post offices, processing about 185.6 million cash payment transactions (thereafter cash transactions). In the following 6 years, a total of 19 post offices were closed and 660 converted into agencies, leaving a network of 979 post offices at the end of 2019, still meeting the Swiss USO requirements and processing about 130.4 million transactions.[4] The crucial question is whether this decrease of about 30% was caused by post office closures or a general decline in cash transactions due to e-substitution.

To separate these two effects, we first derive a general trend for cash transactions for a comparable control group that was not affected by post office closures. A first proxy offers a product of Swiss Post called "payment order by mail"[5], where payment slips are sent by mail and processed by Swiss Post's financial section PostFinance. From 2013 to 2019, volumes were decreasing in average by 9%.[6] We consider this proxy as too pronounced because payment slips are likely to suffer stronger pressure from e-substitution, as cash transfers are not involved. In particular, online and mobile banking are closer substitutes to payment orders than to cash payments.

A second proxy is the volume development of cash transactions in the post office network in Liechtenstein run by Liechtensteinische Post with very similar (or identical) services provided as in Swiss Post's offices. Importantly, between 2013 and 2019 no significant changes occurred in the post office network with respect to cash transactions, as in Liechtenstein, postal partners offer very similar services

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[4] Based on data provided by Swiss Post.

[5] "Zahlungsauftrag per Brief", in short ZAG.

[6] Based on data provided by PostFinance AG.

compared to traditional post offices. Within the period, the decrease in volumes was constant at yearly 5%.[7]

The second proxy coincides with Swiss Post's business plan assumptions and appears reasonable, as postal services in Liechtenstein and Switzerland have been similar if not identical for historical reasons. We therefore assume that between 2013 and 2019, cash transactions would have decreased by 5% if Swiss Post had not touched its post office network.

As reported in Table 7.3, a general trend of −5% translates to a retention ratio of 85%: The 31.8 Mio. transactions in post offices that have been closed somewhere between 2013 and 2019 would, if not closed, have decreased to 23.3 Mio. in 2019, reflecting the "volume at risk". Of these transactions, again applying the general trend, 17.7 Mio. have been diverted to other post offices (difference between hypothetical and effective volumes in 2019) and 2.1. Mio. to agencies run by third parties (with a much more limited scope of cash payment products, if any). In total, about 20 Mio. transactions have been absorbed by the remaining network, amounting to a retention ratio of about 85%.

These results are sensitive to the general trend assumed. Our sensitivity analysis reveals that a trend of 4.5% would result in a retention ratio of about 65.7%. 4% amount to 48.7% and 3.5% to 32.3%. Based on the reasoning above it appears however not convincing that cash payment transaction volumes would have dropped by less than 4.5% per year. We conclude that from the range derived in Table 7.1, the upper bound of 65% appears more reasonable than the lower bound.

Table 7.3 Cash payment transactions between 2013 and 2019 imply a diversion ratio of 85% assuming a general trend of −5% per year

	979 remaining post offices	679 meanwhile closed post offices
Cash payment transactions in post offices 2013	153.8 Mio.	31.8 Mio.
Hypothetical payment transactions in post offices 2019 assuming general trend of −5%	112.7 Mio.	**23.3 Mio (volume at risk**)
Payment transactions in post offices 2019 measured	130.4 Mio.	0
Difference hypothetical / measured = Payment transactions diverted to other post offices	17.7 Mio.	
Payment transactions diverted to agencies that have replaced the 679 closed post offices (measured)		2.1 Mio.
Payment transactions absorbed in post offices and agencies ("diverted volumes")	**19.8 Mio.**	
Average retention ratio 2013–19	**84.9%**	

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[7] Based on data provided by Liechtensteinische Post.

5 Summary and Conclusions

In analogy to diversion ratios, we define retention ratios as the fraction of demand of a particular store or product that is retained within a company. In case of a post office closure, they express how much of the sales in the closed post offices are retained in the remaining post offices. Retention ratios are of particular interest when it comes to the post office network because a significant fraction of post offices have been closed around the globe in the past decades.

Our review of the literature reveals that retention ratios differ between industries as well as product groups. For post offices, retention ratios for letters and parcels are rather low, as post offices are not needed to deliver such services. In the Swiss context, cash transactions are however likely to be affected very significantly. Starting from surveys from retail markets, we have derived possible ranges of retention ratios for cash transactions and have concluded that the density of the existing network is a key factor. Compared to the retail market with a range for retention ratios between 15% and 70%, we expect retention ratios for cash transactions toward the upper boundary in countries with a high density of post office networks and vice versa. In countries that include post office density in their USO, we expect the diversion ratio to range between 45% and 65%.

A validation with Swiss data of post office (closures) from 2013 and 2019 confirms a rather high retention ratio of cash transactions. With an average yearly decline of 5% in cash transactions, the diversion ratio of closing a post office amounted to about 85%, i.e. 85% of cash transactions were recovered by other post offices. The results are rather sensitive to the assumed yearly decline of cash transactions, with lower declines amounting to lower retention ratios.

We have therefore concluded that the upper bound of 65% appears more reasonable than the lower bound of 45%, that is, we estimate the retention ratio of post office closures for cash transactions currently at about 65%, i.e. about two thirds of transactions are recovered in the remaining post offices. As revealed in the analysis, this value is driven by the current USO obligations in Switzerland and will decrease with lower network density.

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Chapter 8
Access Regimes in the European Postal Markets

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1 Introduction

In the next 2 years, an extensive debate at the European level on the regulatory framework of the postal sector is expected. The questions that will be discussed include whether the current postal directive has satisfied the expectations of political and economic stakeholders, and whether there a need for changes and, if so, of what type. One of the issues at the center of the examination will probably be the access regime to postal networks. This chapter addresses access regimes in the postal sector by presenting the "state of the art" in some major European countries.

In this paper we will not address the issue of parcels, because parcel markets are competitive and functioning in the EU largest markets (Parcu et al., 2022). Moreover, parcel delivery markets are growing and we expect this trend to will continue, as no obstacles to this growth seem to emerge linked to access issues or legacy market power. During the recent pandemic, no problems arose regarding access to the national postal operator's delivery network. In our view, for parcel delivery, there is

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no need for more competitive oversight other than that already provided under general competition law.

After this introduction, in Sect. 2 we explain what access means in a postal context and the different models of access (such as commercial access versus mandated access), providing a taxonomy of the terms used with the possible scenarios for regulation. Section 3 discusses how the postal directive adopted in 1997, as subsequently modified in 2003 and 2008, has regulated access. We also review the current debate ahead of a possible redefinition of a new European regulatory framework. In this context, the European Regulatory Group in Postal Services (ERGP) is playing an important role on the issue of access regulation, having in the past few years published several reports addressing the topic (ERGP, 2019, 2020). In Sect. 4 we explain how the postal directive has had an impact on national regulation in five large EU postal markets. To this purpose, we start from research by Cullen (2020) on access in the postal sector and update the set of information with material gathered directly from postal operators in France, Germany, Italy, Netherlands and Spain). In Sect. 5, we summarize the lessons learned taking into account the debate that is taking place inside the Association of European Postal Operators (PostEurop). Finally in Sect. 6 we will draw the conclusions and propose a way forward for future research.

2   Access in a Postal Context

The issue of access to legacy networks in many industries has been highly debated in the past three decades following the start of the process of liberalization in the 1980s. As in other regulated industries, access to the legacy postal network and its services is believed to improve competition and to ensure a level playing field (Cave, 2003). In the postal sector, the benefits of mandating regulated access follow from the prohibitive cost (from a financial, operational or legal, point of view) of replicating the network of the universal service provider. The USP may deny access to its network in order to preserve its advantage, with the result that ongoing competition shrinks and potential competitors may not provide end-to-end or bulk mail service.

Access to the postal network (clearance, transport, sorting and delivery facilities) may occur at different levels of the postal infrastructure, such as distribution centers, inward sorting centers, or outward sorting centers. Generally, other partial competitors, sometimes called consolidators, that don't have their own postal network and base their business model on the access to the USP's network, request access to the USP's sorting or delivery facilities. Note that the delivery network is

characterized by economies of scale and a large share of labor costs.[1] End-to-end (E2E) competition takes place when other postal operators replicate the complete postal network in all the different phases; this may happen at the local or national level. Often consolidators may collect and sort mail, however, they require access to the incumbent's network for delivering mail to the final recipient. Hybrid operators have their own network, but only on a local or regional zone; they need access to the incumbent's network for the delivery at national level or to a wider zone.

There is an extensive literature on access applied to the postal sector; many papers in the past two decades have been presented at the annual Postal and Delivery Conferences. An interesting approach to the issue of access was proposed by Professor Cave (from 1996 to 2002 a member of the UK Competition commission), addressing the issue of regulatory end games in network industries for the OECD (Cave, 2003). He developed a decision tree showing the issue of replicable assets in regulated industries and exploring what type of competition is expected from regulators.

Deduytsche et al. (2007) went a step further and applied scenario planning to Cave's decision tree. In their paper, they underlined the difference between Commercial Access (CA), defined as an access arrangement by negotiations, and Mandated Access (MA), defined as access granted and monitored by regulators under specified conditions, often (but not always) with a defined price or price formula. Furthermore, they addressed whether an incumbent should structurally separate the service to which it granted access. From this exercise they obtained three main most likely scenarios: E2E competition with CA, structural separation and MA, and MA without structural separation. Starting from these three configurations, we develop a taxonomy and a more detailed characterization of scenarios useful to understand the access regimes of the major EU postal markets. In Table 8.1 we have summarized our approach in analyzing the different markets.

Table 8.1 Access framework and definitions

General scenario		Detailed scenario
Regulated access	Structural separation with regulated access	1. Structural separation
	Regulated access with power granted to NRA	1. MA with a role of NRA on ex ante definition of access at different level (national, local) and with different degree (e.g., pricing formula, replicability test)
		2. CA (with dispute resolution powers to NRA)
No regulated access	Non-regulated access	1. CA (without dispute resolution power to NRA)
		2. No access granted

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[1] The Postal sector differs from other network industries that have sunk costs requiring large investment in capital. Its major cost is labor that, while theoretically variable, is fixed in practice. This is because of partial or full ownership of a large number of European postal operators by the State and unionized labor. Because postal operators are often one of the largest employers in a country, public protection of these jobs make these costs de facto fixed.

As Table 8.1 shows, we have subdivided Regulated Access in three different scenarios and No Regulated access in two scenarios. This subdivision is based on different National Regulatory Authorities (NRAs) powers on definition of access conditions and those linked to the resolution powers.

3   The European Union Debate on Postal Access

The European legislation that regulates postal access is contained primarily in Articles 11, 11a and 12 5th indent of the Directive 97/67/EC of the European Parliament and of the Council on common rules for the development of the internal market of Community postal services and the improvement of quality of service (15/12/1997) (PSD). Article 11 states: "*The European Parliament and the Council, acting on a proposal from the Commission and on the basis of Articles 47(2), 55 and 95 of the Treaty, shall adopt such harmonisation measures as are necessary to ensure that users and the postal service provider(s) have access to the postal network under conditions which are transparent and non-discriminatory*."

Concerning Access, European Member States when transposing at the national level the postal directive had to comply to the principles identified by the articles 11a and 12, 5th indent. Directive 2008/6/EC of the European Parliament and of the Council of 20/02/2008 has inserted article 11a which states that: "*Whenever necessary to protect the interest of users and/or to promote effective competition, and in the light of national conditions and national legislation, Member States shall ensure that transparent, non-discriminatory access conditions are available to elements of postal infrastructure or services provided within the scope of the universal service, such as postcode system, address database, post office boxes, delivery boxes, information on change of address, re-direction service and return to sender service. This provision shall be without prejudice to the right of Member States to adopt measures to ensure access to the postal network under transparent, proportional and non-discriminatory conditions*". This Article sets the general rules applicable to the access to elements of postal infrastructure and universal postal services. Recital 34 of the Directive 2008/6/EC identifies the context in which article 11a has to be read. Recital 34 shows the aim of the access to some elements of the postal network in promoting effective competition and protecting users by "*ensuring overall quality of the postal service*". It is important to point out that Article 11a links the mandatory access to universal service provision and lists specific examples of the postal infrastructure.

Directive 2008/6/EC of the European Parliament and of the Council of 20/02/2008 inserted Article 12, and in particular the 5th indent, which states regarding tariffs that: "*whenever universal service providers apply special tariffs, for example for services for businesses, bulk mailers or consolidators of mail from different users, they shall apply the principles of transparency and non-discrimination with regard both to the tariffs and to the associated conditions. The tariffs, together with the associated conditions, shall apply equally both as between different third parties*

and as between third parties and universal service providers supplying equivalent services. Any such tariffs shall also be available to users, in particular individual users and small and medium-sized enterprises, who post under similar conditions." Recital 38 and 39 of the Directive 2008/6/EC set the elements concerning the implementation of the Article. Recital 38 explains that in a fully liberalized and competitive market, in order to preserve the financial equilibrium of the universal service provider and to limit market distortions, prices resulting from normal market conditions and costs "*are only departed from in order to protect public interests*". The recital notes that this aim should be reached by keeping uniform tariffs for single piece mail (services generally used by consumers and small-medium-sized enterprises). Recital 39 emphasizes that for all services, including for business' customers, the universal services provider may implement price flexibility using the cost orientation principle so that tariffs should reflect the avoided cost respect to the provision of a standard service.

There is a growing debate at the European level if this European legislation is sufficient to guarantee access to other players. In the context of the future review of the Postal Services Directive (PSD) by the European Commission, the European Postal Regulators Group (ERGP) calls for empowerment of the NRAs to intervene *ex ante* in the markets in case of actual or potential market failures. ERPG argues that to "*promote a fair and competitive European postal single market, NRAs need to have the power to apply pro-competitive regulatory tools like access to postal networks and services … "*They need "*sufficient powers to intervene ex-ante in case of actual or potential competition problems*". The ERGP is aiming for a regulatory framework where NRAs would have "*specific powers determining how the access to the network should be provided (e.g., defining access prices, processes, interfaces, formats)*". Furthermore, the ERGP believes that these competences should be "*directly grounded in the regulatory framework and not made dependent on discretionary implementation by Member States.*" "*The implementation of this competence should be left to the consideration of NRAs, to ensure the possibility of a more coherent application of the framework in the European markets*" (ERGP, 2020, p. 8).

On the other side, many postal operators do not believe that there is a regulatory deficit on the European level that would warrant the introduction of new EU powers and instruments. The rest of the chapter tries to understand if the current European regulatory framework effectively guarantees some type of regulated access and if this access is generally granted at fair and transparent conditions.

4   State of the Art in Five Large EU Postal Markets

In this section we will analyze how regulated or commercial access has being applied in five large postal markets in the EU: France, Germany, Italy, Spain and The Netherlands. The base for this section is the detailed report by Cullen on Access of the 9th of October 2020 (Cullen, 2020), updated with the latest information

provided by the different postal operators for the five markets taken into consideration.

4.1 France

French law allows its USP to sign contracts with special tariffs and conditions for bulk mail under objective and non-discriminatory principles. La Poste is not required to provide downstream access. It is free to give access to its delivery infrastructure to third parties through negotiated contracts, but is legally required to set tariffs based on avoided cost, calculated on the basis of methods prescribed by law. Yet, La Poste must give access to certain "essential facilities" to all postal operators who hold a license delivered by the NRA (ARCEP), these include: the postcode system database and link to addresses, change of address information, re-direction services, and PO boxes, but, counterintuitively, not delivery (Cullen, 2020), Access to these elements is considered as a right for licensees.

There are legal obligations regarding such contracts both for tariffs and terms and conditions. They must be transparent and non-discriminatory and they have to be communicated to the NRA as described Code des Postes et des Communications Electroniques (CPCE). The NRA has no power to set *ex ante* terms for access to these essential means, but its intervention can be requested by any party involved in case of disputes. If asked to intervene, the regulator has 4 months to decide the controversy. Its decision, once published, can be challenged in the Cour d'Appel de Paris within 1 month from notification and the appeal need not lead to suspension of the NRA decision. In practice, in France there have been very few requests for access to essential resources since 2005 and no recent request. Furthermore, ARCEP has never arbitrated any litigation regarding access to essential facilities.

4.2 Germany

In Germany, there is a legal obligation to grant access to the delivery network under a specified tariff. Licensees with significant market power must offer on request wholesale services to other licensees without significant market power. (Smaller operators need to show they have no market power in their request.) A license is only required for letter delivery services up to 1000 g. Tariffs must be based on cost orientation and non-discrimination. (§28 Postal Act). In particular, Deutsche Post has the legal obligation to grant access to elements of its infrastructure, more specifically access to PO boxes and access to data on changed addresses (§29 Postal Act).

Concerning special tariffs, in the past BNetzA, the German NRA, intervened in cases of (suspected) abusive wholesale pricing, e.g., Deutsche Post discounts (2010), the fee structure of First Mail (2011) and the pricing of 'Impulspost' advertising letters. BNetzA also decides regularly on tariffs for access to PO boxes and

address data. However, German law gives BNetzA the power to set *ex ante* terms for access only in some cases. Single piece letter mail tariffs (and related services), tariffs for access to PO Boxes and data on address changes, are all subject to *ex ante* price control, while other services are subject only to *ex post* price control. Furthermore, BNetzA must be notified of wholesale contracts and may intervene in cases of abuse. The German NRA has dispute resolution powers (§§31, 32, 49 Postal Act) and has the authority to address anticompetitive behavior (§§32, 49 Postal Act) (Cullen, 2020).

Except for access to post-office boxes and access to address data, explicitly mentioned in §29 of the Postal Act where BNetzA approves charges services *ex ante*, there is no general access pricing formula. Bulk mail (>50 letters) is not subject to *ex ante* price regulation at the retail or wholesale level. Other wholesale services are subject to *ex post* regulation if a provider with significant market power includes them in the terms of the contracts (§28 and §19 Postal Act; Cullen, 2020). BNetzA therefore only intervenes *ex post* in cases of suspected abusive pricing.

There is no legal obligation of tariff uniformity for wholesale/bulk products in the Postal Act. In particular, BNetzA accepted that Deutsche Post (DP) reduced its bulk mail prices when the VAT rules were changed in mid-2010. However, BNetzA prevented First Mail (a 100% subsidiary of DP) from offering bulk mail prices, which deemed discriminatory and below costs. In the First Mail case, zonal pricing was one of the issues but not the main one. First Mail offered low "end-to-end" retail prices for letters to Düsseldorf (postal code area 40) and to the Ruhr metropolitan region. As mentioned above, the main problem in the case was not the zonal pricing but the generally low prices of First Mail, which were below costs and caused a loss in each business year. BNetzA found it abusive that DP offered these prices particularly in a region where alternative providers have established their own distribution network.

As a general point, the granting of access to DP's network has favored a competitive environment where there is no full nationwide end-to-end competition and no second letter delivery network covering the whole country. However, access regulation has led to lower prices for smaller senders using consolidators, reducing the margin for the network operator providing the universal service, potentially endangering its ability to continue to provide the latter.

4.3 Italy

Poste Italiane must provide access to its network to other postal operators. This access is commercially negotiated and needs to be under fair and reasonable conditions. Furthermore, in rural areas where only Poste Italiane has a network (so called EU2 areas), access charges must be linked to cost. The Italian Postal operator must also meet a "replicability test", that is, a sort of ex-ante margin squeeze test, for processes offered at a discount for bulk mailings with a contract value greater than 500 thousand euros. Access is given also to PO boxes, and the postal operator needs

to be transparent regarding changes to the post code system. The NRA in Italy has dispute resolution powers, but it does not have the ability to set ex ante terms for access or to address anticompetitive behavior (Cullen, 2020, pp. 5 and 9).

The framework on access is rapidly evolving. On December 2020, the Italian Competition Authority authorized the acquisition of Nexive (the second biggest postal operator in Italy) by Poste Italiane (AGCM, 2020). According to art. 75 of Decreto Legislativo n.104 (2020), the Authority made the conclusion of the transaction conditional on Poste Italiane compliance with certain behavioral measures strengthening the access to its network for competitors. Specific measures concerning access were:

– expansion of postal code in EU2 areas relating to an offer equivalent to existing Posta Time for alternative operators;
– access to delivery network for alternative infrastructure operators with at least 8 million items instead of the 35 million minimum of the previous offer;
– access to 2.000 PI post offices for undelivered items of registered mail service;
– access to the 'modular boxes' based on remote areas;
– provision of two new wholesale access offers, one for unregistered and one for registered mail, in the areas with no coverage of alternative operators.

4.4   The Netherlands

The Ministry of Economic Affairs in the Netherlands oversees the continuity of the national postal service, with the sustainability and affordability of the USO as a priority (MEK, 2017). In the light of its mission, considering developments in the postal market, the Ministry of Economic Affairs has decided a policy, within the framework of market regulation, which no longer focuses on stimulating competition in the postal sector but privileges the exploitation of economies of scale for ensuring continued provision of postal service throughout the country.

On 10 July 2017, the Minister of Economic Affairs published an analysis[2] on the future of the postal sector. The Report found that mail is [being overtaken] left and right by digital alternatives (MEK, 2017). The Report noted that there is a great deal of pressure on the USO. Letter volume reductions have forced all postal operators to review their business model. Mail as a separate market segment as such seemed still relevant (MEK, 2017).

The Report affirms that the benefits of liberalization mainly accrue to the (wholesale) business customers, while the burden falls on the users of the USO. In the words of the Report: As a result of the shrinkage, the benefits of competition in the postal market are mainly felt in the business segment in the form of lower prices, innovation and freedom of choice, while duplication of costs primarily affects the

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[2] Ministerie van Economische Zaken (2017); Analyse toekomst postmarkt. Het belang van post in een digitale wereld. https://zoek.officielebekendmakingen.nl/blg-813616.

ability of Post NL (the Dutch USP) to cover the cost of the USO. The Ministry, therefore, concluded that the amendments to the national Postal Act are aimed at "exploiting economies of scale and no longer at further stimulating competition," in order to protect the affordability of the USO.

There is a legal obligation to grant access to the delivery network at special tariffs, but the rule is still in the implementation stage. Access concerns the postcode systems, the address systems, the return of post that ends up in the facilities of other operators and the PO boxes. More specifically, after the merger with Sandd, the major competitor of the Post NL in the E2E market, there are access conditions both for 24-hour mail, non-24-hour mail and for what is called 'residual mail'.[3]

The Dutch NRA has the ability to set in advance rules on access, dispute resolution powers and the authority to address anticompetitive behavior. The postal regulator OPTA and the competition authority merged to form ACM on 1 April 2013. The Dutch Amendment to the Postal Law entered into force on 1 Jan. 2014. A policy rule by the Minister of Economic Affairs of December 2016 gives guidance to ACM's application of its *ex ante* authority, in particular regarding the goals and proportionality of *ex ante* measures as well as the need for a quantitative impact assessment. With regard to dispute resolution powers at the request of one of the parties involved, ACM can take a binding decision within 4 months of receipt of the request.

In its decision on 27 July 2017, ACM imposed on PostNL access, wholesale price regulation (cost orientation) and transparency remedies. On 3 Sept. 2018, the Trade and Industry Appeals Tribunal annulled ACM's market analysis, designating PostNL as having significant market power on the wholesale market for 24-hour business bulk mail. According to the court, ACM has not proven that digital mail is not part of the relevant market. These remedies were no longer in place following the Tribunal's ruling, which cannot be appealed (Cullen, 2020).

After the Tribunal's ruling, the state secretary of Economic Affairs recently set a number of conditions for PostNL, one being that PostNL provides access to other postal operators. The decision, which includes the access conditions, includes conditions on tariffs. Furthermore, the Postal Act 2009 is currently being revised, the proposal is to be discussed by the House of Representatives. The draft proposes to change, amongst others, the rules on access.

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[3] Residual mail is mainly local mail picked up by a local postal carrier destined for areas not covered by the operator. These volumes To be granted access as "residual mail" by PostNL, these volumes need to be more than 70% of the total mail volume that a local postal carrier collects and/or sorts.

4.5 Spain

Spain's Postal Law (Ley 43/2010, de 30 de diciembre, del servicio postal universal, de los derechos de los usuarios y del mercado postal) guarantees access to the postal network of the USP (Correos). Postal operators (POs) may seek access in relation to the services included in their individual license, necessary to provide anything in the "universal services" category. With regard to special tariffs, Correos is able to offer special prices and discounts, but according to the Postal Law (article 35), principles of transparency and non-discrimination must be respected. The NRA oversees that these prices do not increase the USP's financial needs (too low access prices). The NRA enforces those principles of transparency, and no discrimination has been observed.

Correos must publish a standard access agreement approved by the NRA. Other POs may negotiate individual agreements, which must be communicated to the NRA, which monitors the tariffs. Dispute resolution proceedings arise at the request of a participant to an agreement, with the NRA deciding in 4 months from the beginning of the proceeding. Furthermore, the NRA has powers to impose penalties on all postal operators and to issue binding decisions, including the obligation to conclude an access contract between parties. Moreover, the NRA has powers to implement competition law with regard to access rules. Article 47 of Spain's Postal Law requires that access to other elements of the postal network such as the post-code system, address data base, and post office boxes, have to be transparent and non-discriminatory. These access conditions have to promote competition and protect providers seeking access, customers, and the USO provider. These conditions have to be set through a regulation that, however, has yet to be adopted.

5 Lessons Learned and Policy Implications

Our case studies indicate that while all countries appear substantially in line with the postal directives, different forms of access are granted in the different markets. The forms of access granted are a mix of mandated access (e.g., Germany) and commercial access with NRAs guaranteeing the principle of transparency and non-discrimination (e.g., France), while there is no major market with a structural separation of the postal network. In some cases, there are still forms of E2E competition at the national or regional level e.g., Germany, Spain and Italy, where there are numerous licensees (ERGP, 2020b, p. 32).

Undoubtedly, diminishing volumes have contributed to market consolidation and have led to additional access conditions, e.g., the Netherlands and Italy (Parcu et al., 2022). The Dutch case suggests that often strict access regulation leads to fragmentation of volumes and put an increasing pressure on the sustainability of the USO generating "residual mail".

The current postal regulatory framework has generated in five large European postal markets sufficient access demands for all five markets to end up in a Regulated Access scenario. If the objective of the European legislature is to generate regulated access, with some degree of power given to the NRAs to control, this goal has been achieved and no further rules appear necessary to the purpose. The current European regulatory framework leads to a regulated access at fair and transparent conditions. We strongly believe that the current framework, by using different approaches that fit the specific national conditions (e.g., number of licensees, geographical conditions, urbanization rates), has provided access that is regulated, fair and transparent for alternative POs.

Nonetheless, the ERGP is pushing for a further step-up in access regulation imposed at the European level. The European Association of Postal Operators (PostEurop) has thoroughly discussed this issue and several operators have raised doubts about this effort. Their first concern is legal: competition issues are generally dealt with by the provisions of European and national competition law which covers the postal sector, as it does every other industry. Sector-specific regulation, in parallel or with superseding authority, requires a specific justification because it intervenes more deeply in the market further constraining entrepreneurial freedoms.

To justify a sector-specific approach, evidence must be provided that general competition law alone is insufficient to tackle market failures. This could be the case in markets where no effective competition exists and high barriers of entry hinder market access. European mail markets are all subject to the same trend of volume reductions – with rates of decline varying from country to country. Where digitalization is embedded in society, like in the Nordic countries, mail volumes are a small fraction of those of only 10 years ago. In other countries, such as France or Germany, the decline is still at an earlier stage, however, also there the COVID 19 pandemic has put additional pressure on governments and industries to switch communication to digital tools. In many countries the provision of universal services cannot be financed from postal revenues alone, so that state budgets have to cover and this need will be more relevant in the future, raising also the issue of the potential under-compensation of the net cost generated by postal services. These trends all mean that competition in the sector is less likely, leaving protection against market power to regulation.

In some countries (e.g., Germany), access regulation has brought competition for consolidation service. This has led to lower prices for small business customers where significant volume discounts are granted. However, consolidation as such does not create additional volumes. Even if some countries in the medium term still foresee significant letter mail volumes, imposing further access requirements would only further squeeze the margins of incumbent operators and endanger the financial sustainability of providing the universal service. Competition cannot be expected to grow, because there is no attractiveness for new investments in a sector that is rapidly shrinking. Seeking to increase competition through new access regulation at the European level, beyond mandated access in rural areas or in special conditions and commercial access at fair and transparent conditions elsewhere, will probably neither provide benefits nor increase the size of the market.

The ERGP's recommendations appear to be overly inspired by telecom regulation. Mail and parcels are, however, distinct from telecommunication. Telecom, as well other regulated industries such as electricity and gas services, are only possible if a fixed line network has been established. These lines are typically bottlenecks because each household will only have one telecom or gas connection, thus competition can only exist in upstream services when access to this connection is not reserved to one operator. With postal services theoretically there is no physical barrier to hinder several delivery services providing doorstep delivery. A bottleneck would only exist if investment to build a parallel delivery network would be prohibitively high. However, postal delivery networks do not require large capital investments. A postal network consists of vehicles and buildings, such as sorting facilities and (a lot of) workers. Otherwise, the network is set up new each day by the delivery personnel doing its rounds. Personnel costs are the main cost drivers for postal operators and not capital investments. Furthermore, it is inefficient to have multiple carriers to deliver mail (at affordable prices) in the same address, especially with diminishing volumes leading to a sort of return of a last mile natural monopoly.

6   Conclusion

In the next 2 years, an extensive debate at the European level on the regulatory framework of the postal sector is to be expected. One of the questions to be discussed will be whether the current postal directive satisfied expectations on the access regime to postal networks. We have attempted to address the issue of access regimes in the postal sector and to contribute to the discussion by presenting the "state of the art" in some major European countries.

Our case studies indicate that while all countries appear substantially in line with the current postal directives, different forms of access are granted in different markets. Forms of access granted include a mix of mandated access (e.g., Germany) and commercial access with NRAs guaranteeing the principle of transparency and non-discrimination (e.g., France), while there is no major market with structural separation of the postal delivery network from potentially competitive upstream services. In some cases, there are still forms of E2E competition at the national or regional level (e.g., Germany, Spain and Italy, where there are numerous licensees). Furthermore, diminishing volumes have contributed to market consolidation and have led to additional access conditions (e.g., the Netherlands and Italy; see Parcu et al., 2022).

The five large European postal markets we examined, have all seen sufficient access demands to end up in a Regulated Access scenario. If the objective of the European legislature is to generate regulated access that the NRAs have some degree of power to control, this goal has been achieved and no further rules appear necessary to the purpose. The current European regulatory framework leads to a regulated access at fair and transparent conditions. We strongly believe that the current framework, using different approaches to fit specific national conditions (e.g.,

number of licensees, geographical conditions, urbanization rates), has provided access that is regulated, fair and transparent for alternative POs.

Future research should be carried out on how the USO and in general postal services will evolve in the next two decades and how this evolution will impact the access regime. Moreover, we suggest that in future research the scope of the mail market should not be restricted to the delivery of physical documents. This might have been reasonable when the postal service directive was established in the 1990s. Due to technological advancements, the communication need of the population has changed dramatically. Letter mail is mostly reserved for very important messages or documents. As state administrations and private economies are digitalizing their services—the most relevant digitalization program was carried out in Denmark—letter mail communication will be replaced more by digital communication. Will the digitalization raise the issue of access of hybrid mail?

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Chapter 9
The Economic Implications of "Density-Based Rate Authority"

Timothy Brennan

1   Introduction

At the 23rd Postal Conference, Brennan and Crew (2016) proposed a formula to adjust postal rates under price cap regulation in the face of exogenous declining demand, in order to preserve the ability of a postal service operator to support universal service and remain solvent. That formula was based on the elasticity of average cost with respect to volume—which, in simple terms, turns out to be the ratio of fixed to total cost—with an adjustment for demand elasticity, since increasing price also reduces volumes. At the request of the Public Representative of the US Postal Regulatory Commission (PRC), Brennan (2017, 2018) submitted declarations describing that formula and applying it to a number of regulated postal services, for the PRC's statutorily mandated review of postal price caps.

In a final order, the PRC (2020) proposed allowing the US Postal Service (USPS) to use that formula to increase rates, but with two variations. One was to drop the elasticity adjustment because it was based on a false distinction between adjusting rates to reflect higher costs and adjusting rates to preserve USPS's ability to cover those costs; that is not the primary subject here. The other was to base the

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adjustment on changes in what the PRC called "density", defined as the ratio of volumes to the number of service locations. The PRC called this "density-based rate authority".

The crucial finding of the PRC's order is that average cost is determined solely by density. As we will see, this finding has implications, perhaps not recognized by the PRC, regarding whether and why postal services are natural monopolies and how postal services should be priced to recover their costs efficiently—specifically, pricing delivery of each unit at the marginal cost of delivery and covering other costs through a fixed charge paid by each location (as defined by the PRC). The purpose of this paper is not to argue whether, as an empirical matter, average cost varies only with volume (as in Brennan and Crew (2016)) or varies with density (as in PRC (2020)). Rather, the purpose here is to analyze the potential underpinnings and derive the implications of using density, as stated above.

Section 2 summarizes the reasoning for the original Brennan and Crew (2016) adjustment formula based on changes in volume alone. Section 3 sets out the PRC's density-based adjustment and notes the differences between it and the proposed adjustment formula derived in Sect. 2. Section 3 also discusses the omission of the adjustment for elasticity of demand, specifically, taking into account that adjusting rates upward will itself reduce volumes. Section 4 discusses qualitative implications of the PRC's finding that holding density constant holds average cost constant. This relationship, if valid, suggests that if there were a way for households and businesses to choose a postal provider, and there were a costless way to sort mail going to a location to the provider of their choice, one could have competition in mail. Even if that is implausible, a second implication is to raise the issue of why one has a single national postal operator rather than separate regional ones.

Section 5 contains a derivation of the formal implications of the PRC's density-based formula. Among the findings is that for it to work, the contribution to institutional cost from any service has to vary by the number of locations served. This may be factually accurate, but it is not clear that postal accounting practice shows this. Section 6 discusses some implications of the PRC's density-based approach for alternative methods of pricing postal service, specifically, adding volume-independent charges for each location. Section 7 summarizes and concludes.

2   Rationale and Theory of Rate Adjustments

Since the passage of PAEA in 2006,[1] US postal services deemed "market-dominant" rather than competitive have been regulated by price caps. The main virtue of price caps over the primary alternative, regulation based on the average cost of service, is that divorcing rates from costs provides regulated firms with an incentive to control

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[1] Postal Accountability and Efficiency Act, (PAEA), Pub. L. 109–435, 120 Stat. 3198 (2006).

costs.[2] Some of the benefits of that costs control may be allocated in advance by a commitment (independent of realized costs) to reduce prices by some percentage per year. The regulated rate is allowed to rise by the general rate of inflation of prices in the economy. Thus, price cap regulation is often referred to with the terminology "*CPI – X*", where *CPI* refers to changes in the consumer price index as a general measure of inflation, and "*X*" refers to the annual percentage by which rates are committed in advance to fall.[3]

The concern at the PRC and around the world with reduced volumes is that reduced revenues gives postal operators less funds to cover fixed costs, including costs of meeting universal service obligations. To warrant this concern, the price for a postal operator's service must be above marginal cost, so the firm loses money (price less marginal cost) when its volumes fall.[4] This will be true if postal service is a natural monopoly, as natural monopoly typically (although mathematically not necessarily) implies that marginal cost is less than average cost. If the regulated firm is to be solvent, the allowed rate under price caps should be at least as great as average cost. Putting these together, the allowed price under price caps should exceed marginal cost. This means that if demand for the regulated service falls, the regulated firm will lose money. For political, legal,[5] and economic reasons, losing money is unsustainable.

Demand for regulated postal services, particularly letter delivery, has fallen in the US, and in many if not most developed economies, over the last couple of decades. This is largely because of the attractiveness of Internet-based alternatives such as email, online bill payment, and electronic commerce. Consequently, a price-cap regulated postal service, such as that in the US, will lose money if nothing is done. One could return to cost-of-service regulation but doing so would give up the benefits of having price caps.

An alternative would be a formula to adjust the price cap to preserve the postal service's level of profit from a given product—including that product's contributions to covering the postal service's universal service obligations—when facing a decline in demand. Such a formula would adjust rates by some percentage, based on the percentage by which demand fell.[6] To leave the postal service's overall financial position unaffected, that percentage change in rates should equal the percentage

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[2] A second benefit is that having rates set by a predetermined formula means that regulators, regulated firms, and interested parties can avoid the time and expense of proceedings to ascertain the cost-of-service, including the appropriate rate of return the regulated firm should be allowed to earn on undepreciated invested capital.

[3] Under PAEA, §3622(d) (1), the advance committed reduction in price due to anticipated productivity increases is 0.

[4] Neither Brennan and Crew (2016) nor PRC (2020) dispute this.

[5] Bluefield Water Works v. Public Service Comm'n, 262 U.S. 679 (1923), FPC v. Hope Nat. Gas Co., 320 U.S. 591 (1944).

[6] This decline in demand has to be exogenous, that is, independent of choices of the postal operator. One would not want to insulate a postal operator from service quality reductions that reduce demand by providing an automatic increase in prices.

change in average cost, where cost includes these contributions to what are called in the US "institutional costs".

This rate formula has a major part and a relatively minor adjustment (Brennan and Crew, 2016), which took "institutional costs" as fixed and with variable costs only a function of volume. The major part is to derive the elasticity of average cost with respect to output, since the percentage change in average cost—the desired change in rates—would equal that elasticity times the percentage change in output, that is, the decline in demand. In general, the elasticity of average cost (e_{AC}) with respect to output is given by

$$e_{AC} = \frac{QC' - C}{C},$$

where $C(Q)$ is cost as function of output Q and C' is marginal cost. For a natural monopoly, marginal cost pricing (setting price equal to C') will fail to generate enough revenue to cover total cost, so the numerator of this expression is negative. That implies that when demand falls, average cost rises, which is consistent with the intuition for an upward rate adjustment. If marginal cost C' is constant, then this elasticity of average cost can be expressed simply as the fraction $-F/C$, where F is the revenues of the postal product net of marginal cost, and C is the total cost of the product.[7] The rate adjustment would be found by multiplying this by the percentage by which demand fell.

Finding this elasticity is key, but it is not the entire story. If rates are adjusted upward to take into account of a decline in demand, demand will fall further (unless the price elasticity of demand for the postal product is zero, that is, increasing price does not reduce sales).[8] In the extreme, if the price elasticity of demand is sufficiently large, this rate adjustment would reduce demand by so much that the postal operator would be worse off than if no adjustment had been made at all. Taking the

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[7] If $F = 0$, there would be no adjustment, and no need for it, as price equals marginal cost and the regulated firm therefore loses no profit when demand falls. It also should be noted that in practice, because each postal product makes a contribution to overall USPS operations, the measure of "cost" as a practical matter is overall revenue. In effect, "cost" includes profit attributable to that service.

[8] Brennan and Crew (2014) pointed out that demand for a postal product could fall because of electronic substitution, but that fall could be largely independent of relative prices of postal products and electronic alternatives. They termed this the distinction between "gross" and "marginal substitutes"; electronic alternatives are "gross" substitutes for postal products in that people switch from one to the other, but that switching may have little to do with price, hence they are not "marginal" substitutes. This is relevant for postal policy because although there has been extensive substitution from postal products to electronic alternatives, a postal operator may retain considerable market power over the remaining users.

price elasticity of demand for the postal product makes the formula slightly more complicated than the simple $-F/C$; it becomes[9]

$$\frac{-F}{C + Fe_D},$$

where e_D is the elasticity of demand, also a negative number.

The larger is the elasticity of demand (in absolute value), the greater the price adjustment has to be. However, for reasonably low demand elasticities with respect to price and exogenous changes in demand, the price adjustment is not all that great. For example, using data from the US Postal Regulatory Commission, the price adjustment under this formula for a 5.8% reduction in the quantity of first-class mail would imply a 3.65% rate adjustment, given an elasticity of average cost ($-F/C$) of $-.524$ and a price elasticity of demand of $-.321$ for letter mail (Brennan, 2018).

3 The PRC's Formula

In its 2020 order, the PRC adopted a formula that was superficially similar but, as we will see, has implications for the rationale for the national monopoly structure of postal operators and requires additional justification that may not have been apparent. To see this, we first need the PRC's (2020 at 79) adjustment formula:

$$-1^{*}ICT / TCT * \%\Delta\mathrm{D}\big[\mathrm{T}-1,\mathrm{T}\big],$$

where

T = most recently completed fiscal year;

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[9] To see this, let $\Delta P/P$ be the change in price, equal to the change in average cost, and let $\Delta V/V$ be the exogenous change in volumes because, for example, of movement to electronic communication. In addition to this exogenous change in volumes, volumes will also change by $e_D*\Delta P/P$, that is, because of the price adjustment. To incorporate this effect into the change in price necessary to keep the postal operator solvent, one has to find the relationship between $\Delta P/P$ and $\Delta V/V$ that satisfies

$$\frac{\Delta P}{P} = e_{AC}\left[\frac{\Delta V}{DV} + e_D\frac{\Delta P}{P}\right].$$

Solving this gives

$$\frac{\Delta P}{P} = \left[\frac{e_{AC}}{1 - e_{AC}e_D}\right]\frac{\Delta V}{V}.$$

Substituting $-F/C$ for e_{AC} gives the adjustment factor in the text.

$T-1$ = fiscal year prior to year T;
ICT = institutional cost in fiscal year T;
TCT = total cost in fiscal year T; and.
%ΔD[$T-1,T$] = Percentage change in density from fiscal year $T-1$ to fiscal year T.

The -1 factor at the beginning is the PRC's way of translating a decrease in demand to an upward adjustment in rates. In our terminology, ICT is F, the institutional contribution (including revenues above marginal cost), and TCT is total cost C. In this respect, the PRC's formula was very close to the one derived in Brennan and Crew (2016). Using the notation here, it would use as a factor $-F/C$. In this regard, the adjustment factor is the same as above.

The key (but not only) difference is that the PRC defines the relevant percentage change as that of "density", not volume. The PRC defined density as the ratio of volumes to delivery points. Three important implications follow. The first is that if the number of delivery points does not change, the percentage change in density equals the percentage change in volumes, so the basis for the PRC's formula and the one in the previous section are the same. The second is that if volumes and delivery points grow (or shrink) at the same rate, the PRC's formula implies that average cost remains identical. The third is that $-F/C$, the adjustment factor (assuming constant marginal cost for volumes) needs to be the elasticity of average cost per volume unit with respect not to volumes, but to density.

It is also important to note here that the PRC's (2020) formula essentially treated all locations as identical in calculating average cost. That is unlikely to be true in practice, as distance and the number of delivery locations in a given unit of area (another interpretation, but not the PRC's of "density") are likely to affect costs (e.g., Cigno et al. (2021)). For purposes of this discussion, we use the PRC's definition of density and its relation to average cost of postal delivery.

Before getting to those implications of the PRC's use of density, note that the PRC's adjustment formula lacks an adjustment for the elasticity of demand. Its explanation was that it believed it was obligated not to preserve USPS solvency, but merely to adjust rates to reflect the effect of changes in demand on average cost. However, one needs to incorporate the effect of adjusting rates on sales, as that also affects average cost in the same qualitative ways as does the effect of declining demand due to electronic substitution. I incorporated the demand elasticity adjustment to make the adjustment formula neutral regarding the amount the regulated firm was earning over marginal cost, regarding that as a separate policy question.[10]

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[10] Incorporating elasticity of demand is slightly more complicated under the PRC's approach. When average cost and the relevant measure of a chance in demand are all based solely on volume, then one can adjust the measure by noting that the change in demand will go up by the elasticity of demand times the price adjustment. When the change in demand is not a change in volumes but a change in density, this multiplication step cannot take place without assuming, at least for purposes of this stage of the calculation, that the number of locations cannot change. This does not eliminate the need for the adjustment under the PRC's density-based approach. It shows only that it requires additional assumptions that may be inconsistent with the need for a density-based approach, specifically, that the number of deliver locations changes.

4   Density Based Costs and the Scope of Natural Monopoly

As noted above, and leaving out the elasticity of demand adjustment, the formula proposed in Brennan and Crew (2016) works the same as the PRC's density-based formula, if the number of locations does not change year to year. Consequently, if the number of delivery locations does not change very much year-to-year, for example, that change is an order of magnitude less than the change in volumes, volume-based adjustment will work about as well, arguable within the margin of error of measurement for anything used in the practical application of the formula.

However, in principle if the number of delivery locations changes, a postal operator's cost will change, and likely increase. Qualitatively, that assumption seems plausible. To remain within the limits of practicality for using a density-based rate adjustment, the assumption that the cost of delivery for each location is the same is reasonable. Neither of those, however, leads to the conclusion that if the volume of mail and number of delivery locations both increase (or decrease) by the same percentage, the fall in average cost per piece delivered brought about by the former is exactly offset by the increase in average cost per delivered piece by the latter. The PRC's formula reflects that assumption.

Before getting to the implications of the PRC's assumption for rate adjustment, it is worth noting its implications for the natural monopoly in ("market-dominant") mail delivery. The general if somewhat informal basis for the natural monopoly assumption is simply that average cost declines with volume.[11] However, if costs are only a function of density, then two postal operators would have the same costs if they deliver the same volume of mail per each location that they serve. In principle, one could have ongoing competition among postal operators if they signed up recipients to receive mail exclusively from one of the postal operators, in order to maintain the same density, that is, volume delivered by the selected operator to that location.[12]

For this to happen, the overall mailing system would require a virtually costless method for sorting mail not just by location, but by carrier to that location. For some communications technologies, computerized switching for telephones and routing protocols for the Internet, directing traffic to carriers selected by receivers of communications is relatively simple and cheap. This allows a system by which carriers can compete to be a recipient's telephone or Internet service provider. Were a similar system available for mail, postal operators could similarly compete. That they do not implies that if the PRC is correct regarding density as determining average cost,

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[11] Glass et al. (2021) recently assessed Panzar and Waterson's (1991) arguments for the natural monopoly status of postal service.

[12] One might contrast this assessment with the existence of competition in parcel delivery. The ability of carriers to deliver to a particular location, without a location committing to accept delivery from only one company, implies that for parcels costs are not simply a function of density, as the PRC assumes they are for market-dominant mail products. This may be because with parcels, average cost of delivering parcels must rise beyond some quantity delivered holding the number of delivery locations constant, implying that average costs rise with density.

we do not see competition in postal carriers not because of declining average cost with respect to volume, but for the impossibility of having a system in which recipients select exclusive carriers to deliver to their locations.[13] Without such exclusivity, increasing carriers holding volumes per location constant reduces density and thus increases cost for each carrier.

Even if additional considerations satisfactorily explain the natural monopoly status of letter delivery (assuming equal delivery costs per location), they raise questions about the national status of that monopoly. Perhaps ongoing competition between carriers is unsustainable, but one could have different postal operators in different parts of the country. One could have different postal operators in New York and Los Angeles—or, for that matter, Paris and Marseilles, Madrid and Barcelona, and Rome and Florence—just as, at least in the US, one sees separate local monopolies in water delivery, electricity distribution, and natural gas delivery. Of course, if separate regional carriers would not face ongoing competition, one might not gain very much, although perhaps there would be some benefit to regulators from benchmarking price and performance of carriers under their jurisdiction against the service characteristics of other carriers.

I pose these possibilities not to advocate for them, but only to note that the PRC's assumption that density determines costs opens the door to considering them.

5 Specific Formal Implications of Density-Based Rate Setting

5.1 The Form of the Cost Function

To understand the specific implications of the PRC's assumption that cost is purely a function of density, we define a postal operator's (e.g., USPS) cost as $C(q, n)$, where q is the total volume of mail delivered and n is the number of locations. In addition, following the PRC's order, we can define density k as the ratio of volume to locations, that is, $k = q/n$, which implies that, holding density constant, $q = kn$ and cost is $C(kn, n)$.

The PRC's density-based adjustment formula implies that the average cost per unit of volume delivered, the basis for the rate, is constant if k does not vary, that is,

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[13] Other transaction costs of such a system may also be high. Presumably, competing carriers would want to attract customers which high density, that is, high volumes at their location. If carriers can do this, they would predictably compete either in payments to high density recipients or charges to low density recipients reflecting the different density costs for each location. (This ignores other location-specific costs, which the PRC's rate adjustment order also ignores.) The costs of the marketing, monitoring and verification to sustain such a system may well be prohibitive. In any event, this provides an additional reason why to have only a single carrier per location is more complicated that the simple story of scale economies in letter delivery.

$$\frac{C(kn,n)}{kn} = H(k),$$

where $H(.)$ is independent of n. This implies that if we hold density constant, the derivative of average cost with respect to the number of locations served is zero.

$$\frac{d\left(\dfrac{C(kn,n)}{kn}\right)}{dn} = 0.$$

Solving this gives

$$\frac{\left[kC_q + C_n\right]kn - kC}{\left[kn\right]^2} = 0,$$

where the subscripts indicate partial derivatives. Accordingly, the numerator of this expression must equal zero. This implies that

$$C(kn,n) = knC_q + nC_n.$$

Recalling that $q = kn$, this gives[14]

$$C(q,n) = qC_q + nC_n.$$

and average cost per unit of volume becomes just

$$\frac{C(q,n)}{q} = C_q + \frac{n}{q}C_n = C_q + \frac{C_n}{k}.$$

(We will return to the average cost relationship when considering rate adjustment.)

We can simplify the cost function further. To get a simple formulation of the elasticity of average cost with respect to volumes, in particular, that the difference between total cost and marginal cost of the last output times volume just equals the institutional contribution, we can assume that the marginal cost of output C_q is constant, defined here as M. The PRC's Order's analysis adopted the simplification that the delivery cost to each location is identical, which here would entail that the marginal cost of serving an additional location, C_n, is constant, defined here as V.

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[14] If one thinks of q and n as inputs into some generalized measure of postal output, then the assumption that average cost is constant holding density constant is tantamount to saying that the postal production function has constant returns to scale. If so, the cost function in general equals the sum of the products of the volume of each input times that input's marginal cost. The expression in the text could be considered an example of that relationship.

Hence, the simple linear cost function

$$C(q,n) = Mq + Vn$$

is implied by the PRC's density-based ratemaking.

The PRC (2020 at 75) says that the institutional cost of USPS varies with the number of locations. We can go farther and say that density-based ratemaking says that all volume-independent costs vary with volume; there are no other fixed costs. This reinforces the finding above that the PRC's finding that average costs vary only with density removes simple scale economies as the explanation for the natural monopoly status of the delivery of market-dominant products. It also suggests the virtue of having volume-independent delivery "access" charges at each location to cover costs, rather than recovering costs entirely through, in effect, markups over the marginal cost of delivery. We return to this in Sect. 6.

5.2 Average Cost Elasticity and Rate Adjustment

The crucial step in determining a rate adjustment formula is to calculate the elasticity of average cost per unit volume with respect to changes in some relevant variable. One then multiplies the change in that relevant variable by this elasticity to calculate the change in average cost per unit volume. This, in turn, becomes the basis for the change in the allowed rate for the postal product, since it is that cost (including contribution to overall institutional cost) that these rates must cover.

In the initial formulation, the relevant variable was changes in volumes. This made deriving the relevant elasticity relatively easy, as shown in Sect. 2. When the relevant variable is a change in density rather than volume, that calculation becomes more difficult. As shown above, average cost is given by

$$\frac{C(q,n)}{q} = C_q + \frac{C_n}{k}.$$

Because in general C_q and C_n both depend separately on q and n, they are not uniquely determined by density.

However, we can invoke the simplifications that marginal costs of volumes and of locations are each constant. In that case, average cost becomes

$$\frac{C(q,n)}{q} = M + \frac{V}{k}.$$

where M and V are both constants. This makes the elasticity of average cost with respect to density

$$e_{AC} = \left[\dfrac{d\left[M + \dfrac{V}{k}\right]}{dk}\right]\left[\dfrac{k}{M + \dfrac{V}{k}}\right] = \left[\dfrac{-V}{k^2}\right]\left[\dfrac{k}{M + \dfrac{V}{k}}\right] = \dfrac{-V}{kM + V}.$$

Multiply both the numerator and denominator by n, the number of locations, and recalling that $q = kn$, one gets

$$e_{AC} = \frac{-Vn}{Mq + Vn} = \frac{-Vn}{C(q,n)}.$$

This reproduces the PRC's adjustment formula—with demand elasticity effects neglected—if one interprets the PRC's "institutional cost" as Vn and its "total cost" as $C(q, n)$. The latter is reasonable. The former interpretation might be reconciled with standard US postal accounting definitions if Vn, the constant volume-independent marginal cost of adding a delivery location, V, times n, the number of locations, as the difference between total cost and the volume-variable cost (Mq) of delivering q units of that postal product. In my admittedly limited experience with US postal accounting, I have not seen "institutional cost" calculated on a per-location basis. Whether postal accounting will change to become more consistent with the PRC's commitment to density-based cost measures is a question I leave to others.

6 Implications for the Structure of Postal Pricing

This analysis of the PRC's rate adjustment formula was based on a simplified cost model,

$$C(q,n) = Mq + Vn,$$

as the constant marginal cost version of the more general cost function.

$$C(q,n) = qC_q + nC_n.$$

We showed that the above follows from the PRC's assumption that average cost per item delivered ($C(q, n)/q$) is constant as long as density (q/n) does not change.

The reason rate adjustment is necessary is that costs are recovered solely by charges per item delivered, that is, postage, which must be above the marginal cost of delivering an item in order to cover costs. However, this cost function implies an alternative based on marginal cost pricing: charging marginal cost C_q to deliver an item, and charging an access fee C_n to each location so it can obtain mail.

This kind of pricing would be an improvement over purely volumetric pricing. It would be more efficient, as senders and receivers would compare the value of sending and receiving mail to the marginal cost of doing so. Moreover, if the PRC is correct regarding its assumption about density-based average cost, marginal cost pricing for delivery and location would cover costs. This would mean that all costs are covered, eliminating the need for adjusting price when demand falls (or rises), other than to reflect differences in marginal cost that the price adjustment methods assume away.[15]

These compelling advantages lead to the question of why postal service is not priced this way. A few related possibilities come to mind, with some responses:

Variation in delivery and political opposition Locations vary in how much mail they get. Charging a constant fee to be able to receive mail will imply that some locations will pay the same fee as others, but get fewer mail items. One can predict that those low-volume recipients will balk at paying that fee. The US had a similar experience in the 1980s when regulators attempted to rationalize pricing of (then exclusively wireline) telephone service away from volumetric surcharge on (then separate) long distance service toward non-volumetric (then called "non-traffic sensitive") monthly charges to cover the cost of the physical phone line to one's location (Kaserman and Mayo, 1994). An argument made at the time was that if one does not make or receive many calls, why should that person have to pay the same fixed fee as one who does? The economic answer is fairly obvious; a politically acceptable answer may be harder to come by.

Universal service The mission of postal operators around the world includes an obligation to provide universal service, that is, service to all at some minimum level of quality. If locations have to pay a uniform fee to receive mail, some recipients may drop out. This may be exacerbated if these location-based access or reception fees were to be based on the cost of serving a particular location, rather than uniform as implied by the PRC's adjustment formula.[16] The obvious method for doing this would be to subsidize service to such high cost or low-income locations through reductions or waivers of the fixed fee. Whether the cost of those universal service subsidies should be covered through general taxation, surcharges on postal services, or other means is an extensively analyzed topic that will not be reviewed here. I point out only that meeting a universal service obligation could be done within a pricing structure that included marginal-cost based prices for delivery and, separately, for delivery locations.

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[15]An open question, pointed out by Bruno Basalisco, is whether this fixed fee should be set by a regulator on a cost-of-service basis or regulated by a price cap to be independent of realized cost. Notably, the price adjustment method proposed in Brennan and Crew (2016), with implementation in Brennan (2017 and (2018), presumed that the average variable cost of a market-dominant mail service was known. However, this leaves the fixed fee as something that could be set by a price cap, giving the postal operator the incentive to realize location-based efficiencies.

[16]Cigno et al. (2021) noted that USPS examines postal cost and service quality by separate regions in the US. One might imagine that these regions might have different per-location costs and fees.

Network externalities   The marginal cost pricing structure implied by the PRC's density-based rate adjustment assumptions would leave senders paying the full price of to deliver mail and recipients the full price for being able to receive mail. This is efficient only if senders are the sole beneficiaries of sending an individual piece of mail, and recipients are the sole beneficiaries of being able to receive mail. Under this pricing structure, senders would mail letters only if the marginal benefit to them of doing so exceeds the marginal cost of delivery, and recipients would choose to be able to get mail only if the marginal benefit to them of doing so exceeds the marginal cost of adding a location for the postal operator to deliver mail.

It is unlikely if not inherently impossible that benefits fall in exactly this pattern. For at least some mail, the recipients benefit from getting it, whether correspondence from a friend, a magazine to read, notification of a government benefit, a bill to pay to ensure continuation of a service, or advertising for products of interest. Without such benefits, recipients would be unlikely to place any value on being able to receive mail. Similarly, senders benefit from having a larger number of recipients and perhaps some specific ones as well; this is an economic justification for ensuring universal service.

It is not clear what this implies. One could say in principle that senders should pay something for each location of their mail to subsidize recipients signing up to get mail. However, one could also say that recipients should pay a surcharge for signing up to subsidize senders for mail the recipients want to receive. If these subsidies fall within the revenue requirements of the postal operator, it is not clear which direction of the subsidy is the biggest. They could in principle cancel out, leaving the same marginal cost pricing structure as before. Which way they should go could be a worthwhile topic for empirical research.

Opting out: The wrong cost function?   Having recipients at delivery locations pay a fixed fee for the ability to get mail invites the possibility, if not the inevitability, that some will choose not to get mail. Along with the network externality issue posed above, this possibility forces a more careful consideration of the PRC's implicit cost function. Its definition of delivery locations does not distinguish between locations the postal operator passes and locations to which the postal operator delivers. Under the current postage-only pricing structure, all locations receive mail without having to pay a fee to do so.

This distinction matters because the marginal cost of delivering to a location a postal operator is already passing—an office in a building, an address in a community postal box, a house along a street—may be much lower than the cost of adding a location, such as a new street or office building, not already along a route. One could and probably should interpret the PRC's measure of density as based on volume per location passed, not volume per location electing to get mail, because there is no measure of the latter.

This does not eliminate the efficiency of covering postal costs through both volume-based postage and volume-independent location charges. At minimum, this allows marginal cost pricing of delivery, presumably more efficient than current

surcharge-based methods. However, if the marginal cost of delivering to a location already along a served route is low, there is little to be gained by letting people decline delivery. Charging a volume-dependent marginal delivery fee based on the PRC's cost function would provide too great an incentive to opt out.[17] This suggests that a delivery fee has merit, but not one where a recipient could opt out, but would rather be mandatory. Such a fee, essentially a location tax to fund postal service, is likely to be politically controversial, for reasons presented above in this section.

7   Conclusion

The US Postal Regulatory Commission recently concluded a statutorily mandated review of the pricing system used to cover the cost of the US Postal Service, the US postal operator. In its Order No. 5763, the PRC (2020), among many other things, adopted a formula to adjust postal rates in light of declining mail volume. Brennan and Crew (2016) proposed a formula to do this, and the PRC's formula was similar in many respects, but not identical. It omitted any adjustment of rates to take into account the possibility that adjusting rates upward will induce a further decline in volume.

More importantly, the PRC based its formula not on changes in volumes but in changes in "density," that is, volumes per location. The PRC's use of density implies that average cost per unit of providing mail service is constant as long as density is constant. This implies that the cost of mail delivery is the sum of two things: the marginal cost of delivering a letter times the quantity of letters, and the marginal cost of serving a location times the number of locations. No fixed costs are included. This implication first raises issues regarding rationales for having a monopoly postal provider, both locally and nationally. The PRC's rate adjustment formula is correct given its density-based method, assuming marginal costs of deliver and of locations are constant and that what it refers to as "institutional costs" equals the product of the number of locations times the marginal cost of serving a location. However, this measure suggests consideration of funding the postal service not through surcharges on postage above marginal cost, but using marginal cost pricing of letters along with marginal cost based fixed charges for locations, the latter perhaps mandatory.

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[17]Ability to opt-out of subscription could lead recipients to share a postal delivery location, e.g., one house on a residential block. On the other hand, one could imagine different fees for home delivery, delivery to a shared box, and picking up mail at a post office.

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Chapter 10
E-Commerce, Parcel Delivery and Environmental Policy

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1 Introduction

E-commerce has been growing significantly and the Covid epidemic has further accelerated this trend. Its expansion has been raising many regulatory issues, ranging from competition policy questions to issues of profit shifting. In addition to these traditional issues, the environmental impact of the sector has been subject to

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ever increasing scrutiny and the appeals for policy intervention have become increasingly pressing.

We study the design of environmental policy in the e-commerce sector. Environmental protection, particularly the limitation of CO_2 emissions, is a concern that is relevant for all economic activities, and should be addressed via a consistent and well-designed economy-wide CO_2 policy. However, in reality such a policy does at least currently not exist. The environmental impact of the e-commerce sector has been widely debated in the media and in political circles. Furthermore, the appropriate regulatory design in this sector raises specific questions. First, one has to determine the appropriate "level" of intervention along the value chain. Should the policy target the retailer, the producer, or the delivery operator? Alternatively, is an intervention at all levels desirable and necessary? Second, which instrument should be used at a specific level in the vertical chain? Possible options include a carbon/emissions tax that could be levied wherever the emissions are generated or concentrated on the final product. A specific tax per parcel delivered at home has also been discussed. Many regulators are also tempted by more "command and control" oriented policies like restrictions on the vehicles used for delivery.

To get some insight into this issue, we consider a model with two retailers/producers who sell a differentiated product and two parcel delivery operators. The production, retailing and delivery of these goods generates CO_2 emissions. We assume that the cost of production and the cost of delivery decrease with the level of emissions, at least up to some level. It is more expensive for the producers and the delivery operators to use "green" technologies, they have no incentive to reduce their emissions despite the fact that these emissions create a global (atmosphere) externality which is a potential source of global warming and climate change. We assume that this negative externality is not internalized in the individual decisions of all economic actors along the value chain.

We consider different scenarios reflecting the type of competition and the vertical structure of the industry. In the reference scenario all firms (upstream and downstream) are independent and behave competitively so that retail prices and delivery rates are set at marginal costs. Then we consider a setting where all firms remain independent but where there is imperfect competition which involves strategic interactions and yields a (subgame perfect) Nash equilibrium. Finally, we assume that there is vertical integration between one of the retailers and one of the delivery operators. The vertically integrated firm may or may not exclusively deliver via its own delivery operator.

The different scenarios yield different equilibria, implying different levels of emissions and outputs. The market structure also affects the environmental policy because this one has to account for the adjustments induced in the market and in particular the pass-through of taxes to consumers.

In all cases the equilibria are inefficient for two reasons. First, at both stages of the value chain (production/retailing and delivery), the levels of emissions are too large (given the output levels - the number of items produced and delivered). Second the levels of outputs are not efficient because the cost of emissions is not reflected

by consumer prices. Under perfect competition, output levels are too large, but this effect is mitigated under imperfect competition.

We show that in the perfect competition scenario a uniform Pigouvian tax on emission, reflecting the marginal social damage, is sufficient to correct both types of inefficiencies. The same result can be achieved by a Pigouvian subsidy on emission reductions. Under imperfect competition a Pigouvian emissions tax is also necessary, but it should to be supplemented by positive or negative taxes on the quantity of good produced and delivered. The specific design of these instruments is affected by vertical integration.

2   The Model

Consider an e-commerce sector with two producers/retailers, $j = A$, B and two delivery operators, $i = 1$, 2. Consumer prices are denoted p_A, p_B and demand function by $x_A(p_A, p_B)$ and $x_B(p_A, p_B)$. They are obtained by solving

$$\max_{x_A, x_B} U(x_A, x_B) - p_A x_A - p_B x_B \tag{10.1}$$

Production costs of retailers $j = A$, B are denoted $y_j k_j(e_j)$, where y_j is the number of items produced, while e_j represents the level of emissions per unit of good produced. We assume that

$$k_j'(e_j) < 0 \ \text{ for } \ e_j < \overline{e}_j \quad \text{and} \quad k_j'(e_j) = 0 \ \text{ for } \ e_j \geq \overline{e}_j. \tag{10.2}$$

This assumption represents the property that producing and retailing in a less polluting way is more costly. Formally this means that increasing emissions decreases cost at least up to some level $\overline{e}_j$.

Delivery costs of operator $i = 1$, 2 are given by $c_i(y_i, e_i)$, where y_i is the number of parcels delivered and e_i is emissions per parcel delivered. Assume for simplicity that:

$$c_i(y_i, e_i) = C_i(y_i) - \gamma_i(e_i) y_i, \tag{10.3}$$

where

$$\gamma_i'(e_i) > 0 \quad \text{for} \quad e_i < \overline{e}_i \quad \text{and} \quad \gamma_i'(e_i) = 0 \quad \text{for} \quad e_i \geq \overline{e}_i. \tag{10.4}$$

This is the counterpart to expression (10.2) and implies that delivering in a less polluting way is more costly.[1] Observe that both for retailers and delivery operators, the same level of output can be produced by different combinations of inputs where the use of each particular input entails a different emission level.

Total emissions, E, have a social cost $\psi(E)$. Observe that only total emissions matter irrespective of their origin, which is the case for global externalities like climate change resulting from concentrations of CO_2 in the atmosphere.

2.1 Laissez-Faire

Since there is perfect competition in the delivery segment and the services offered by operators 1 and 2 are considered as perfect substitutes, there is a unique delivery rate r, is endogenously determined in equilibrium to equalize demand and supply. Delivery operators choose $e_i = \overline{e}_i$ for $i = 1, 2$. Their respective supply function $y_i(r)$ is determined by

$$C_i'(y_i) - \gamma_i(\overline{e}_i) = r \quad \text{for} \quad i = 1, 2$$

Turning to the production/selling segment, retailers choose $e_j = \overline{e}_j$ to minimize their production cost. By assumption, retailers are price takers so that $p_j = k_j(\overline{e}_j) + r$ for $j = A, B$.

In equilibrium demand must equal supply both in the production and the delivery part of the value chain, where the demand for delivery services addressed to operators 1 and 2 equals total demand for goods produced and sold by retailers A and B. Formally this is expressed by the following conditions.

$$y_A(r) + y_B(r) = y_1(r) + y_2(r) = x_A\left(k_A(\overline{e}_A) + r, k_B(\overline{e}_B) + r\right) + x_B\left(k_A(\overline{e}_A) + r, k_B(\overline{e}_B) + r\right)$$
$$y_A(r) = x_A\left(k_A(\overline{e}_A) + r, k_B(\overline{e}_B) + r\right); \quad y_B(r) = x_B\left(k_A(\overline{e}_A) + r, k_B(\overline{e}_B) + r\right)$$

Total emissions are $E = \overline{e}_1 y_1(r) + \overline{e}_2 y_2(r) + \overline{e}_A y_A(r) + \overline{e}_B y_B(r)$.

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[1] This is a reduced form of a model where the firms invest in emission reducing technologies. Formally we would then have $e \equiv e(g)$ where g is investment per unit of y in reducing e and $e'(g) < 0$. Rewrite $k_j(e) \equiv k_j(e(g_j))$ and $\gamma_i(e) \equiv \gamma_i(e(g_i))$, then yields our formulations.

2.2   First-Best Allocation

The first-best allocation (FB) is obtained by maximizing total surplus net of the social cost of emissions. With Eq. (10.3), we obtain the following Lagrangian expression:

$$
\begin{aligned}
\mathcal{L} = & U\left(x_A, x_B\right) - k_A\left(e_A\right)x_A - k_B\left(e_B\right)x_b - C_1\left(y_1\right) + \gamma_1\left(e_1\right)y_1 \\
& - C_2\left(y_2\right) + \gamma_2\left(e_2\right)y_2 - \psi\left(y_1 e_1 + y_2 e_2 + x_A e_A + x_B e_B\right) \\
& - \mu x_A + x_B - y_1 - y_2],
\end{aligned}
$$

where μ is the multiplier associated with the constraint requiring that all sales are delivered, while $y_1 e_1 + y_2 e_2 + x_A e_A + x_B e_B = E$ is the total level of emissions.

The FOCs (first-order conditions) w.r.t x_j, y_i, e_j, e_i are respectively given by

$$
\frac{\partial \mathcal{L}}{\partial x_j} = U_j - k_j\left(e_j\right) - e_j \psi'\left(E\right) - \mu = 0, \tag{10.5}
$$

$$
\frac{\partial \mathcal{L}}{\partial y_i} = -C_i'\left(y_i\right) + \gamma_i\left(e_i\right) - e_i \psi'\left(E\right) + \mu = 0, \tag{10.6}
$$

$$
\frac{\partial \mathcal{L}}{\partial e_j} = -k_j'\left(e_j\right)y_j - y_j \psi'\left(E\right) = 0 \tag{10.7}
$$

$$
\frac{\partial \mathcal{L}}{\partial e_i} = \gamma_i'\left(e_i\right)y_i - y_i \psi'\left(E\right) = 0 \tag{10.8}
$$

Using $*$ to denote FB values, combining (10.8) and (10.7) yields:

$$
-k_j'\left(e_j^*\right) = \gamma_i'\left(e_i^*\right) = \psi'\left(E^*\right) \tag{10.9}
$$

These equations state that the private marginal benefit (cost reduction) of emissions from retailer j and delivery operator i should be equal to the marginal social damage per unit of good produced and delivered.

Equation (10.6) implies that

$$
C_1'\left(y_1^*\right) - \gamma_1\left(e_1^*\right) + e_1^* \psi'\left(E^*\right) = C_2'\left(y_2^*\right) - \gamma_2\left(e_2^*\right) + e_2^* \psi'\left(E\right) \tag{10.10}
$$

so that the social marginal cost of delivering one parcel should be the same for the two delivery operators.

Now combining (10.5) to (10.6) yields:

$$
U_j = k_j\left(e_j^*\right) + C_i'\left(y_i^*\right) - \gamma_i\left(e_i^*\right) + \left(e_i^* + e_j^*\right)\psi'\left(E^*\right) \tag{10.11}
$$

This equation states that the marginal willingness to pay for good j should be equal to the sum of private and social marginal cost of producing and delivering it.

2.3 Decentralization

We now study how the FB allocation can be decentralized under perfect competition. Potential instruments are: a linear tax on each unit of good produced t_j, a linear tax on each parcel delivered δ_i and a linear tax on the pollution emitted by producing and delivering the good τ.

Retailer j solves for given prices p_j and τ

$$\max_{y_j, e_j} \quad \left(p_j - t_j\right) y_j - r y_j - y_j k_j\left(e_j\right) - \tau y_j e_j. \tag{10.12}$$

The FOCs w.r.t y_j and e_j are given by

$$\left(p_j - t_j\right) - r - k_j\left(e_j\right) - \tau e_j = 0 \tag{10.13}$$

$$-y_j k_j^{'}\left(e_j\right) - \tau y_j = 0 \tag{10.14}$$

Parcel delivery operator i solves

$$\max_{y_i, e_i} \left(r - \delta_i\right) y_i - C_i\left(y_i\right) + \gamma_i\left(e_i\right) y_i - \tau y_i e_i \tag{10.15}$$

The FOCs w.r.t y_i and e_i are given by

$$\left(r - \delta_i\right) - C_i^{'}\left(y_i\right) + \gamma_i\left(e_i\right) - \tau e_i = 0 \tag{10.16}$$

$$\gamma'\left(e_i\right) y_i - \tau y_i = 0 \tag{10.17}$$

The FOCs of the consumers' problem (10.1) are given by

$$U_j - p_j = 0 \tag{10.18}$$

From (10.14) and (10.17) and using (10.9), we must have:

$$\tau = \psi'\left(E^*\right) \tag{10.19}$$

This is the classical equation of a Pigouvian taxation of emissions. Furthermore, combining (10.13), (10.16), (10.18) and (10.19) yields (10.11) with $t_j = \delta_i = 0$.

In words, the optimal solution can be achieved by a uniform tax on emissions at all levels (production and delivery). As explained above, what matters is the total

amount of emissions irrespective of their origins. So one should tax a ton of CO_2 the same way wherever it is emitted during the production or the delivery phase. This result is interesting because it shows that we are able to correct two inefficiencies generated by a laissez-faire approach with a same and unique tool, contrary to the classical rule of "one instrument for one issue." In this *LF* situation, *(i)* the level of emissions per unit of output is too large (both upstream and downstream); *(ii)* the consumer price does not reflect the social cost of pollution so that output levels will be too large. As usual, the emissions tax achieves the correct level of emissions. Furthermore, under perfect competition with marginal cost pricing, the tax is fully reflected in the price charged by producers. Consequently, the consumer price also increases so that it now reflects the (marginal) social cost of emissions and solve the second inefficiency.

Before turning to imperfect competition, two remarks are in order.

2.3.1   Subsidizing Emission Reduction

Note that rather than taxing emissions we could subsidize emission reductions $(\overline{e} - e_i) y_i$. Denoting the subsidy s, the producer and delivery operator's profit functions would then respectively be given by

$$\pi_j = (p_j - t_j) y_j - ry_j - y_j k_j (e_j) + s(\overline{e}_j - e_j) y_j$$
$$\pi_i = ry_i - C_i (y_i) + \gamma_i (e_i) y_i + s(\overline{e}_i - e_i) y_i,$$

which differs from (10.12) to (10.15) only by a constant so that nothing changes, and we have of course

$$s = \psi'(E^*).$$

This may at first be surprising, but one has to realize that when emissions reductions are subsidized, emissions have a positive marginal cost: increasing e_j and e_i reduces the subsidy!

2.3.2   Inefficiency of Uniform Quotas

Another interesting point is that the FB implies in general that delivery operators and producers have different emission levels (unless their cost functions are identical). The solution will imply thus different emissions levels (per unit of output) for the different actors. Consequently, uniform emissions quotas or emission standards cannot implement the FB and may actually reduce welfare.

3   Imperfect Competition

While the perfect competition case provides an interesting benchmark, in reality
market power appears to be pervasive in the e-commerce sector. Consequently, it is
important to revisit our analysis in a setting of imperfect competition, possibly com-
bined with vertical integration. Market power typically implies that firms reduce
their output in order to keep prices high. Now, when the good is polluting this output
reduction may, at least in part, be socially desirable. However, imperfect competi-
tion does not in itself provide any incentives to retailers or delivery operators to
adopt cleaner production technologies.

We study two settings of imperfect competition. In the first one, there is no verti-
cal integration; all retailers and delivery operators are independent. In the second
one we assume that one of the retailers is vertically integrated with a delivery opera-
tor. We further assume that the integrated delivery operator only delivers the product
sold by the integrated firm, but the latter may choose to deliver part of its sales via
the independent delivery operator. Alternative types of vertical restraints could be
considered but to avoid a multiplication of scenarios, we concentrate on this empiri-
cally appealing case.

3.1   *Independent Retailers and Delivery Operators*

The model is similar to the basic model with emissions both in production and in
delivery. However, we no longer assume perfect competition. We introduce the
taxes considered above from the outset (to avoid repetitions). Recall that these are a
linear tax on each unit of output produced t_j, a linear tax on each parcel delivered δ_i
and a linear tax on emissions generated by the production and the delivery τ. The
laissez-faire equilibrium can be obtained by setting all the taxes equal to zero. The
timing, inspired by Borsenberger et al. (2021a), is as follows.

1. Delivery operators choose r_1, e_1 and r_2, e_2.
2. Retailers choose p_A, e_A and p_B, e_B.
3. Consumers choose x_A and x_B.

We determine the subgame perfect equilibrium and solve the game by backward
induction.

3.1.1   Equilibrium

Stage 3 Nothing changes for consumers who continue to solve (10.1), yielding
demand functions $x_j(p_A, p_B)$ for $j = A, B$.

Stage 2 Retailer j chooses p_j, e_j to solve

$$\max \pi_j = \left(p_j - t_j - \min\{r_1, r_2\} - k_j(e_j) - \tau e_j \right) x_j(p_A, p_B).$$

The FOCs are given by

$$x_j + \left(p_j - t_j - \min\{r_1, r_2\} - k_j(e_j) - \tau e_j \right) \frac{\partial x_j}{\partial p_j} = 0 \quad \text{for} \quad j = A, B, \quad (10.20)$$

$$-k_j^{'}(e_j) - \tau = 0, \quad (10.21)$$

which yields $x_j(t_j, \min\{r_1, r_2\}, \tau)$ and $e_j(\tau)$.

Stage 1 Delivery operators solve

$$\max_{r, e_i} \pi_i = \left(r_i - \delta_i + \gamma_i(e_i) - \tau e_i \right) y_i - C_i(y_i).$$

Since delivery services are prefect substitutes, we have Bertrand competition which, with a strictly convex cost function, yields marginal cost pricing so that

$$r = \delta_i - \gamma_i(e_i) + \tau e_i + C_i^{'}(y_i) \quad \text{for} \quad i = 1, 2 \quad (10.22)$$

$$\gamma_i^{'}(e_i) - \tau = 0 \quad (10.23)$$

Each delivery operator chooses the same delivery price because otherwise the operator with the higher price has a zero demand from retailers.

3.1.2 Implementation of the FB

The first-best solution is the same as the one derived in Sect. 2.2. Recall that in a first best one has to satisfy eq. (10.9) so that one needs again

$$\tau = \psi'(E).$$

In words the emissions tax continues to be given by the Pigouvian rule. With this level of emission taxes eq. (10.10) continues to be satisfied because of pure Bertrand competition on the delivery side.

On the retailer side, we have

$$U_j = k_j(e_j) + C_i^{'}(y_i) - \gamma_i(e_i) + \left(e_i + e_j \right) \psi'(E),$$

so that the social marginal cost of delivery is equalized across retailers.

However, we now need one more instrument to ensure that consumer prices are set at the optimal level. This is because under imperfect competition an increase in marginal cost is not passed on to consumers on a one-by-one basis. Combining (10.20) and (10.22), we have:

$$U_j = t_j + k_j\left(e_j\right) + \delta_i - \gamma_i\left(e_i\right) + e_i\psi'\left(E\right) + C_i'\left(y_i\right) + e_j\psi'\left(E\right) - \frac{x_j}{\dfrac{\partial x_j}{\partial p_j}}$$

In order to satisfy (10.11), that is to get the correct level of the consumer prices, one thus needs either:

$$t_j = \frac{x_j}{\dfrac{\partial x_j}{\partial p_j}} < 0 \; ; \quad j = A, B \qquad (10.24)$$

$$\text{and} \quad \delta_i = 0, \qquad (10.25)$$

or

$$t_j = 0$$

$$\text{and} \quad \delta_i = -\frac{x_j}{\dfrac{\partial x_j}{\partial p_j}} < 0, \quad i = 1, 2.$$

This is in line with the "classical" result that under imperfect competition implementing the FB requires a subsidy because prices are too high. In our case, either the production or the delivery must be subsidized.

As already mentioned in the *laissez-faire* equilibrium where emissions are not taxed, this effect goes in the right direction because it reduces output, which is otherwise too large because of pollution. Depending on the cost of pollution and the extent of market power, the output may the be smaller or larger than the socially optimal one. However, when emissions are taxed, we return to the case where market power is detrimental to welfare, since price will be too large.

3.2 Integrated Firm I and Foreclosure

We now assume that retailer A and delivery operator 1 are vertically integrated. We refer to them as the integrated firm I. We assume that the integrated delivery operator (operator 1) delivers exclusively retailer A's product. In that sense there is

foreclosure. However, retailer A may decide to have part of its sales delivered by operator 2, as long as this proves profitable. (We'll see below in the numerical examples that this may or may not be the case). Indeed, there are two conflicting effects. On the one hand, delivery costs are convex, which implies using both delivery operators. However, in this situation delivery operator 2 has market power and sets its price above marginal cost, a situation that does not encourage the integrated firm to use operator 2's parcel delivery services.

The timing is as follows:

1. The independent delivery operator chooses r_2, e_2
2. The integrated firm chooses p_A, e_A and e_1 and μ which is the proportion of x_A that is delivered by delivery operator 2 at price r_2. Note that a corner solution with $\mu = 0$ is possible if the markup of operator 2 is large. The independent retailer simultaneously chooses p_B, e_B for a given delivery price r_2.
3. Consumers choose x_A and x_B given prices p_A and p_B.

Stage 3 is the same as in the previous sections, so we concentrate on the other two stages. Due to space limitations, we skip most of the formal expressions. The complete proofs can be found in the working paper version Borsenberger et al. (2021b).

3.2.1 Stage 2

The integrated firm chooses to:

$$\max_{p_A,\mu,e_A,e_1} \left(p_A - t_A - k_A\left(e_A\right) - \tau e_A\right)x_A\left(p_A,p_B\right) + \left(\gamma_1\left(e_1\right) - \delta_1 - \tau e_1\right)\left(1-\mu\right)x_A\left(p_A,p_B\right)$$

$$-C_1\left(\left(1-\mu\right)x_A\left(p_A,p_B\right)\right) - r_2\mu x_A\left(p_A,p_B\right).$$

We assume an interior solution for all variables except possibly for μ for which a corner solution at $\mu = 0$ is a possibility that cannot be ruled out. As discussed above and illustrated by the numerical examples below, the integrated firm may prefer to deliver all its parcels via its own delivery operator.

The independent retailer B chooses p_B and e_B such that:

$$\max_{p_B,e_B} \pi_B = \left(p_B - t_B - r_2 - k_B\left(e_B\right) - \tau e_B\right)x_B\left(p_A,p_B\right)$$

Each player's FOCs implicitly define their best-response functions, and the Nash equilibrium must satisfy all of them. This yields the equilibrium of the second stage induced by the choices of the independent delivery operator (r_2, e_2) made in the first stage and by the various taxes $p_A(t_A, t_B, r_2, \tau, \delta_1 \delta_2)$, $p_B(t_A, t_B, r_2, \tau, \delta_1, \delta_2)$, $\mu(t_A, t_B, r_2, \tau, \delta_1, \delta_2)$, $e_A(\tau)$, $e_B(\tau)$, $e_1(\tau)$.

3.2.2 Stage 1

The independent delivery operator chooses r_2, e_2 anticipating the induced equilibrium in stage 2. Formally, it solves

$$\max_{r_2, e_2} \left(r_2 - \delta_2 + \gamma_2 \left(e_2 \right) - \tau e_2 \right) \left(x_B \left(p_A \left(. \right), p_B \left(. \right) \right) + \mu \left(. \right) x_A p_A \left(. \right), p_B \left(. \right) \right)$$

$$- C_2 \left(x_B \left(p_A \left(. \right), p_B \left(. \right) \right) + \mu \left(. \right) x_A \left(p_A \left(. \right), p_B \left(. \right) \right) \right). \tag{10.26}$$

3.3 Implementation

We now examine how the first-best solution can be achieved with this game by the use of the considered tax instruments. Combining the (10.8), (10.7), with the FOCs defining the equilibrium shows that we again need a linear Pigouvian tax on emissions so that

$$\tau = \psi' \left(E \right).$$

To obtain the levels of the other instruments, we again have to combine the FOC for the first-best with those characterizing the equilibrium of the game and then solve for the relevant instrument. This yields

$$t_A = \frac{x_A}{\dfrac{\partial x_A}{\partial p_A}} < 0 \tag{10.27}$$

$$t_B = \frac{x_B}{\dfrac{\partial x_B}{\partial p_B}} < 0 \tag{10.28}$$

$$\delta_2 = \frac{\dfrac{\partial x_B}{\partial r_2} + \dfrac{\partial \mu \left(. \right) x_A \left(. \right)}{\partial r_2}}{x_B + \mu x_A} < 0 \tag{10.29}$$

The first two of these conditions are identical to their counterparts obtained with independent firms because they are evaluated at the FB to be implemented which is the same in both cases. Consequently, they have the same interpretation. The new feature is that we now need δ_2 as an additional instrument. This is necessary because delivery operator 2's rates no longer reflect marginal costs. Consequently, a correction is needed to achieve the efficient allocation of parcels across operators. The

property that δ_2 is negative (the independent delivery operator must be subsidized) arises because the rate of operator 2 is too high (because of its market power over retailer B).

4 Numerical Illustrations

To illustrate our results, we now present some numerical examples. They are purely illustrative and not calibrated. Nevertheless, they provide some extra insights even though our analytical results are unambiguous. In particular, they allow us to examine how various asymmetries in costs and the environmental quality of production technologies affect the orders of magnitude of the various effects. Furthermore, they show that we can indeed have interior as well as corner solutions for μ in the scenario with the integrated firm.

4.1 The Specification

We used a quadratic utility which yields linear demands. The goods produced by retailers A and B are substitutes. Formally, consumer surplus CS is given by $CS = U(x_A, x_B) + m - p_A x_A - p_B x_B$ where m is the consumer's revenues and U is assumed quadratic and given by

$$U = a_1 x_A + a_2 x_B - b_1 x_A^2 -_2 b_2 x_B^2 - \sigma x_A x_B$$

This yields the following expression for the demand function

$$x_A \left(p_A, p_B \right) = \frac{1}{4b_1 b_2 - \sigma^2} \left[2\left(a_1 - p_A \right) b_2 - a_2 \sigma + \sigma p_B \right],$$

$$x_B \left(p_A, p_B \right) = \frac{1}{4b_1 b_2 - \sigma^2} \left[2\left(a_2 - p_B \right) b_1 - a_1 \sigma + \sigma p_A \right],$$

where we assume that

(i) $b_i > 0$, $i = 1, 2$ so that demands are decreasing in their own price,
(ii) $\sigma = \partial x_A / \partial p_B = \partial x_B / \partial p_A > 0$ so that the goods x_A and x_B are substitutes because the cross-price elasticity is positive; and
(iii) $4b_1 b_2 - \sigma^2 > 0$ to ensure concavity of utilities.

Retailers' unit cost of production is defined by

$$k_j(e) = \kappa_j + (e - \bar{e}_j)^2 \quad \text{for} \quad e \leq \bar{e}_j,$$
$$= \kappa_j \quad \text{otherwise,}$$

where $\kappa_j > 0$. Note that

$$k_j'(e) = 2(e - \bar{e}) \quad \text{for} \quad e \leq \bar{e}$$

The costs of delivery operator i to deliver y parcels $c_i(y, e)$ are given by

$$c_i(y, e) = C_i(y) + y\gamma_i(e_i)$$

where

$$C_i(y) = (\theta_i / 2) y^2$$

and

$$\gamma_i(e) = \eta_i + (e_i - \bar{e}_i)^2 \quad \text{for} \quad e_i \leq \bar{e}_i$$
$$= \eta_i \quad \text{otherwise,}$$

where $\theta_i > 0$ and $\eta_i > 0$. These cost functions satisfy the assumptions made in the analytical part and their interpretations are in line with those discussed there.

The social cost of emissions is given by

$$\psi(E) = \varphi E$$

so that the marginal cost of emissions is constant. Within the context of climate change this would be the social cost of a ton of CO_2.

4.2 Illustrative Results

We start with a symmetric benchmark scenario. The illustration uses the following parameters in the benchmark/symmetric scenario: $a = 100$, $b = 2$, $\sigma = 3$, $\bar{e} = 1$, $\kappa = 1$, $\theta = 1$, $\eta = 1$, $\varphi = 5$.[2] Then we introduce various types of asymmetries.

In all tables, LF_1 refers to the competitive equilibrium; LF_2 is the equilibrium with imperfect competition and independent retailers and delivery operators (Sect. 3.1); LF_3 is the equilibrium with imperfect competition and foreclosure (Sect. 3.2).

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[2] We have dropped the subscripts because we assume perfect symmetry in the benchmark scenario to that the parameters apply to both retailers or delivery operators.

We know from theory that emission taxes are given by $\tau = \varphi = 5$ in all scenarios. To avoid repetition we do not report this in each table. We also know that under perfect competition (case LF_1) this is the only instrument we need.

4.2.1   Example 1: Benchmark/Symmetric Scenario

The different allocations are given in Table 10.1.[3]

When firms are independent (case LF_2), we have $t_A = t_B = -0.046$ while $\delta_1 = \delta_2 = 0$: the production of the goods is subsidized (as noticed in the analytical part of the paper, one could consider the reverse scenario where the delivery is subsidized instead of the production). We can calculate these levels based on the FB without actually calculating LF_2. The fact that $t_A = t_B$ is of course due to the symmetry of the firms. On the other hand, $\delta_1 = \delta_2 = 0$ (or if we consider the reverse scenario where the delivery is subsidized instead of the production, $t_A = t_B = 0$) is a general result we already know from the analytical model.

With integrated firm and foreclosure (case LF_3), we have again $t_A = t_B = -0.046$ but $\delta_2 = -0.082$, while $\delta_1 = 0$: not only the retailers but also the independent delivery operator are subsidized. We know from the analytical results that t_A and t_B are the same as in the case LF_2. Without these taxes, LF_3 leads to bundling and foreclosure, that is the integrated firm does not use the services offered by the independent delivery operator.

We now examine various asymmetric scenarios, which provide a stylized representation of differences in the current environmental properties of the production technologies across delivery operators. Each scenario is identified by the parameters that differ from the benchmark scenario.

4.2.2   Scenario 2: $\eta_1 = 0.8$, $\overline{e}_1 = 1$, $\overline{e}_2 = 0.8$, $\eta_2 = 1$

This scenario represents a scenario in which the independent delivery operator is currently less polluting than its competitor so that its costs are higher. The results are presented in Table 10.2.

Qualitatively the outcomes in this case are similar to the benchmark scenario. We have again bundling in case LF_3 and we continue to have $\delta_2 < 0$. Interestingly the asymmetries in delivery costs do not affect the symmetry of the subsidies on the retailers. This may be at first sight surprising since, due to the possibility to have the corner solution for μ, marginal costs differ in LF_3. However, the FB which is implemented requires that marginal delivery costs are equalized which, along with the fact that demands are symmetric, explains that the t's are equal.

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[3] In LF3, π_1 represents the profits of the integrated firm.

Table 10.1 Benchmark scenario

Scenario	LF_1	FB	LF_2	LF_3
x_A	12	11.51	9.48	11.62
x_B	12	11.51	9.48	5.84
y_1	12	11.51	9.48	11.62
y_2	12	11.51	9.48	5.84
p_A	16	19.39	31.07	35.96
p_B	16	19.39	31.07	41.75
m	13	14.45	10.84	28.52
e_1	1	0.28	1	1
e_2	1	0.28	1	1
e_A	1	0.28	1	1
e_B	1	0.28	1	1
E	48	13	39	34
CS	1008	928	678	542
π_A	0	0	169	–
π_B	0	0	169	59
π_1	72	66	48	304
π_2	72	66	48	143
SWF	912	995	917	803
t_A	t_B	δ_2		
−0.046	−0.046	0		

4.2.3   Scenario 3: $\theta_1 = 1$, $\bar{e}_1 = 1$, $\bar{e}_2 = 0.8$, $\theta_2 = 0.1$

This scenario returns to the case where the η's are the same for all delivery operators. Like in the previous one operator 2 is cleaner (so its delivery services are most costly all other things being equal) but now has a less convex cost function (so its services are less costly all others things being equal, for instance because it is the incumbent and has a larger scale of activity).

The main contribution of this scenario is that it yields an interior solution in LF_3 (a share of the items produced and sold by the integrated firm is delivered by the independent parcel operator) thereby showing that this is indeed a possibility (see Table 10.3). Intuitively, this case occurs when the independent delivery operator's cost advantage dominates the market power effect and as this example suggests this requires a quite drastic difference in the degree of convexity of delivery costs.

4.2.4   Scenario 4: $\theta_1 = 0.8$, $\bar{e}_1 = 1$, $\bar{e}_2 = 0.8$, $\theta_2 = 1$

This scenario is similar to Scenario 2, except that the cost advantage of the more polluting operator is reflected by a lesser degree of convexity of delivery cost. The results presented in Table 10.4 are not very different from Table 10.2 which suggests

Table 10.2 Scenario 2:, $\bar{e}_1 = 1$, $\bar{e}_2 = 0.8$, $\eta_2 = 1$

Scenario	LF_1	FB	LF_2	LF_3
x_A	12.14	11.68	9.96	11.78
x_B	12.14	11.68	9.96	5.89
y_1	12.24	11.55	10.06	11.78
y_2	12.04	11.82	9.86	5.89
p_A	15.04	18.23	30.29	35.20
p_B	15.04	18.23	30.29	41.08
m	13.04	14.29	10.86	28.76
e_1	1.00	0.29	1.00	1.00
e_2	0.80	0.23	0.80	0.80
e_A	1.00	0.29	1.00	1.00
e_B	1.00	0.29	1.00	1.00
CS	1031.23	955.31	694.27	555.36
E	46.14	12.68	37.86	34.17
π_A	0.00	0.00	173.57	312.23
π_B	0.00	0.00	173.57	60.81
π_1	74.88	66.67	50.59	
π_2	71.97	69.82	48.21	146.29
SWF	947.37	1028.42	950.88	903.84
t_A	t_B	δ_2		
−0.049	−0.049	−0.095		

that what matters is the cost advantage and not so much its exact specification (constant or quadratic term).

5   Conclusion

This paper has studied the design of environmental policy in the e-commerce sector. We have considered a model with two retailers/producers who sell a differentiated product and two delivery operators. The production, retailing and delivery of these goods generate CO_2 emissions. At all levels of the value chain, it is more expensive to use "green" technologies.

We have considered different scenarios reflecting the type of competition and the vertical structure of the industry. In all cases the equilibria are inefficient for two reasons. First, both upstream and downstream the levels of emissions are too large (given the output levels). Second the levels of outputs are not efficient because the cost of emissions is not reflected by the consumer prices.

We have shown that under perfect competition a uniform Pigouvian tax on emission, reflecting the marginal social damage, is sufficient to correct both types of inefficiencies. The same result can be achieved by a Pigouvian subsidy on emission reductions. Under imperfect competition a Pigouvian emissions tax is also

Table 10.3 Scenario 3: $\theta_1 = 1$, $\overline{e}_1 = 1$, $\overline{e}_2 = 0.8$, $\theta_2 = 0.1$

Scenario	LF_1	FB	LF_2	LF_3
x_A	13.51	13.03	10.86	10.02
x_B	13.51	13.03	10.86	10.02
y_1	2.46	1.94	1.97	9.30
y_2	24.56	24.11	19.75	10.74
p_A	5.46	8.82	23.98	29.84
p_B	5.46	8.82	23.98	29.84
m	3.46	4.88	2.97	10.30
e_1	1.00	0.29	1.00	1.00
e_2	0.80	0.23	0.80	0.80
e_A	1.00	0.29	1.00	1.00
e_B	1.00	0.29	1.00	1.00
CS	1276.95	1187.71	825.58	703.19
E	49.11	13.51	39.49	37.94
π_A	0.00	0.00	206.40	219.05
π_B	0.00	0.00	206.40	175.80
π_1	3.02	1.88	1.95	
π_2	29.17	29.06	18.70	94.16
SWF	1063.56	1151.11	1061.58	1002.49
t_A	t_B	δ_2		
−0.044	−0.044	−0.154		

necessary, but it has to be supplemented by positive or negative taxes on delivery and production. The specific design of these instruments is affected by vertical integration.

This paper represents just a first step and can be extended in various directions. First, we have lumped together production and retail. Separating them would add another layer in the vertical chain and allow for richer representations of vertical restraints. Our main results can be expected to remain valid in such a setting, in particular the optimality of a Pigouvian emissions tax. However, more instruments would be needed at the retail and production levels.

Second, we have concentrated on a duopoly. Considering a larger number of retailers or delivery operators would have no impact on the results obtained in the baseline scenario. In the other scenarios with imperfect competition the linear emissions tax would remain optimal. The specific expressions for the other instruments would change but the qualitative conclusions would remain unchanged. In particular we would continue to need the (positive or negative) taxes on retailers and/or delivery operators to correct for the distortions created by imperfect competition.

Third, we have neglected three of the issues traditionally dealt with in taxation models, namely, the necessity to raise government revenue, preexisting distortions other than imperfect competition and particularly those due to other taxes, and most significantly, the redistributive (and probably regressive) impact of environmental taxation; see Sandmo (1975), Cremer et al. (1998, 2010) and Goulder (1995). This

Table 10.4 Scenario 4: $\theta_1 = 0.8$, $\bar{e}_1 = 1$, $\bar{e}_1 = 0.8$, $\theta_2 = 1$

Scenario	LF_1	FB	LF_2	LF_3
x_A	12.30	11.83	10.06	12.18
x_B	12.30	11.83	10.06	5.74
y_1	13.66	12.88	11.18	12.18
y_2	10.93	10.78	8.95	5.74
p_A	13.93	17.19	29.56	34.06
p_B	13.93	17.19	29.56	40.50
m	11.93	13.25	9.95	28.45
e_1	1.00	0.29	1.00	1.00
e_2	0.80	0.23	0.80	0.80
e_A	1.00	0.29	1.00	1.00
e_B	1.00	0.29	1.00	1.00
CS	1058.30	979.76	708.90	572.37
E	47.00	12.90	38.46	34.69
π_A	0.00	0.00	177.23	318.95
π_B	0.00	0.00	177.23	57.67
π_1	74.66	66.40	50.01	
π_2	59.29	58.07	39.65	141.11
SWF	957.27	1039.71	960.70	916.64
t_A	t_B	δ_2		
−0.048	−0.048	−0.102		

would make us leave the realm of a first-best solution and require a second-best analysis. While this might have a drastic impact on the output taxes the results of Cremer and Gahvari (2001) suggest that we can expect that the Pigouvian rule would continue to apply for the taxation of emissions (as these do not directly determine consumer prices).

Fourth, we have concentrated on environmental policy and not explicitly considered the possibility that some of the actors may be subject to sectorial regulation. Introducing price regulation for instance would affect the level of taxes used to correct for market power since operators would be unable to set freely their tariff. This also raise the issues of the division of labor and the coordination between sectorial regulator and tax administration(s) regarding taxes and prices settings. Fifth we have ignored the possibility of substitution between e-commerce and brick and mortar retailers. It would raise a number of additional questions and in particular it would require comparing the environmental impact of delivery vs. that of customers driving to stores. This is a challenging and mainly empirical question leading to a fully-fledged research program.

Last and not least, we have neglected the possibility that consumers might care about the environmental friendliness of the products and particularly the delivery; see for instance Cremer and Thisse (1999). In that case delivery operators would no longer be considered as perfect substitutes and the consumers' environmental concern would "internalize" part of the externality and thus lead to an amended

Pigouvian rule (reflecting merely the cost which is not spontaneously accounted for by consumers). Since this might fundamentally affect the strategic interactions and the specification of the game it would require drastic changes in the model. This would not be a mere extension, but essentially represent a different paper. All of these issues are on our research agenda for the future.

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Chapter 11
Assessing Efficiencies and Benefits of "Sustainability Agreements" in the Postal Sector

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In 2019, the EC launched the Green Deal – its plan to make the EU's economy environmentally sustainable (European Commission, 2019). Since then, the increased and sustained focus on environmental sustainability has spurred discussions about whether the competition law framework should be adjusted in the light of the Green Deal.

The application of competition law in the postal sector in Europe has been addressed by various studies (Kjolbye & Malamataris, 2016; Geradin & Malamataris, 2013; Valentiny, 2015; Bohorquez & Neveu, 2019). Those studies, however, have mainly focused on a case-by-case assessment of the European Commission's (EC) decisional practice in the postal sector or on the link between the competition law and regulatory changes in the postal sector.

This paper focuses on a link between environmental sustainability policies and competition law (in particular Article 101 of the TFEU concerning agreements between undertakings or associations of undertakings) and its relevance for players in the postal and delivery sectors. In a recent publication, the Dutch postal sector regulator and competition authority ACM suggested explicitly weighing sustainability benefits against harm from reduced competition when assessing agreements and their compliance with competition law under Article 101 (ACM, 2021a). Similar proposals were discussed by the competition authorities in Greece (Hellenic Competition Commission, 2021), UK (CMA, 2021), and the European Commission

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(2021a). For such sustainability agreements to be accepted, the benefits to the society, including sustainability benefits (e.g., reduced CO2 emissions), must outweigh the costs of reduced competition (e.g., increased prices).

Hence, in this paper we explore three research questions:

1. What is the link between environmental sustainability and competition law?
2. What types of vertical and horizontal agreements between private companies in the postal and delivery sector present sustainability benefits, but may also require an approval by a competition enforcement agency?
3. How can a competition enforcement body, such as ACM, or a party wanting to demonstrate environmental benefits estimate the benefits of sustainability agreements in the postal and delivery sector accruing to postal consumers and the society at large?

This chapter is structured as follows: Sect. 1 defines sustainability; Sect. 2 discusses the link between sustainability agreements and competition law, including the economic test of in-market and out-of-market efficiencies; Sect. 3 presents examples of horizontal and vertical agreements in the postal and delivery sector that present sustainability benefits but could potentially reduce competition; Sect. 4 discusses methods to quantify sustainability benefits; Sect. 5 concludes.

1   Definitions

The European Commission defines sustainable development as "meeting the needs of the present generation without jeopardizing the ability of futures generations to meet their own needs – in other words, a better quality of life for everyone, now and for generations to come" (European Commission, 2021b). It follows closely the original definition of sustainable development offered by the United Nations: "development that satisfies the needs of the present without compromising the ability of future generations to meet their own needs" (Wced, 1987). Such development occurs at the interaction of three dimensions: economic, social, and environmental (Elkington, 1998). This paper focuses on environmental sustainability.

The European Green Deal sets the political action blueprint for what environmentally sustainable development means. All 27 EU Member States have committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce CO_2 emissions by at least 55% by 2030, compared to 1990 levels. In particular, the European Commission proposes more ambitious targets for reducing the CO2 emissions of new cars and vans: 55% reduction of emissions from cars by 2030, 50% reduction of emissions from vans by 2030, and zero emissions from new cars by 2035 (European Commission, 2019). All these ambitions have direct implications for postal sector stakeholders.

2 The Link Between Sustainability and Competition Law

The concept of sustainability is closely linked to the long-term welfare of consumers. For this reason, there is also a clear connection between sustainability and competition policy that pursues consumer welfare too. This section describes the link between sustainability policies and competition law with regard to agreements among competitors.

Article 101 (3) TFEU is explicit regarding the potential benefits of agreements between undertakings. They may be allowed when contributing *"to improving the production or distribution of goods or to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit"*. However, they may not *"(a) impose on the undertakings concerned restrictions which are not indispensable to the attainment of these objectives; (b) afford such undertakings the possibility of eliminating competition in respect of a substantial part of the products in question."*

In a recent publication, the Dutch postal sector regulator and competition authority ACM suggested explicitly weighing sustainability benefits against harm from reduced competition when assessing agreements and their compliance with competition law under article 101 (ACM, 2021a). The ACM's draft guidelines stretch EU competition law to the extent that "sustainability agreements" between private companies would be tolerated if the sustainability benefits of such agreements offset the harm from reduced competition. Companies could enter into sustainability agreements that hamper competition but contribute to a policy objective of the Dutch government or any international standard to which the Netherlands is bound. For such sustainability agreements to be accepted, the benefits to the society, including sustainability benefits (e.g., from reduced CO_2 emissions), must outweigh the costs of reduced competition (e.g., from increased prices).

2.1 In-Market Efficiencies

Under the ACM's proposed approach, competition authorities would have to weigh the likely impact on competition in terms of higher prices against the likely benefits of the cooperation agreement, i.e., effects on sustainability within the relevant market. As part of this exercise, to integrate sustainability into an economic assessment, the benefits accruing to consumers in the market must be quantified in monetary terms. In cases where the agreement has not been executed yet, choice modelling techniques can be used to estimate the willingness to pay (WTP) or willingness to accept (WTA) for the environmental benefit of agreement, e.g., the new service made possible by the agreement or an agreement not to compete on dimensions that increase pollution, e.g., to use only electric vehicles and forego air delivery of mail or parcels.

Determining a consumer's willingness to pay can be challenging. The economic and business literature covers various methods to determine a consumer's willingness to pay, ranging from simply asking consumers directly to more complex experimental setups to infer willingness to pay. These methods have been long applied in postal economics too. For instance, to target customer groups with different needs and willingness to pay, some postal operators adopt the strategy to introduce a wide spectrum of different products with different list prices (Copenhagen Economics, 2012). We describe these methods in Sect. 4 below.

In addition, an individual might not always exactly know its own willingness to pay in all detail and its willingness to pay might not flawlessly reflect its true perception of importance of a sustainability benefit (Ito & Zhang, 2020). For example, the question "What would I be willing to pay for cleaner air?" is not one which you can easily find the answer to. Hence, any estimation method would have to deal with bounded rationality (e.g., by providing full information to the respondent), which means that revealed preferences methods may not be trusted. Secondly, individuals tend to view willingness to pay as private information and might be reluctant to share this information in abundance.

2.2 Out-of-Market Efficiencies

Paragraph 43 of the 81(3) Guidelines requires that *"[…] efficiencies achieved on separate markets can be taken into account provided that the group of consumers affected by the restriction and benefiting from the efficiency gains are substantially the same"* (emphasis added). A strict interpretation of the Guidelines would leave no room for out-of-market efficiencies in the economic test. Most environmental sustainability benefits, however, are enjoyed by society rather than by a group of consumers in a specific market. When companies for example cooperate to enhance production standards that lead to cleaner air, the benefits of cleaner air are enjoyed by others besides the customers of the respective companies.

In some cases, competition authorities extend their analysis to out-of-market efficiencies. For example, ACM seems open to considering broader sustainability benefits stemming from horizontal agreements. The Dutch guidelines also describe who should be the beneficiaries of such benefits. The ACM acknowledges the importance of considering all groups of beneficiaries. Paragraph 43 of the Dutch guidelines states the following: *"… users (buyers) of the products that are the object of an agreement must be allowed a fair share of the benefits. These can be current users as well as future ones. In addition, these can be direct users as well as indirect ones, lower in the production chain, and (finally) the end-user."* (ACM, 2021b). Hence, the set of beneficiaries seems to be enlarged beyond the immediately and directly affected consumers.

In this case, the relevant question is: What is the incremental contribution of the sustainability agreement to the wider reduction of CO_2 emissions? What is the impact of such a reduction on the well-being of current and future generations of

citizens? We can use different techniques to answer these questions, including choice modelling, abatement costs and discount factors.

We find that when environmental effects are included in a competition assessment, the time horizon for assessment matters, as competitive effects are typically evaluated over a comparatively short time period, typically 2–3 years. However, as also acknowledged by the ACM, sustainability benefits often only become substantial in the long term, e.g., the benefits from reduced air pollution on ecosystems. Moreover, the time horizon as well as the effects of sustainability benefits are to some extent uncertain (Heal & Millner, 2014). If a delivery operator installs a solar powered heating system in its postal network, the effects of such a change on the local and global air quality as well as the time horizon for such effects to materialize are difficult to predict with standard modelling techniques.[1] Technological advances, political and social opinions, and more general changes in the climate add to the uncertainty.

To combat the abovementioned uncertainty, environmental economics developed non-traditional modelling techniques which help internalize uncertainty and account for the time dimension of preferences and outcomes. One simple non-traditional modelling approach employs social discount rates for environmental impacts that lie in general below market interest rates (Giglio et al., 2015). A lower discount rate entails that more 'weight' is placed on later periods. Hence, the discount rate for environmental impacts should be lower than the normal discount rate used in business/project appraisal, to ensure that adequate weight is placed on the longer term and potential losses in the worst-case scenario (Giglio et al., 2015). Moreover, uncertainty about the discount rate itself can justify focusing on lower rates (Newell & Pizer, 2003).

This means that (a) the usual timeframe of 2 or 3 years for collaboration efficiencies to be realized will underestimate the magnitude of any environmental benefits which may not be realized until far in the future; (b) the assessment should be geared for the high level of uncertainty, i.e., non-traditional modelling techniques focusing on the worst outcome, considering multiple probability distributions of potential outcomes (Heal & Millner, 2014).

3   Examples of Sustainability Agreements in the Postal Sector

In this Section, we turn our lens on the postal sector. Many postal operators are implementing sustainable practices. In most cases, national postal operators are the owners of the biggest vehicle fleets and a substantial real estate network on a national level (Universal Postal Union, 2021). This means that postal operators have a significant environmental footprint. As a result of this footprint, postal operators

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[1] The measurement problem would be the same if the agreement had clauses that restricted competition.

around the world are transitioning their fleets to more efficient vehicles, increasing the energy efficiency of their buildings, and changing their operational models and services to more efficient ones. With the rise of e-commerce, an increasing demand from consumers for sustainable products and delivery solutions provides additional incentives for postal operators to reduce their environmental footprint.

However, no single postal operator can overcome the challenge of full decarbonization alone (The Pathways Coalition, 2018). Market stakeholders will need to cooperate in new ways, sharing ideas, financial resources, and risk. For example, transport providers must adopt emerging technology; retailers and transport buyers need to drive CO_2 reductions in their supply chains; energy providers must continue to drive renewables penetration and ensure grid stability. Some of these cooperation agreements may, however, test the boundaries of competition law.

In this chapter, we explore different types of vertical and horizontal agreements between private companies in the postal and delivery sector which present benefits to the society, including sustainability benefits as well as potential costs of reduced competition.

In terms of *horizontal agreements*, we present several examples:

First, postal operators A and B may agree on a technological standard or to only source input from certain certified suppliers. Both these agreements may reduce CO_2 emissions, while increasing prices due to a reduction in the competitive pressure in the market. For instance, in theory, operators (as well as retailers) could agree on using only eco-friendly packaging for their parcels. This would increase the marginal costs of deliveries and at the same time reduce CO_2 emissions.

Another hypothetical example is where national postal operators (only) through industry association agree on a green certification or a trademark that only national postal operators can get if they comply with certain standards for CO_2 emissions. Whereas the certification might promote environmental sustainability, it might also hamper competition if this trademark/certification becomes important to attract customers (e.g., if e-retailers require certification to collaborate with delivery operators). Based on the EU case law, even non-binding recommendations by industry associations could result in an inquiry by the competition authority.[2] Hence, it is likely that any agreement between association members could face regulatory scrutiny.

Second, postal operators A and B may agree to reduce the overlap of their delivery networks to reduce congestion and emissions in city centers. This agreement

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[2] See, for instance, *IAZ International Belgium v Commission* (96/82) where a recommendation made by an association of water-supply undertakings that its members should not connect "unauthorized" appliances (without a conformity label supplied by another Belgian trade association) to the mains systems was held to be binding decision capable of restricting competition within the meaning of Article 101(1).

results in less choice to final consumers (reduced competition) which, other things equal, makes consumers in the relevant market worse off.

In 2020, such an arrangement was suggested by Deutsche Post for parcel delivery in Germany. Deutsche Post argued that the coverage of one street by various delivery operators on the same day is harmful for the environment. It suggested that municipalities should support operators in setting up a more efficient, consolidated delivery model, where competitors agree on a single operator to execute final mile delivery in a specific area. Competitors would then hand over parcels to said operator and pay a fee for the delivery. Moreover, Deutsche Post suggested that the choice of the final mile deliverer should be based partly on social and environmental criteria.

The agreement was criticized by various other operators (Die Zeit, 2020). Delivery companies such as Hermes and DPD voiced concern that a consolidated system would devalue the competitive advantage of a well-established delivery network, reducing competition, and ultimately harming consumers. Moreover, the study from the German federal association of parcel and express logistics (BIEK Verband) found that the environmental benefits of a consolidated delivery model are small, highlighting the ambiguity of measures towards a more sustainable postal sector (Bogdanski et al., 2019).

Another example is the UPS/TNT merger in 2013 (European Commission, 2013). Despite its final prohibition, the EC had acknowledged a significant share of economic efficiencies. Combining two logistics networks, by eliminating overlaps in both land and air fleets, creates significant scope for cost savings. At the same time, there is a clear scope for CO_2 emission reductions due to the reduction in the number of cars and planes that transport packages. Those environmental benefits were not claimed by the parties; however, it seems uncontroversial that they exist and that they are substantial. Hence, we may only wonder how the UPS/TNT merger had been viewed if sustainability had been part of the assessment. These examples highlight the importance of having sound measures of the benefits (environmental) and drawbacks (reduced competition).

In terms of *vertical agreements*, delivery operator A and retailer B may agree to adopt a new technology or a service which reduces their joint CO_2 emissions but raises their marginal costs of production.[3] The agreement results in higher market prices, which other things equal makes consumers in the relevant market worse off. The incentive to enter into such agreement can be facilitated by environmental regulation. For instance, a court in the Netherlands has ruled that by 2030 the oil giant Shell must reduce its CO_2 emissions by 45% compared to 2019 levels and that the Shell group is responsible for its own CO_2 emissions and those of its suppliers (BBC, 2021). If similar rulings were adopted, for instance, in the e-commerce sector, they could create incentives to enter into a vertical agreement described above.

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[3] The agreement may trigger competition law, if it includes an exclusivity clause, so that retailer B can only buy the new service from operator A; and the operators' position on the relevant markets is such that the agreement does not fall within the vertical block exemption regulation.

An example of a vertical cooperation agreement is between PostNord and Telia (mobile and fixed broadband/telco provider) in Sweden.[4] Telia wanted to increase the return rate of old mobile phones in relation to consumers' purchase of a new phone; however, it faced certain challenges: (i) too high investment in packaging technology, (ii) excessive costs for storing multiple sized boxes, (iii) faster and more efficient to use larger boxes, (iv) practical challenges, e.g., common use of large-scale shipping labels that do not allow a small package, (v) fear of jeopardizing a positive consumer experience. As a result, in cooperation with PostNord, Telia developed custom-made return packaging. This packaging reduces the need for transport capacity and hence, lowers CO_2 emissions. However, in this case, the agreement does not restrict competition as it, for example, does not include an exclusivity clause. But the measurement problem would be the same if the agreement had clauses that restricted competition.

4   Methods to Quantify Sustainability Benefits

When considering the potential efficiencies stemming from an agreement or a merger, ordinary competition assessments distinguish between *in-market* and *out-of-market* efficiencies. The former is considered to accrue to consumers in those markets directly affected by the agreement or the merger. The latter is related to those efficiencies that benefit other consumers, besides those directly affected.[5] Such out-of-market benefits play an important role in the quantification of environmental sustainability benefits in competition cases. In this and the following sections, we discuss both in-market and out-of-market efficiencies.

Quantification methodologies can be divided into four groups, according to whether they generate new data or not, see Fig. 11.1. We categorize revealed preference methods, stated preference methods, benefit transfers, i.e., estimates from other studies, as well as valuation derived from implemented economic instruments, stated policy objectives, and estimations. In this section, we describe each of the four types of methodologies.

4.1   Revealed Preference Methods

Revealed preference methods infer individuals' valuation of sustainability from observed market behavior. Data on individuals' behavior is gathered either directly from the good or service traded or via proxy data from tangent markets. The

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[5] Note the difference with the "nonmarket" concept, used in environmental economics to refer to effects that do not show up in any market, such as existence or option values.

Source: Inderst, R. et al., 2021

Fig. 11.1 Four types of methodologies to quantify sustainability benefits. (Source: Inderst et al., 2021)

valuation is then used to quantify benefits in assessment of agreements or mergers. We find that the following two revealed preference methods in environmental economics are directly applicable in the postal sector:

The first method is the travel cost method (TCM)[6]: Even if the service or good itself is unpriced, many of the other factors employed in the production of a good or service do command prices in markets, and these prices can be used to infer the value of the unpriced service or good (Cameron, 1992). For instance, the visitation of natural areas typically does not command a price in the market, but with the TCM approach it is possible to infer such value using various inputs to the production of a recreational experience. This may include travel to and from the recreational area, local accommodations, and so on (Inderst et al., 2021).

In the postal sector setting the TCM method would ask, for example, how much does someone spend to pick up her parcel from a parcel locker (often considered a more sustainable delivery option than home delivery[7])? To answer this question, one can count the amount of visits of an individual to a specific parcel locker location and the cost for an individual to arrive at the site. Both parameters can be determined by a questionnaire.[8] Multiplying the amount of visits with the cost per visit yields a valuation of pick-ups from parcel lockers.

The second method is Hedonic pricing[9]: With hedonic pricing an individual's willingness to pay for a non-marketed good is observed through its willingness to

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[6] For a more detailed outline of the travel cost method, see Cameron (1992).

[7] It rests on the assumption that home delivery is the standard option and that an individual can choose delivery to a parcel locker as a greener alternative.

[8] Although questionnaires are typically used in Stated preferences methods, they can also be applied in Revealed preferences methods. For example, the questionnaire can be used to ask about objective information, e.g., the number of times a person visits a parcel locker location, which would then be used to infer her willingness to pay.

[9] For a more detailed outline of the Hedonic pricing method, see Harrison Jr and Rubinfeld (1978).

pay for good that is related but marketed.[10] This method derives originally from housing market observations. Besides quantifiable characteristics, such as its size, a price for a house also reflects indirectly priced values, such as local air quality and noise levels. Hedonic pricing models have statistical techniques to isolate the implicit prices of such non-marketed goods from observed, marketed goods.

4.2 Stated Preference Methods

Stated preference methods identify individuals' valuation of sustainability through questionnaires. When conducted on a sufficiently large sample, they can yield accurate results, following the law of large numbers. Stated preference methods also allow to single out the effect that is supposed to be researched, as the questions in a survey can be formulated to explicitly ask about one single effect. The main criticism towards stated preference methods have arisen simply because they are based on behavioral intentions, which can result in an overestimate or underestimate of individual actual values. In particular, an individual might not always exactly know its own willingness to pay in all detail (e.g., due to information asymmetry) and/or its stated willingness to pay might not flawlessly reflect its true perception of importance of a sustainability benefit.

Researchers typically apply two types of techniques of stated preference methods:

The first method is the Contingent valuation method: A contingent valuation method asks participants via a questionnaire to state their willingness to pay for a certain sustainability benefit. This creates a hypothetical market for an otherwise non-marketed good or service. The contingent valuation method can determine valuations for a wide range of non-marketed goods and services. Imagine a random sample of individuals are asked to state their willingness to pay for a green or electrified last-mile delivery compared to a conventional last-mile delivery. Participants' statement then forms the valuation of green or electrified last-mile delivery.

The second method is Choice modelling/conjoint analysis: Choice modelling is able to capture multi-dimensional aspects of valuation, beyond prices only. Different variations of choice modelling have been established:

1. Discrete choice experiments: participants are asked to make a choice between options with different attributes.
2. Contingent ranking: participants rank options with different attributes according to their valuation.
3. Contingent rating: participants rate options with different attributes on a semantic or numeric scale.

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[10] For an example of a hedonic pricing approach to evaluate the impact of farming to maintain rural landscapes on local tourism, see Vanslembrouck et al. (2005).

4. Paired comparison: participants rate options with different attributes and make a choice for one option.

The Chicken of Tomorrow case in the Netherlands is an example where the competition authority applied a contingent valuation method as well as a conjoint analysis (ACM, 2015). In 2015, ACM decided that cooperation between suppliers and retailers to set industry-wide standards for chicken in supermarkets restricted competition disproportionally according to Article 101(3). The initiative aimed to increase animal welfare by setting a standard for chicken sold in supermarkets to be farmed for a lifetime of 45 rather than 40 days and with 19 rather than 21 chicken per square meter. In a survey with 1600 consumers, these were asked to state their willingness to pay for increased welfare directly and could also choose between options with different attributes of chicken welfare and price. The additional consumers' willingness to pay for better chicken welfare was 0.82 EUR per kilo. The additional costs indicated by the initiative were estimated at 1.56 EUR per kilo. This outweighed the benefits, and the ACM found the initiative would not lead to net benefits for consumers and prohibited the standard.[11]

4.3   Benefit Transfer from Related Cases

Conducting the abovementioned methods can be time- and resource-consuming. Hence, it is interesting instead to use previous studies and transfer the values from their results. Moreover, using stated and/or revealed preferences methods raise a fundamental concern: should CO_2 emissions from parcel delivery be valued differently than CO_2 emissions from e.g., flights? It would be logical that the societal value of CO_2 is the same (at least the climate does not care where the CO_2 comes from). And if that is true, using same valuations of sustainability benefits across multiple studies would be an appropriate approach to take.[12]

A benefit transfer uses existing values for non-marketed goods and service from a previous study and transfers these from one study to another one. The existing values than yield an approximation for the valuation of similar non-marketed goods and services in the assessment of the sustainability agreement at hand.[13]

Benefits are usually transferred per unit, e.g., per letter, per parcel, per kilometer driven or per household. For example, the CO_2 emissions can be determined per

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[11] In this case, ACM only considered in-market efficiencies. However, there might still have been a societal willingness to pay for animal welfare, but since that is an externality, it is not captured by the consumers' willingness to pay.

[12] This may not be true for in-market efficiencies, as the value of the CO2 emissions from parcel delivery may be different for a sub-segment of the society, i.e. parcel delivery consumers.

[13] For a more detailed overview over benefit transfers in environmental evaluation, see Wilson and Hoehn (2006).

parcel in one study, transferred to the policy question at hand, and then multiplied by the number of parcels in that context to arrive at total emissions.

The transferred values can also be adjusted to the case-specific context to account for socioeconomic or physical differences in the studies, e.g., differences in population density or geographical conditions. This is achieved by determining the underlying function that leads to the values in the original study and adjusting this function with the socioeconomic and physical parameters of the competition assessment at hand.

4.4   Valuation Derived from Implemented Economic Instruments, Stated Policy Objectives, and Estimations

If a valuation of CO_2 emissions is required and there are no comparable studies from which benefits could be transferred, economists can rely on a two-step approach to quantify sustainability benefits[14]:

Step 1:   Quantify reduction in emissions from a certain agreement. This step may draw on the existing research in the areas of e.g., physics or engineering. The main goal of this step is to identify the quantity of reduction in emissions, e.g., expressed in tons.

Step 2:   Multiply the reduction in emissions identified in step 1 with the price per additional unit of emissions that enters the atmosphere to determine the valuation of emission reduction, following a simplified formula:

Valuation of emission reduction = Emission reduction ∗ Price per unit of emissions

The price for emissions, or any other non-marketed good is called a "shadow price". This price is not established as a market equilibrium but stems from other sources, see the following three examples:

First, Valuation derived from implemented economic instruments: Many jurisdictions have implemented economic instruments to target increased sustainability. In Europe, CO_2 taxes and emission trading schemes have been established. For instance, the European Emission Trading Scheme is world's most developed marketplace for carbon certificates that emitting companies need to acquire. Such schemes can help establish a shadow price per unit of CO_2 emission.

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[14] For an example of such analyses, see Copenhagen Economics (2016).

Second, Valuation derived from stated policy objectives: Politicians agree on a certain policy objective, e.g., the reduction of emission levels by 55 per cent compared to 1990 levels. These policy objectives come with a certain price tag of implementation. Dividing the price tag by the required magnitude of emission reduction e.g., results in a price per unit of emission reduction.

Third, Valuation derived from the estimation of the Social Cost of Carbon (SCC): Implemented economic instruments or stated policy objectives provide carbon prices on a cost basis. What does it cost to implement a "technology" to reduce one unit of emissions? Pricing of CO_2 can, however, also be established from the opposite side, answering the question "What is the harm to society[15] from another unit of pollution (e.g., emissions in the atmosphere)?" Harm in this context can be defined as the loss in socioeconomic welfare, e.g., as health-economic consequences of pollution.

4.5   Illustrative Application of the Quantification Methods

In this section, we discuss which and how the abovementioned quantification methods could be applied on the three types of sustainability agreements in the postal sector identified in Sect. 2.

Consider the first example of sustainability agreements where postal operators A and B may agree on a technological standard or to only source input from certified suppliers (e.g., eco-friendly packaging, green certification). First, using the *stated preferences* approach (also applied by the ACM in the Chicken of Tomorrow case), it would be possible to perform a *contingent valuation* based on a survey. The survey question would focus on asking consumers how much more would they be willing to pay for a parcel/letter if they knew the packaging was sustainable. This can be complemented with another stated preferences method – the *conjoint analysis* – where consumers could be presented with a hypothetical choice between cheaper, but less sustainable packaging and more expensive, but more sustainable packaging.

In the second example, parcel companies' "A" and "B" merge into company "C", resulting in a reduced vehicle fleet (e.g., the UPS/TNT merger blocked by DG COMP) and less congestion in cities. Such agreement may be assessed using both hedonic pricing models and valuation methods. First, *hedonic pricing models* allow to put a monetary value on the reduced congestion by for instance, assessing how much citizens pay for detours to avoid congestion and are willing to accept longer travel times. This reveals the valuation of avoidance of congestion. Also, house prices along congested roads are different from house prices on other roads, all else equal. This reveals the value of quiet roads. Second, *valuation methods* allow

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[15] We note that according to a strict interpretation of Article 101(3), the relevant level of the analysis is limited to consumers of the relevant good or service.

monetizing reduced vehicle fleet. Fewer kilometers driven from more efficient delivery results in less CO_2 emitted, which can be quantified. Using a CO_2-price, one can calculate a monetary value for this reduction.

In the third example, postal operator A and retailer B may agree to adopt a new technology or a service which reduces their CO_2 emissions. It is possible to perform a *valuation derived from estimates on the social cost of carbon* (SCC). Various studies have been carried out on the damages of carbon emissions to society, e.g., due to worsened air quality. These damages are quantified in monetary terms. Hence, the value of reduction in emissions would equal to reduction in damages.

5 Conclusions

The Green Deal and other national sustainability objectives have a high priority on the European postal regulators and policymakers' agendas. At its end, the postal community is discussing how to best contribute to the Green Deal without compromising its primary purpose of ensuring a ubiquitous access of postal services as well as enabling e-commerce growth. Due to Covid-19 restrictions imposed on brick-and-mortar retail, the latter objective is of utmost importance.

This paper aims to show that applying Article 101(3) in agreements that deliver sustainability benefits in the postal sector might encounter certain challenges. The first one concerns the identification of these benefits. We believe that environmental economics could significantly contribute to the understanding of the sustainability objectives as well as the quantification of those. We describe four well established methodologies from environmental economics that can be used to different degrees in quantification of sustainability benefits. The most accurate methods for such exercise are based on gathering new, case-specific data regarding consumers' willingness to pay for sustainability advances. In addition, simpler methods exist which rely on existing information.

The second challenge that may hamper the full potential of sustainability agreements to contribute to the Green Deal is the relatively strict interpretation of benefits to consumers (in particular, Paragraph 43 of the 101(3) Guidelines, see European Commission, 2004). In the case of environmental benefits, there is significant scope for positive externalities when various private entities agree on pushing for sustainable solutions. It is very likely that such advances may benefit the whole society and not only the customers of those firms. Should those externalities be considered when measuring the positive effects of the agreements, firms might have the right incentives to pursue sustainability goals.

Finally, with this paper, we seek to encourage the postal business community to start claiming sustainability benefits, should they be associated with agreements and mergers. It is feasible to quantify such benefits in a concrete and robust manner. It is also possible to present such evidence in a compelling manner to the sctor regulators and/or competition enforcers in line with the current competition framework.

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Chapter 12
The Effects of the Covid-19 Crisis on Postal Markets

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1 Introduction

The Covid-19 pandemic has major economic impacts around the world. Only essential services have been functioning in many countries due to the introduction of extreme measures. The Covid-19 economic crisis is also having several impacts on postal markets. The lockdowns periods in the countries around the world have encouraged the use of e-commerce and the e-substitution of some activities. Therefore, parcel revenues of the main postal operators increased in 2020 compared to 2019. However letters revenues of the main postal operators decreased between 2019 and 2020 more sharply than in previous years (see Table 12.3).

This paper represents the personal views of the authors and should not be taken to represent the position of La Poste.

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The effects of the Covid-19 crisis on postal markets are not exactly the same as the previous subprime mortgage crisis in 2009, which had a negative impact on postal operators' profitability. Then postal operators experienced a decline in sales of both mail and parcel markets.[1]

The purpose of this paper is to estimate the impact of the Covid-19 crisis on postal markets in Canada, Europe and in the United States. This is a difficult exercise given the very recent nature of the crisis. It requires further investigation when more data will become available. Section 2 presents the main Covid-19 effects on the economic situation of European and non-European countries. Section 3 gives a general overview of the evolution of mail and parcel volumes, and turnover for 13 postal operators in recent years, from 2016 to 2020. Then an econometric analysis is carried out on a smaller sample of postal operators (France, Germany, Italy, Portugal and the United States) to identify the main factors underlying the evolution of mail and parcel volumes. Section 4 explores a counterfactual scenario of the mail and parcel volumes evolution assuming that the Covid-19 crisis had not occurred for our sample of 5 postal operators. Section 5 concludes.

2 General Economic Impact of the Covid-19 Crisis

The Covid-19 pandemic has created an unprecedented crisis, even of greater magnitude than that of the 2008–2009 global financial crisis.

According to the April 2021 IMF World Economic Outlook, the global economy is projected to grow at 6 percent in 2021, after an estimated contraction of −3.3 percent in 2020. We have analyzed GDP impact of the crisis for 14 European and non-European countries (see Table 12.1). Not all countries have been impacted by the pandemic in the same way. In some countries (such as France, Italy, Portugal and United Kingdom), the drop in GDP has been significant, while other countries have been much more resilient to the crisis. Norway's GDP fell by only 0.76% in 2020. In Ireland, GDP even increased in 2020.

The main economic impacts have moved from the indirect effects of disruption in international supply chains when the crisis was focused in China to the quasi-freeze out of economic activity during lockdowns afterworld. The severity of the Covid crisis has been different in these countries due to the severity of lockdown measures, the structure of national economies (importance of tourism), the fiscal capacity of governments to counter the collapse in economic activity, and the quality of governance (Sapir, 2020). However there are some similarities in the crisis in these 14 countries.

First the impact of the Covid-19 measures is distributed differently across sectors (European Commission, 2020; Passet & Balboni, 2020; Insee, 2020). The most

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[1] This was the case for Canada Post, Deutsche Post DHL, Le Groupe La Poste, Österreichische Post, Post NL, Poste Italiane, Posten Norge, Posti Group, Royal Mail, Swiss Post and USPS

Table 12.1 Changes in real GDP (Percent change, projections in 2021)

Country	2019	2020	2021
Austria	1.42	−6.59	3.48
Belgium	1.74	−6.42	4.04
Canada	1.86	−5.4	5.05
Finland	1.27	−2.89	2.28
France	1.49	−8.23	5.81
Germany	0.56	−4.9	3.6
Ireland	5.92	2.48	4.23
Italy	0.29	−8.87	4.15
Netherlands	1.68	−3.8	3.5
Norway	0.85	−0.76	3.86
Portugal	2.49	−7.59	3.9
Switzerland	1.11	−2.98	3.49
United Kingdom	1.43	−9.92	5.34
United States	2.16	−3.51	6.39

Source: April 2021 IMF World Economic Outlook

affected sectors are retail businesses, food and accommodations services, aviation, entertainment, tourism and automotive. Some of these sectors are not generally the most unstable and normally are not especially affected by the international business. On the contrary, some others sectors like pharmacy, telecom and non-market-oriented sectors (health, education) have fared better in the crisis.

Second, social distancing and lockdowns have an impact on labor markets. Brodeur et al. (2020) literature review shows that workers who cannot perform their tasks from home are more likely to lose their jobs. Younger individuals and people without university education are more likely to experience drops in their income. Generally the financially vulnerable population has been more affected. And job losses might have been more severe for industries with highly concentrated labor markets (where hiring is concentrated within few employers) and non-tradable sectors (construction, health services).

Finally the Covid-19 crisis has created a surge in e-commerce and deliveries due to social distancing and regulatory measures like forced stores' closures. Consumer's habits in the crisis have changed with massive use of e-commerce and food deliveries. For Copenhagen Economics (2020), this changes of consumer's patterns could be permanent. According to IPC (2020), Covid-19 has seen a surge in domestic B2C e-commerce as consumers continue to buy more goods online. In both Q2 and Q3 in 2020, posts in countries with stricter lockdowns saw faster parcels growth than those with more lenient restrictions. For Eurostat (2021), online shopping is ever more popular in 2020. Online shopping increased by 4 percentage points compared with 2019 and by 10 percentage points compared with 2015. UNCTAD (2020) underlines that online retail grew by 22% in 2020 in 7 countries.[2] This also pushes

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[2] Average for Australia, Canada, China, Korea, Singapore, United Kingdom and United States.

Table 12.2 Average annual growth rate 2016–2019 and annual growth rate 2019–2020 for mail and parcel volumes for 11 postal operators

	Mail volumes		Parcel volumes	
	Average annual growth rate 2016–2019	Annual growth rate 2019–2020	Average annual growth rate 2016–2019	Annual growth rate 2019–2020
Canada Post	−2.5%	−20.7%	13%	19.2%
CTT Portugal Post	−3.7%	−18.5%	12%	41%
Deutsche Post DHL	−5.1%	−10.4%	6.5%	8.8%
Le Groupe La Poste	−4.6%	−18.1%	6.2%	38.1%
Österreichische Post	−1.7%	−9.6%	13.7%	30%
Poste Italiane	−7.9%	−16.7%	15.3%	41.5%
Posti	−12.0%	−15.9%	10.8%	27.4%
PostNL	−7.7%	17.9%	16.9%	19.1%
Royal Mail	−5%	−25.1%	5.7%	30.0%
Swiss Post	−4.4%	−8.5%	6.6%	23.1%
United States Postal Service	−3.4%	−10.3%	4.7%	27.6%

Sources: IPC, postal operators' report

omnichannel distribution like ordering online or via phone from physical stores (McKinsey, 2020).

3 Overview of Postal Sector Data

We gathered annual volume and revenues data for 13 postal operators (bpost, Canada Post, CTT Portugal Post, Deutsche Post DHL, Le Groupe La Poste, Österreichische Post, Poste Italiane, Posten Norge, Posti, PostNL, Royal Mail, Swiss Post and United States Postal Service) between 2016 and 2020.

Complete annual mail and parcel volumes data are available for 11 of 13 operators of our sample. The pandemic seems to have generated a decline in mail volumes that exceeded the trend decline[3] and an increase of parcel volumes that exceeded the pre-existing raising trend (see Table 12.2).

Revenues data are more complete and complete annual mail and parcel revenues are available for all the 13 operators. As Table 12.3 shows the pandemic seems to have generated a decline in mail revenues that exceeded the trend decline for most operators. The pandemic seems to have resulted in an increase in parcel market revenues above the medium-term trend for all operators.

The total turnover of some operators decreased during the pandemic while the turnover of other operators increased. However, most operators registered an

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[3] In 2020, PostNL's mail volumes increased due to the acquisition of the competing operator Saand.

Table 12.3 Average annual growth rate 2016–2019 and annual growth rate 2019–2020 for mail and parcel revenues for 13 postal operators

	Mail revenues		Parcel revenues	
	Average annual growth rate 2016–2019	Annual growth rate 2019–2020	Average annual growth rate 2016–2019	Annual growth rate 2019–2020
bpost	−5.2%	−6.8%	19.2%	32%
Canada Post	−3.3%	−12.9%	12.5%	20.5%
CTT Portugal Post	−3.6%	−10.8%	8.1%	26.6%
Deutsche Post DHL	−5.2%	−2.1%	9.5%	14.6%
Le Groupe La Poste	1.1%	−10.3%	9.0%	40.1%
Österreichische Post	−1.1%	−7.2%	3.9%	46.5%
Poste Italiane	−5.5%	−22.8%	9.5%	36%
Posten Norge	−8.1%	−26.1%	1.9%	5%
Posti	−6%	−5.5%	13.8%	16.2%
PostNL	−19.3%	5.3%	22.4%	26.5%
Royal Mail	−2.4%	−12.5%	7.7%	33.7%
Swiss Post	−3.5%	−3.4%	2.9%	12.9%
United States Postal Service	−3.2%	−7.7%	8.3%	36.6%

Sources: IPC, postal operators' reports

increase in total revenue growth in 2020 (see Table 12.4). Therefore, the positive effects of the pandemic on the parcel market appear to have offset the negative effects of the pandemic on the mail market for most operators of our sample.

4   Econometric Models to Assess Impact of Covid-19

(a) Data and models specification

We tested several econometric models to examine in more detail the effects of the pandemic on the activity of postal operators. We have chosen to present the estimation of two models that explain the impact of the Covid-19 crisis on mail and parcel volumes. The data used in our econometric analysis are quarterly data for 5 countries (France, Germany, Italy, Portugal and the United States), between the first quarter of 2015 and the fourth quarter of 2020 (this set of countries is the one for which we have observation about traffic volumes). The general form of models we consider is as follows:

$$\ln\left(VOL\right)_{it} = \alpha_i + \beta_{1i}\ln\left(GDP\right)_{it} + \beta_{2i}Internet_{it} + \beta_{3i}Covid_{it} + \theta_{1i}Q1_t$$
$$+ \theta_{2i}Q2_t + \theta_{3i}Q3_t + \varepsilon_{it}; i = 1,\ldots,5, t = 1,\ldots,24$$

$$(12.1)$$

Table 12.4 Average annual growth rate 2016–2019 and annual growth rate 2019–2020 for operators' revenues

	Average annual growth rate 2016–2019	Annual growth rate 2019–2020
bpost	14.2%	8.4%
Canada Post	4.1%	4.7%
CTT Portugal Post	2.0%	0.7%
Deutsche Post DHL	3.4%	5.5%
Le Groupe La Poste	3.7%	4.4%
Österreichische Post	0.8%	1.7%
Poste Italiane	1.2%	−5.6%
Posten Norge	−0.8%	−0.9%
Posti	−1.0%	1.9%
PostNL	−5.9%	14.5%
Royal Mail	3.5%	16.6%
Swiss Post	−4.5%	−1.6%
United States Postal Service	−0.3%	6.3%

Sources: IPC, postal operators' reports

where the dependent variable $ln\ (VOL)_{it}$ is the logarithm of either mail or parcel volumes per capita, for a country i at date t, *GDP* is the GDP per capita, *Internet* is the internet penetration in households assumed to capture e-substitution phenomena, Covid is a dichotomous variable equal to 1 if the country is affected by the Covid -19 in quarter t and zero otherwise. Before the first quarter of 2020, this variable is equal to zero in all countries. Starting from the first quarter of 2020 it is equal to 1. Q1, Q2, Q3 are dummies for quarters. The data for mail and parcels volumes come from the IPC database and internal data of Le Groupe La Poste. Data for GDP per capita come from the BEA, Eurostat and the World Bank. Data for Internet come from Eurostat, Statista and the World Bank.

The data used for this analysis are panel data. Standard modelling for this type of data are well known, with random effects and fixed effects models for example. This type of models in their general form assumes the homogeneity of the effects of explanatory variables meaning that in Eq. (12.1), except α_i capturing individual heterogeneity, all other coefficients are constant over individuals (that is, $\beta_{ki}=\beta_k$ and $\theta_{ki}=\theta_k$, $\forall\ i\ and\ k = 1, 2, 3$). Obviously in this analysis we are interested in heterogeneous effects of various explanatory variables. A simple panel model allowing for heterogeneous effects is for example the *random coefficient panel model*, estimated using Weighted Least Squares (WLS) method (Swamy, 1970; Hsiao, 1975; Hsiao & Pesaran, 2004).

An important point to notice is that we consider Eq. (12.1) as a long run relationship between volumes, and GDP and Internet penetration rates. To validate this interpretation and avoid the problem of spurious regression, we must examine stationarity property of these variables. Indeed, to be interpreted as a long run relation, the variables must be either stationary or cointegrated (that is, variables are

non-stationary with a unit root and a linear combination of these variables is stationary). If variables are stationary, standard estimation methods may be applied (for example Ordinary Least Squares in a standard fixed effect model or WLS in a random coefficient model). If variables are cointegrated, we deal with a non-stationary panel model, and standard least squares estimation methods can be still applied but efficiency of estimation is improved by application of dedicated methods such as Fully Modified OLS (FM-OLS) or Dynamic OLS (DOLS). For technical details about these methods for time series data see Phillips and Hansen (1990), Saïkkonen (1991) and Stock and Watson (1993) and for extension on panel data models see Philipps and Moon (1999), Pedroni (2000) and Kao and Chiang (2000).

It is then important to test for unit roots and cointegration of the variables before undertaking estimation of the model. Several different statistical tests exist, dedicated to panel data: for example, Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), or Fischer type tests for unit root, and Pedroni, Kao or Johansen type tests for cointegration (see Pesaran, 2015; Hsiao, 2014 for description of these tests).

Unfortunately, the validity of these tests relies on a "reasonably" large dimension in N and/or T ("asymptotic tests"), and here we work with N = 5 and T = 24. Application of various unit root tests on our data give some contradictory results: in some cases we conclude that variables are "trend stationary" (that is characterized by a deterministic stationarity, without unit root) and in other cases, it seems that variables are integrated with order 1 (that is characterized by stochastic stationarity, with unit root). Similarly, the results on cointegration tests, assuming that variables are integrated with order 1, seem to show that there exists a cointegrating relation between the variables. Again, the small sample size should lead us to be cautious.

For these reasons, we proceeded to the estimation of the model by using the following different methods: WLS in a random coefficient model, OLS and FM-OLS on separate models for each country, and pooled OLS with mixed homogeneous/heterogeneous coefficients (all or some of the variables are interacted with a dummy for each country). Having in mind the caveats mentioned above, results on estimated coefficients seem however robust with all these methods.

We have chosen to present the results from the application of FM-OLS method on separate models for each country. One must keep in mind that all these results are preliminary and that given the small size of the sample, they must be considered with cautious.

(b) Empirical Results

Table 12.5 below shows our preliminary estimation results for the model for mail volumes.

We first notice the good performance of these models, with R^2 around 0.98 for Germany, Italy and France, and around 0.90 for Portugal and US. These results must nevertheless be taken with caution as we are working with a limited number of observations.

According to our first estimations, long run elasticity of mail volumes per capita with respect to GDP per capita is always positive but lesser than 1 for Germany and Italy and greater than 1 for other countries. The long run effect of Internet is

Table 12.5 Estimation of Eq. (12.1) for mail volumes

Variable	Germany		Italy		France		Portugal		USA	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Ln(GDP)	0.9374*	0.2945	0.8289*	0.2020	1.6564*	0.1874	1.5385*	0.6665	1.2658*	0.4823
Internet	−0.0386*	0.0044	−0.0397*	0.0020	−0.0554*	0.0027	−0.0306*	0.0086	−0.0115*	0.0023
Covid	−0.1117*	0.0256	−0.0648*	0.0240	−0.0267	0.0240	0.0144	0.0900	−0.0786*	0.0289
Q1	−0.0431*	0.0153	0.0010	0.0162	0.0167	0.0149	−0.0098*	0.0461	−0.0406	0.0330
Q2	−0.1446*	0.0177	−0.0546*	0.0151	−0.0666*	0.0160	−0.0516	0.0444	−0.1206*	0.0279
Q3	−0.1233*	0.0142	−0.1434*	0.0137	−0.1296*	0.0155	−0.0646	0.0447	−0.1080*	0.0231
C	−1.0332	2.5082	−1.6130	1.7373	−6.8163*	1.6118	−7.1722	5.0555	−6.4324	4.4490
R2	*0.9742*		*0.9836*		*0.9867*		*0.8747*		*0.9141*	

Notes: *: significant at 10%

negative and significant (at 1% level) for all countries. A one-point increase of Internet penetration rate leads to a decrease of almost 4% of mail volumes in Germany and Italy, 3% in Portugal, 5.5% in France and 1.1% in USA, ceteris paribus.

The Covid-19 crisis, as expected, has a negative effect on mail volumes. According to our preliminary results, the most impacted country would be Germany with a decrease by more than 11%, ceteris paribus. This decrease would be of 6.5% in Italy and 7.8% in USA.

Table 12.6 below gives estimation results for the model for parcels volumes.

We can notice here again the good performance of these models, with R^2 between 0.89 and 0.95. Estimated elasticity with respect to GDP are non-significant, except for USA. This may be due to the short time frame. The counterintuitive negative effect of GDP per capita on parcel volumes per capita in the U.S may come from the fact that USPS is facing increased competition in the parcel delivery market from traditional players such as UPS or FedEx, e-retailers like Amazon but also from delivery startups. USPS parcel volumes decreased in 2019 while GDP increased. In 2019, USPS lost market share in comparison with its competitors.[4]

The effect of Internet penetration is positive and significant in all countries. The largest effect is in Germany: a one-point increase of Internet penetration rate leads to an increase of 6.8% for parcel volume per capita. The smallest effect is for USA, with an increase of 2.4%.

The effect of Covid is positive and significant, except in Germany and Portugal. The largest effect is for Italy, with an increase of more than 28% during the sanitary crisis, ceteris paribus. The lowest effect is for USA, with an increase of 10.4%.

5   What Would Have Happened Without Covid-19?

An important question concerns the possible lasting consequences of this sanitary crisis on postal markets. Has consumer behavior changed due to this crisis? Is the increase in parcel volumes due to consumers shopping more via internet and therefore announces a long-lasting accelerated growth of parcels? Did mail volumes decrease due to a long-lasting acceleration of e-substitution? Obviously, it is still too early to answer any of these questions in a reliable way.

In this section we perform a forecasting (or simulation) exercise in order to assess what would have happened to mail and parcel volumes if the Covid-19 crisis had not occurred. For this purpose, we re-estimate the same type of models as in the previous section (FM-OLS models) but using the shorter period, from 2015 to 2019, that is before the Covid-19 crisis. Assuming these models are valid for the following periods, we use them to forecast mail and parcels volumes for the 4 quarters of 2020.

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[4] USPS data indicates that USPS parcel volumes decreased by 2.6% from 2018 to 2019 while Pitney Bowes data for the overall U.S. market indicates that parcel volumes increased by 13.6% from 2018 to 2019 (source: Statista).

Table 12.6 Estimation of Eq. (12.1) for parcel volumes

Variable	Germany		Italy		France		Portugal		USA	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Ln(GDP)	−0.6202	0.6354	−0.4415	0.7470	−0.1607	0.4759	−0.3105	1.1944	−2.5744*	0.7448
Internet	0.0679*	0.0095	0.0581*	0.0072	0.0388*	0.0068	0.0367	0.0154	0.0237*	0.0035
Covid	−0.0535	0.0552	0.2832*	0.0888	0.2131*	0.0610	0.1875	0.1612	0.1040*	0.0446
Q1	−0.2312*	0.0330	−0.2475*	0.0600	−0.3013*	0.0379	−0.1990*	0.0827	−0.3849*	0.0509
Q2	−0.2386*	0.0381	−0.2201*	0.0557	−0.3118*	0.0406	−0.1286	0.0795	−0.3160*	0.0430
Q3	−0.2348*	0.0305	−0.2338*	0.0505	−0.3352*	0.0392	−0.1354	0.0801	−0.2605*	0.0357
C	1.0191	5.4102	−1.3294	6.4238	−1.4984	4.0924	−0.3226	9.0592	24.3380*	6.9062
R2	*0.9511*		*0.9475*		*0.9261*		*0.8895*		*0.9355*	

Notes: *: significant at 10%

These models contain GDP per capita and Internet as explanatory variables: in order to obtain forecasts for mail and parcel volumes, we forecast these variables over the 4 quarters in 2020. For GDP per capita, we estimate separate ARMA models for each country over 2015–2019 and use these models to forecast over the 4 quarters of 2020. We assume that these forecasts represent the value of GDP per capita that would have been realized in the absence of the Covid-19 crisis.

For the Internet variable, we consider the actual values in 2020. Graph 12.1 shows the values for mail volumes per capita forecasted by the models, with and without Covid-19 crisis (using the estimated values for GDP shown in Graph 12.1).

As expected, in each country mail volumes would have been higher in 2020 than they actually were – with a gap between actual and forecasted mail volumes more or less important according to the country.
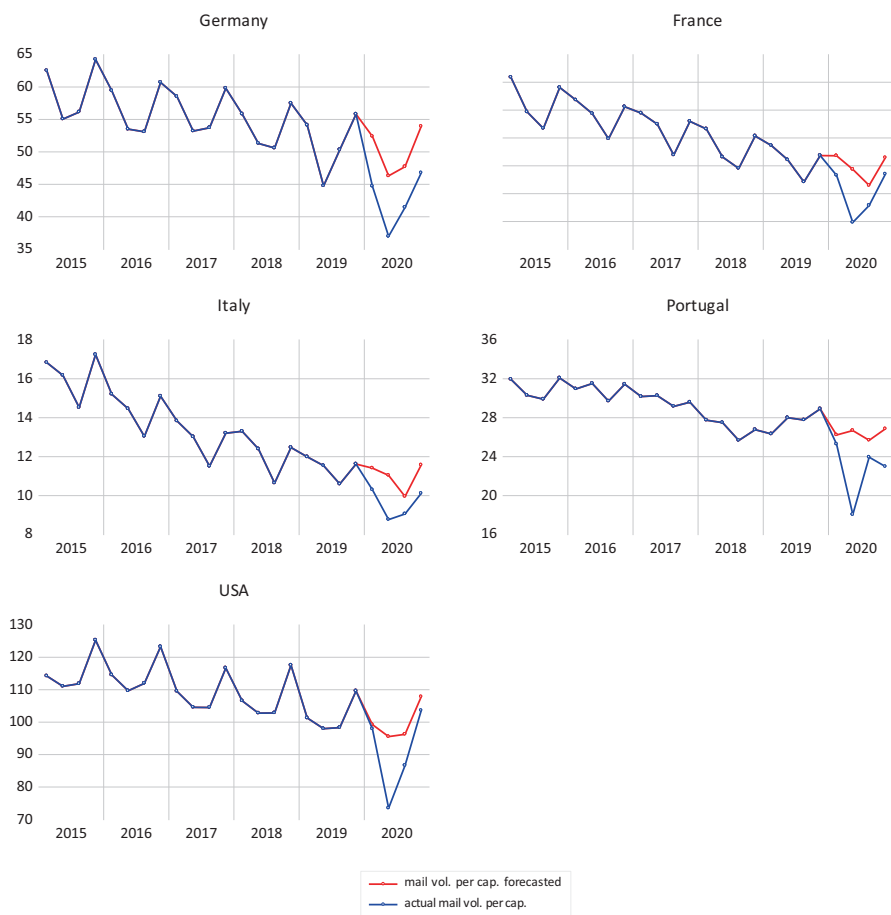
Graph 12.1 Mail volumes per capita: actual values (in blue) and forecasted values without Covid-19 crisis (in red). Notes: for confidentiality, values for France have been removed
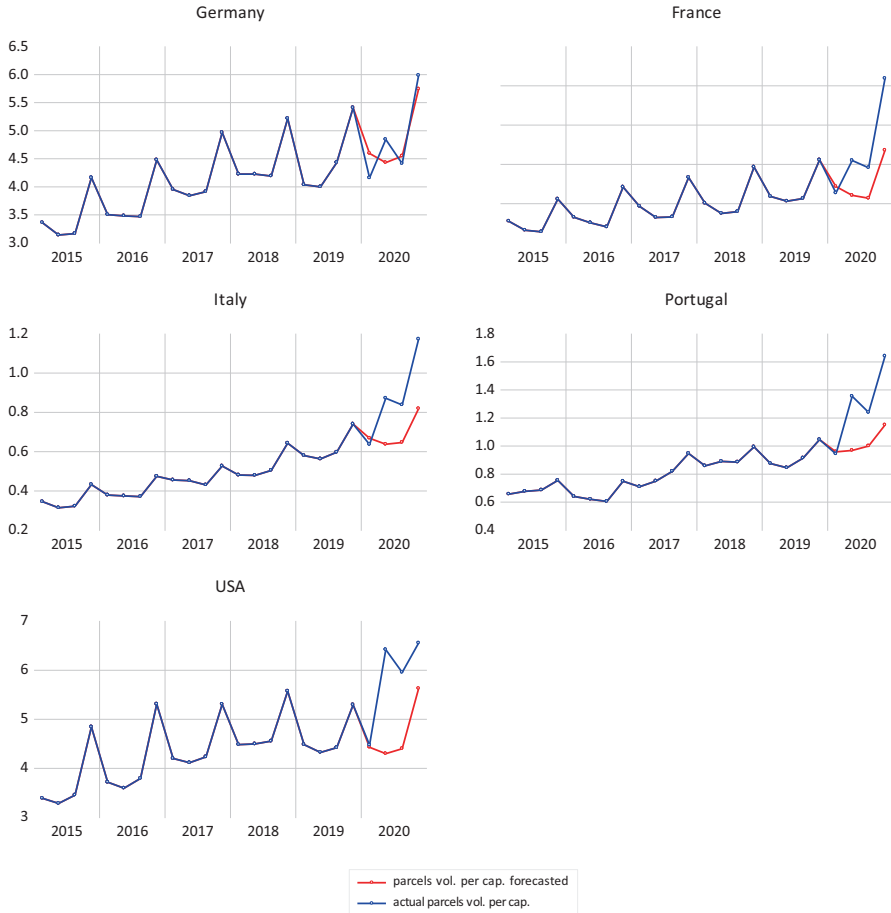
Graph 12.2 Parcel volumes per capita: actual values (in blue) and forecasted values without Covid-19 crisis (in red). Notes: for confidentiality, values for France have been removed

Graph 12.2 shows the values for parcel volumes per capita forecasted by the models, with and without Covid-19 crisis (always using the estimated values for GDP).

Except for Germany, we notice that parcel volumes during the Covid-19 crisis are substantially higher than the forecasted parcel volumes that would have been achieved without the Covid-19 crisis. The effect of Covid-19 crisis on parcel volumes per capita is not significant in our econometric estimation in Germany. The results of our econometric analyses suggest that the crisis has increased per capita parcel volumes by 28% and 10.4% depending on the country, but does not indicate whether consumers will continue to make frequent e-commerce purchases in the future. As already said, further analysis using more data will be needed to confirm whether this crisis has had a lasting effect with an acceleration of the upward trend in parcel volumes.

6   Conclusion

In this study we have begun to investigate the effects of the Covid-19 pandemic on postal markets for mail and parcel volumes. Data on annual postal volumes and revenues suggest that the pandemic generated a decline in mail volumes and revenues that exceeded the declining trend and an increase of parcel volumes and revenues that exceeded the increasing trend.

We first presented the estimation of an econometric model to study the impact of the Covid-19 crisis on mail volumes and on parcel volumes. Then we conducted forecasts to compare the evolution of mail and parcel volumes to a scenario in which the pandemic did not occur. Our preliminary estimates suggest that mail volumes would have been higher in 2020 than they actually were and also that parcel volumes during the Covid-19 crisis are substantially higher than the forecasted parcel volumes that would have been achieved without the Covid-19 crisis.

Although many of the results of our econometric models are consistent, they should be taken with caution. The Covid-19 crisis is relatively new and we need to improve these estimates by enriching our database in our further research. Therefore this article can be extended with the future publication of postal market data that will give us more perspective on the actual crisis.

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Chapter 13
Short and Longer-Term Impacts of the Covid-19 Pandemic on Postal Consumer Demands, Universal Service Providers and the Wider Postal Sector

Philip Groves, Alexander Mapletoft, and Gianpiero Roscelli

1 Introduction and Background

The global Covid-19 pandemic public health crisis led to dramatic changes in society as consumers and businesses adapted to a new emergency with substantial government-imposed restrictions on normal life. The main changes included: requirements to work at home for office workers, "social distancing" and wearing of face masks, restrictions on meeting other people and public gatherings, a ban or severe limitations on non-essential travel, and mandated closure of non-essential shops, leisure and hospitality venues.

This crisis resulted in a sharp fall in GDP during 2020 however, although it was far more severe than previous recessions, this was different as large parts of the economy were frozen not due to lack of demand but due to the response to the pandemic. Unprecedented government and central bank action took place to support jobs and ensure liquidity. As governments' understanding of the pandemic was imperfect and the type of responses varied, restrictions were not co-ordinated or uniform though they normally coincided with heightened national infection or hospitalisations.

These changes in society had a profound impact on the postal sector including the Universal Service Providers (USPs). In the short term, USPs had to adapt their operations to the new restrictions and in some cases were also asked, or volunteered, to provide new services to support government responses to the pandemic. The

Please note that the views expressed in this chapter are the personal views of the authors alone.

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"stay at home" rule also led to a dramatic acceleration in e-commerce, with unprecedented pressure on all parcel operators to ensure deliveries of goods which would otherwise have been bought in person.

1.1 Purpose and Methodology

The chapter aims first to assess the short-term impacts of Covid-19 on society and the respective implications on USPs and the wider postal sector primarily in the UK and Europe but also considering different global regional trends.

The chapter starts by considering the changes to the demand side and analyses the societal changes stemming from the pandemic: how consumers, households and businesses were affected, how their behaviour changed, and how this impacted the postal sector both in the changed demand for services and how postal operators were in practice able to respond.

The chapter goes on to examine which of these changes are likely to be temporary, which may become permanent and why, including any available evidence, and what trends are new as opposed to development and acceleration of changes which were already to some degree in place (see Fig. 13.1). It also explores how some initial responses taken by postal operators in adapting to changing consumer demands or operational challenges may precipitate longer term service changes, including new product offerings.

The chapter examines four core areas of life that have been most affected by the pandemic and the associated societal and postal impacts. The four areas are: public health and social responsibility; shopping and leisure; business; and communications.

Accordingly, after Sect. 1, the Introduction, Section 2 examines the Public Health and Social Responsibility aspects of the pandemic and their short and longer term
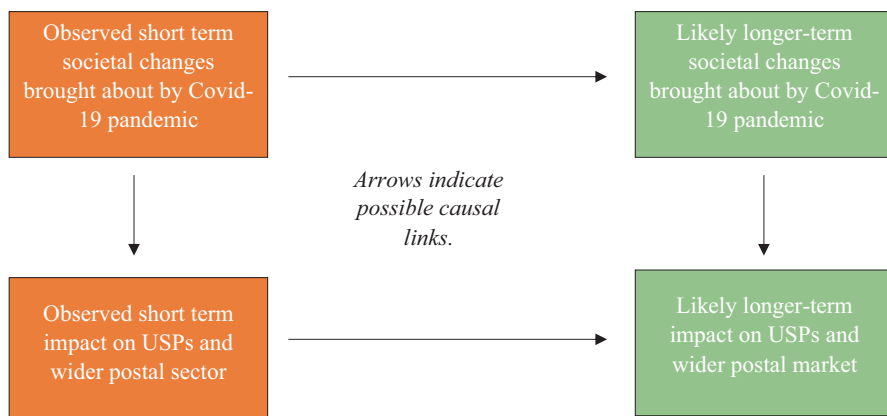
Fig. 13.1 Is a diagram summarising the analyses undertaken for the paper and possible linkages

societal and postal impacts. Sections 3 and 4 assess Shopping and Leisure, and Business, respectively, in the same way. Section 5 explores how the pandemic affected communications between citizens, diverging slightly from the previous analytical structure by considering the societal and postal impacts in tandem. Finally, Sect. 6 summarises the analysis and conclusions of the earlier sections.

2   Public Health and Social Responsibility

2.1   Short Term Societal Impacts

The Covid-19 virus reached the UK in late January 2020. On 23rd March 2020, the British government imposed a stay-at-home order banning all non-essential travel and contact with people and closing schools, businesses, and most workplaces. Shielding of the clinically vulnerable and others was introduced. Social distancing became the norm and the use of personal protective equipment was encouraged in workplaces where social distancing wasn't possible. This approach was typical of most European countries who imposed similar restrictions between 1 and 25 March 2020 (Imperial College COVID-19 Response Team, 2020), and around the world.

In the UK, the initial lockdown was gradually eased in June and July 2020 with some residual public health restrictions. In the autumn, case rates began to increase again prompting a tiered restriction regime to be introduced in England and Scotland geared to localised infection rates. In November, the UK entered a month long 'circuit breaker' lockdown.[1] Further lockdowns in response to new variants and rising case rates followed in January 2021 which were gradually phased out between March and August 2021 as vaccination rates increased. Many other countries experienced subsequent lockdowns of varying durations and stringency.

2.2   Short Term Postal Impacts

2.2.1   Demand Side

Many operators experienced a surge in demand for parcel services as national lockdowns and the subsequent closure of businesses and retail forced consumers to rely on online and mail-order shopping. Amongst the EU27, the value of retail sales via e-commerce increased by 30% in April 2020 compared to April 2019, despite a fall in total retail sales of 17.9% (Eurostat, 2020). In the UK, e-commerce sales as a proportion of total retail sales increased especially steeply from 18.8% in May 2020 to 32.9% in May 2021 (ONS, 2021).

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[1] Wales and Northern Ireland had slightly shorter and longer lockdowns respectively.

The European Regulators Group for Postal Services (ERGP) found that as of August 2020, 22 of 30 European National Regulatory Authorities (NRAs) who responded to a questionnaire reported increases in parcel volumes by domestic postal operators since the beginning of the pandemic, 2 NRAs reported volume declines and 6 did not report any notable volume changes (ERGP, 2020b). UNCTAD's B2C E-Commerce index measures the preparedness of economies to support online shopping and found that postal operators in countries scoring highly by this measure experienced greater e-commerce driven demand for parcel delivery services than those performing less well (UNCTAD, 2021). Meanwhile, the closure of businesses because of lockdowns had an opposite effect on letter volumes which in the UK declined by 25% in 2020–2021 over the prior year, driven primarily by the negative economic impact of the pandemic and related reduction in business mail (Royal Mail, 2021).

The pandemic influenced the types of products consumers sought to purchase. UNCTAD reported that health-related goods (including personal protective equipment or PPE), devices for home working and home entertainment were initially the most purchased online in the early stages of the pandemic, but that as the lockdown restrictions continued, consumers began to purchase a wider range of goods. Postal operators responded to such demands. For example, Royal Mail launched a pharmacy delivery service, offering home delivery for prescription drugs and return service for medical samples illustrating a pandemic driven demand for virtual medical services (Royal Mail, 2020).

Finally, governments drove demand for new postal services to support pandemic-related public health measures. In the UK, Royal Mail convened a network of 35,000 'priority post boxes' to fast track the delivery of Covid tests to laboratories and deliver samples from over 100 regional test centres. USPs also delivered letters inviting citizens to book vaccination appointments. In France, e-learning initiatives such as "homework at home" relied on the postal USO for free return of homework assignments by post for those without broadband access or computers. In developing countries, the social role of USPs was also reinforced through enhanced or new services to mitigate the impact of the pandemic such as the delivery of food parcels to relatives in outlying areas (e.g. Ghana). An increase in postal voting in elections, to minimise physical interaction, also boosted demand for postal services both for the delivery/return of ballots and election campaign material.

2.2.2 Supply Side

Postal operators experienced considerable disruption to supply broadly mirroring the public health measures arising from the pandemic. This disruption centered primarily on human resourcing volatility due to high and unpredictable absence rates, and from social distancing requirements which impacted upon ordinary collection, delivery, and processing activities.

High infection rates during the first wave (spring 2020) of the pandemic led to higher than usual staff absentee rates compounded by self-isolation rules, posing

serious challenges to consistent service delivery. The US Postal Service experienced a reduction in employee levels by 20% in April 2020 (US Postal Service, 2021). In Austria, the military was required to reinforce processing capacity in two distribution centres for 2 weeks in May 2020 due to clustered outbreaks (ERGP, 2020a, b).

As the pandemic progressed, operators developed contingency plans to stem supply disruption. In Portugal, the USP Correios de Portugal, also known as CTT, adopted a system of segmenting and periodically rotating workers at its distribution centres to minimise virus exposure. In the US the Postal Service (USPS) partially activated its Continuity of Operations Plan in New York, instructing the redirection of mail if processing units were shut down, in this case due to local staff absences. Nonetheless, social distancing measures significantly hampered delivery efficiency and reduced processing capacity (USPS, 2021).

In many European countries, Post Offices operated by USPs assumed reduced operating hours and strict capacity limits to reduce the scope for virus transmission between customers and staff. Also, services typically requiring consumers to visit branches were fulfilled by other methods such as physical delivery of pensions by Poste Italiane in cash to the most vulnerable citizens, with the support of the national army (UPS, 2021). Meanwhile, postal operators across Europe devised contactless delivery systems, typically replacing the need for signatures for tracked items with alternative measures such as photographing the item in the delivered location (ERGP, 2020b).

The most acute periods of restriction, coinciding with the greater demand for parcel delivery services, gave rise to quality of service issues. In seven European countries, national regulators declared force majeure situations during the first wave of infections as USPs were unable to meet the requirements of respective USOs (ERGP, 2020b).

2.3   Longer Term Societal Impacts

Several factors will determine the pace and extent of a return to more normal conditions globally, over the longer term. Principally, that vaccines have been administered unequally with higher income countries having vaccinated citizens much more quickly than emerging and developing countries. This has precipitated concerns that the development and spread of variants may outpace vaccine uptake (Trapper & McKie, 2021), and whether and how long some restrictions remain. Moreover, a residual caution on the part of a section of the population in resuming all social activities, especially by those who feel most vulnerable to any future virus resurgence, is likely to persist.

In addition, hygiene and healthcare, including closer monitoring of personal health, are likely to become a greater consideration in everyday life and may lead to enhanced measures such as sanitisation stations in public spaces and workplaces, while early signs are that formalised working from home arrangements for office workers may become the norm for at least part of the time (Marr, 2020).

Finally, we might expect the continuation of virtual delivery of some healthcare services that were established as temporary measures at the height of the pandemic to minimise potential transmission of the virus where virtual consultations are effective. The convenience to patients and improvements in technology are two factors likely to facilitate further development of such services.

2.4   Longer Term Postal Impacts

For the most part, a relaxation of restrictions will see the removal of safeguard measures that have impeded operators' efficiency and capacity. The removal of social distancing rules, for example, will allow Royal Mail to return to shared van working arrangements and for those operators still reliant, or partly reliant, on manual sorting processes, to increase capacity by allowing more workers within closer proximity. Operators are likely to see spend on PPE and sanitation fall, whilst costly contingency measures, such as hiring additional vans, are dropped. Improved operating efficiency and expanded processing and delivery capacity should improve quality of service alongside efficiency improvements introduced during the pandemic which reduced customer contact.

Alongside more virtual health consultations, increased use of delivery services for prescriptions and medical testing is likely. The NHS already automatically sends out bowel cancer screening testing kits to all people over a certain age deemed at risk. Such initiatives may multiply, reflecting increased caution in social interactions and visiting public spaces by the vulnerable despite eased legal restrictions. Some individuals who registered for a postal vote during the pandemic may also continue to do so, leading to long term increased demand for postal services.

Where changes in services occurred as a temporary response to public health threats, we may see their continuation if acceptable to consumers. For example, contactless parcel drop-off arrangements seem likely to remain given such measures appear to have worked smoothly while also reducing contact time for individual deliveries. Where post offices operated by USPs have temporarily closed or offered reduced opening hours, we might expect this to persist if it has prompted consumers to develop acceptable alternative arrangements, such as accessing services online or via alternative outlets and if respective regulations allow.

Finally, where USPs were able to offer public service solutions during the pandemic, we may see governments explore longer-term opportunities to expand their social role.

3   Shopping and Leisure

3.1   Short Term Societal Impacts

In the UK the Office of National Statistics, ONS (2021), estimated that ten million new users started buying digitally during the pandemic. There was large growth in particular retail categories: for example, Kingfisher, which includes the DIY brands B&Q and Screwfix, recorded online sales growth of 158% year over year. Other sectors which benefitted included online fashion (+72%), health and beauty (+102%), beer and wine (+105%), electrical (+206%) and clothing (+22%). Overall, online retail was up 74% in January 2021 compared to January 2020.

Strikingly, during the pandemic, 46% of UK consumers purchased a product online that they had only purchased previously in a store. Retired households were a big driver of increased online grocery spend during the pandemic, increasing their spending by 229% between January 2020 and January 2021. Research from Global Web Index showed that suburban and rural consumers drove the bulk of global online shopping growth during the pandemic whereas pre-pandemic this growth was driven by millennials. Overall, between Q1 and Q2 2020, Latin America showed the largest shift to online grocery adoption (+31%) followed by the US (+23%).

Reported on different impacts of the pandemic by country on the shares of e-commerce in retail. It found a non-uniform impact; in the US, for example, there was greatest demand for PPE, home activities, groceries and computer equipment and reductions in travel and sports goods and formal clothing. In China, food products were the biggest winner, growing by 36% between January and April 2020 compared to the equivalent period in the previous year. Conversely hospitality and tourism, especially international leisure air travel, were badly affected globally during the pandemic. Business travel was similarly affected.

3.2   Short Term Postal Impacts

USPs and other parcel operators responded to the increased demand for e-commerce by adapting their operations and stepping up innovation. In the UK, Royal Mail reported that for the first time in its history it was attracting more revenues from parcels than letters. However, the increased demand was not uniform reflecting a mix of factors, such as maturity of the e-commerce market, the nature and timing of lockdown restrictions and cultural factors. Some countries, especially outside of Europe, did not, for a variety of reasons, benefit from a rise in e-commerce, such as Kenya and New Zealand.

During the pandemic, first time delivery of e-commerce items was far easier to achieve during lockdowns or where many more people continued to work from home. Nevertheless, perhaps with a view to longer-term sustainability in more

normal times, the pandemic also provided a stimulus to continued expansion of out of home (OOH) delivery solutions, whether parcel lockers or pick-up and delivery points (PUDOs). These offer the advantages of being open 24/7. Moreover, sustained first time delivery, easy access, and an efficient delivery method could avoid traffic congestion and reduce carbon emissions.

3.3   Longer Term Societal Impacts

Various studies show that many of the online shopping habits which UK and European consumers adopted over lockdowns are most likely here to stay and that e-commerce sales will continue to grow faster than in the pre-pandemic era. For example, DS Smith (2020) found that 89% of European consumers will continue to shop as much or even more online post lockdowns. Target, a US department store chain, reports higher levels of spending and loyalty among its new online customers. This appears to be borne out so far, as existing evidence indicates that consumers returned only partially to physical retail when restrictions were lifted while maintaining some of their newly acquired online shopping habits. Royal Mail's Trading Statement for Q1, 2021–2022 reported strong year on year revenue performance with Royal Mail's Chairman commenting: "we are starting to see evidence that the domestic parcel market is rebasing to a higher level than pre-pandemic." Moreover, consumers may be left with less choice of physical retail. For example, GAP and Debenhams (clothing retailers) closed all UK stores to operate entirely online. Other retailers have developed plans to further integrate online and instore experiences, repurposing stores as 'show rooms'.

3.3.1   "Home as a Hub"

In addition to the step change in buying online, and the implications for the high street, a new attitude to the importance of the home started during lockdowns but has continued since. Identified "Home is the new hub" as one of its four consumer trends arising from the pandemic. Changes to work and socialising gave an opportunity for a new lifestyle, including relocation away from large cities to suburbs, towns, and villages with a perceived healthier and cheaper way of life and extra space. KPMG also saw an associated, increased focus on in-home experiences and investments, such as buying furniture, electronics and gardening activities and eating in, linked to convenience, accessibility, and safety.

3.4   Longer Term Postal Impacts

USPs and other carriers are likely to continue to benefit from the step change in e-commerce levels and develop innovative services to meet this demand, such as collection on delivery, expanded parcel collection options, improved delivery flexibility and tracking, wider use of lockers for different types of delivery and potentially downstream access services, either to individual addresses or to lockers for companies looking to benefit from the economies of scale and scope offered by the USP's regular household delivery services.

One key theme that emerges is how to make parcel deliveries more cost effective and sustainable when multiple carriers can be delivering packages to households or blocks of flats, sometimes on the same day. Wien box is an open locker system developed in Vienna. Wien Box worked with relevant authorities to establish open systems of lockers which integrated different carriers. Wien Box explained that one advantage of such boxes is that they can have different uses, including for collection, and that they can save up to two thirds of CO_2 emissions related to last mile delivery.[2]

The ways in which parcel lockers can be most efficiently set up and used, and their relationship PUDO delivery points, for example at local retailers, are still the subject of study. One such study[3] points to the expansion of locker installations and retailers partnering with delivery companies to become PUDO points, facilitating a higher number of parcels per stop than for residential deliveries. While they are currently capital intensive to set up, lockers are normally well-located, with good accessibility and parking, enabling 100% first time delivery. In contrast PUDO points are easier, quicker, and cheaper to set up, making them a good complementary option or a testing ground for locker developments.

The study, which surveyed 200 retail businesses, reports that 70% of them see the future as carrier agnostic networks, meaning locker networks which accept parcels from multiple carriers. It also highlights some of the other issues which are critical to success such as incentivising early collection from the locker.

Such urban consolidation arrangements could be made available to both retailers and postal operators who want to outsource the final mile delivery and benefit from the associated economies of scope and scale. Conversely, where Universal Service Providers or other postal operators hold a strong market share in the delivery of e-commerce packages, they could make their networks, to home or to lockers, available to third parties on a commercial basis to increase their drop rates per address and/or locker.

In addition, postal operators are increasingly looking to accelerate plans to reduce their environmental impact, for example, by lowering the CO_2 footprint per kilometre, improving network efficiency, and reducing the number of kilometres per delivery. Fleet electrification is also already underway with the main remaining

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[2] ERGP public workshop in July 2021.

[3] Last Mile 2020: Before and after COVID-19, Last Mile Expert and Postal Hub Podcast.

challenge the "greening" of long-distance transport. There is potentially a wider benefit of the shift to online and e-commerce, with consumers no longer travelling to purchase goods. Similarly, if consumers are predominantly buying online in the future, items can be packaged, presented, and delivered in a more efficient and sustainable way. This would in practice mean smarter route planning and increased use of parcel lockers, reduced air transport for parcels and smarter packaging, especially reduced air in parcels (currently running at 30–50%).

Finally, while earlier delivery targets, and associated offers, for parcels have increased, quality of service targets for letters delivered under the universal service have been modified in several countries in recent years away from next day targets to targets of 2–5 days. Next day letter targets sometimes require reliance on air transport so changing the USO specification can reduce the reliance on air transport reducing costs and emissions, as evidenced by the changes to the USPS USO service standards in the US earlier this year. This can also facilitate fewer deliveries to the door. In France, La Poste was reported to want to add an extra day to the delivery time for its "lettre vert" service to save costs. Such changes may also have a positive environmental impact and may be further replicated in other countries.

4 Business

4.1 Short Term Societal Impacts

The pandemic has had widely different impacts on work by sector, influenced by the impact of government restrictions and guidance and the state support offered. The shift to digital transactions propelled high growth in delivery, transportation, and warehouse jobs, with Amazon hiring 400,000 new workers worldwide during the pandemic. According to the McKinsey Global Institute (2021a) the pandemic showed that much more work could be done remotely than had previously been thought possible. However, the study also highlighted that certain work was still best conducted in person, such as negotiations, brainstorming, inducting new employees and teaching of young children.

Small businesses suffered mixed fortunes because of Covid-19, however most countries saw a notable rise in new small businesses either starting up, or growing significantly, with the rise in e-commerce. The United States saw double the number of new business applications in Q2 2020 compared to the previous year, France saw a record number of new businesses formed in October 2020, and the UK saw a 30% increase in the number of new businesses registered in Q3 2020 compared to Q3 2019 (US Census Bureau, 2020). Smaller businesses not online, or without an e-commerce presence before the pandemic, were often forced to migrate online during the first lockdown (March–May 2020).

4.2   Short Term Postal Impacts

Postal operators took an active role in supporting small and medium local businesses through the pandemic, as well as managing the extra demand they provided. For instance, DHL's initiative in Germany, 'DHL lokal handeln' (DHL shop locally) encouraged shopkeepers and retailers, who did not generate revenues due to the closure of their shops during Covid-19, to increase their engagement in the area of e-commerce and to register as a business customer at DHL Parcel to benefit from the company's expertise and offerings. Of the 315,000 new companies in the UK, nearly 16,000 were e-commerce leading to corresponding demand for B2B and B2C delivery services. eBay saw a surge of new businesses on the site: a 335% increase from June 2019 to June 2020, its biggest on-year rise (Royal Mail, 2020). Germany and Japan saw similar trends compared to 2019. Some smaller businesses felt obliged to migrate to online marketplaces and aggregator websites, which became 'gatekeepers' to running a successful online business.

4.3   Longer Term Societal Impacts

McKinsey (2021a) identifies an acceleration in three trends already in existence pre-pandemic with wider economic impacts which may provide a guide to potential future developments: hybrid working from home for most computer-based office employees; growth in economic importance of e-commerce and "delivery economy", and business use of AI and automation.

McKinsey observed six consumption shifts whose continuation (or not) will influence the post-pandemic economy including the acceleration of e-grocery shopping, a decline in live entertainment, the emergence of "home nesting" and a decrease in leisure air travel. Most consumer surveys show that some of the shift to e-commerce, both by age and by products purchased, is likely to continue. Similarly, with "home nesting", individuals and households continue to seek more space commensurate with the increased time spent at home, including for work. Demand for leisure air travel and live entertainment are predicted gradually to return to normal in the medium term while business travel may not recover to the same extent.

For retail, the businesses that can quickly adapt their services to go directly to the consumer are most likely to succeed. Examples cited include Nike, selling direct rather than via department stores, and the restaurant chain Cote Brasserie offering fresh produce boxes based on its most popular restaurant dishes. Business hotels are also showing adaptability by rebranding for staycations or even "workcations", also offering day rooms or offices.

4.4   Longer Term Postal Impacts

Longer term, the shift in people working from home more often may have several consequences for the postal sector. Primarily, the greater mobility of people's locations may require assumptions to be recast about where parcel volumes and traffic will be, both now and in the future, away from city centers and workplaces to individual residential addresses. The parcels sector is characterised by increasing consumer expectations with next-day delivery standard, some adoption of same day delivery, and increased flexibility as part of the delivery process (e.g. DPD UK's recent introduction of changeable one-hour timed delivery slots). Delivering parcels in urban and city locations carry greater volume density, and thus more efficiency from both an environmental and financial perspective, so delivering a greater proportion of parcels in the future to individual residential addresses may increase costs.

Alternatively, parcel operators may look to reduce costs by offering cheaper alternatives or a discount if consumers choose to collect their parcels from a point of aggregation, where the parcel operator can retain the current volumetric efficiencies – for instance, parcel boxes or local shops. In addition, operational advances e.g. greater use of autonomous guided vehicles (AGVs) may contribute to further cost reductions.

However, the greater proportion of employees still working from home may mean that the high first-time success rate that parcel operators had in delivering parcels during the strictest lockdowns, may continue to some degree.

An additional consequence of the pandemic with implications for small businesses is that supply chains may become more local, so that they are more resilient and have fewer international dependencies on its consequences (e.g. reduced air transport) (ECB, 2020). As such, companies may look to more distributed manufacturing, storage, dual sourcing, and re-shoring in the future. If this were to occur, smaller SMEs might become more of a part of a localised supply chain, so benefitting more local, domestic parcel operators, to the detriment of international parcel traffic (DHL, 2020).

5   Communicating

5.1   Short Term Societal Impacts and Postal Impacts

Covid-19 and the associated social restrictions changed how we communicate towards online communication. Reduced travel meant airlines reduced their capacity dramatically, with adverse consequences for international mail deliveries. Generally, 50% of air cargo on passenger flights was e-commerce and cross border goods. When passenger flights stopped because of Covid, this capacity was reduced by 70%. To cope with this, freighter sea networks were used, and retired planes

were brought back into use. 2500 passenger planes were used for cargo only and 300 of these had their seats removed for greater capacity.[4]

As widely reported on, letter volumes significantly fell for most, but not all, USPs, for a variety of different reasons. Marketing and advertising mail were particularly affected, as companies' profitability and revenues suffered due to the pandemic, leading to substantial reductions in their advertising spend, at least in the short term. In the year prior to Covid-19, marketing mail accounted for $16 billion and over half the total volume delivered.

Nonetheless, for those businesses who were still able to send mail, due to the significant number of people staying at home, in the UK, direct and business mail saw record increases in the 'effectiveness' of mail (9% and 16% increases compared to the previous year, measuring whether consumers act on mail that they receive), and interaction rates with mail from sectors increased 14% to 23% from the previous year (JICMail, 2020). Therefore, whilst bulk mail volumes decreased, for some of those continuing and able to post letters, it became a more effective medium. A UPU (2021) report on Covid-19, Posts and Direct Marketing found a similar effect, noting the increase in e-commerce during Covid-19 "amplified the way customers have engaged with direct mail and boosted the impact of direct mail by driving B2C transactions."

5.2   Longer Term Societal and Postal Impacts

How much of this shift in communications will remain permanent is hard to quantify given that letter volumes were in long term decline before Covid-19 (UPU, 2020). Historical data show that in periods of economic decline, some letter volumes disappear, and postal operators cannot plan on them returning (IBM, 2020).

Direct mail volumes often decline sharply in a recession as companies cut all marketing spending considering reduced demand for their products, as witnessed in the US between 2007 and 2009. In the longer term, the wider benefits of direct mail over more transient forms of digital advertising may become evident as consumers spend more time at home and value more its tangibility, relative durability, and its ability to capture the receivers' attention.

Another example is the shift to online, or home, learning for schools and universities, with a virtual, online presence seemingly likely to remain (especially for universities). Therefore, there may be less demand for physical books, and their associated deliveries.

For international letters as well as some domestic mail and B2B mail, the continued constraint of reduced airline capacity for cargo, which is likely to continue until the mid-2020s when passenger numbers are expected to return to pre-Covid levels,

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[4] June 2021 UPU conference, Impact of COVID-19 on e-commerce logistics.

may mean that international mail capacity is both reduced, and/or more expensive, in the medium future (Kada, 2020).

6   Conclusion

The Covid-19 pandemic had far reaching, short and longer-term, societal impacts with implications for the postal sector which are described and assessed in the chapter. It considers that some of these societal changes and associated postal impacts are likely to prove transitory, such as the lockdowns and associated increased costs of operating during the pandemic. Others, such as hybrid working and the growth in importance of the home, are likely to be longer-lasting and lead to postal operators introducing more flexible collection and delivery options, including lockers.

From the available evidence, the most prominent societal change with the greatest sustained effect on the postal sector is the step change in e-commerce, driven by changed consumer retail behaviour. It was initiated by necessity as a result of the closure of physical retail outlets during national lockdowns but was since sustained (at least partially) by convenience. Consumers appear to want to continue to shop online more than before the pandemic with wider categories of online purchases and types of online purchaser. The effects are likely to be long-lasting based on observed and surveyed consumer behaviour post-pandemic to date.

This development is seen as providing the impetus for postal operators to invest in capital upgrades and to expand parcels capacity. The chapter argues that it may lead USPs and other postal operators, given the higher volumes, to look to consolidate deliveries and improve delivery efficiency, and meet environmental goals, through innovations such as open parcel lockers and/or commercial downstream access agreements where there is an operator with sufficient existing scale to do this.

Across other areas of society that we examined; public health and social responsibility, shopping and leisure, business, and communication, postal operators adapted their services to overcome immediate challenges posed by the pandemic. In some instances, such changes to postal services also offered incidental benefits to consumers and other stakeholders, namely through offering greater convenience, choice, environmental sustainability, or efficiency. For example, the widespread replacement of signatures with contactless solutions for tracked items was convenient for recipients and was also more efficient, while maintaining delivery security. We consider it is likely that this type of service adaptation will persist even as the pandemic-linked reason falls away given its continued benefit to consumers.

One of the societal changes driven by the pandemic was widespread working from home by office workers, which has since been supplanted by hybrid working following the ending of lockdowns. An accompanying trend identified in the paper, of the "home as a hub" for work and leisure, has important potential implications for postal services. First, the growth of e-commerce spurred the further development of OOH pick up points and locker systems which have the potential to change the economics of parcel deliveries. In B2C parcels markets that are highly developed

and competitive, the final mile delivery might be outsourced to a third party to enable consolidation and optimisation of deliveries to alternative delivery points as already was observed through Budbee's services in Nordic cities. Second, the growth in importance of the home could benefit advertising mail which, as a personalised medium, combines well with e-commerce and a home setting where it commands more attention, as we saw occurring during the pandemic.

Finally, the chapter anticipates that the enhanced and successful public service roles assumed by many USPs during the pandemic, may lead to other greater public service opportunities for USPs. Postal operators, especially USPs, re-emphasised the social value of comprehensive physical delivery networks in delivering critical communications and supplies (such as Covid-test kits) at the height of the pandemic. Such services enhance the trust and brand value of USPs which should also prove beneficial to their future expansion in parcel delivery markets where trust is also important, and can be leveraged there.

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Chapter 14
Covid-19 and Swiss Post: Volume Developments and the Economic Value of Postal Service, in the Pandemic and Beyond

Felix Gottschalk and Alexandra Lehmann

1 Introduction

There is no need to apply scientific approaches to see that the Covid-19 pandemic had a substantial impact on the postal industry. For perhaps the first time, mail order was given a new role as part of a necessary basic service that was no longer just the luxury of internet-savvy sections of the population. In the course of the pandemic, Postal Service Providers in general, and Universal Service Providers in particular, played a crucial role in ensuring the supply of the population with goods of all kinds that they normally purchased in traditional bricks-and-mortar stores. The growth rates of e-commerce – and correspondingly of parcel volumes – in 2020 were as high as in several normal years combined, in a market that had already been growing strongly for some time. By contrast, mail, the classical postal product, received no comparable attention, and the quantities fell more sharply than in previous years, which had already been marked by a sharp decline.

This chapter analyses the effects of the pandemic on Swiss Post activities and is organized as follows: After a short literature review in Sect. 2, we analyze the pandemic's impact on volume patterns in Sect. 3. Section 4 highlights the wider economic value generated by Swiss Post through its role as an e-commerce enabler during the pandemic. Section 5 comments on the shortcomings of our analysis and Sect. 6 concludes.

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2   Literature Review

There is an extensive literature on the economic justifications or benefits of a USO. Significantly, many studies focus on the value of the Universal Service Obligation (USO) rather than on the value of the postal operator itself. In fact, there is a close link between a postal operator's generation of socioeconomic value and its USO.

Crew and Kleindorfer (2000) argue that the combination of ubiquity and uniformity in prices is the basis of the USO's benefit because it reduces transaction costs for customers. Other arguments often raised are that the USO can be seen as an instrument to correct market inefficiencies in the presence of network externalities or as an instrument for rural development because it usually includes redistributive pricing that makes postal delivery affordable in sparsely populated areas (Cremer et al., 2008).

Several authors have described the market enabler-role of postal operators. For example, Jaag and Trinker (2011) argue that postal operators act as enablers of other parts of the economy as they link buyers and sellers. The importance of e-commerce delivery as a basic service has only recently been described. Copenhagen Economics (2020) assessed the role of national postal operators in connecting e-sellers in peripheral regions to their customers and thus, their impact on rural development. Our study analyses the impact of Swiss Post in the pandemic using similar economic logic, but examines the general importance of e-commerce during the pandemic with no specific focus on peripheral regions.

Borsenberger (2020) argued that the emergence of new technologies have extended the type of benefits (potentially) provided by postal operators through their network, now including indirect benefits through the postal operators' inclusive involvement in the digital economy, in elderly society and in a sustainable circular economy.

Pindus et al. (2010) provide a general framework for measuring the social value of the United States Postal Service. They identify eight broad categories of social values and present possible metrics and methods for quantifying them. In our work, we mainly focus on purely economic benefits and on the production side because it is easier to quantify than the consumption side.

An obvious approach for measuring the value of postal services from the consumption side is to identify the consumer surplus by comparing the willingness to pay (WTP) of customers with what they actually have to pay for the services (see Ellison et al., 2016, for an application to the UK's postal network). Some studies also identify the WTP for specific services or certain USO dimensions (e.g., RAND Europe, 2011; Copenhagen Economics, 2010; Lindhjem & Pedersen, 2012). Other studies conduct cost-benefit analyses using a willingness to pay approach in order to identify the optimal scope of the USO (see, e.g., Lindhjem & Pedersen, 2012 and Houpis et al., 2015).

Several studies quantitatively show that postal services are crucial for economic development. Boldron et al. (2008) argue that postal outlets in France play an

important role in local economic development by generating spillovers and positive demand externalities for commercial services. Rogowski et al. (2021) show that post offices in the US positively affected economic development in both the long and short terms.

Our main approach is yet another one: We conduct an input-output analysis in order to estimate Swiss Post's indirect contributions to the national economy – both through its own operations and through its role as an e-commerce enabler. To our knowledge, the study from Deloitte (2018) about Australia Post is the only one that conducted a comparable analysis for a postal operator. It finds that for every $ 1 in value added directly created Australia Post generates another $ 0.86 in other industries, and that for every full-time equivalent (FTE) worker directly employed Australia Post creates almost another one working position elsewhere in the economy.

3   The Pandemic in Switzerland and its Effects on Postal Operations

3.1   The Course of the Pandemic in Switzerland

The course of the covid-19 pandemic in Switzerland is shown in Fig. 14.1. The pandemic started in early 2020, much at the same time as in the rest of Europe, when cases began to rise quickly. The first shutdown, which included the closure of all non-food and non-essential stores, started on March 17th and lasted seven weeks until May 11th (shutdown I). In this paper, taking an economic point of view, we
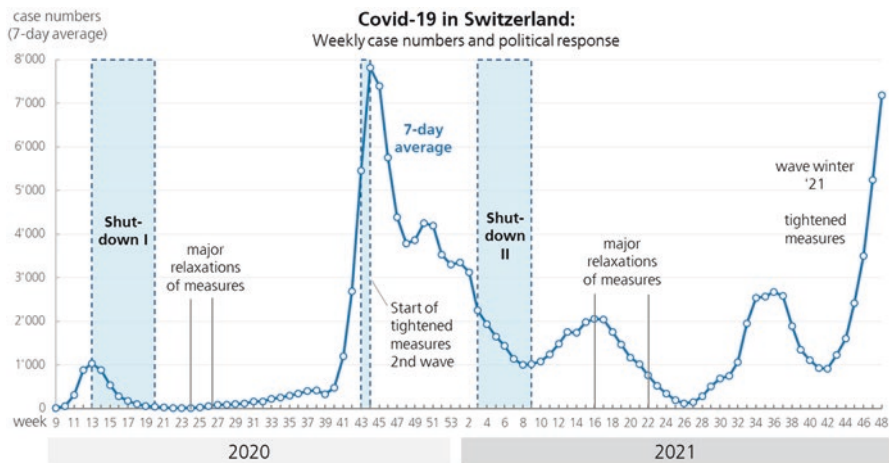
Fig. 14.1 The course of the Covid-19 pandemic in Switzerland. (Source: Federal Office of Public Health, own representation)

consider the start of this shutdown as the start of the pandemic. With the shutdown, case numbers decreased again within a few weeks.

In autumn 2020, the second wave started when case numbers started to ascend quickly to levels several times above the first wave, with a peak of the 7-day-average at the end of October. This led to a political response in the form of tightened measures (although not yet a shutdown), and case numbers soon declined again, yet still remained at a level that could be considered high compared to the first wave until the beginning of 2021. In mid-January, the Swiss government initiated a second shutdown (shutdown II) which lasted until the end of February, a total time of six weeks. With the increasing number of administered vaccinations, major relaxations of the political measures occurred in April and June 2021. In winter 2021, cases numbers increased steeply, again, the government has so far avoided another shutdown.

3.2 Parcel Volumes in the Course of the Pandemic

3.2.1 The Data: Looking Back and Forward

Using weekly data on the number of domestic parcels processed by Swiss Post, Fig. 14.2 shows how parcel volumes have developed in every calendar week of 2019, 2020 and 2021. There are five major observations:

Fig. 14.2 Parcel volumes (domestic) of Swiss Post 2019–2021 and political milestones of the Covid-19 pandemic in Switzerland. (Sources: Swiss Post, Federal Office of Public Health)

First, we observe that volumes in the first 12 weeks of the year 2020 were roughly 5% above those in 2019, in line with the growth trend of the years before.

Second, in the first shutdown in 2020, volumes increased sharply from around 600'000 to up to 900'000 parcels per day. This indicates a clear shutdown-effect.

Third, after the shutdown, the 2019 and the 2020 curve approached each other to a certain degree but remained further apart than in the first 12 weeks of the year. In total, Swiss Post delivered 180 million domestic parcels in 2020, compared to 147 million in 2019 (+22.8%).

Fourth, in 2021, parcel volumes reached above the pre-pandemic numbers from the year before and even increased further during the shutdown in early 2021, to levels similar to the first shutdown in 2020. This indicates an impact of the second shutdown.

Fifth, after week 20 of 2021, when we are able to compare a relatively smooth pandemic situation in 2020 to a relatively smooth pandemic situation in 2021, volumes have remained above the levels of 2020, close to the pre-pandemic growth trend of about 5% per year (or even slightly above this trend). This development persisted also when case numbers rose again at the end of 2021. With all due caution, we may interpret this as an indication for a lasting level effect on volumes caused by the pandemic. At the same time, parcels' volume growth continues, driven by fundamental developments such as demographics and improving convenience of online shopping.

3.2.2 Operative Situation

Especially in the early days of the pandemic, it was difficult for Swiss Post to process the unexpected large volumes. This was not only due to the high quantities themselves, but also to the restrictions caused by the pandemic, e.g., the absence of many employees and the protective measures in the sorting centers and in the delivery.

Due to the exceptional situation, the national regulation authority for the universal postal service, PostCom, has agreed that Swiss Post would not consider the periods from March to July and October 2020 to February 2021 for measuring the punctuality of parcels (the Swiss USO requires that 95% of all parcels have to be delivered on time, which means D+1 for priority parcels and D+3 for standard parcels).

Unlike the shutdown period during spring 2020, Swiss Post was able to anticipate the high parcel volumes in the following autumn and winter. A number of measures were taken to cope with the record volumes. One such measure was the processing of smaller parcels in the letter centers – totaling up to 150,000 items a day.[1] Furthermore, and just at the right time, two regional parcel centers opened in

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[1] For more details see Swiss Post, "Swiss Post breaks record once again", press release 4 December 2020.

September and November 2020 respectively and eased the burden on the four exist-
ing parcel centers, and special shifts in sorting centers made it possible that parcels
were sorted for up to 22 hours per day. Moreover, personnel in sorting centers and
delivery were increased by up to 30%, up to 400 additional delivery rounds per day
were carried out with around 300 extra delivery vans rented and delivery on
Saturdays was introduced. In addition, thanks to a close dialog with corporate
accounts, the mail-order companies helped in the process. They pre-sorted parcels,
separated them by size and specific areas and announced the expected volumes in
advance. Small parcels were transported to the letter centers from the very outset
while bulky goods were sorted at the beginning of the process.

3.3   Mail Volumes in the Course of the Pandemic

Using weekly data of letters processed by Swiss Post (including international mail),[2]
Fig. 14.3 shows how volumes have developed in every calendar week of 2019, 2020
and 2021. Compared to parcels, the patterns are generally reversed and less pro-
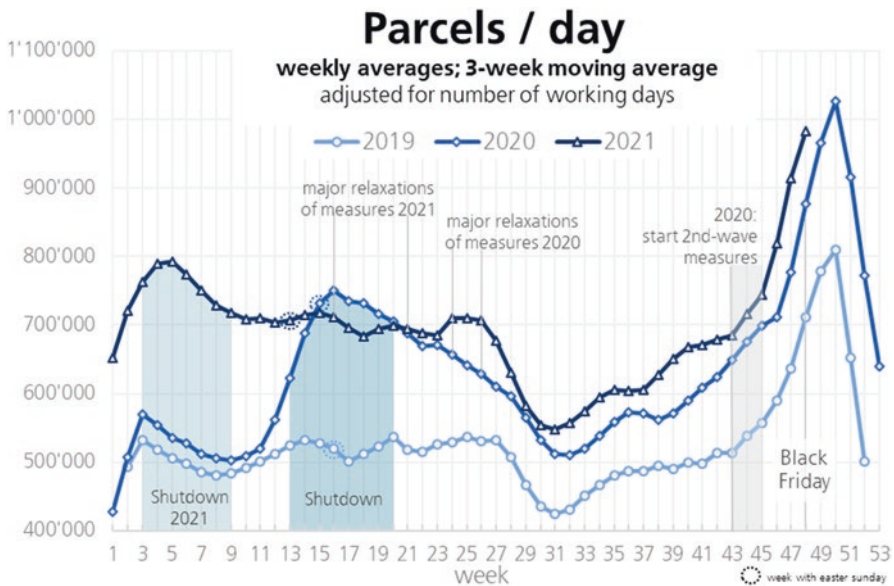nounced. There are five major observations.
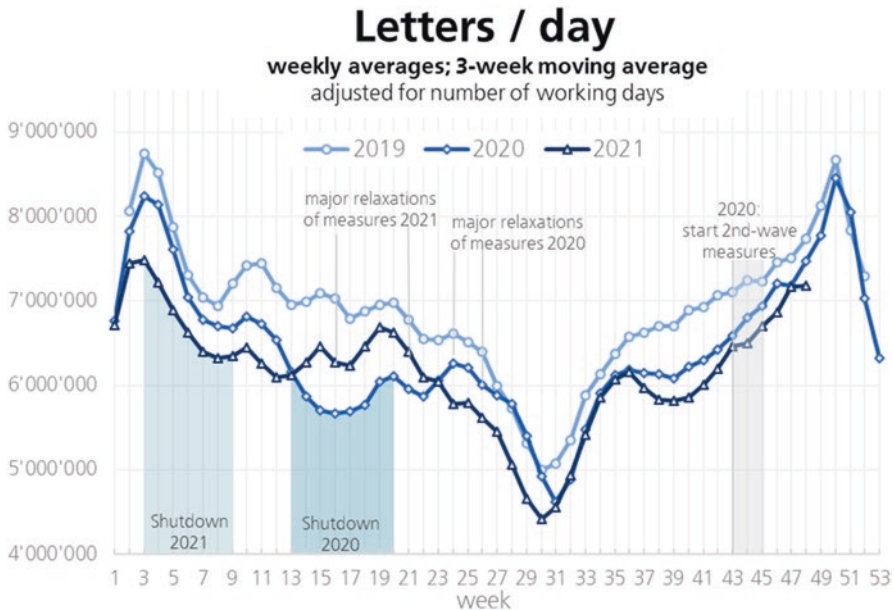
Fig. 14.3 Letter volumes of Swiss Post 2019–2021 and political milestones of the Covid-19 pan-
demic in Switzerland. (Sources: Swiss Post, Federal Office of Public Health)

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[2] Due to differences in the data generating process, these numbers differ slightly from those of the
official reporting of Swiss Post.

First, we observe that volumes in the first 12 weeks of the year 2020 were roughly 5% below those in 2019, in line with the growth trend of the years before. Second, in the first shutdown in 2020, volumes decreased sharply from around 7 million letters per day in 2019 to below 6 million letters per day in 2020. This indicates a clear shutdown-effect.

Third, after the shutdown, the 2019 and the 2020 curve approached each other to pre-pandemic levels. In total, Swiss Post delivered 1.829 million letters in 2020, compared to 1.938 million in 2019 (−5.6%). Notably, the volume of priority mail did not decline for the first time since 2012 and the total volume decline was purely driven by non-priority items. This may be attributed to the pandemic as urgent communication, for instance by public authorities, became relatively more important.

Fourth, in 2021, letter volumes in the first few weeks of the year roughly were what would have been expected without the pandemic. The second shutdown does not leave an obvious trace in the graph, indicating that the second shutdown had no effect on letter volumes.

Fifth, after week 20 of 2021, when we compare a relatively smooth pandemic situation in 2020 to a relatively smooth pandemic situation in 2021, volumes have remained below the levels of 2020, close to the pre-pandemic negative growth trend of about −5% per year. This development persisted also when case numbers rose again at the end of 2021.

Due to the exceptional situation in 2020, the national regulation authority for the universal service, PostCom, decided to exclude the periods mid-March to July and December 2020 for measuring the punctuality of letters. (The Swiss USO requires that 97% of all letters have to be delivered on time, which means D+1 for priority letters and D+3 for standard letters).

3.4   How Much Did the Pandemic Influence Volume Developments in 2020?

In 2020, Swiss Post saw both its greatest decline in mail volumes and its greatest growth in parcel volumes: Mail volumes declined by 5.6% and parcel volumes increased by 22.8%. We try to estimate how volumes would have developed without the pandemic by using the trend between the first 12 weeks of 2020 and the first 12 weeks of 2019 as a proxy for the rest of the year. We adjust the data for the number of working days which differed between 2019 and 2020 (2020 had five working days more than 2019[3]). Figure 14.4 shows the results.

Without the pandemic, we would have expected a volume decline for mail of 3.9%. This number is slightly lower compared to the rates in the last few years,

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[3] We do not fully compensate the data for working days, however, as some the number of working days has an effect on only some letters and parcels.

Impact of Covid-19 on volume developments of Swiss Post, 2020

■ Trend-growth   ■ Covid-Effect
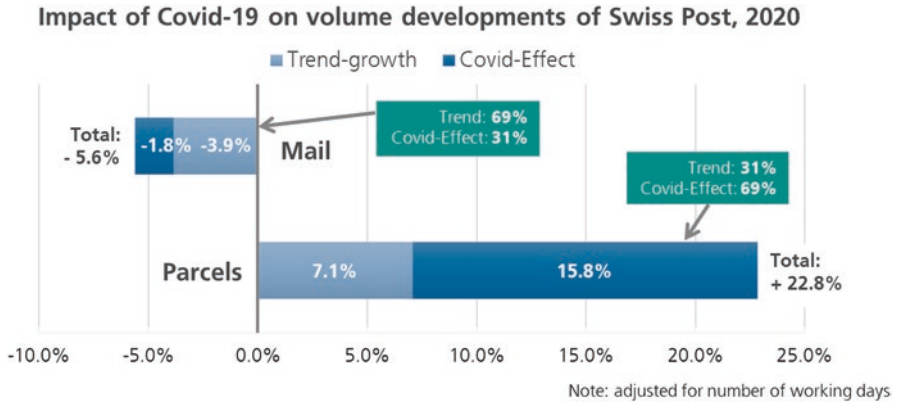
Fig. 14.4 Decomposition of growth rates 2020 in trend and Covid-effect

which saw an average decline of 4.7% between 2017 and 2019. A further decline of 1.8% is attributed to the pandemic.

With respect to parcels, we would have expected a growth rate of 7.1% without the pandemic, which is slightly higher than the average growth rate between 2017 and 2019 at 6.5%. A further growth of 15.8% can be attributed to the pandemic.

3.5   The Impact of Pandemic Periods on Volumes

Figure 14.5 shows volume trends in comparison to the same weeks a year before for four different periods: the pre-pandemic period (weeks 1–12 in 2020), the first shutdown (weeks 13–19 in 2020), the period in-between shutdowns (week 20 in 2020 to week 2 in 2021) and the second shutdown (weeks 3–8 in 2021). All comparison periods are pre-pandemic and adjusted for the number of working days in each period.

For both parcels and letters, the two shutdowns had a large impact on volumes. In the first shutdown in spring 2020, parcel volumes increased by 37.2% (compared to the same period the year before), compared to a pre-shutdown trend of 5.4%. The increase in the second shutdown in the beginning of 2021 was even greater at 44.5%, but the weekly volume developments in the second shutdown are statistically not differentiable from the weekly volume developments of the first shutdown ($p = 0.13$, two-sided t-test[4]). Between shutdowns, the volume increase was 25.2%, and the weekly volume developments were significantly lower than in the two shutdowns, respectively ($p < 0.01$, two-sided t-tests, respectively).

With respect to letters, a similar pattern with different sign occurs. Volume declines have been accentuated during the two shutdowns. Statistically, only the

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[4] The t-test (two-sample with the assumption of unequal variances) is arguably not the most accurate statistical test that could be employed in this context. But we think it gives us a sufficiently well founded indication of what we want to test.

Changes in parcel and mail volumes during the pandemic 2020/21

adjusted for number of working days

%-change to previous year

	5.4% pre-shutdown trend (2020)
Parcels	Shutdown I (2020) 37.2%
	between shutdowns 25.2%
	Shutdowns II (2021) 44.5%

-5.2%	pre-shutdown trend (2020)
-16.2%	Shutdown I (2020)
-3.6%	between shutdowns (2020) Letters
-8.7%	Shutdown II (2021)
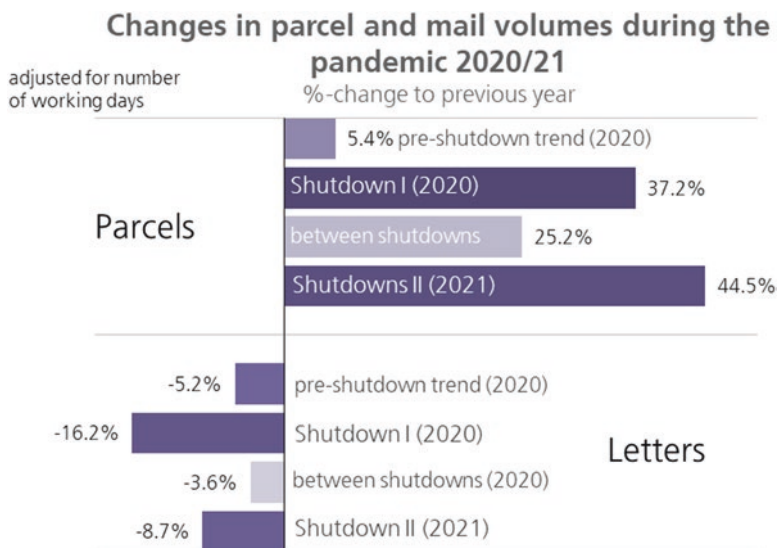
Fig. 14.5 Changes in parcel and mail volumes during different periods of the pandemic 2020/21

volume developments in shutdown I differ significantly from the pre-shutdown weeks and the period between shutdowns (p < 0.002, respectively, two-sided t-tests). The volume developments in shutdown II are statistically not distinguishable from the volume developments between the shutdowns (p = 0.35) or pre-shutdown-levels (p = 0.21).

4 Generating Wider Economic Value as an e-Commerce Enabler

Between 2019 and 2020, e-commerce consumption in Switzerland increased by 27.2% (GfK Switzerland AG, 2021). Especially during the two shutdowns in spring 2020 and winter 2021, when non-food and non-essential stores in Switzerland were closed for 7 and 6 weeks respectively, mail order-became a necessary basic service for the Swiss population. Also, in the time between or after the shutdowns, when stores reopened again, many people chose mail-order as a saver alternative to shopping in crowded stores. As Switzerland's universal postal operator, Swiss Post has been playing a crucial role in enabling this development. Despite the challenges of the pandemic, it could guarantee an efficient and reliable delivery of thousands of e-commerce deliveries per day to all areas of Switzerland. Considering Swiss Post's high market share in the parcel market (2020: 83%[5]), we assume that other postal operators alone would not have been able to handle the high volumes during the

[5] For domestic parcels included by the universal service obligation

pandemic. In this sense, one can state that the rapid e-commerce growth could not have been achieved without Swiss Post.

Online traders were not the only businesses that could benefit from the e-commerce boom enabled by Swiss Post. Also several upstream sectors such as wholesale, IT, financial services, or advertising, provide important inputs for the (online) retail sector and could as well benefit from the e-commerce boom. In this sense, Swiss Post has fundamentally supported many parts of the national economy during the pandemic. By means of an input-output model developed by Swiss Post, we have quantified the extent of this support.

4.1 Methodology

Our input-output model was initially developed to quantify Swiss Post's direct and indirect economic contribution through its own operations (and not through its role as enabler of other businesses). In this contribution, we focus on Swiss Post's economic contribution through its role as e-commerce enabler. For this purpose, we have concentrated on the economic contribution of the e-commerce sector enabled by Swiss Post.

In a first step, we estimated the revenues earned by online traders thanks to Swiss Post's services with the help of internal data, assuming an e-commerce net revenue share of 75% (the rest are mainly returns) and an average delivery value of 123.50 Swiss francs per parcel. Then, we have estimated the value added and employment generated by these revenues in the e-commerce sector using publicly available data from the Swiss Federal Statistical Office. These figures represent the direct economic contributions of the e-commerce sector enabled by Swiss Post.

In a second step, we estimated the indirect economic contributions the e-commerce sector generates in terms of revenue, value added and employment in upstream industries. For this purpose, we used the retail sector multipliers developed by our input-output model. The model is based on an input-output table from the Swiss Federal Statistical Office showing the economic linkages between different sectors for the year 2017. With this data we have elaborated a so-called Leontief-Matrix, following the guidelines of the *Eurostat Manual of Supply, Use and Input-Output Tables* (Eurostat, 2018), in order to identify different sector multipliers. The identified multipliers for the retail sector as well as for the four relevant sectors in which Swiss Post itself operates are listed in Fig. 14.6. They can be interpreted as follows: For every Swiss franc of revenue in the retail sector, another 0.57 Swiss franc of revenue is indirectly generated in upstream industries. Analogously, for every Swiss franc of value added or every job in the retail sector, another 0.32 Swiss franc of value added, or another 0.13 job is indirectly generated in upstream industries. The retail sector's employment multiplier seems relatively low (0.13), which could be explained by the fact that e-traders often purchase their outlays

Different sector multipliers					
	Retail	Transport	Postal services	Financial services	Other economic services
Revenue	0.57	1.24	0.54	0.63	0.85
Value added	0.32	1.73	0.59	0.47	0.79
Employment	0.13	1.42	0.30	0.84	0.63

Fig. 14.6 Sector multiplier for the retail, transport, postal services, financial services, and other economic services sectors. (Source: Input-Output model by Swiss Post)

abroad. All multipliers are type I-multipliers, which means that they do not include effects induced by the e-commerce employees' consumer spending in other industries.

Adding up direct and indirect contributions results in an estimate of the e-commerce sector's total economic footprint enabled by Swiss Post. In the following subsections, we will show the results of this analysis for the first and second shutdown, for the whole period of the pandemic as well as for the additional number of parcels delivered thanks to the pandemic.

4.2   Shutdown I

During the first shutdown in spring 2020, stores were closed for 7 weeks in Switzerland. In this period, Swiss Post delivered about 20 million e-commerce parcels. Using internal data of key accounts of Swiss Post to predict the revenue per parcel for e-commerce providers, we have estimated that Swiss Post consequently enabled CHF 2.5 billion of revenues as well as CHF 1.7 billion of value added in the e-commerce sector (see Fig. 14.7). Thanks to the sector multipliers generated by our input-output model (see Fig. 14.6), we could estimate that the online retailers additionally generated CHF 1.4 billion of revenues and CHF 500 million of value added in upstream industries. In total, online trade supported by Swiss Post generated CHF 2.3 billion of value added during these 7 weeks, which corresponds to 2.5% of Swiss GDP. Further, Swiss Post contributed to secure 34'000 jobs in the e-commerce sector as well as 5'000 jobs in upstream industries. This results in a total of 39'000 jobs that were supported by Swiss Post in different parts of the economy – apart from its own employees (we address potential methodological shortcomings in Sect. 5).

It is important to note that inputs in the retail sector are often purchased abroad. However, in our analysis we only considered contributions to the national economy. Thus, indirect contributions to foreign economies through e-commerce inputs purchased abroad are not included in the figures above.
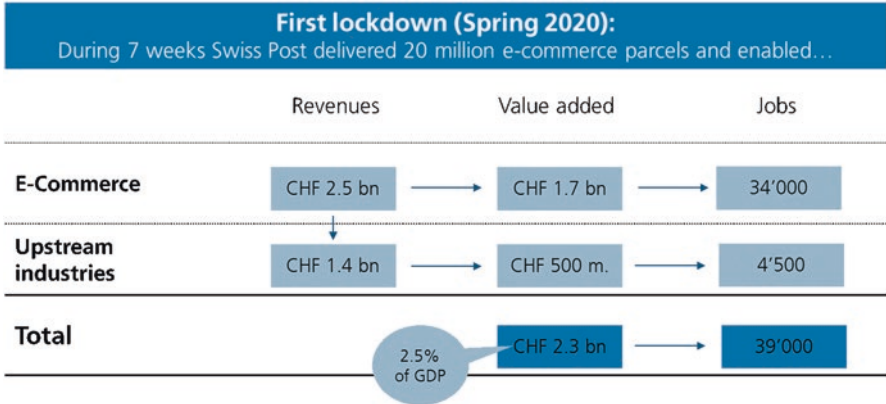
Fig. 14.7 Economic contribution through e-commerce in shutdown I
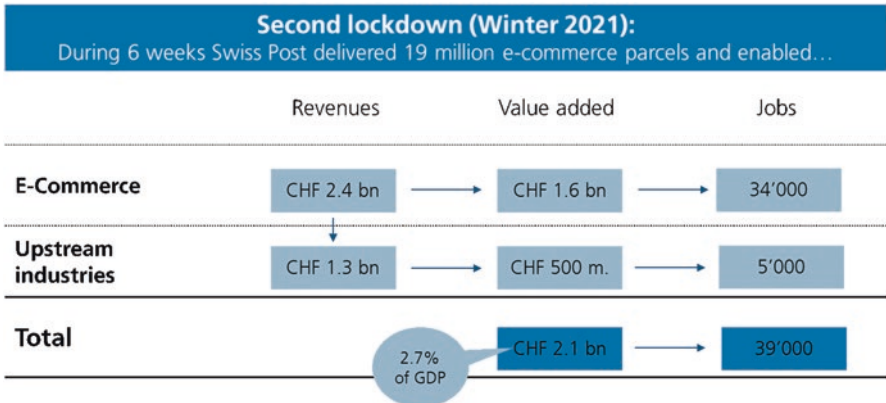
Fig. 14.8 Economic contribution through e-commerce in shutdown II

4.3   Shutdown II

The second shutdown in Switzerland was in winter 2021 and lasted 6 weeks. In this period, Swiss Post delivered about 19 million e-commerce parcels – which represents an even higher weekly or daily volume than in the first shutdown (see Fig. 14.8). Based on the same assumptions as in the previous analysis, we have estimated that thanks to the support of Swiss Post's services, online traders could earn revenues of CHF 2.4 billion and generate value added of CHF 1.6 billion during this period. Together with the indirect value added of CHF 500 million, Swiss Post supported the generation of CHF 2.1 billion of value added, which accounts for 2.7% of GDP. The estimated number of supported jobs was equal to the first shutdown.
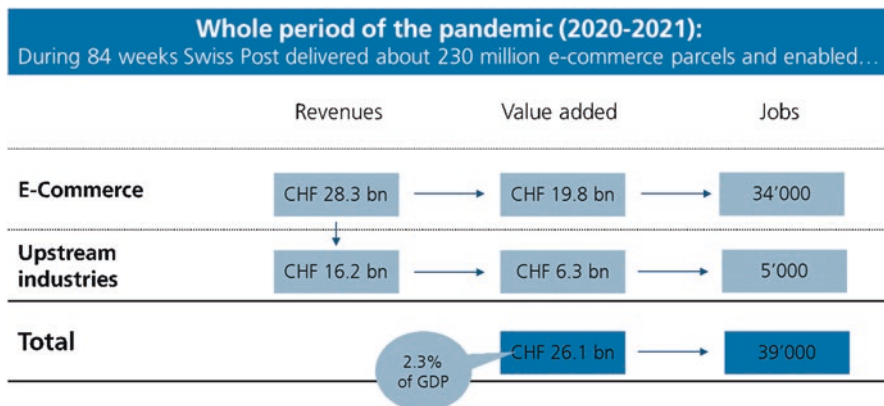
Fig. 14.9 Economic contribution through e-commerce during the whole pandemic

4.4   The Whole Pandemic

In the course of the whole pandemic – lasting from spring 2020 (week 13) until now (week 43) – Swiss Post has delivered about 230 million e-commerce parcels and has helped the e-commerce sector directly and indirectly generate a total of CHF 26.1 billion in value added, which accounts for 2.3% of GDP in this period (see Fig. 14.9). Again, it helped securing about 39'000 jobs in the whole economy – apart from its own employees.

4.5   Impact of the Covid-19 Volume Effect

Total parcel volume increased by 23% or 33.5 million parcels between 2019 and 2020. As parcel volumes have been rising already for years, it is clear that only a part of this increase was due to the pandemic. Assuming a pre-pandemic trend of 7.1% per year (see Sect. 3.4), Covid-19 caused an increase of 18 million e-commerce parcels in 2020. Coming from this number, we have estimated Swiss Post's additional economic contribution as an e-commerce enabler caused by the Covid-19 volume effect. The results in Fig. 14.10 show that due to the pandemic, Swiss Post could help generate additional CHF 2.0 billion in value added in the e-commerce sector and its upstream industries.
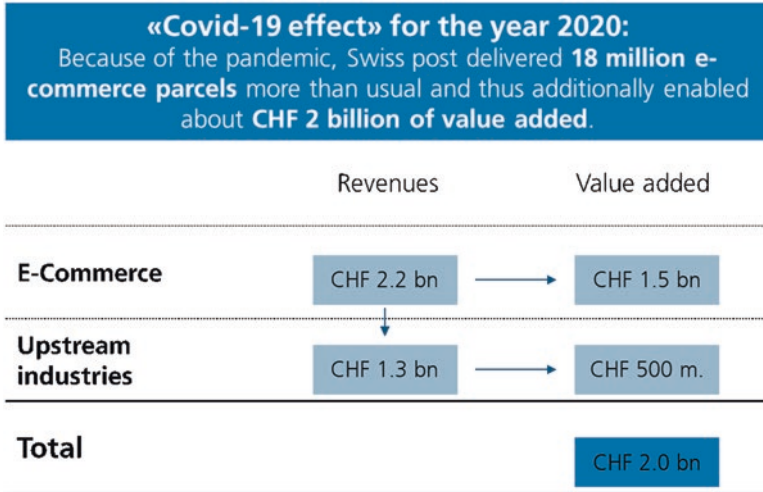
Fig. 14.10 Economic contribution through e-commerce for the pandemic caused parcel volume increase

5 Shortcomings

In this section, we point out some weaknesses of our analysis and present a few aspects that have potential for improvement or further research.[6]

First, with respect to our analysis of lasting effect of the pandemic on volumes, it is still too early for firm conclusions and things may look different some years ahead. Our results have to be taken with due care.

With respect to the economic impact analysis, it is important to note that we mainly use value added and employment as proxies for the socioeconomic value created by Swiss Post. But the opportunity of a fast and affordable mail order service can also increase welfare from the consumers' point of view: it increases consumer surplus and improves the standard of living. The consumption side of the socioeconomic value is still largely neglected in our analysis and might be an area of further research.

There are also some methodological shortcomings with respect to our input-output analysis. First,, the latest input-output table available for Switzerland dates back to the year 2017 and might therefore reflect a slightly outdated structure of the economy. In particular, the pandemic might have caused some changes in economic structure, for example in the hiring patterns of certain sectors. Second, our input-output model is static and does not consider dynamic effects. Third, it neglects the production factor land. Fourth, the model is based on a linear Leontief production function and therefore assumes that the relation between different input factors as

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[6] We thank participants at the 29th Conference on Postal and Delivery Economics for their valuable inputs, especially Ted Pearsall who discussed our work thoroughly.

well as the input-output relation are independent from the scale of production. This implies that the model does not consider returns to scale or substitutions between input factors. These assumptions might be violated - particularly during the pandemic, when important substitutions between the inputs from different industries may have occurred.

6   Conclusion

In this article, we have documented the impact of the Covid-19 pandemic on Swiss Post's operations and estimated Swiss Post's generation of wider economic value trough its role as an e-commerce enabler.

The first part of the article was dedicated to an analysis of volume developments in the Swiss postal market since the beginning of the pandemic. The pandemic seems to have accelerated the transition form letters to parcels in postal markets. For Swiss Post, we have found that the pandemic has caused a substantial increase in parcel volume and a slight decrease in mail volumes. In 2020, about 70% of the increase in parcel volumes could be explained by the pandemic, while for the mail volumes, the pandemic was only responsible for about 30% of the decrease. As we are still in the middle of the pandemic, it is too early for final conclusions about its long-term volume effects. However, our latest data suggests that the pandemic might have had a lasting positive level effect on parcel volumes, while there is no such effect for mail.

In the light of two temporal closures of all non-essential stores in Switzerland, mail order was given a new role as part of a necessary basic service. Swiss Post has played a crucial role in enabling this development by supplying the population with goods of all kind. In this sense, it has created a new kind of wider economic value, which we have tried to quantify in the second part of the article. For this purpose, we have used an input-output model, which allowed us to derive the e-commerce sector's economic footprint enabled by Swiss Post through its provision of essential inputs. The results of this analysis suggest that Swiss Post has supported the generation of CHF 2.3 billion or CHF 2.1 billion of value added in the e-commerce sector during the two shutdowns, respectively. This accounts for nearly 3% of Swiss GDP in the two corresponding time periods.

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Chapter 15
A Global Survey of Covid-19 Postal Regulatory Responses, to Appraise Short and Long-Term Impacts

Susan Alexander, Bruno Basalisco, Henrik B. Okholm, Siva Somasundram, and Stephanie Tizik

1 Introduction and Method

The Covid-19 pandemic and the subsequent measures to ensure global safety have drastically changed the habits of citizens and businesses around the world. Ultimately these changes have intensified the already existing trends of increased demand for e-commerce parcel deliveries and letter volume decline. In addition, many postal and delivery operators experienced widespread logistical challenges as they swiftly adapted their delivery models to both accommodate changing consumer demand and incorporate additional precautionary health and safety procedures.

Amidst these challenges, postal operators have proven to be important suppliers in the economy throughout the duration of the crisis. Postal and delivery operators have supported continued economic activity by maintaining consumer and business access to crucial goods and services throughout periods of lockdown.

Around the world national regulators and policy makers had varying responses to the onset of the global pandemic. Some countries were quick to close down businesses and schools and mandate a lockdown, while other countries did not require citizens to stay home but instead recommended that they pay extra attention to washing their hands and limiting their social interactions.

Likewise, policy actions and changes regarding postal operations also varied around the world. Section 2 of this paper reviews the implications of the global pandemic and specifically how these effects on the global economy also affect the

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postal sector. The paper then turns to assessing specific aspects of regulatory changes that occurred throughout 2020 in response to the pandemic. Section 3 looks at the role of the post as an essential service. Section 4 analyses revisions to quality of service. Section 5 assesses state funding and support to postal operators. Finally, Section 6 concludes with prospective policy and regulation developments in response to Covid-19.

1.1 Survey Methodology

This paper is based on the results of a survey developed by Copenhagen Economics in partnership with the Universal Postal Union International Bureau and run in June 2021. The survey investigated the impact of Covid-19 on postal services globally. To deepen the shared global understanding of the impact of the Covid-19 pandemic, the member states of the Universal Postal Union were invited to respond to a voluntary survey on the postal regulatory response to the Covid-19 pandemic in June 2021. The survey covered topics such as the role of essential services, revisions to quality of service requirements, state funding to support postal operators and policy and prospective regulatory changes in response to the pandemic.

The survey was sent to Ministries, Regulators, and Designated Operators – which had the possibility to present a joint response for their country. This was a voluntary survey, which requested collaboration within a short time frame. All responses were much appreciated and we are grateful for the broad range of information and insights shared by postal experts all over the world.

The survey resulted in 71 responses from 65 countries in each of the major global regions, see the Fig. 15.1 below. Given the information and knowledge sharing
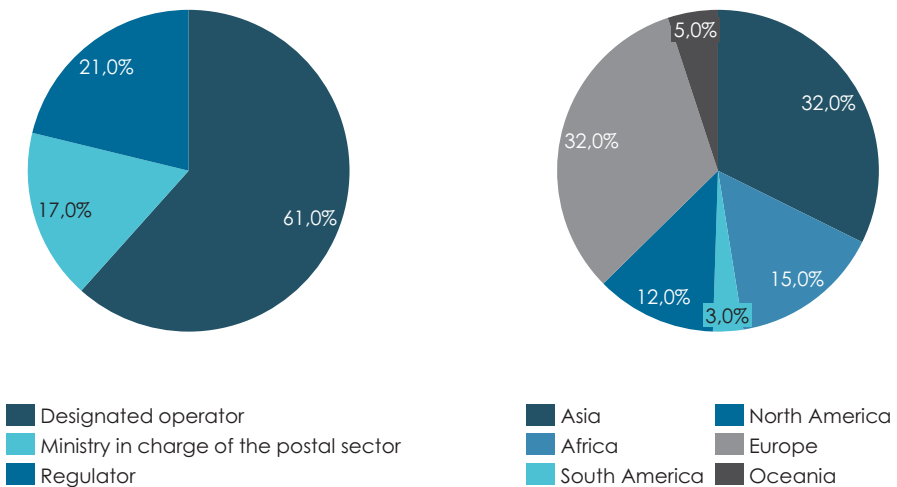
Fig. 15.1 Survey responses by region and organisation. (Source: June 2021 survey of UPU Member States [run by Copenhagen Economics on behalf of the UPU IB])

nature of the questionnaire, each stakeholder could choose to submit a single response per-country or also to submit parallel responses for the same country (which occurred only in a few instances) Therefore, responses submitted by a specific stakeholder can capture broader perspectives relative to their country. Questionnaire recipients and respondents include Designated Operators, Regulators and Ministries in charge of the postal sector. The findings from the survey are presented in the following sections of this chapter.

2 The Covid-19 Impact on the Economy in Light of Postal Impacts Following Macroeconomic Shocks and Financial Downturns

2.1 GDP Trends Linked to Covid-19

Despite dismal initial estimates suggesting that the Covid-19 pandemic and subsequent lockdowns would have severe economic consequences,[1] we saw that the global economy was not hit as hard as initial estimates proposed. Still, the impact of the pandemic on global growth was significant. The IMF stated that the global economy contracted by 3.5% in 2020,[2] a 7% loss compared to the original forecast for 2020 of 3.4% rate of growth estimated in late 2019.[3] Nearly every country had negative growth in 2020, with the exception of 26 countries, most of which are in Africa. Thus, Asia and Africa experienced more moderate growth in comparison to other regions. Conversely, we can see that GDP in North and South America was hit the hardest in 2020.

2.2 Implications of Covid-19 and Major Macroeconomic Shocks on Postal Demand

The Covid-19 pandemic also had a significant impact on the postal sector from both the demand and supply side. A key effect is that GDP changes are connected to postal demand changes. More broadly, the global macro-economic consequences ultimately trickle down to different effects that have a direct impact on the demand and supply of postal and delivery services, see Table 15.1. From the demand side,

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[1] In June 2020, the IMF projected global GDP growth to be −4.9% in 2020. See IMF (2020). World Economic Outlook Reports: World Economic Outlook Update, June 2020.

[2] See IMF (2021). World Economic Outlook Reports: World Economic Outlook Update, January 2021.

[3] See IMF (2019). World Economic Outlook Reports: World Economic Outlook Update, October 2019.

bulk mail senders and business customers switched to digital solutions, while e-commerce took a spot center stage supporting consumption needs throughout the lockdown periods. The latter resulted in an unprecedented increase in parcel demand. On the supply side, lockdowns interrupted supply chains and postal operators were challenged to adapt to the new delivery environment, taking into account, among others, health and safety initiatives.

An important consideration when analyzing the demand-side of the postal sector is whether shocks, such as the ones discussed above, lead to persistent or only temporary effects. A closer look at the 2007–2008 Financial Crisis shows that greater (than cyclical averages) GDP variations (i.e. GDP shocks) have a permanent effect on letter volume demand. Anecdotal observation indicates that in countries where digitalization is more advanced, the GDP shock caused letter volume losses to be more permanent, while for countries less digitally evolved, there was still a permanent loss in letter-post, but it was less pronounced.

At the same time that postal operators are adjusting businesses to account for the decline in letter volumes, they are faced with continuously rising demand for parcel delivery due to rising demand in the e-commerce sector. The growth of the parcel delivery business has created many opportunities for postal operators but also requires changes in operations to meet new market requirements. As consumers increasingly rely on e-commerce, delivery operators are faced with the task of handling the rising demand, while continuing to improve delivery speed and available delivery options in order to remain competitive on the market. The global pandemic expedited the demand for parcel delivery as consumers were forced to adapt to new

Table 15.1 The pandemic macroeconomic shock trickled down to postal demand and supply

Macro-impact	Effects driving the impact	Effect on postal demand	Effect on postal supply
Economic growth declines by 3.5% in 2020	Lockdowns resulted in store closures	Increased demand for e-commerce delivery	Pressure on parcel pick-up locations and delivery logistics
	Many businesses started working from home	Less bulk mail letter deliveries as people are not in the office to send or receive letters. Higher demand for home delivery of parcels	Costs decrease due to higher share of 1st time successful home delivery of parcels
	Lockdowns halted travel		Grounded flights led to bottlenecks in logistic supply chains
Unemployment increased globally	Unemployment contributes to lower consumption spending	GDP-driven effect reducing the growth potential of e-commerce	

Source: Team analysis
Note: This table does not display an exhaustive list of the impacts of these macro-effects on postal demand and supply

shopping habits in a situation where shops were not open or in consumers preferred online shopping to maintain social distancing.

We have seen that the Covid-19 pandemic has exacerbated the existing trends in postal demand: letter demand declines and parcel demand increases. This shift in operators' product mix is a promising opportunity reinforcing the diversification and an effort by many postal designated operators to serve e-commerce demand as well as possible. However, profit margins are historically higher for letter mail than parcel products, and as such this shifting product mix will likely have impacts on operators' bottom lines.

These topics were at the core of the Cazals et al. (2020) paper, which was at the forefront of the assessment of Covid-19's impact on mail volumes and focused on commercial letter mail volumes. Their findings showed that economic activity is still a significant driver of mail volumes. Further, while Covid-19 has aggravated the pre-existing e-substitution trend, it has not led mail volumes to decline at an expedited rate compared to what would be expected based on previous historical relationships.[4]

3   The Role of the Post as an Essential Service

Many countries globally define a universal service obligation (USO) for postal operators. For the universal service obligation to remain relevant and useful for users, it needs to reflect market trends and user needs. Thus, it is important that the USO is reviewed and adjusted regularly.

Postal services remain important in today's society, regardless of the need to regularly review and adjust the USO services to reflect user needs. This was emphasized through the post's response to lockdowns and changes in delivery protocols following the international health crisis. In many ways, the Covid-19 pandemic has been a lightning rod for pending and anticipated policy changes.

3.1   The Postal Network Proves to Be Vital Amidst Global Lockdowns

One of the post's greatest assets is the network infrastructure it relies on. Due to their history of nationwide coverage and local presence, postal operators play an important role connecting individuals as well as businesses and customers in peripheral regions with urban areas. In relation to the Covid-19 crisis and global lockdowns, postal operators and their network served as essential infrastructure - in

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[4] A related, contemporary paper is Arlandis et al. (2021).

conditions and circumstances where no alternative supply was able or willing to serve all potential customers.

The Covid-19 pandemic resulted in a unique response relative to previous crises, as it required long-term lockdowns across the globe. Our survey found that Covid-19 lockdowns required brick & mortar stores to close in 50 out of the 65 countries responding to our survey, although in many cases brick & mortar shops operating essential services were permitted to stay open, which in the majority of countries included post offices.

The designation (by the executive or legislative branch) of the post as an essential service signals the vital role operators played throughout the pandemic response period and beyond. Our survey results showed that in 56 of the 65 responding countries, the post received this designation, although the specific services identified under this designation varied among countries. In some countries, postal operators received the essential service designation (i.e., front-line service status) over all of their services including delivery operations for both letters and parcels, newspaper delivery, the postal network (due to its function as critical infrastructure), retail and counter activity available at the post office and financial services, see the following Fig. 15.2.

3.2   Introduction of New Essential Services Geared Towards Covid-19 Resilience

Postal operators generally provide services beyond their typical mail delivery services. In particular, posts are well known for providing social interaction, especially to people who are isolated. Post offices often serve as a hub for social connection (Borsenberger, 2020).[5]

The UPU Guide to Postal Social Services (2021e) identified that, even before the pandemic, posts often provide administrative services on behalf of government, such as managing social security payments or processing requests for documents renewal. Some have even been mobilized to help implement specific social development policies, such as distributing food parcels to undernourished children and promote awareness campaigns about communicable diseases. Posts have also taken the initiative to establish services in social care, health, and education.[6] For example, in Indonesia the designated operator reported that they worked closely with the public service institution to develop digitally based public services.

We have seen that in addition to continuing to provide their existing services, postal operators also contributed to the frontline response by introducing new services during the last year. Our survey found that 41 countries introduced or mandated new services to be fulfilled by the post to meet essential needs which emerged

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[5] Related contemporary contributions include Borsenberger et al. (2021).

[6] UPU (2021e). UPU guide to Postal Social Services.

Number of responding countries

Fig. 15.2 Postal and delivery services identified in national legislation as essential due to Covid-19. Note: Table based on ministry or regulator information, where available. Many respondents indicated that these serves were already mandated as essential service and therefore their response is not included here. In addition, other services mandated as essential were identified, for example the postal network was considered an essential infrastructure and financial services. (Source: June 2021 survey of UPU Member States)

due to Covid-19 and the accompanying impacts and restrictions. These services included for example services for the elderly/frail citizens, services for rural citizens or those in disadvantaged locations, services related to the disbursement of public payments and pensions, health related services, and services to support the dissemination of information related to the Covid-19 practicalities and restrictions, see the Fig. 15.3 below. All these services were classed as essential by the authorities, in relation to ensuring the provision during (despite the restrictions imposed with respect to) the pandemic. This appears as evidence of diversification of the activities performed by postal operators, which is one of the strategies increasingly embraced by operators in response to core business (letter mail9 decline. At the same time, postal diversification involves several potential pitfalls and considerations (Brennan, 2020; Bailly & Meidinger, 2013).

The recent introduction of some of these services as a result of the heightened need throughout the pandemic response has once again proven the value of the postal operator's network as a way to incorporate new economic and social services that support communities, national economies and public authorities – one example being local farmer community support in rural Vietnam.[7] These services are highly valued by society and could become a permanent offering outside of the mandated service offerings or universal service. In fact, 53% of countries responding to our

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[7] See UPU (2021c, d). Union Postale: COVID-19 One year later. No.1.2021 and UPU webpage on Postal social, financial and trade services during COVID-19 for information and detailed commentaries on how postal operators adjusted their services in response to the pandemic. See also Vietnam Post (2020).

Number of countries introducing new services
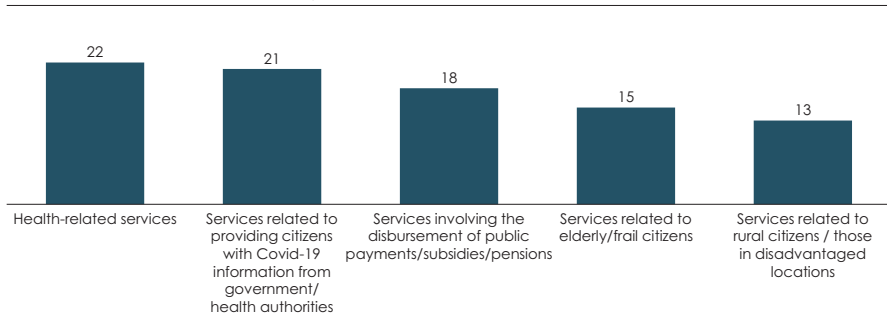
Fig. 15.3 New services introduced as a response to Covid-19. Note: Figure based on ministry information, where available. For countries with multiple respondents' responses were consolidated. (Source: June 2021 survey of UPU Member States)

survey indicated that the introduction of these services throughout the pandemic will be implemented long term as ongoing services with a statutory mandate.

Operational changes responding to Covid-19
The post's ability to continue to provide essential services and introduce new services throughout the entirety of the pandemic is an indicator of how dynamic postal operators are. The Covid-19 pandemic has had a profound effect on the economy and specifically on business operations. Lockdowns and other measures were implemented to inhibit the spread of contagion, but this ultimately affected how businesses across all economic sectors operated.

In the postal sector, operators around the world had to adjust their delivery operations and infrastructure to adapt to the new Covid environment. All but two countries responding to our survey identified that they made changes to their delivery procedures, but no country stated that mail delivery operations had to be suspended entirely, highlighting the resilience of postal operators. In many cases changes included smaller adjustments to procedure such as suspending signature upon receipt for parcel deliveries and implementing additional hygiene precautions, such as increasing the use of hand sanitizer and providing medical masks and social distancing measures, see the following Fig. 15.4.

In other countries, operations were adjusted more significantly leading to downscaled operations, introducing a rotational/staggered work schedule for employees, and encouraging working from home where possible. This had further repercussions for delivery times, which were also adjusted in some cases, for example in Canada where on-time guarantees were suspended. In the United States timelines for business customers to collect their mail from the post offices were extended and the Postal Service even established its own Close Contact Tracing Program to ensure safe working conditions for employees during the pandemic. The pattern of adjustments applied not just to developed but also developing economies. Further examples of adjustments to delivery operations across the world can be found in the box below.

Number of responding countries
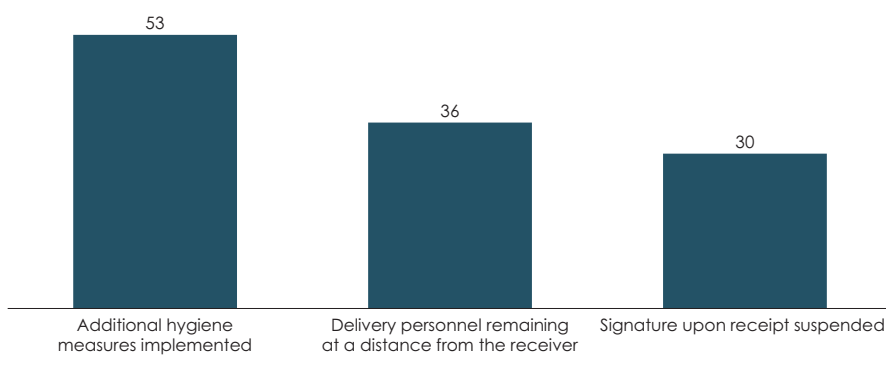
Fig. 15.4 Adjustment of delivery operations in response to Covid-19. (Source: June 2021 survey of UPU Member States)

Box 15.1 Select Examples of Adjustments of Delivery Services

- In Fiji, extra processes were implemented due to the stringency of the Covid-19 lockdown protocols in the country. For example, courier services operating after curfew required specific documentation and delivery personnel had special procedures to follow when handing over delivery vehicles at the containment zone borders. This had further implications for delivery times which needed to be changed because of the delays for domestic deliveries.
- In China, not only postal personnel but also customers had to follow a comprehensive hygiene and health procedure, including the measurement of body temperature before accessing postal locations. Moreover, parcels were disinfected from the outside by the post to reduce health risks.
- In Macao, the delivery of express mail service items had to be suspended during February 2020. To ensure the timely and safe arrival of express mail at its destination, the designated operator contacted recipients via telephone, informing customers about an alternative pick-up location for the mail items.

Source: Copenhagen Economics survey

4   Revisions to Quality of Service

The operational challenges and changes that arose following the Covid-19 pandemic further affected the quality of delivery services. Many postal operators reported experiencing significant operational bottlenecks throughout the pandemic,
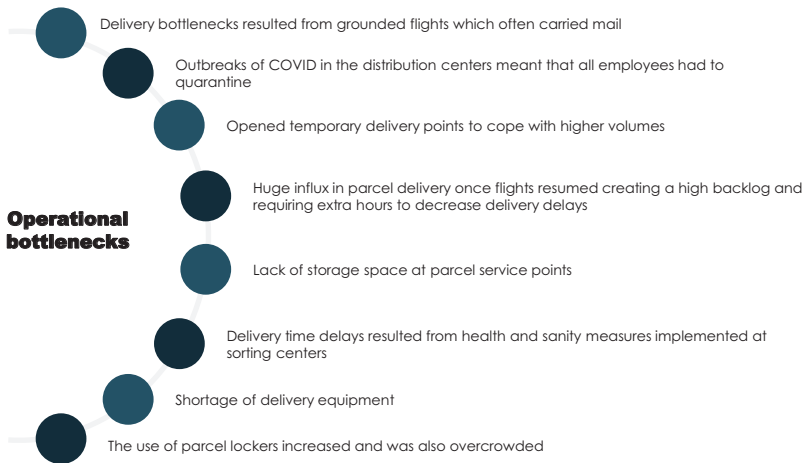
Fig. 15.5 Operational bottlenecks during the Covid pandemic response. (Source: June 2021 survey of UPU Member States)

which led to declines in quality of service. These bottlenecks ranged from logistical challenges caused by the lack of air transport to challenges related to limited capacity within existing infrastructures, exacerbated by the need to operate at peak performance for a sustained period of time, see the Fig. 15.5 below.

In addition, the Covid-19 lockdowns and related restrictions significantly increased the demand on postal and delivery services. This pressure meant that postal operators were operating at peak performance for several weeks while simultaneously adapting to the new safety requirements and incorporating additional services that were necessary to support the pandemic response. This also contributed to challenges for operators to ensure quality of service in their deliveries.

4.1 Key Statistics on Quality-of-Service Changes in 2020

In 2020 many operators experienced challenges achieving their quality-of-service targets, in part due to unique sector demands resulting from the Covid-19 pandemic. According to our survey, 43% of operators in responding countries met or exceeded their D+1 quality of service requirement for letters in 2020, and only 37% of operators in responding countries met or exceeded their D+1 quality of service requirement for parcels in 2020. Further, we found that many operators missed their D+1 target by more than 5% for both letters and parcels; see the following Fig. 15.6.

Letters
Number of responding countries

Parcels
Number of responding countries
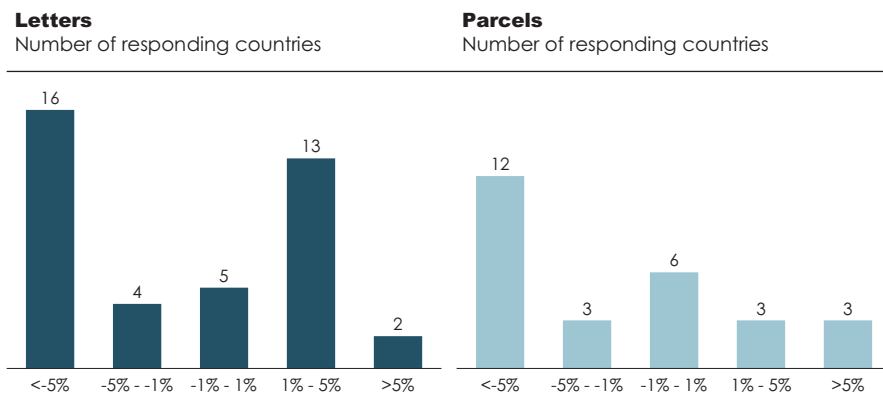
Fig. 15.6 Distribution of under/over performance vs. QoS target, across countries. Note: The calculated ranges display the difference between the actual percentage of letters or parcels delivered D+1 compared to the target for 2020. (Source: June 2021 survey of UPU Member States)

It is clear that 2020 was a challenging year for postal operators in terms of quality of service. This was discussed in detail during the UPU webinar on 1 July 2021.[8] Participants agreed that for the regulatory QoS process, measuring, quantifying, and even capturing the impact of an event like the Covid-19 pandemic and its effects on quality of service is challenging. While the force majeure framework is a natural starting point to relax regulatory enforcement during an emergency, it became clear that given the persistent and multi-faceted impacts of Covid-19, force majeure exceptions risk not being a fit-for-purpose mode of dealing with this type of situation. Webinar participants agreed that, above all, an immediate and continued dialogue and shared understanding of the situation between designated operators and regulators is essential. Furthermore, the Covid-19 regulatory response and challenges highlighted the value for future regulatory reforms to frame quality of service targets as primarily a means to ensure reliability as key policy aim, with the specific agreed speed of delivery as a second consideration.

The survey found that in many countries, national regulators and ministries in charge of postal services have granted leniency in the assessment of quality-of-service objectives in 2020. In particular, our survey revealed that roughly half of responding countries adjusted their quality of service in 2020 in response to the challenges arising from the pandemic, see the following Fig. 15.7.

A closer look at the types of adjustments granted reveals that the most common adjustment for both letters and parcels was lower frequency requirements, although many operators were also granted decreased quality of service targets and flexibility regarding quality-of-service standards, see the Fig. 15.8 below. Lowering letter mail delivery frequency requirements is a way for postal operators to cope with the lower levels of personnel active during the pandemic, constraints in front-line activity,

[8] UPU (2021a). Additional sources of information on events.

Number of responding countries
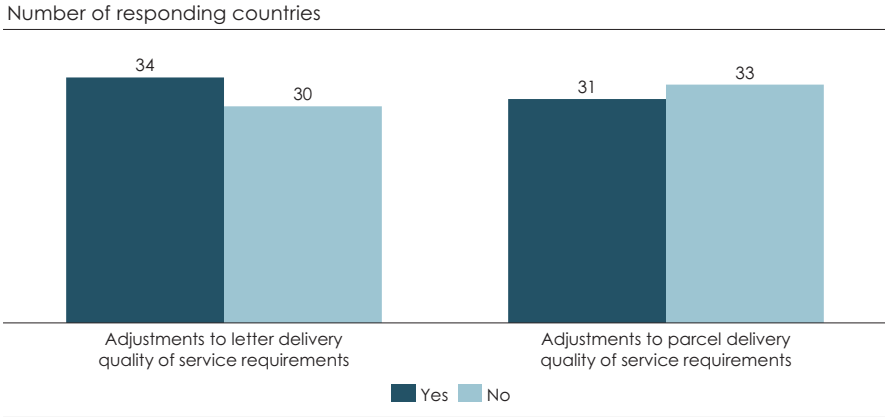
Fig. 15.7 Roughly half of surveyed countries adjusted quality of service requirements in 2020. Note: Figure is based on regulator information, where available. (Source: June 2021 survey of UPU Member States)

Number of responding countries
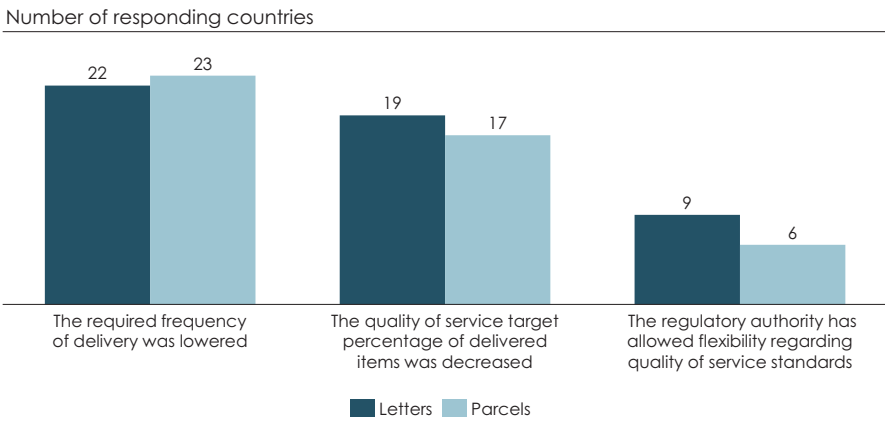
Fig. 15.8 Type of quality-of-service adjustments in response to Covid-19. Note: Figure is based on regulator information, where available. Changes to required frequency of delivery include, i.e., lower number of days per week when delivery takes place in a specific location. (Source: June 2021 survey of UPU Member States)

ensuring compliance with safety measures – as well as adjusting to suddenly reduced demand (e.g., for letter mail, where this has been the case), while catering as far as possible for the boom in parcels.

5   State Funding to Support Postal Operations

Some universal service providers receive funding from the State to support the provision of postal services in their country. As described above in Sect. 2, throughout the pandemic some operators were asked to assume additional roles, such as delivering pension checks, to assist on the front-line of the pandemic. In some cases, support from the State is needed in order to sustain these services provided by the post.

Even before the Covid-19 pandemic, several countries identified the importance of sustaining these public services including those provided through the USO. For example, in the European Union this concept of valued services for societal benefit is referred to as Services of General Economic Interest (SGEI). These services exist both inside and outside of the universal service and can be compensated for through public funding. In the UPU webinar on the topic of state funding on 29 June 2021[9] an important distinction was highlighted: State funding for postal operations should be based primarily on the identification of citizen needs, rather than funding postal operations per se. The importance and societal need for certain social services provided by postal operators is also addressed in the UPU's Guide to Postal Social Services.[10]

The implication is that for many designated operators, the State as a customer for a class of socially-oriented services can and is constituting a new business line, insofar as the State (representing all taxpayers and citizens) has the willingness to pay. As in any form of public procurement, it is expected the State will consider the value for money and competition impacts – which suggests that Designated Operators can succeed best where their unique assets (e.g., the postal network) are key to deliver the services sought.

Still, the global pandemic increased the need for state funding in many countries. Specifically, our survey found that 37 out of 65 responding countries indicated that the recent crisis has increased the need for state funding for delivery operators. Thus, while several postal operators have been able to tap into the growth of e-commerce parcel delivery services (which is broadly a contested space), this opportunity seems to have been generally outweighed by the losses in the core letter mail business linked to the pandemic Although this is an indication of an increased need for postal funding, there is still a large portion of respondents that do not require or see a need for financial support. Given that in a large majority of countries the Designated Operators are ultimately State owned, a degree of financial backing applies, while the question remains of the extent to which explicit Covid-19 financial support is to be expected. Although different stakeholders in each country may naturally have different viewpoints on funding questions, it is important that all stakeholders can hold a shared understanding of the financial reality associated with the Covid-19 pandemic.

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[9] UPU (2021a). Additional sources of information on events.

[10] UPU (2021e). UPU guide to Postal Social Services.

5.1 Is the Legal Framework Underpinning the Postal Sector Resilient Enough?

This recent unprecedented crisis proved the importance of a flexible postal sector, which ultimately reveals an important question: Is the legal framework itself resilient enough? In other words, does the relevant postal law provide sufficient flexibility and provisions to allow for designated operators and regulators to respond to significant exogenous shocks, such as Covid-19. In particular, is the regulatory flexibility, and/or the availability of state financial support, enough to promote the financial viability of the designated operators and the USO.

Our survey found that 10 operators have already received state funding to provide support from pandemic efforts; this was the case mostly in developing economies, as well as in some cases in Europe and America. In general, our survey also revealed that existing state funding frameworks do not automatically adjust to provide financial support in times of crisis. At the same time, this does occur, since 14 respondents stated that decreases in letter demand resulting from Covid-19 will have an impact on the level of state funding or compensation according to state policies. This could be the case if operators have a compensation that accounts for the USO net costs. In this case the amount of compensation would adjust if letter volume declines increased the unfair financial burden of the net cost due to pandemic circumstances. Therefore, a larger set of countries surveyed may – after a lag – be in a situation where State funding responds to the Covid-19 financial impacts on the Designated Operator.

When designing funding for the postal sector, policymakers must be aware of the economies of scope and synergies in postal operations. The Covid-19 postal frontline response has demonstrated that the existence of a postal infrastructure (in many cases funded with a purpose to ensure the delivery of key communications services e.g., letter mail) gives benefits in terms of the possibility to deliver additional essential services. As discussed at a UPU webinar on 22 June 2021,[11] the post's ability to include all citizens in the provision of and access to such new services through its network, while establishing a relationship of trust, was a strong asset that the State can tap into to achieve policy aims of socio-economic cohesion, resilience and inclusion. For example, in Japan the postal network is additionally used to allow access to cutting-edge financial and digital services for all citizens, emphasizing social inclusion. The webinar participants also highlighted the importance of balancing the establishment of new services and maintaining a focus on financial profitability of the postal operator as a business.

Broadening the scope of postal operations to include essential health, education or government services inevitably requires cooperation with actors from other sectors and engagement with associated regulatory frameworks. The role of postal legal frameworks in supporting this cross sectoral working, and the experiences of posts in navigating these new policy landscapes, are important subjects for

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[11] UPU (2021a). Additional sources of information on events.

additional analysis, with the aim of further increasing postal resilience and relevance during future crises.

6   Reported Emerging Policy and Regulation Developments in Response to Covid-19

It is clear that regulatory and policy changes have been widespread in effort to support the postal sector and the broader economy throughout the global pandemic crisis. All-in-all, our survey finds that regulatory changes were made in 14 of the 65 responding countries, see Fig. 15.9 below. These changes were implemented in many different areas but included universal services, e-commerce and social services. At the same time 18 countries indicated that they believed that there would be future policy changes due to the long-lasting impacts of the Covid-19.

Regulators and policymakers have an important task of balancing the needs of society and safeguarding the future viability of postal services. Throughout the Covid-19 pandemic, we saw that regulators and policy makers around the world have stepped in to ensure safety. In addition, regulatory bodies reacted and provided support to operators in terms of adjusting quality of service and delivery frequency requirements and providing financial support while also ensuring that essential services were provided to society during this unprecedented time. At the same time, the survey has revealed that existing postal regulation can be relatively rigid and, while quality-of-service targets were adjusted widely, state funding and financial support might be less easily adjusted to the post's provision of additional services in times of unexpected crisis.
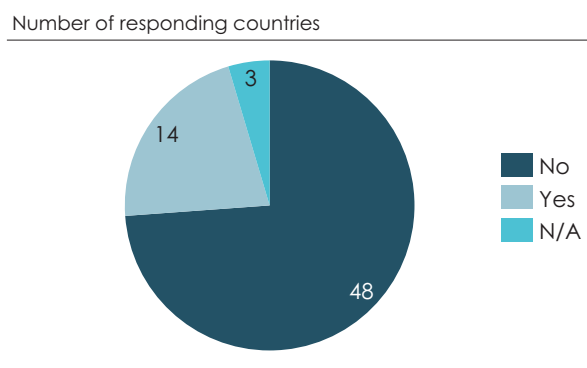
Fig. 15.9 Many countries implemented regulatory changes in the postal sector in 2020. (Source: June 2021 survey of UPU Member States)

7   Concluding Remarks

Although it is still unclear how the effects of the Covid-19 pandemic will affect the post in the future it is clear that the support of regulators and policymakers is vital to ensuring that operators can continue to provide these essential services, especially during times of crisis. Given the lessons learned during the pandemic so far, several insights can be gained about what governments, postal regulators and operators could explore further from a policy perspective in anticipation of future crises.

To inform policymakers, it can be helpful to perform an exercise in retrospection (always easier than anticipation) and ask the following key question: given the emerging information on postal experiences of the pandemic, what would governments do differently from a regulation/policy perspective, if they knew in advance that COVID-19 was on the way?. A useful document to inform thinking remains the Pandemic recovery guide (UPU, 2021b).

With the caveat that the lessons are still being learned, and that the pandemic continues to pose new challenges for posts, we offer the following suggestions and observations. First, governments and regulators will benefit from enhancing their ability to detect and respond to unexpected social or economic conditions. Anticipating the severe effects such events can have not only on the economy but on the postal sector is key. Such contingencies and resulting financial and operational support for postal operators should be included in postal regulation to facilitate a smoother coping mechanism in case of future shocks and crises.

The notion of preparedness can be extended to include enhanced policy coherence and joined-up activities involving the postal sector – for example allowing Designated Operators more possibilities to provide essential services in the health, education, and governmental sector in case of another unforeseen event. Governments' flexibility to consider and provide emergency funding for postal operators, once the crisis has materialized, could be increased by streamlining related legal and policy processes. Defining these in advance could accelerate the ability to respond and safeguard citizen needs in the best way.

The postal sector can benefit from engaging with and learning from related economic sectors, such as the transport (incl. aviation) or energy sector, to learn from their regulatory frameworks and potential recent adjustments of regulations in anticipation of future crises. Last but not least, governments, regulators, and operators should take this opportunity to become even more prepared, pro-active, and adaptable. Already during the Covid-19 pandemic, it has become apparent how essential these capabilities are and how they have enabled postal operators to adjust and continuously support their country in times of unexpected crisis.

Appendix

Overview of the Questionnaire

This questionnaire is organised into four sections (i) the role of essential services (ii) revisions to quality of service (iii) state funding to support postal operators and (iv) prospective policy and regulation changes. The summary of the questionnaire responses is organised in the same way.

The role of essential services
In this section we asked the following questions:

- Have brick-and-mortar stores closed at any time in your country?
- Have existing postal and delivery services been mandated/identified as essential services in your country as a result of COVID-19?

  – If so, please indicate the specific service(s).

- Have new services been introduced/mandated to fulfil specific essential needs that emerged owing to COVID-19 and the accompanying impacts and restrictions?

  – If so, please indicate the specific service(s).

- Will at least some of the above services continue to be offered and become established within the framework for ongoing essential services (including universal postal services)?
- In response to COVID-19, were delivery operations adjusted in any way?

  – If so, please indicate in which way(s).

Revisions to quality of service
In this section we asked the following questions:

- Have letter delivery quality of service requirements been adjusted in response to the COVID-19 pandemic?

  – If so, how?

- Have parcel delivery quality of service requirements been adjusted in response to the COVID-19 pandemic?

  – If so, how?

- In 2020, what were the quality of service targets for letter mail and what was the actual quality of service achieved?
- In 2020, what were the quality of service targets for parcels and what was the actual quality of service achieved?
- Did the combination of COVID-19 restrictions and the increased use of e-commerce create operational bottlenecks in parcel delivery?

Regarding the two questions addressing actual and targeted quality of service information in 2020 for letters and parcels, large amounts of data were received. We choose to present this data by calculating the difference between the actual percentage of letters or parcels delivered D+1 compared to the 2020 target. This is reported here for the D+1 products as these are the most standard products across countries.

State funding to support postal operators

In this section we asked the following questions:

- Does the designated operator (DO) receive compensation or state funding owing to the impact of COVID-19 on the postal service?
- Does existing legislation or regulation enable the level of state funding/compensation to the DO to increase in circumstances linked to COVID-19 and related responses?
- Do any COVID-19-related decreases in demand for letter mail have an impact on the level of state funding/compensation in accordance with current state policies and regulatory rules?
- Do you consider that COVID-19 has increased the need for state funding for DOs?

Prospective policy and regulatory changes

In this section we asked the following questions:

- In 2020, have you introduced new legislation, policy or new postal regulations?

  – If so, please indicate in which areas.

- Do you anticipate any policy changes to the provision of the universal postal service in your country owing to long-lasting impacts of COVID-19 (for example, universal postal service standards, financing of the universal postal service and/or other aspects)?

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Chapter 16
The Impact of the COVID-19 Pandemic on the Postal Market. Challenges and Opportunities for the Postal Regulatory Framework

Mateusz Chołodecki

1 Introduction

Change always brings challenges. The COVID-19 pandemic must be seen as an extraordinary situation that has demanded constant adaptation to new circumstances. This paper shows how the EU Member States have adopted different solutions to cope with such an extraordinary situation. This extraordinary situation forced all the market players, i.e., postal operators, courier operators, and postal regulatory authorities, to adjust to new challenges. These new challenges include, for example, the health protection of postal workers and couriers, processing increasing volumes of parcels from e-commerce, adjustments of last mile logistics, and safeguarding the Universal Postal Service (UPS).

This paper focuses on the amendments made in the postal framework in the EU countries and discusses of the amendments will have a temporary or permanent effects. One of the issues discussed in the paper is the possible grounds for the different approaches adopted to deal with the circumstances of the pandemic in selected jurisdictions. Furthermore, in the context of the ongoing discussion about the increasing sector-regulation of the postal market or its deregulation, the paper presents new arguments addressing the pros and cons of this issue. Thus, the paper is organized as follow: Section 2 concentrates on the general pandemic restrictions

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in the EU Member States and the measures taken in response to the crisis. Section 3 presents the economic and infrastructural effects on the postal market caused by the COVID-19 crisis in selected EU countries. Next, Sect. 4 focuses on the specific responses to COVID-19 that have been adopted in the postal market. The first subsection (A.) describes the closed-door-policy as a specific measure taken for the postal market. The second subsection (B.) demonstrates the role of the EU postal National Regulatory Authorities (NRAs) during the COVID-19 pandemic. Finally, Sect. 5 concludes the paper.

2   COVID-19 Pandemic Restrictions. An Overview

The SARS-CoV-2 virus triggered a pandemic that began in China in December 2019. European countries took very different approaches to deal with the pandemic.[1] One of the reasons for these different approaches is that EU countries possess different legal solutions for responding to exceptional situations like a pandemic or natural disasters. Most countries were not ready to deal with such an extraordinary situation, in terms of their legal framework. For example, in Greece, the "*state of siege*" defined in Article 48 of the Greek Constitution applies only to extreme threats to Greek democracy and sovereignty. On the other hand, in other countries like Poland[2] or Cyprus, a State of Emergency has not been declared, due to the far-reaching constitutional consequences (e.g., the postponement of general elections and the limitation of certain liberties), but other legal measures have been taken. To cope with the rapid-changing pandemic situation, some states, like Denmark, decided to grant the government certain tools with limited judicial and parliamentary oversight.[3]

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[1] For a wider overview see: Naja Bentzen, Albin Boström, Micaela Del Monte, Ingeborg Odink, Martina Prpic, Mari Tuominen: States of emergency in response to the coronavirus crisis: Situation in certain Member States III, PE 651.972 – June 2020 and Zuzana Alexandre, Micaela Del Monte, Gianna Eckert, Silvia Kotanidis, Vendula Langova and Violeta Rakovska *States of emergency in response to the coronavirus crisis: Situation in certain Member States IV*, DG Presidency PE 652.002 – July 2020.

[2] See especially the Law on Specific Measures to Prevent, Counteract and Combat COVID-19 and Other Contagious Diseases and Associated Crisis Situations and Certain Other Laws of 2 March 2020 (Journal of Laws 2020, Section 374, as later amended) and the Law amending the Law on Specific Measures to Prevent, Counteract and Combat COVID-19 and Other Contagious Diseases and Associated Crisis Situations and Certain Other Laws of 31 March 2020 (Journal of Laws 2020, Section 568, as later amended).

[3] Lauta, Kristian Cedervall: *The Eternal Emergency? Denmark's Legal Response to COVID-19 in Review, VerfBlog,* 2021/3/22, https://verfassungsblog.de/the-eternal-emergency-denmarks-legal-response-to-covid-19-in-review/, DOI: https://doi.org/10.17176/20210322-151511-0

Every public action taken by a government must follow the principle of proportionality, as one of the fundamental principles of law. The regulations against disasters were very often related to significant civil rights restrictions. Portuese (2013, p. 1) highlights that the principle of proportionality is *more than a legal principle. Proportionality has continuously been seen as the very condition for delivering justice*; yet given that the COVID-19 pandemic began in early 2020, such civil rights restrictions seem to be against the principle of proportionality. Table 16.1 shows this variety of responses.

The efforts to fight the COVID-19 pandemic triggered the adoption different types of extraordinary measures. Governments started to apply various bans and social restrictions, which medical advisers recommended to stop spreading the virus. Lockdowns became one of the prime restrictions. Table 16.1 shows that all the EU countries, under the World Health Organization (WHO) recommendations, established a nationwide stay-at-home order, and either issued social distancing and respiratory hygiene advice or introduced measures in this regard (e.g., mask recommendations or mandates). Furthermore, many businesses and public administration bodies ordered their employees to work from home (remote work). In addition, some countries have adopted special legal restrictions to cope with the COVID-19 pandemic, and almost half of the countries had announced a State of Emergency based on the constitution.

No matter what kind of legal restrictions were adopted, every EU country initiated a public discussion about the indispensability and proportionality of the pandemic laws. In some countries, anti-lockdown movements organized protests.[4] Several countries have replaced the State of Emergency with new restrictions called "the new normal"[5] to reduce social discontent, to give people hope for the future, and to suggest that all the imposed limits make sense. However, this "the new normal" only lifted some of the restrictions in public areas. In sum, this variety shows a great need for a legal framework or decision-making process for emergencies in the future, on both the national and the EU level. Remarkably, the EU was not prepared to deal with the pandemic. The certain freedoms of its citizens and open borders only complicated their efforts to deal with the crisis.

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[4] DW, *Coronavirus: Thousands protest against restrictions across Europe*, https://www.dw.com/en/coronavirus-thousands-protest-against-restrictions-across-europe/a-58627841

[5] The term "new normal" has appeared in several publications i.e.: J. Samuel et al., "Feeling Positive About Reopening? New Normal Scenarios From COVID-19 US Reopen Sentiment Analytics," in IEEE Access, vol. 8, pp. 142173–142190, 2020, doi: 10.1109/ACCESS.2020.3013933.; Jens O. Zinn (2020) 'A monstrous threat': how a state of exception turns into a 'new normal', Journal of Risk Research, 23:7–8, 1083–1091, DOI: 10.1080/13669877.2020.1758194 or E. Mińska-Struzik, & B. Jankowska 2021(Eds.), Toward the "new normal" after Covid-19 – a post-transition economy perspective (pp. 5–8). Poznań University of Economics and Business Press. https://doi.org/10.18559/978-83-8211-061-6.

Table 16.1 Legal measures taken by the EU Member States and the UK in response to the COVID-19 pandemic

Country	A State of Emergency	Other legal restrictions	Lockdowns[6]	Other
Austria			Yes	
Belgium		Yes	Yes	
Bulgaria	Yes[7]		Yes	
Croatia		Yes	Yes	Earthquake
Cyprus		Yes	Yes	
Czechia	Yes		Yes	
Denmark[8]		Yes[9]	Yes	
Estonia	Yes		Yes	
Finland	Yes		Yes	
France		Yes[10]	Yes	
Germany		Yes[11]	Yes	
Greece		Yes[12]	Yes	
Hungary		Yes	Yes	
Ireland		Yes	Yes	
Italy	Yes[13]		Yes	
Latvia	Yes		Yes	
Lithuania	Yes[14]		Yes	
Luxembourg	Yes[15]		Yes	
Malta	Yes		Yes	
The Netherlands		Yes	Yes	
Poland		Yes	Yes	
Portugal	Yes		Yes	
Romania	Yes[16]		Yes	
Slovakia	Yes		Yes	
Slovenia		Yes	Yes	
Spain	Yes[17]		Yes	
Sweden		Yes	Yes	However, most of the restrictions are the government's recommendations rather than legal restrictions.
UK		Yes	Yes	
Total 28	13	14		

Source: ERGP summary information on measures adopted for postal service in view of the COVID-19 outbreak, Reports 1–6

[a]In most countries, there were several lockdowns

[b]Declared by a Decision of 13 March 2020 of the National Parliament (https://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=147150)

[c]The Danish Constitution contains no specific references to the declaration of a State of Emergency as such

(continued)

Table 16.1 (continued)

ᵈLauta, Kristian Cedervall: *The Eternal Emergency? Denmark's Legal Response to COVID-19 in Review, VerfBlog,* 2021/3/22, https://verfassungsblog.de/the-eternal-emergency-denmarks-legal-response-to-covid-19-in-review/, DOI: https://doi.org/10.17176/20210322-151511-0

ᵉThe Act of 23 March 2020 allows the declaration of a "sanitary state of emergency"

ᶠPrimarily lies on the federal parts of the country, since April 2021 the government has had extra power

ᵍKaravokyris, George: Constitutionalism and COVID-19 in Greece: The Normality of Emergency, VerfBlog, 2021/2/25, https://verfassungsblog.de/constitutionalism-and-covid-19-in-greece-the-normality-of-emergency/, DOI: 10.17176/20210225-153933-0

ʰCanestrini N. Covid-19 Italian emergency legislation and infection of the rule of law. New Journal of European Criminal Law. 2020;11(2):116-122. doi:10.1177/2032284420934669

ⁱ26 February 2020 Government of the Republic of Lithuania Resolution No 152 Declaring a State of National Emergency (https://koronastop.lrv.lt/uploads/documents/files/Nutarimo%20152%20suvest_redakcija_EN2021-07-20.pdf)

ʲ*Expressis verbis* "State of crisis", based on Article 32.4 of the Constitution of the Grand Duchy of Luxembourg.

ᵏAfter that, on 15 May 2020, a State of Alert was declared

ˡThe Royal Decree 463/2020 of 14 March 2020 declaring "the alarm status" in Spain, which is one of the State of Emergency according to the Constitution of Spain

3   The Impact of the COVID -19 Pandemic on the Postal Market

Before the pandemic occurred, reports about the postal market highlighted two major markets trends—the decline of mail volume contrary to parcel volume growth.[6] The pandemic has probably sped up these ongoing trends in the postal market. During the pandemic the letter market has suffered a significant decrease, in contrast to the parcel market boosted by the e-commerce, which is rapidly growing. This effect has been primarily due to the stay-at-home rule and economic restrictions on some or most business. It seems that the postal market, especially parcel delivery, has never been more important and needed.

Figure 16.1 shows the decrease in the letter market in the selected countries during the pandemic - between 2019 and 2020. This decrease is presumably, in part, a consequence of the pandemic. At the same time, the parcel market has grown. An interesting point is the different impacts of the pandemic for these two postal segments. Only in Germany (Deutsche Post),[7] Netherlands (PostNL) and Finland (Posti) do these changes balance each other in term of volume. In contrast, in Belgium (bpost), the parcel market has grown by 50% in term of volume, with a respective decline of the letter volume by only 14%. Nevertheless, in 2020 the volume of letter items shrank by 12.2%, the most significant drop in Belgium since

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[6] International Post Corporation (2019), Global Industry Report 2019, December 2019.

[7] The revenues from the parcel segment allowed Deutsche Post to pay €200 m in staff bonuses, source: https://www.ft.com/content/e6547bb9-e9fb-4ee2-8161-3c544df8ba80
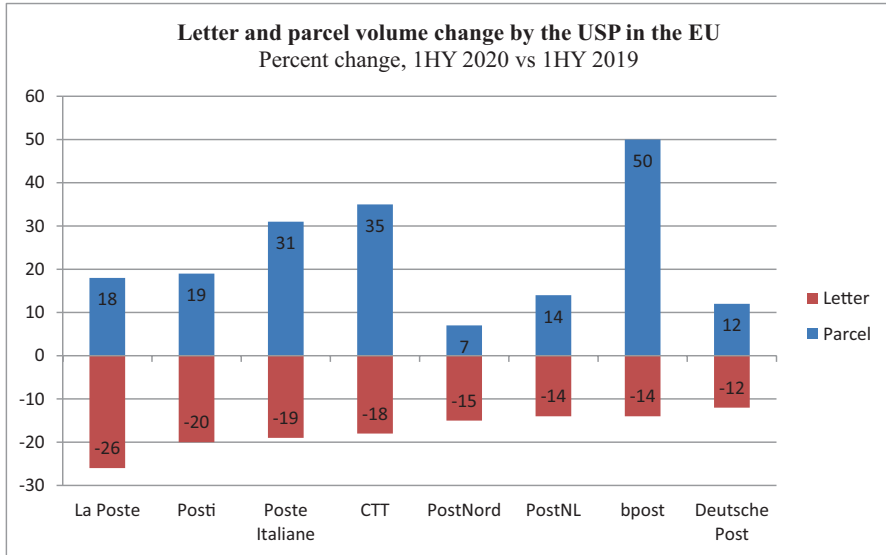
Fig. 16.1 Letter and parcel volume change by the Universal Service Providers in the EU (percent change, First half of 2020 vs First half of 2019). (Source: PostNL (2021), European Postal Markets 2021 an overview)

2010.[8]The French (La Post) example is remarkable because the parcel market has grown by 18%, but the letter market has dropped by 26%.

　　Figure 16.1. also shows that the impact of the COVID-19 on the national postal markets was different in the selected countries. Nevertheless, the common effect is the letter segment's continued decline, which primarily influences the Universal Service Providers (USP). The segment is less profitable for postal operators and is often subsidized by the government, e.g., the Compensation Fund (Chołodecki, 2020). The growing competition on the parcel segment of the market, especially from the e-commerce platforms such as Amazon or Allegro, which constantly expand their delivery service, can be another significant consequence of the pandemic.

　　A closer look at the Polish postal market gives us a better view of the market situation during the pandemic. Figure 16.2 illustrate the growth of the revenues from the courier segment in 2020 increased by 32.6% compared to 2019, whereas the letter market shrank by 3.4%.[9] Even more important is that the courier segment accounted for a 33.9% increase of the entire volume of postal services on the market and as much as 58.8% of its value (Urząd Komunikacji Elektornicznej, 2021, p. 16). Accordingly, Fig. 16.3 illustrates that the volume of courier items has increased

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[8]INSTITUT BELGE DES SERVICES POSTAUX ET DES TÉLÉCOMMUNICATIONS, (2021) Impact significatif de la pandémie de COVID sur le marché postal belge en 2020.

[9]Urząd Komunikacji Elektornicznej (2021), Raport o stanie rynku pocztowego w 2020 roku.
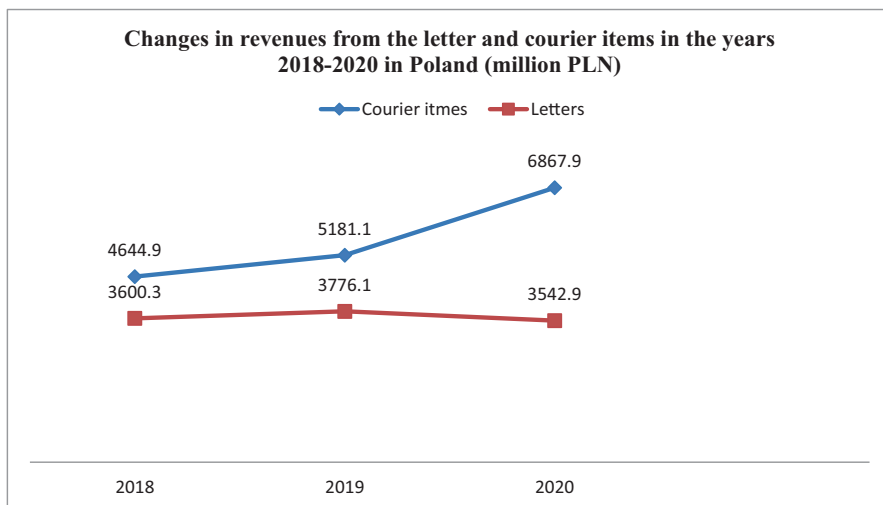
Fig. 16.2 Changes in revenues from the letter and courier items in 2018–2020, in Poland (million PLN). (Source: Urząd Komunikacji Elektornicznej (2021), Raport o stanie rynku pocztowego w 2020 roku.)
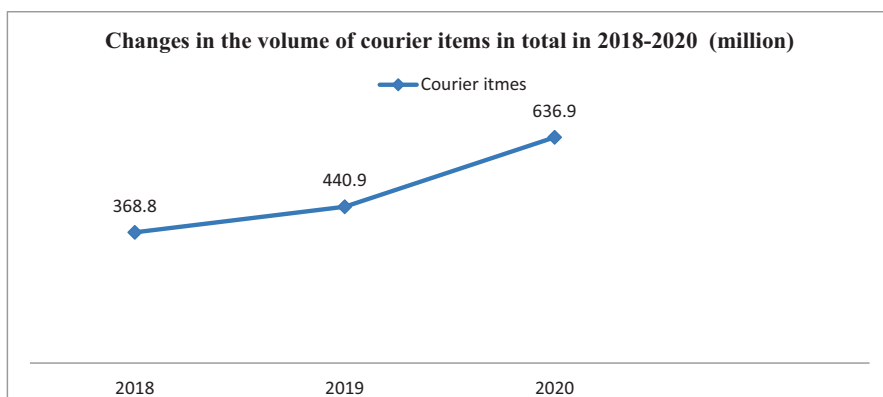
Fig. 16.3 Changes in the volume of courier items in total in 2018–2020, in Poland. (Source: Urząd Komunikacji Elektornicznej (2021), Raport o stanie rynku pocztowego w 2020 roku)

45% from 440 mln in 2019 to almost 637 million items in 2020.[10] On the other hand, the Polish USP - Poczta Polska SA has a meagre share in the parcel segment of the market. Thus, the letter market is the most crucial part of the Polish postal incumbent activity in volume and revenues.

The pandemic restrictions also had an impact on the last mile infrastructure. Over the last years of constantly growing e-commerce, the last mile has become the

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[10] Urząd Komunikacji Elektornicznej (2021), Raport o stanie rynku pocztowego w 2020 roku.
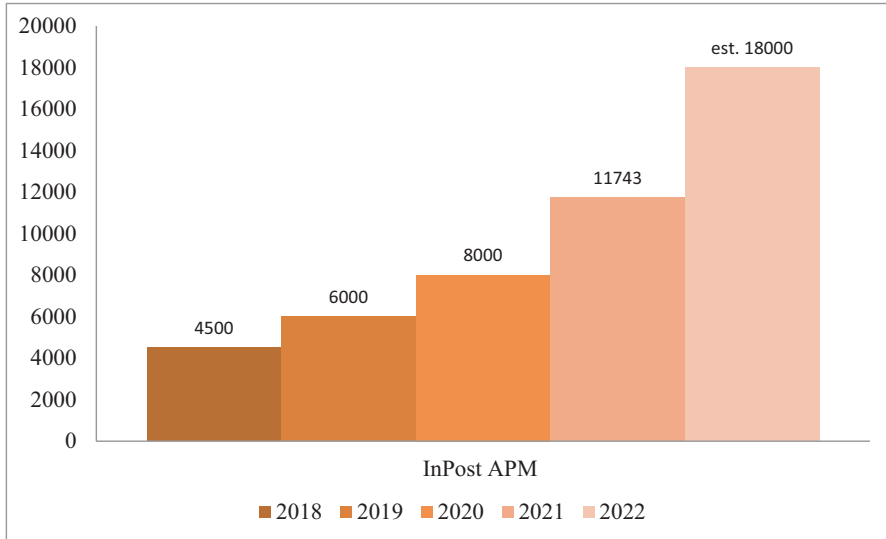
Fig. 16.4 Changes in the number of APM owned by InPost in 2018–2022, in Poland. (Source: InPost company information's.)

soft underbelly of postal logistics. The pandemic restrictions accelerated the development of OHD primarily by courier operators rather than postal incumbents.[11] According to the report *Out-Of-Home Delivery in Europe 2021* published by the "Last Mile Experts"*,* Poland (11,000), Spain (10,000) and Germany (7000) have the most automated parcel machines (APM) available in the EU. The data show that APM infrastructure is rapidly developing in all the EU countries. Figure 16.4 shows that the Polish InPost has increased four-fold their APMs in only five years. For example, CTT – Portugal has now only 100 APMs and plans to increase it to 1000 by 2022. The "Last Mile Experts" report states that the greatest number of pick-up and drop-off (PUDO) points in Europe are located in Germany (57,000), France (45,000), Great Britain (38,000), and Italy (36,000), which are the biggest postal markets in the EU.

At this moment, the presented data suggests that the impact on the postal market by the COVID-19 pandemic is potentially severe.[12] However, it is hard to predict how these trends will be in the near future, mainly because the pandemic has not ended -- if it will ever end. E-commerce, the booster of the parcel market, has been a constantly growing trade sector since 1999 and was largely unaffected by the previous global economic downturns (Garver et al., 2016). Moreover, the data show a somewhat negative impact of the pandemic crisis on the USPs. This has been caused

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[11] An exception is Deutche Post – DHL.

[12] There are several reports about the COVID-19 impact on the postal market, e.g. made by Universal Postal Union (2020) (*The COVID-19 crisis and the postal sector*) and ERGP (*ERGP summary information on measures adopted for postal service in view of the COVID-19 outbreak*).

by the fact that most USPs are focused on letters[13] and do not have considerable shares in parcels.[14] Markets revenues from the parcel segment are higher than from the mail market.[15]

The pandemic showed the new social needs, e.g., access to OHD like APMs or more common access the digital public services (e-administration). This can be seen as a signal, especially for EU lawmakers, that the shape of the USO in the future postal framework should be changed and adjusted to the new post-pandemic social needs.

4   Legal Restrictions Imposed on the Postal Sector

The postal market is increasingly significant in European social life. This role is emphasized by the last EU postal Directive 2008/6/EC (the so-called 3rd Postal Directive),[16] which stated that the postal market is an essential instrument for communication and information exchange. Postal services are essential instrument for trade and social and territorial cohesion as well. The postal market is rapidly changing, adjusting to contemporary social and public needs. Hearn (2020) accurately emphasized that the adjustment of the postal market to new situations is a continuous and never-ending process. Several authors have highlighted the changing role of the postal service (Hearn, 2020; Jaag et al., 2016) considering the technical revolution (Alloo, 2018; Scorca, 2018). The extraordinary situation caused by the pandemic shows that the postal industry played an indispensable role, particularly during the lockdowns and stay-at-home orders. The pandemic entailed that the postal service once again is playing a crucial and irreplaceable role in communication and trade, as it used to before.

The above section shows that all the EU Countries established stay-at-home orders and restrictions on free movement. In addition, a specific part of the economy was temporarily suspended. Thus, it must be noticed that not all countries treated the postal services as vital for society and allowed them to stay open during the lockdowns. Table 16.2 describes legal measures taken in the EU and UK with regard to postal services.

Table 16.2 shows that only 8 out of 28 EU Member States (and the UK) considered the postal service vital or essential for society. This limitation can be seen as a signal that the postal service is considered merely one of many business services rather than a special component of the public administration, which it used to be in

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[13] United States Postal Service (2017), Mail Profitability in International Posts, Report Number RARC-WP-17-008.

[14] Deutsche Post – DHL is one of the exemptions.

[15] International Post Corporation (2020), Global Industry Report 2020, December 2020.

[16] Directive 2008/6/EC of the European Parliament and of the Council of 20 February 2008 amending Directive 97/67/EC with regard to the full accomplishment of the internal market of Community postal services, OJ L 52, 27.2.2008, p. 3–20.

Table 16.2 Legal measures the EU Member States and the UK took against the COVID-19 pandemic regarding the postal sector

Country	Postal sector among those vital for society[36]	Special restrictions for the postal service[37]	Special restrictions for UPS[38]	Additional info
Austria	Yes	No	No	
Belgium	Yes[39]	No	No	
Bulgaria	Not specified	No	No	
Croatia	Yes	No	No	Ministry reduces USO.
Cyprus	No	No	No	Cyprus Post extensively used the 24-hour Parcel24 locker systems
Czechia	No	No	No	
Denmark	No	No	No	
Estonia	No	No	No	Signature in the postal service not a required policy
Finland	No	No	No	Signature in the postal service not a required policy
France	No	No	Yes	La Poste temporarily reduced the number of days of postal deliveries maximum to 3 from 6
Germany	No[40]	No	No	
Greece	Yes	No	No	Reduction of VAT for courier companies and license fee for some of the postal operators
Hungary	Yes	No	No	Signature in postal service not a required policy
Ireland	No	No	No	Signature in the postal service not a required policy
Italy	No	No	No	Some mail delivery was temporarily suspended
Latvia	No	No	No	
Lithuania	No	No	No	
Luxembourg	No	No	No	
Malta	Yes	No	No	
The Netherlands	No	No	No	
Poland	No	No	No	
Portugal	No	No	No	CTT introduced the closed-door service
Romania	No	No	No	
Slovakia	No	No	No	
Slovenia	No	No	No	
Spain	Yes	No	No	
Sweden	Yes	No	No	
UK	Not specified	No	No	

(continued)

Table 16.2 (continued)

Source: The European Regulators Group for Postal Services (2020) summary information on measures adopted for postal service in view of the COVID-19 outbreak, Reports 1–6

[a]The author considered the postal sector to be among those vital for society when it was or still is clearly expressed or identified by a legal regulation (order) or when it was free to operate during different stages of lockdowns, and the post offices were at least partly open, especially when other sectors of the economy were at least partly closed

[b]Restrictions which were specific only for the postal sector

[c]Restrictions which were specific only for the UPS

[d]According to the annex to the Ministerial Order of 23 March 2020, the postal services are considered essential services necessary to protect the nation's vital interests and the needs of the population

[e]Yes, but only during the curfew, which was not adopted in Germany

the past. Such a limitation should not be viewed as a decline in the status of the post, but rather as a sign of the times. The pandemic has significantly accelerated the ongoing processes rather than created new ones.

A. **The closed-door policy**

All countries imposed general hygienic (anti-epidemic) requirements on postal operators, like those imposed on other businesses. However, some reports show that postal workers were one of the groups most affected by the pandemic. As they could not work from home, they were forced to work and thus were much more likely to get infected and have COVID-19. On the other hand, "the civil society began to manifest more publicly their deep appreciation of key workers' efforts, through the weekly national 'clap for careers' and similar activities, thus it is plausible that these could have had a positive psychological impact on key workers" (Topriceanu, et al., 2021, p. 960).

Nevertheless, only a few measures were specifically taken for the postal market. One of the most important is the so-called closed-door policy, meaning that a signature is not required for a recipient to receive postal items, like parcels or letters. All the EU Countries used to have a physical signature obligation for some postal items to be received. This obligation could spread the virus during the pandemic, due to physical contact between the deliverer and recipient. This closed-door policy will likely become permanent. Future policy could facilitate new forms of last-mile delivery that does not need physical contact between the postal worker and deliveryman. That will probably push governments to change the distribution of official letters issued by different public bodies from hard copies to e-delivery. In e-commerce, it will accelerate different forms of out-of-home delivery (OHD) parcels.

Adoption of the closed-door policy is an excellent example of how the EU Countries are dealing with regulatory issues differently. Nearly every country has adopted this policy, but in a different form. These differences can be categorized in four ways:

1. amending or changing the law (Italy[17] and Poland[18]);
2. governmental ordinance or policy measures (Hungary);
3. a decision of the NRA (Greece), and
4. operators' self-policy (e.g., Belgian Bpost, Croatia, Estonian, Finnish Posti Oy, Irish AnPost, Lithuania, Maltase MaltaPost, Portuguese CTT, and British Royal Mail).

This question is why some postal operators adopted the closed-door policy of their own accord, not due to a government or regulatory obligation. The operators were probably able to introduce necessary measures much faster than public bodies such as the NRA, which would require much longer formal proceedings. This is the case in Poland, where the Postal Law amendment concerning the closed-door policy only confirmed the existing practice.

Among the 28 analyzed countries (see Table 16.1), only Malta and Spain considered the postal sector as vital for society and declared a State of Emergency at the same time. On the other hand, most states do not consider the postal sector vital for society, even though they declared a State of Emergency (Czechia, Estonia, Finland, Italy, Latvia, Lithuania, Luxemburg, Portugal, Romania, and Slovakia).

B. **The role of NRA during the pandemic**

The above analyses raise the question of the future objectives of postal NRAs. In the infrastructure markets, like railways or energy markets, general safety is one of the primary objectives of the regulator. The COVID-19 pandemic seems to prove that postal NRA should be responsible for some of the safety aspects of the postal market like introducing the closed-door policy.

The NRA role has been formed in the EU regime mainly for economic intervention (economic regulation) and safeguarding consumer rights on the market (social regulation), where the universal service obligation is the central focus of the regulatory policy. According to the postal directive the NRA shall have as a particular task ensuring compliance with the obligations arising from the directive, in particular by "*establishing monitoring and regulatory procedures to ensure the provision of the universal service. They may also be charged with ensuring compliance with competition rules in the postal sector*" (article 22.2). The framework for regulatory authority on the postal market, as with any other market, is to safeguard and protect the basic needs of the market. Thus, regulation is considered a method of correcting different market failures (Prosser, 2010, p. 1; Ogus, 1994, p. 4–5). Market inefficiency can have different aspects, but it is a situation where the market has common obstacles and players cannot overpower or adjust to them.

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[17] Decree-Law No. 18 of 17 March 2020 on Measures to strengthen the National Health Service and economic support for families, workers and businesses related to the COVID-19 epidemiological emergency. ("CURA ITALIA" DECREE) (20G00034) (Italian Official Gazette - General Series No. 70 of 17 March 2020).

[18] Amendment of the Postal Law by adding an article 51a.

Nonetheless, the postal NRA is not the public body primarily responsible for responding to such extraordinary situations as the COVID-19 pandemic. At the same time, only such a regulatory body has the necessary specialized knowledge about the market and can properly adjust general rules and ordinances for the market. Only the postal NRA has an obligation to ensure overall supervision of the market. Thus, a regulatory response to the COVID-19 pandemic by postal NRAs is needed.

5   Conclusions

Apart from the challenges described above, the European postal market emerged from the crisis with success. For the author this success is evident in the fact that the postal markets in different EU countries were able operate and deliver items constantly (at least domestically). In terms of economic success, the courier operators delivering parcels have profited from this situation. On the other hand, for the last decade, the letter market has been constantly shrinking. This has mainly been caused by the digitalization of society and by e-administration in most of the EU Member States. The COVID-19 pandemic seems to have accelerated this inevitable process. In particular, USO regulation must adjust to new challenges triggered by the pandemic. Therefore, the main regulatory policy objectives should be shifted. Postal operators, mainly incumbents, must include these factors and transform their business, especially to deal with the new post-pandemic reality.[19]

Public law regulations concerning disasters like earthquakes, hurricanes or floods, which mainly have their basis in the constitutions of the EU Member States, have failed as an effective tool against the pandemic. Above all, these regulations did not benchmark regulatory action against the COVID-19 pandemic; they were often an obstacle to an appropriate response. This paper showed that only a few legal measures were specifically taken for the postal market. The most important was the closed-door policy, mainly to protect postal workers who needed physical contact with customers delivering postal items. Thus, out-of-home delivery (OHD) expansion has increased in many countries, one of the solutions limiting people from physical contact.

With the need for social distancing, the pandemic will probably push governments to change the distribution of official letters issued by different public bodies from hard copies to e-delivery. However, such change can be challenging for some of the postal incumbents relying on the revenues from the mail market.

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[19] For example, according to Article 45 (a) of the Postal Law Act, universal service includes postal services provided in domestic and cross-border traffic, covering clearance, sorting, transport, and delivery of letter items, including items for the blind and postal parcels. In recent years, the declining trend in letter items continued. Institutional and business bulk mailers generate the most significant volumes of letters. Public administration and the judiciary system use only mail (recorded letters). Polish law requires to use of recorded letters in civil, administrative, and criminal procedures. There is no other method to inform citizens, e.g. to appear in court.

Nevertheless, the regulatory response to the COVID-19 pandemic by the postal NRAs was feeble. In the author's opinion, the postal market needs appropriate assistance from the NRAs. This weakness needs to establish a new goal and suitable legal apparatus. Considering the future shape of the EU postal regulation, the consequences of the COVID-19 pandemic must be considered. The postal market must adapt, like any other market, to a new and still unknown reality. Change always brings challenges, and the new EU postal regulation must face them,[20] otherwise the purpose of the regulation will come under question.

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[20] See *ERGP summary information on measures adopted for postal service in view of the COVID-19 outbreak* (updated until 24 August 2020) (https://ec.europa.eu/docsroom/documents/42541/attachments/1/translations/en/renditions/native).

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Chapter 17
Digital Exclusion and the Role of Posts Have to Play to Fight Against It

Claire Borsenberger, Hélène Delahaye, and Muriel Barnéoud

The COVID-19 pandemic has once again spotlighted the "digital divide" issue globally, including in the most advanced countries. Lockdowns, closures of shops and schools, prohibitions on gathering have obliged people and economic actors to rely more than ever before on the internet to work, sell, purchase, teach, learn, access to information and stay connected to family and friends. Having access to the internet, being well-equipped with devices and having the skills to use them are becoming more and more essential as services and activities are increasingly moving (in some cases exclusively) online. The almost overnight transition, forced by the Covid-19 pandemic, to engage in many "e-things" from home has highlighted multiple dimensions of the digital divide, issues such as quality of infrastructure, affordability and technical skills needed to be "connected" were clearly exposed.

After dealing with various dimensions of the digital divide in Sect. 1, its effects are discussed in Sect. 2. Focusing on advanced countries, first lessons about the impact of the Covid-19 crisis on digital divide are drawn in Sect. 3. Some ways to

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improve digital literacy are discussed in Sect. 4 and the role of postal operators have been playing and could continue to play in Sect. 5, before concluding in Sect. 6.

1 The Digital Divide: Definition and Roots

1.1 What Are we Talking About?

The digital divide issue is not new. The notion appeared in the early nineties and emphasized the risks linked to the exclusion of some social groups from the information and communication technologies (ICTs) and the "divide" between those who benefit from the digital economy called the "Haves" and those who are excluded called the "Have-nots". The term itself was evoked in 1995 by Long-Scott, Professor of Statistics and Sociology, who showed the risks of excluding the poorest people and minorities from communication technologies regarding the participation in democratic life (Rallet & Rochelandet, 2007).

Initially focused on the material access to ICTs (having a connection to internet and a computer to surf the web), the digital divide debate was then enlarged to include actual uses of ICTs, leading to issues relating to people skills and cognitive capabilities. The OECD (2001) emphasizes the two dimensions of the digital divide, by defining it as "*the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies and to their use of the internet for a wide variety of activities*" (p. 5).

For more than 25 years, the topic has been extensively studied. Initially focused on individuals' access to internet infrastructure (Newhagen & Bucy, 2005), academic works then focused on divides in skills, uses, motivation and reasons for not using internet even when access has become more common (see among others Dimaggio et al., 2004; Helsper & Eynon, 2013; Lee et al., 2015; Pearce & Rice, 2013; Van Deursen & Van Dijk, 2011, 2014, 2015; Zillien & Hargittai, 2009). As summarized by Helsper and Galácz (2009), "*there is a consistent pattern of people that are excluded at the most basic level from internet use. These are typically of low income and low educational background*" (p.161). Furthermore, it is possible that many individuals could face difficulties or experience feelings of technological discomfort and be temporarily excluded or cut off from the internet and the information society because of the constant evolution of the digital environment and the technical progress.

1.2   *The Digital Divides in 2021*

Obviously, having a connection to the internet is a *sine qua non* condition to be able to use it. One could think that in 2021 this would no longer be an issue in the most advanced countries. But this is not the case. Indeed, despite the impressive growth in communications access paths in the OECD countries over the 20 last years, on average 11% of households do not access to fixed or mobile broadband services with 256 Kbps advertised speed or more at home, and 7% of firms (2% of large firms and 9% of small ones) lacked a broadband connection in 2019 (OECD, 2020).

These averages hide huge differences among OECD countries. For instance, in Greece, the share of households without access to broadband services is approximately 20%. From the firms' perspective, the gap between large and small firms reaches 15 to 20 percentage points in Poland, Latvia, Greece, and Hungary (OECD, 2020).

Moreover, one can observe that in most of OECD countries there still exists a huge gap in connectivity between rural and urban areas. For instance, in Greece, whereas 84.6% of households living in urban areas have access to (fixed or mobile) broadband internet, only 64.2% of households living in rural areas do. At the other extreme of the spectrum, in Switzerland, Sweden, Iceland and Belgium, the share of households connected to internet is higher in rural areas than in urban ones (OECD, 2020).

If part of the connectivity gaps observed between and within countries is linked to the deployment of communication networks, the more or less affordable character of internet subscription rates and the cost of digital devices are other factors explaining these differences: not surprisingly, in all countries, the poorest are more likely to be unconnected to internet. According to Eurostat, in 2019, a third of the UE-28 households without internet access at home are in that situation because they consider that the access and equipment costs were too high.

Moreover, being connected to the internet and getting a digital device to surf the web does not mean that one may fully benefit from the opportunities offered by the digital society because it also depends on the actual usage made from the internet. Unfortunately, among the billions of people who have access to affordable devices and broadband networks globally, many do not have the motivation and/or the skills to take full advantage of this technology to improve their lives.

Age and educational level are two important factors often used to explain the divides that exist between and within countries and which are linked to capabilities and motivation. In most OECD countries, internet usage is almost universal among people aged 16–24, reaching 95%. Internet usage among older generations is much less frequent, only 58% of individuals aged 55–74 are frequent users of the net. This generational gap could be explained by the fact that due to the relative recent character of the digital revolution, older people have not necessarily used digital tools in their professional lifetime. Having spent much of their lives without digital tools, they do not necessarily see their utility.

Nevertheless, more and more studies alert stakeholders to the fact that being born in the digital world does not mean individuals are effectively able to usefully manage different types of digital devices, especially when they are constantly evolving. It appears that while most "digital natives" primarily use digital tools for fun, some are lost when they are required to search and use information published online or perform administrative tasks.

Besides income, age and education, another gap emerges when dealing with digital divide: a gender gap. For instance, the 2020 EU Gender Equality Index shows that the share of women aged 55–74 and of women with lower education who have never had the chance to use internet are larger than the corresponding share of men. In addition, women experience bigger obstacles than men in acquiring and upgrading digital skills.

As for individuals, usages of internet vary among firms according to their size and their location. For instance, by 2017, whereas on average more than half of businesses in the OECD had a social media presence, this percentage is below 30% in Poland and Mexico and less than one in three for small firms.

1.3 A Long-Lasting Issue Due to the Permanent Technological Progress?

In this context, one may wonder if the digital divide will in fact have a natural tendency to disappear. Indeed, technical progress has an ambiguous impact on this issue. On the one hand, there is an increase in the number of alternative technologies (DSL, cable, fixed and mobile lines, radio, Wi-Fi, satellite) which increases an individual's ability to access the internet and helps to prevent "dead zones". But, on the other hand, technological innovation tends to continuously reproduce geographical inequalities by creating new needs and consumer demands, especially regarding the speed of connections. The Covid-19 crisis has revealed the importance to have access to fast broadband networks (above 30 Mbps). Such speed levels are the new normal and are necessary to seize the opportunities of digitalization and take benefits to many online services that did not exist twenty years ago, such as watching films and documentaries, participating in webinars, providing medical teleconsultations, working remotely, and so on. The continuous and extremely fast rate of technological change has left some geographic areas in a constant state of catch-up regarding access to what is temporarily considered a good-quality internet connection.

In the same way, divisions and delays related to skills and motivation issues should be considered a dynamic phenomenon due to the permanent technological progress and the constant evolution of the digital ecosystem. If the probability to be excluded or remote from the digital society is higher for some categories of individuals, it is possible that anyone could face a situation of digital illiteracy at one time or another in their life. Consequently, the digital divide should be analyzed as

the concept by the flow of people who can temporarily feel uncomfortable, distant, or excluded from the digital society. Indeed, contrary to the fight against reading or writing illiteracy (which presumes the acquisition of a stock of finite knowledge that in times changes little – alphabet, grammatical rules, words spelling and so on), the fight against digital illiteracy presumes the acquisition of a flow of skills that must be continuously updated, following the evolution of technologies, the development of new software, apps and services, the more or less planned obsolescence of digital devices, and so on. In this context, anybody could face at any one time some situation of discomfort, which could lead to digital exclusion in the worst cases. This dynamic dimension highlights the need to continuously acquire capabilities and adapt to new tools.

2 The Costs and Consequences of Digital Divide

2.1 *Less Opportunities and More Risks of Being Abused*

Being unconnected could reduce the opportunities to access many online products and services, which are sometimes provided on more favored terms than their offline alternatives. Indeed, according to the French Competition Authority (2020), in some cases, the internet allows the sale or purchase of products or services not offered in traditional sales channels, either for technical or for economic reasons (like products with low demand that meet very specific tastes or needs). Moreover, by allowing new players to compete with those already on the market, internet is stimulating competition that could bring down prices and/or improve the quality of goods and services offered.

In a growing digitalized world, the lack of digital skills is also becoming a disadvantage for seizing job opportunities. For instance, jobs associated to the "gig economy" in the delivery or passenger transport sectors require knowing how to handle a smartphone, and use the apps developed by the platforms to connect customers and service providers. According to Rey et al. (2021), basic digital skills (use of a computer in its basic functions, office tools and so on) are now cross-disciplinary skills for all occupations, like working in teams. Over the past six years, job positions that were on a growing trend, require digital skills. Also, people remote from digital access risk complete exclusion from certain labor market opportunities. Furthermore, people who are uncomfortable with using the internet will, in general, have less access to information that is essential to improve and renew their "human capital", acquire new knowledge, skills and so on.

If the internet provides greater opportunities for informed users to enter into better business and personal deals, it also exposes individuals to some risks, especially those who have fewer digital skills. For example, people with lower digital skills have a higher probability to be victims of credit card frauds, data and identity theft, or invasions of privacy. In addition, the profusion of offers and information

available online reinforces both the risks of over-consumption and indebtedness to which some groups (young people, the poorest) are particularly exposed, and the risks of misinformation and manipulation (OECD, 2017). For instance, in the UK, Ash et al. (2018) showed that access to digital forms of credit via mobile devices like smartphones and laptops is changing consumer use of credit and their experience of indebtedness. According to the authors, the speed and ease of access to online borrowing encourage people to consider credit as money and not as debt, which minimizes the consequences and implications of using high-cost short-term credit. In many cases, this leads to financial, psychological, and emotional harm for the consumer.

From the point of view of firms, digitization is undoubtedly a source of profit: according to a study carried out by the French Ministry of Economy, during the first lockdown, small retailers who had no website suffered turnover loss on average 25 points higher compared to their competitors who sold online; companies belonging to the industry, wholesale trade and communication sectors which had a pre-crisis rate of equipment in laptops 10 points higher than their competitors, on average, reduced their loss of activity from 2 to 4 points.

2.2   Towards a Reinforcement of Social Inequalities?

As we saw, part of the digital divide is rooted in social-economic inequalities even if it could potentially affect everybody with more or less intensity. Among others, Tapia and Ortiz (2010) noted that there is a high degree of correlation between social and digital exclusion: those who suffer from social exclusion often also suffer from digital exclusion. But the relationship goes also in the other way: digital divide amplifies social-economic inequalities. The amplification mechanism of digital exclusion, suggesting that the internet is a magnifier of existing offline inequalities, has notably been demonstrated by Kraut et al. (2002), Kvasny (2006) or Toyama (2011).

As explained by Helsper and Galácz (2009), those who are socially excluded are less likely to have the material and educational resources to engage with technologies in a meaningful way. So providing access to technologies will not solve wider issues of social inequality because even when socially disadvantaged people are online, they are unlikely to engage with technologies in the same way as those who are not disadvantaged. At the extreme, this gap between the socially included and the socially excluded could even grow wider over time because the socially included would proportionally benefit more from having access to information and educational materials online since they are able to understand them and use them more efficiently. According to Van Deursen et al. (2017), historically marginalized groups are likely to also be marginalized by technology.

3   Focus on the Covid-19 Pandemic and the Digital Divide: An Ambiguous Relationship

Concerns about the digital divide have been particularly acute during the COVID-19 pandemic as internet and digital instruments have played an important role in allowing people to access services, attend medical appointments and stay in touch with friends and family.

3.1   An Acceleration of Digital Usages and a Decrease in the Number of People Excluded From the Digital Society

According to Ofcom (2021), during the pandemic people used online services more than ever as they were becoming more dependent on online tools for entertainment, shopping, keeping in touch, getting information, home working and home schooling. Undoubtedly, the pandemic has been a factor in accelerating the digitization of our economies and societies. To maintain contact with relatives, or to be able to continue to exercise a professional activity, some people who previously remained voluntarily remote from digital technology because they did not see its utility, decided to take out a subscription and made their first steps online.

The increases in the number of households connected to internet, in the number of e-consumers and social networks' users illustrate this evolution: by the end of 2020, about 94% of UK homes had internet access, up from about 89% in 2019 (Ofcom, 2021); according to DPDgroup (2021), 15 million new e-shoppers appeared in 2020 compared to 2019 in the European countries covered by this survey; according to We Are Social (2021), over half a billion new users joined social media platforms between April 2020 and April 2021.

From the firms' side, the lockdowns due the Covid-19 pandemic have undeniably contributed to changing their perception of digitization.[1] For instance, during the first lockdown, a third of French SMEs have identified digitalization of their activity as a necessary step to get out of it. To counterbalance the sudden end of their offline activity in March 2020, many small businesses (from 1 to 19 employees) notably in the retail sector have turned to social networks and e-commerce marketplaces. Some have set up a drive or click & collect service (ACSEL, 2020).

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[1] Before the pandemic, due to a lack of digital culture, SMEs perceived digitization as a cost (setting up a database or an e-commerce website was seen as an expenditure and not an investment) and many business leaders were not convinced of the ability of digital tools to ultimately increase their profits. Many mentioned the lack of time, the financial cost, the difficulties in setting up digital tools or the lack of internal skills to set up and use them. Ultimately, few business leaders devoted the time and resources needed to implement a digital strategy.

3.2   A Smaller But Deeper Digital Divide

But the acceleration of economies and societies digitization intensifies digital divide difficulties for people who remain offline because they are digitally excluded or mis-equipped.[2] They were unable to keep in touch with their family and friends during the lockdowns, to use internet for work, to learn at home, or to benefit from online health and information services. Similarly, SMEs unprepared for the rapid digital shift accelerated by Covid-19 were unable to execute effective business continuity plans or adapt their business models, leading to significant revenue losses.

Beaunoyer et al. (2020) argued that the pandemic and the digital divide were mutually reinforcing. Whereas the financially constrained households were the ones that would need the most to invest in proper and up-to-date digital equipment because they experienced adverse income shocks, many lost the means of paying for these investments. This in turn has further reduced their possibility to leverage digital and online opportunities to find another job, to readily access health advice, medical appointments, or support services for housing or social care, to access and manage their finances as banks and retailers have increasingly encouraged their customers to use online services, and so on.

Concerns have also been raised that those who are digitally excluded may not be able to use the mobile phone apps developed to prevent the spread of the virus because they may lack the digital skills required to operate it, or not own a smartphone or a phone that can support the app. This leads to further social exclusion when access to certain locations or services becomes conditional upon having the app installed.

4   How to Bridge the Digital Divide?

Logically, the first thing to do is to identify needs, such as a lack of resources (connection to internet, personal computer or other device, capabilities) or reasons for not using the internet (fear, lack of motivation, and so on) that prevent people being fully included in the digital society, in order to provide in a second step an appropriate remedy. Public authorities, private companies, charities, and civil society all may play a key role to sustain digital inclusion.

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[2] People who rely only on a mobile phone for internet access might struggle to work or learn from home or complete online forms – this represents 10% of all adults, and 18% of adults in lower socio-economic households.

4.1   Invest in a Reliable Infrastructure and Guarantee an Affordable Access to Internet

Regulatory measures and policies that promote access to high-speed broadband networks at affordable prices are crucial given the role of these networks for a successful and inclusive digital transformation. Policy makers should promote investment in communications infrastructures, address barriers to investment and improve competitive dynamics; for example, by simplifying license requirements and removing regulatory uncertainty.

Regarding the affordability issue, the European Directive of 11 December 2018 established new universal service obligations in the communications sector. Concretely, considering specific national circumstances, Member States may require providers of internet access and of voice communications services to offer tariff options and/or packages different from those provided under normal commercial conditions when they consider this to be necessary to ensure consumers' full social and economic participation in society. They can do this by implementing special aids or tariffs if it is determined that retail prices are not affordable for consumers with low incomes or with special social needs.

In addition to these issues, public authorities also have a role to play in securing the digital economic environment. A few years after the adoption of the General Data Protection Regulation (GDPR) by the European Parliament, the recent initiatives presented by the European Commission to regulate digital platforms (via the Digital Services Act and the Digital Market Act) go in the same direction. This digital regulation should increase the confidence of citizens and consumers, thus helping to reduce certain forms of voluntary self-exclusion motivated by the fear of making mistakes or being the victim of malicious acts. It should facilitate the digital inclusion of SMEs by re-establishing a level playing field between small and large digital players and by supporting the creation of innovative business models.

4.2   Identify and Train People Facing Digital Illiteracy

The dynamic feature of the digital divide makes the identification of people who do not have easy access and skills to fully utilize the internet a complex issue since people initially included in the digital society (thanks to initial education program for instance) could, some years after leaving school, after a period of unemployment or simply due to a lack of interest in new technologies, be overwhelmed by technical progress and fall into a digital exclusion category.

In this context, beside the school system, it is necessary to set up non-stigmatizing (people may be reluctant to call upon a third party) ecosystems made up of qualified professionals who will be able to first detect people facing digital illiteracy and then propose actions adapted to their needs. To efficiently fight against digital divide, it

is necessary to convince people that they will benefit from regularly updating their skills.

If public authorities have a clear role to play to improve digital education during individual's school years, many other actors (charities, sociologists but also private companies) can also help to identify people who have fallen through the cracks or who need to update their knowledge (a role the national public education system is unable to undertake once people have left the schools).

4.3 Thinking Upstream About Digital Tools and Applications: Inclusion by Design

To democratize internet, it is necessary to make it easier to use and reassure people who voluntarily steer away from it, due to fear or other reasons, that it is in their interest to remain digitally active. Similar to the model underpinning the "privacy by design" principle, a principle of "inclusion by design" could be implemented.

Aware of these challenges, private companies and developers of digital tools already focus on "UX Design" (User eXperience Design). The objective is to design digital interfaces in such a way as to make their use as efficient as possible while considering user experience. In this regard, artificial intelligence and the development of voice assistants could be sources of major improvements. For instance, artificial intelligence could help to develop voice interfaces of apps, allowing people to access the service without reading information on a screen or using a keyboard to perform a search or submit a request. Everybody could be able to complete an application form by dictating various information. Voice interfaces could be a means of promoting the inclusion of people facing non only difficulties to use digital tools but also difficulties to read and write.

5 What Could Be the Role of Postal Operators?

As emphasized by Sheedy and Moloney (2015), "*postal operators are well placed to assist in bridging the digital divide*" (p. 184). By their large physical presence across their domestic country and their "open" character, post offices are a good place to detect people who are not familiar with or confident users of the internet and to offer both a material access to internet and digital devices and human support and training to those people.

Gori and Parcu (2018) also argued "*especially, considering their local presence, POs can be of extreme help in the digital transition phase*" (p. 12). These authors are convinced that postal operators could become "*groundbased platforms*", that is to say "*a sort of "Google Home" but for the outside, (…) a "personal life assistant" for citizens impacted by the digital transformation*" (p. 12).

Sheedy and Moloney (2015) showed in particular that, in the UK, post offices network could replace public libraries that, until the mid of 2010, were a central point of free access to computers, before closing their doors. The availability of postal outlets in most towns and villages across a country makes them a logical point of contact for governmental services provision in general, access to internet and online services in particular.

Moreover, a pilot study[3] revealed the post office appears to consumers as a good place to provide free access to internet and to electronic services (this place was the top location choice by consumers, followed by local supermarkets) and 11% of respondents who had never previously been connected would be willing to get training from their local post office workers to learn how to use the system. Indeed, in many countries, post offices are seen as non-stigmatizing places given the fact that they are open to all and postmen are considered as trustworthy and caring people. Similar observations have been made in France where, among other initiatives,[4] La Poste and La Banque Postale have launched a digital inclusion plan, offering individual or collective training workshops near or inside post offices with the support of qualified mediators to postal and banking services' customers who encounter difficulties to use ICT.

In Spain, Correos is currently digitizing 2295 customer service points located in rural areas to bring new technologies closer to remote areas.

In the USA, the U.S. Postal Service Office of Inspector General (2013) suggested that "*the Postal Service could become a portal for broadband intensive secure transmissions for vulnerable populations*" (p. 2). More precisely, the author argued that "*the organization would not only serve as an enabler of traditional physical communications and commerce, but would also serve as a bridge between those that have embraced or have access to digital services (digital natives) and those lacking the ability, willingness or the access (digital refugees)*" (p. 7). He suggested to create a partnership between the Postal Service and rural telecommunications companies in particular "*to (…) ensure adequate digital access in rural areas (…) and reach rural Americans, particularly those who currently lack affordable and reliable broadband access*" (p. 1). More recently, the U.S. Postal Service Office of Inspector General (2020) looked at possible roles the U.S. Postal Service, which

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[3] A pilot project was carried out in the London Borough of Tower Hamlets: it consisted in proposing to residents, especially those generally excluded from digital society, a local government community platform to encourage the use electronic public services. Consumers of the borough of Tower Hamlets were asked to test a beta version of a government community platform, entitled Community Infopoint that was delivered through four ruggedized iPads located at four strategic locations (three libraries and one mosque) in the borough of Tower Hamlets. These iPads were deliberately not located in local post offices to avoid introducing bias among the respondents when deciding where the access points to the community platform should be located.

[4] Among others initiatives, we can mention the platform "mavillemonshopping.fr" launched in 2015 that help small retailers to digitalize their activities and sell their products online, or the commitment to train 40,000 of its employees with AI by 2025 and to support up to 200,000 people in a situation of digital exclusion per year made in its new strategic plan "La Poste 2030, committed for you".

has a physical presence in nearly every community, could play in helping bring the full benefits of 5G and other broadband service to parts of the country that are currently unserved or underserved and considered for instance that some post offices could be turned into digital hubs for Wi-Fi access.

All these initiatives are complementary to other public policies and provide many opportunities for implementing quadruple-win strategies: (i) for the direct beneficiaries of a material access to internet or a training program to use ICT; (ii) for the whole society, considering the direct and indirect benefits (positive externalities) of a better digital inclusion as explained in the previous sections; (iii) for the postal operators who could benefit from increases in the footprint in their physical network, in the use of automatic machines (reducing staff costs) and indirectly from potential increases in online purchases (which lead to increases in parcel delivery activity related to e-commerce) and who may, at least in theory, benefit from a State aid covering the net cost associated with this services, if they are considered as services of general economic interest and compensated as such; (iv) for the State who could benefit from economies of scope by mutualizing several SGEI (access to postal services and digital inclusion policy) in the same place.

6   Conclusion

Digital inclusion is the empowerment of individuals and societies to effectively use ICT, enabling them to contribute to and benefit from today's digitalized economies and societies. It is crucial to create an equitable and sustainable digital society, and to facilitate both personal income growth and macro-economic development.

The Covid-19 epidemic has highlighted and deepened the digital divide between the Haves and the Have-nots. Questions relating to territorial connectivity and the geographic divide in terms of internet access have returned the issue back to the front stage. Governments have a key role in promoting the expansion of broadband networks, improving the quality of connections in underserved areas, and making internet access affordable for all.

The skill issue has appeared in a new light and some presumptions have fallen. In particular, it emerges that young people who were thought to be comfortable with digital technology did not necessarily manage all its subtleties. On the business side too, the difficulties or lack of motivation faced by SMEs to digitalize their activities has come to forelight.

Aware of these issues and of the economic and societal challenges linked to digital inclusion, not only public authorities, or charities but also private companies (and in particular postal operators) have a role to play in order to allow everybody to navigate safely and efficiently in a constantly evolving information society.

It is necessary to anticipate, and as far as possible prevent, the next (but already in development) forms or sources of exclusion linked to digital technology. Particular attention should be paid to artificial intelligence. While AI can contribute to the digital inclusion - via, for example, the development of voice interactions which can

constitute a relevant solution to overcome reading and writing difficulties - it can also reinforce the risks of exclusion of already vulnerable people if the biases which can be introduced more or less involuntarily in the programs of learning algorithms are not mitigated. It is crucial to ensure that AI, like digital technology in general, remains a tool for democratic inclusion and not a new occasion for exclusion.

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Chapter 18
The Response to Extensions of Vote-by-Mail and Early In-person Voting in the 2020 U.S. General Election

Margaret M. Cigno, Ruth Y. Goldway, and Edward S. Pearsall

1 Introduction

To cope with the COVID-19 pandemic during the 2020 general election, many U.S. states changed their election systems to encourage use of alternative methods of voting. Some states made greater use of the mail to distribute and collect ballots[1]; others permitted early in-person voting prior to election day.[2] Many did both and a few did neither. As a result, mail-in and early in-person voting reached historically high levels. In effect, the 2020 election became a vast unplanned experiment in which voters were confronted with diverse systems involving mail-in ballots, early access to polling places and, often, liberalized eligibility and procedures. In this paper we report the results of an econometric examination of this experiment with

[1] A fairly detailed description of these changes and the practical issues raised by the wider use of mail ballots may be found in a report by the U.S. Postal Service Office of Inspector General (USPS OIG 2021).

[2] The National Conference of State Legislatures (2021) maintains a website with up-to-date summaries of the laws and other state-level provisions governing voting by mail and in-person in all 50 states and DC.

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emphasis on how the estimates relate to increased usage of the mail to conduct elections.

To perform the econometrics, the 2020 election is modelled as a multi-stage process in which the Citizen Voting Age Population (CVAP) of each U.S. county is subdivided to generate proportions that describe various aspects of the election's outcome. For example, at an early stage of the process, CVAP is divided into active registered and unregistered components. Later, the sub-population of active eligible voters is further subdivided into cohorts that did and did not vote. Altogether, our model employs twelve proportions to fully describe the processes of the election in each county and its outcomes.

These divisions are described by nine equations relating the proportions to pre-determined demographic, economic, geographic and election-specific variables. The dependent variable of each equation is a logit, defined as the natural logarithm of the odds of an event. For example, the logit for ballots cast is the natural logarithm of the ratio of the proportion of active eligible voters casting a ballot to the proportion that did not cast a ballot.

The right-hand explanatory variables included in each equation fall into two general categories. First, the model employs an extensive list of descriptors of conditions at the county level. We choose a set of exogenous variables broadly representing predetermined conditions that might have affected the proportions describing the election's outcomes. Second, the model employs a set of exogenous variables predetermined at the state level to describe the election systems in use for the 2020 election. The most important of these variables are a subset of dummy variables generally classifying each state's system with respect to voting by mail and in-person.

The econometrics uses a large county-level cross section created by merging data from diverse sources. The equations were fit individually using weighted least-squares. The weights for the fits were generated by applying an Iterative Reweighted Least-squares (IRLS) algorithm conceived to treat equations exhibiting errors with unequal variances (multiplicative heteroskedasticity). IRLS is effective at treating the heteroskedasticity and allows us to draw inferences from the estimates as we would if the equations had been fit by ordinary least-squares (OLS).[3]

By design, the model has a recursive structure that facilitates simulations of the 2020 election. The fitted equations may be ordered in a sequence that allows forecasts of the outcomes of early stages (such as registration) to be employed in the forecasts of the results of later stages (such as the vote for the presidential candidates). When used to simulate the 2020 election, the results approximately match the actual aggregate outcome at every stage. The model was used to simulate the various steps, including registrations, mail ballots requested and sent, in person

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[3] The IRLS algorithm is fully described in Pearsall (2021). If the IRLS algorithm is terminated after just one iteration, the method of estimation is identical to the estimated generalized least squares (GLS) method for "multiplicative" heteroskedasticity described in Godfrey (1978) and Judge et al. (1985). The IRLS estimates are those that would be obtained by applying OLS to weighted observations, or by applying GLS with a diagonal variance-covariance matrix.

votes, and the electoral outcome, under a number of counterfactual scenarios: without the measures introduced by the states to promote voting by mail, without the measures taken to facilitate early in-person voting, and, with neither of these collections of provisions.

The simulations address a number of issues of interest to the U.S. Postal Service (USPS), to state election authorities and to the political parties and candidates. To USPS, these are issues that arise with the introduction of new products, primarily how the demand for service is affected by the properties of the products. These properties are implicitly defined by each state's rules governing the availability, distribution and return of mail ballots. To the states, the issues of interest relate to the conduct of elections. The basic concern should be to find voting methods that facilitate participation while uniformly serving all segments of the electorate. While the best combination may vary depending upon how potential voters respond to the available alternatives, an efficient mix would include both voting by-mail and early in-person. To the political parties and candidates, the issues of concern relate to whether the electoral outcomes of elections are affected by the voting methods selected by state authorities. Adopting voting methods is a political choice that becomes easier to make when the effects are politically neutral.

The simulations show that the measures introduced by the states for the 2020 election had strong distributional effects on the ways people chose to vote, but only weakly affected overall participation. Furthermore, the measures had almost no role in determining the outcome of the presidential race. These results should encourage the states to make greater use of the mail to conduct future general elections.

The model is presented in Sect. 2; data sources and the problems we encountered assembling a suitable sample are described in Sect. 3; our econometric results are presented in Sect. 4; the simulations are described in Sect. 5; the major general findings indicated by the simulations are discussed in Sect. 6; and the paper concludes in Sect. 7. Detailed definitions and descriptions of the functional purpose of the explanatory variables used in the model have been placed in an Appendix.

2   A Model of the 2020 General Election

The processes and outcomes of the 2020 general election are measured by an interlocking set of rates. These rates are used to define logits that serve as the dependent variables of the model. The following rates apply to a single U.S. county:

Active Registered Voters/CVAP
*Active Eligible Voters/CVAP
Requests for Mail Ballots/Active Eligible Voters
*Mail Ballots Sent/Active Eligible Voters
Mail Ballots Returned/Mail Ballots Sent
Total Ballots Cast/Active Eligible Voters
In-person Ballots Cast/Total Ballots Cast

*Mail Ballots Cast/Total Ballots Cast
Turnout (Votes for President)/Total Ballots Cast
Biden Votes/Turnout
Trump Votes/Turnout
New COVID-19 Cases/Population

The nine unstarred rates correspond to the nine behavioral equations of the model. The remaining three starred (*) rates are determined by differences in practices at the state level.[4]

The dependent variable (y) of each behavioral equation is a logit derived from one of the unstarred rates, r, according to the equation: $y = ln\,(r/(k − r))$. The rate is assumed to be bounded $0 \le r \le k$. It can be retrieved from the logit with the inverse equation: $r = k\,\exp\,(y)/(1 + \exp\,(y))$. A prediction of r made from its logit y can never violate the bounds. For any given k, the relationship between y and r is one-to-one, so the logit embodies the same information as its associated rate. However, a logit is unbounded so it can include an unrestricted random error. However, r cannot include such an error if the error makes the probability of violating the bounds non-negligible.

Logits serve to mostly isolate the dependent variables of the model on the left-hand sides of the equations. This allows us to apply single-equation estimation methods without a serious concern for inconsistencies introduced by using endogenous variables on the right-hand sides. All of the explanatory variables in the equations may reasonably be considered to be predetermined within the short time span (about 2 months) of a single general election.

The logit for Active Registered Voters/CVAP was calculated using $k = 1.2$; the logits for all of the other equations assume $k = 1$.[5] The dependent variable for the first equation of the model is:

$$y = \ln\left(Active\ Registered\ Voters\ /\left(k * CVAP − Active\ Registered\ Voters\right)\right)$$

Every equation of the model, including the first equation, includes an intercept. The other explanatory variables begin with a set of general controls that are unrelated to the methods the states used to conduct the 2020 general election. These variables

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[4] Specifically, Active Eligible Voters equal CVAP in North Dakota, which does not register voters; Mail Ballots Sent equals Requests for Mail Ballots in non-vote-by-mail states but equals Active Registered Voters in vote-by-mail states; and, Mail Ballots Cast are derived as the residual of Total Ballots Cast after deducting In-Person Ballots Cast.

[5] The special treatment for Active Registered Voters is designed to deal with observed values that exceed CVAP, for which a logit cannot be computed using $k = 1$. These values arise because U.S. counties do not always promptly identify and delete a voter from their registration lists after the voter moves outside the county. As a result, counties with a high turnover can carry non-residents on their registration rolls to the extent that registered voters exceed the county's CVAP. Setting $k = 1.2$ is a better alternative than deleting these observations because it will not introduce a selection bias in the fit of the logit equation for Active Registered Voters. The value of k was set just high enough to include all counties in the sample.

assume values that are mostly unique for each county. There are 3152 possible observations consisting of election districts in Alaska, parishes in Louisiana, towns in New England and counties in all other states. Consequently, it is possible to define and include a large and diverse set of descriptors from which the general controls for the individual equations are selected. All of the general controls are listed and described in detail in Section 1 of the Appendix.

The controls that were selected as explanatory variables for the first equation are:

for the population and previous general elections

> *ln* (CVAP/2016 CVAP)
> Historical Democrat/Turnout logit
> *ln* (Population)
> 2016 (Registered Voters/*k* * CVAP) logit

for the age distribution of CVAP[6]

> 30 to 44 Voting Age Population share
> 45 to 59 Voting Age Population share
> 60 to 74 Voting Age Population share
> 75 and Older Voting Age Population share

for characteristics of the general population

> Male Population share
> Rural Population share
> Veteran Population share

for the ethnicity of the general population[7]

> Black Population share
> Asian Population share
> Other Population share (mostly Hispanic)
> Native American Population share

for the educational attainment of the population 25 years of age and older[8]

> High School Graduate (share)
> Associate or Bachelor's Degree (share)
> Graduate or Professional Degree (share)

for general economic, geographic and miscellaneous other characteristics

> *ln* (Personal Income per capita)
> Unemployment Rate
> *ln* (GDP per capita)

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[6] The 18–29 Voting Age Population share must be omitted to avoid co-linearity with the intercept.

[7] The White Population share is omitted to avoid near co-linearity with the intercept.

[8] The share of the population 25 and older with no degree is omitted to avoid co-linearity.

COVID Infection Rate
ln (County Land Area)
ln (Number of Post Offices)
Election Day Temperature – 70
ln (Number of Polling Places)

for electioneering intensity[9]

Senate Election (no = 0, yes = 1) dummy
ln (Biden Airings in DMA)
ln (Trump Airings in DMA)
ln (Broadcast Media Cost per TV Family)

The remaining explanatory variables of the model are mostly defined at the state level.[10] The majority of these variables are dummy variables that are assigned a value of zero or one depending upon a specific condition. The principal distinction between voting systems is that traditional states primarily rely on voting in-person on election day while vote-by-mail states send mail ballots to all registered voters. There are only 50 states plus DC, so it is essential to define a sparse set of variables to avoid co-linearity. This has been done partly by placing the states within one of seven mutually exclusive broadly-defined categories[11]:

1. Traditional with restricted mail ballots and without early in-person voting.
2. Traditional with less restricted mail ballots and without early in-person voting.
3. Traditional with restricted mail ballots and with early in-person voting.
4. Traditional with less restricted mail ballots and with early in-person voting.
5. Vote-by-mail pre-2020 without in-person voting.
6. Vote-by-mail pre-2020 with in-person voting.
7. 2020 election vote-by-mail with in-person voting.

Dummy variables for these categories were constructed by setting the dummy equal to one if the county was within a state to which the category applied, and to zero otherwise. No more than six of these dummy variables may be included in any single equation. Therefore, the dummy for category 1 was always omitted. If there were no states with strictly traditional systems in a sub-sample, the variable describing the fewest states was excluded. It was also necessary to exclude variables from specific equations due to the absence of a category from the sub-sample. These variables are described in greater detail in Section 2 of the Appendix. The dummy

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[9] The last three variables are statistics collected for Nielson Designated Market Areas (DMA) and imputed to the counties in the DMAs.

[10] Nebraska is the only major exception. State law mandates a traditional election system for all counties except those with less than 10,000 inhabitants. The small counties may opt to conduct elections by mail. Eleven of them have done so.

[11] The states (and DC) were placed in the categories as follows 1: MS, 2: CT, DE, MO, NH, SC, 3: IN, LA, TN, TX, 4: AL, AK, AZ, AR, FL, GA, ID, IL, IA, KS, KY, ME, MD, MA, MI, MN, NE (see Note 5), NM, NY, NC, ND, OH, OK, PA, RI, SD, VA, WV, WI, WY, 5: OR, 6: CO, HI, NE (see note 5), UT, WA, 7: CA, DC, MT, NV, NJ, VT.

variables for all of the categories except category 1 are included as explanatory variables in the logit equation for Active Registered Voters.

The remaining explanatory variables are applicable to specific election processes. Each variable appears in one equation or, at most, two equations of the model. They enable us to focus on specific aspects of election rules that promote or deter registration, voting by mail and voting in-person. These process variables are described in detail in Section 3 of the Appendix.

The specific process variables appearing in the logit equation for Active Registered Voters are:

Automatic Registration dummy
Pre-registration dummy
Party Registration dummy
Online Registration dummy
Election Day Registration dummy
ln (Registration Deadline)

3 Notes on the Assembly of the Sample

Virtually all of the data was downloaded from public sites on the Internet and reassembled according to a list of 3152 U.S. counties.[12] Sub-samples of various sizes were then extracted to fit each equation by mobilizing all of the usable observations from the larger sample.

The ultimate origin for most of the 2020 election data used to calculate the eleven rates are the offices of the Secretary of State in each state. These do not follow a standard format, or necessarily report the same data as other states. Assembling the data in a nation-wide sample required the resolution of many differences in scope and definition. We have mostly avoided reconciling data from different states by relying on intermediaries such as Dave Liep's Atlas of U.S. Presidential Elections (Leip, 2021) and the U.S. Bureau of the Census (2021) wherever possible. Liep's 2020 election files served as the template for assembling the data by counties.[13]

A fair amount of the data that should have been reported proved difficult to retrieve. This was particularly true of data for methods of voting. Most states fail to distinguish between early in-person votes and votes cast on election day. Many states with traditional systems record only the mail-ballots received from voters, and not the numbers of ballots requested and sent. In order to avoid discarding a

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[12] Three states (Alaska, Maine and Rhode Island) have small numbers of absentee voters that could not be matched to counties. This data is omitted from the sample. Alaska's non-election data is available by municipalities and census areas that include the election districts. Non-election data as rates and averages for a municipality (or census area) were imputed to all of the election districts in the municipality.

[13] The data were assembled in an Excel worksheet that is available on request at espearsall@verizon.net

great deal of relevant data, we estimated state-wide ratios of mail ballots sent to those received for those states reporting ballots returned but not sent, and applied the averages to county-level ballots returned to estimate the numbers sent.[14] This calculation mostly depended on pre-election state-level totals reported by the University of Florida's U.S. Election Project (McDonald, 2020). The estimates of ballots sent were then included in the sub-sample for Requests while the same observations were excluded from the sub-sample for Receipts.

In rare circumstances data regarding registration, voting by mail and early in-person voting have been downloaded from an unofficial source such as a newspaper report or a university web site. Data from these sites have been used sparingly to fill strategic gaps in the coverage offered by more inclusive and/or official sources.

The model incorporates two types of explanatory variables describing a county and the conduct of the 2020 election. Almost all of the data of the first type comes directly or indirectly from public sources such as the Bureau of Labor Statistics (BLS), the Bureau of Economic Analysis (BEA), the Election Assistance Commission (EAC), and the Bureau of the Census (Census). The data of the second type was largely derived from web sites offering guides to the rules for registration and voting in the various states. Organizations maintaining such sites include the National Conference of State Legislators (NCSL 2021), Ballotpedia, Wikipedia, Vote.org, and news organizations such as Reuters and The Washington Post. For a detailed description of vote-by-mail in the 2020 general election see USPS OIG (2021).

Ideally, all of the data of the first type would describe conditions at the time of the 2020 election. However, much of this data is subject to long reporting lags and remained unavailable 1 year after the election. The EAC collects detailed statistics at the county level (and below) regarding the conduct of elections, however, the EAC does not publish its data until 2 years after an election. The data we have taken from the EAC site apply entirely to the 2016 general election.

The population data available from Census were a mix of reports from the 2020 Census and projections based on the U.S. Census taken in 2010. We have used the 2020 Census data wherever possible. Critically, the values for CVAP are county-level estimates derived from the 2020 Census data for the population 18 years of age and older, and earlier reports of the share of this population that are citizens.

As collected, the sample inevitably included a few mis-reported observations. The large size of the sample allowed us to identify outlying observations from pre-liminary fits. The outliers were flagged as observations with residual errors that

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[14] This procedure unavoidably introduces an error into the observations for the numbers of ballots sent. However, the error is in the dependent variable of the equation for Ballots Requested so it does not bias the estimates. Ballot requests were estimated in this way in order to obtain a sufficient sub-sample to fit the equation. These observations are excluded from the sub-sample for ballots returned to avoid using logits calculated from a common rate for all of the counties in a single state.

exceeded five standard errors in magnitude. They were deleted from the sub-samples and the equations refit to produce the estimates reported in Table 18.1.[15]

4 The Estimates

The rates for the nine behavioral equations of the model are listed across the top of Table 18.1. The equations have been specified using a common set of explanatory variables described in detail in the Appendix. These variables are listed in blocs down the left-hand side of the table. Not every variable is included in every equation, although every effort has been made to keep the equations as consistent in form as possible. A variable is included in an equation if a non-zero entry appears in Table 18.1 in the column for the equation; otherwise, the location is left blank.

The logit equations of the model are all of the same linear form: $y_i = X_i\beta + e_i$. Each observation i of the dependent logit, y_i, is linearly related to a row vector of m predetermined linearly independent explanatory variables, X_i, and an additive error, e_i. β is a column vector of m (unknown) coefficients to be estimated from a sub-sample consisting of n observations. To fit the equation directly to a large sample using OLS we would normally make four assumptions.[16] The errors e_i (1) have a zero mean, (2) are uncorrelated with the explanatory variables, (3) are independent of each other, and (4) have a constant variance (homoskedasticity). However, it is well-known that the last assumption does not generally hold for an equation with a logit as the dependent variable, or if the dependent variable is an average from sub-samples of widely differing sizes. Both circumstances apply to our model when fit to a county-level sample. As expected, when the equations are fit by OLS, the resulting residuals fail the Harvey-Godfrey (1978) test for multiplicative homoscedasticity. Although the OLS estimates are unbiased, they cannot be employed in the usual tests of statistical significance.[17]

The preferred treatment for heteroskedasticity is to fit the model using weighted observations that correct for the differences in the variances of the errors (see Pearsall, 2021). The equations, as refit, are of the form: $w_i y_i = w_i X_i\beta + u_i$. w_i is a positive weight assigned to observation i. Weighted least-squares is simply OLS applied to this equation. If the weights have been chosen so that the errors u_i are homoskedastic, we may examine t-values and conduct other tests of statistical significance exactly as we would with OLS estimates.

IRLS determines the weights iteratively by fitting a regression with provisional weights, testing for heteroskedasticity and revising the weights to correct for

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[15] This screen excluded less than 12 observations from each sub-sample.

[16] Under these assumptions the OLS estimates are Best Linear Unbiased Estimates (BLUE). If the OLS estimates are also Maximum Likelihood estimates, as is usually the case, then the asymptotic properties of the estimates are fully known.

[17] The statistical properties of OLS estimates are mostly unknown when the errors are heteroskedastic.

Table 18.1 Iterative re-weighted least-squares estimates of the election model

	Active registered voters/ k*CVAP	Requests/ Active eligible voters	Returns/ Ballots sent	Ballots/ Active eligible voters	In-person/ Ballots cast	Turnout/ Ballots cast	Biden votes/ Turnout	Trump votes/ Turnout	New COVID cases/ Population
Equation R-Square (Adjusted)	0.9319	0.9440	0.9082	0.8995	0.9778	0.9685	0.9419	0.9401	0.9274
Equation Standard Error	0.146	0.279	0.335	0.178	0.196	0.347	0.177	0.176	0.341
Degrees of Freedom	2601	1975	1573	3074	2119	2336	3115	3114	3111
Heteroskedasticity F	0.055	0.119	0.083	0.131	0.076	0.063	0.068	0.057	0.070
Critical Value (0.95)	0.435	0.446	0.441	0.438	0.441	0.446	0.446	0.446	0.447
Explanatory variables	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**
Intercept	−4.141** (−14.623)	−4.379** (−7.423)	8.589** (10.052)	−1.264** (−4.263)	−2.520** (−4.864)	0.443 (0.759)	−1.687** (−5.442)	1.664** (5.412)	−4.608** (−8.419)
ln(CVAP/2016 CVAP)	−1.536** (−15.267)								
ln(Eligible Voters/2016 Eligible Voters)		0.295* (2.366)		−2.325** (−37.934)					
ln(Ballots Sent/2016 Ballots Sent)			−0.134** (−6.866)						
ln(Ballots Cast/2016 Ballots Cast)					0.496** (5.268)	−0.448** (−2.913)			
ln(Turnout/2016 Turnout)							0.688** (10.051)	−0.664** (−9.512)	
Historical Democrat/ Turnout Logit	−0.066** (−8.300)	0.120** (6.451)	0.132** (5.063)	−0.031** (−3.432)	0.056** (−4.336)	0.006 (0.318)	0.774** (83.704)	−0.760** (−81.888)	−0.022 (−1.276)
ln(Population)	0.066** (10.685)	0.061** (4.054)	0.005 (0.350)	0.071** (10.760)	−0.024* (−2.464)	0.035* (2.542)	0.070** (10.053)	−0.063** (−9.051)	−0.066** (−5.208)

2016 (Ballots Returned/Ballots Sent) logit		0.278** (17.492)							
2016 (Ballots/Eligible Voters) logit				1.059** (101.293)					
2016 (In-person/Ballots Cast) logit					0.156** (21.064)				
2016 (Turnout/Ballots Cast) logit						0.490** (34.974)			
30 to 44 Voting Age Population Share	0.947** (4.949)	0.413 (0.971)		0.030 (0.145)	−0.781** (−3.202)	0.239 (0.557)	−0.175 (−0.856)	0.044 (0.210)	0.909* (2.305)
45 to 59 Voting Age Population Share	1.278** (6.647)	−1.075** (−2.809)		0.255 (1.337)	0.911** (3.979)	0.544 (1.345)	−1.039** (−5.611)	1.193** (6.386)	0.152 (0.419)
60 to 74 Voting Age Population Share	1.734** (9.787)	1.580** (4.522)		0.957** (5.149)	−0.223 (−0.967)	−0.853* (−2.142)	1.312** (7.145)	−1.072** (−5.995)	−3.281** (−8.504)
75 and Older Population Share	−0.644* (−2.514)	0.514 (1.058)		−1.330** (−5.326)	1.101** (3.485)	−0.969 (−1.854)	−1.073** (−4.324)	1.062** (4.424)	4.756** (8.953)
Male Population Share	1.015** (7.142)	−0.033 (−0.190)		0.370** (3.590)	0.510** (4.135)	0.579* (2.509)	−0.223* (−2.191)	0.227* (2.547)	−0.935** (−3.979)
Rural Population Share	0.150** (8.276)	−0.092* (−2.353)		0.139** (7.098)	0.036 (1.376)	0.086* (1.983)	−0.108** (−5.284)	0.113** (5.597)	−0.418** (−10.923)
Veteran Population Share	0.361* (2.521)	−0.440 (−1.524)		0.626** (4.246)	−0.302 (−1.754)	1.069** (3.329)	0.354** (2.752)	−0.529** (−4.152)	−2.006** (−7.126)
Black Population Share	0.068 (1.751)	0.345** (4.356)		−0.545** (−5.391)	−0.282** (−7.687)	−0.509** (−5.643)	2.150** (54.894)	−2.122** (−55.796)	−1.039** (−13.921)
Asian Population Share	−0.791** (−7.300)	0.144 (0.270)	−1.679** (−6.379)	−0.024 (−0.209)	0.838* (2.465)	−0.629* (−2.533)	0.447* (2.508)	−0.463* (−2.410)	−1.889** (−5.879)

(continued)

Table 18.1 (continued)

Other Population Share	0.421** (7.649)	0.502** (3.842)	−0.237 (−1.561)	0.155** (2.596)	0.163 (1.535)	−0.762** (−5.904)	2.060*** (30.375)	−2.003** (−29.031)	−0.424** (−3.454)
Native American Population Share	0.225** (4.145)	−0.578 (−1.584)	−1.259** (−3.863)	0.027 (0.561)	0.091 (0.697)	0.254 (1.326)	0.868*** (7.302)	−0.840** (−7.185)	0.118 (1.074)
High School Graduate	0.374** (3.867)	1.543** (7.068)	1.807** (6.069)	−0.110 (−1.173)	−0.570** (−4.286)	−0.185 (−0.819)	0.298*** (2.892)	−0.242* (−2.400)	0.540** (2.702)
Associate or Bachelor's Degree	1.127** (9.587)	1.144** (4.413)	3.115** (9.869)	0.516** (4.521)	−0.341* (−2.125)	−0.458 (−1.896)	1.875*** (15.509)	−1.826** (−15.216)	0.853** (3.912)
Graduate or Professional Degree	1.023** (5.758)	2.969** (7.253)	0.365 (0.827)	0.015 (0.094)	−0.047 (−0.187)	−0.088 (−0.255)	2.819*** (15.044)	−2.925** (−15.751)	−3.583** (−9.917)
ln(Personal Income)	0.096** (3.778)	0.164** (3.152)	−0.197** (−2.908)	−0.004 (−0.137)	0.027 (0.758)	0.072 (1.462)	0.062* (2.199)	−0.075** (−2.735)	0.138** (2.706)
Unemployment Rate	0.006** (2.891)	−0.005 (−1.155)	−0.029** (−4.558)	0.004 (1.927)	0.008** (2.712)	0.003 (0.619)	−0.029* (−10.695)	0.026** (10.066)	0.002 (0.360)
ln(GDP per Capita)	−0.053** (−6.246)	−0.041** (−2.617)	0.053* (2.351)	−0.027** (−3.927)	0.028** (3.004)	−0.024 (−1.554)	−0.030** (−3.848)	0.031** (4.408)	−0.024 (−1.472)
COVID Infection Rate	−1.648** (−7.805)	−0.823* (−2.322)	0.163 (0.230)	−0.374 (−1.512)	−0.914** (−3.162)	−2.225** (−4.268)	−2.257*** (−9.134)	2.215*** (9.515)	6.886** (16.382)
ln(County Land Area)	−0.010 (−1.800)	0.070** (5.091)	−0.062** (−4.429)	0.006 (1.110)	0.047** (5.716)	0.049** (4.634)	−0.061** (−11.153)	0.051** (9.468)	−0.009 (−0.819)
ln(Number of Post Offices)	−0.014* (−2.229)	−0.031* (−2.359)	0.026 (1.654)	−0.043** (−7.024)	−0.018* (−2.214)	−0.045** (−3.483)	0.021** (3.393)	−0.015* (−2.498)	0.012 (1.068)
Election Day Temperature – 70	−0.001* (−2.199)	−0.006** (−4.311)	0.003 (1.565)	−0.001 (−0.793)	0.007** (7.642)	0.005** (4.407)	−0.014** (−23.141)	0.016** (25.682)	−0.019** (−15.897)
ln(Number of Polling Places)	−0.018** (−3615)	−0.031* (−2.151)	0.025 (1.858)	−0.022** (−4.048)	0.019 (1.862)	−0.020 (−1.849)	−0.021** (−3.995)	0.021** (3.966)	0.074** (6.505)
Senate Election (no = 0, yes = 1)	0.168** (15.928)	−0.072** (−3.961)	0.062 (1.676)	0.028** (2.983)	0.264** (19.877)	−0.075** (−4.095)	−0.027** (−3.322)	0.036** (4.329)	0.078** (4.880)

ln(Broadcast Media Cost per TV Family)	0.000 (0.151)	0.001 (0.167)	0.074** (11.614)	0.006** (3.032)	−0.001 (−0.239)	0.013** (3.009)	0.009*** (5.004)	−0.007** (−3.612)	−0.009* (−2.513)
Traditional with less restricted mail ballots without early in-person voting	−0.172** (−6.300)			−0.050** (−2.605)			−0.229** (−8.463)	0.218** (8.716)	−0.371*** (−10.005)
Traditional with restricted mail ballots with early in-person voting	−0.279** (−10.874)	−0.302** (−7.648)		0.141** (6.131)	0.746** (15.405)	0.006 (0.099)	−0.203** (−7.526)	0.199** (8.054)	−0.020 (−0.607)
Traditional with less restricted mail ballots with early in-person voting	−0.116** (−4.620)	−0.102** (−3.265)	−2.015** (−26.085)	−0.015 (−0.794)	0.877** (19.508)	0.430** (8.073)	−0.142** (−5.626)	0.123** (5.408)	−0.303*** (−9.499)
Vote-by-mail pre-2020 without in-person voting	0.151** (2.852)		−2.438** (−21.575)	−0.045 (−1.075)		−0.269** (−3.497)	0.009 (0.238)	−0.049 (−1.376)	−0.854*** (−10.359)
Vote-by-mail pre-2020 with in-person voting	0.006 (−0.170)		−2.326** (−23.220)	0.542** (8.616)	−1.112 (−1.438)	0.211** (3.341)	−0.190** (−5.997)	0.146** (4.819)	−0.203** (4.018)
2020 Election	−0.120** (−3.903)								
Vote-by-mail with in-person voting			−2.891** (−32.106)	0.184** (4.405)	1.933** (21.303)	0.068 (1.107)	0.076* (2.281)	0.053 (1.772)	−0.410** (−8.045)
Automatic Registration	−0.171** (−12.962)								
Pre-registration	0.140** (16.236)								
Party Registration	−0.087** (−9.986)								
Online Registration	0.141** (15.472)								
Election Day Registration	−0.006 (−0.480)								
ln(Registration Deadline)	0.083** (13.839)								

Table 18.1 (continued)

Variable					
No Voter Registration	−0.203** (−7.696)				
Mailed Mail-ballot Applications		0.342** (15.878)			
No Excuse Needed		0.773** (27.757)			
ln(Application Deadline)		−0.188** (−13.886)			
Notary or Witness Required			−0.300** (−9.099)		
Harvesting Prohibited or Restricted			−0.451** (−14.425)		
Prepaid Return			0.687** (17.772)		
ln(Return Mailing Deadline)			−0.172** (−9.143)		
Unknown Proportion of Active Eligible Voters Sent Mail Ballots				−0.050** (−3.518)	
Proportion of Active Eligible Voters Sent Mail Ballots				−0.071 (−1.895)	−5.048** (−86.537)
ln(Early In-person Voting Window)				−0.010* (−2.014)	−0.154** (−12.345)
Photo Identification					0.003 (0.208)
ln(Polls Open Hours)					0.877** (5.985)

*Denotes an estimate that is unequal to zero with probability ≥0.95
**Denotes an estimate that is unequal to zero with probability ≥0.99

whatever heteroskedasticity is found. The algorithm repeats these steps until weights are found that leave a weighted least-squares fit of the model without heteroskedastic residuals.[18]

The estimates of the parameters displayed in Table 18.1 were taken from the final iteration of the IRLS algorithm as described in Pearsall (2021). Goodness-of fit statistics are displayed for the fitted equations along the top of Table 18.1. The adjusted R-square statistics are all high for a cross-section sample thus indicating that the individual equations are unusually good fits. Visual inspections of the residuals indicate that they are roughly normal. Also, the F statistics for a strong version of the Harvey-Godfrey test are all well below their critical (0.95) values, so the null hypothesis that the errors are homoscedastic cannot be rejected on the basis of the fits. As can be seen from Table 18.1, many of the individual estimates have t-values indicating statistical significance at very high levels.

Most of the explanatory variables appear in several equations. The interlocking character of the model means that a change in such a variable works through multiple equations to affect the various outcomes. Therefore, the effects of changes in the exogenous variables are typically too complex to be drawn simply by inspecting the estimates. An exception are the process variables listed last in Table 18.1.

Active registration was most effectively encouraged by pre-registering young voters and by offering online registration. Active registration tended to be discouraged by making registration automatic, by party registration and, unexpectedly, by moving the registration deadline closer to the election. Allowing voters to register on election day had no significant effect on active registrations.

Requests for mail ballots in states with traditional election systems were most encouraged by relaxing or eliminating requirements for an excuse. Requests were also strongly stimulated when states mailed applications to all registered voters. Moving the application deadline closer to the election was somewhat effective in stimulating requests.

The most effective way states encouraged the return of mail ballots was by prepaying the return. Moving the effective mailing deadline closer to election day also increased the rate of return of mail ballots. Adding a notary/witness requirement or restricting harvesting both significantly reduced return rates.

The estimates suggest that states could do little to directly increase the proportion of active eligible voters who actually cast a ballot. The coefficient for the proportion of active eligible voters sent mail ballots is barely significant; the coefficient for the early in-person voting window is not significant. The coefficients for the other two election-specific variables are just place holders for missing data.

The states had several possible ways to influence how voters chose the method to vote. The estimates show that increasing the proportion of voters receiving mail ballots strongly encouraged voting by mail and, conversely, discouraged in-person voting. In-person voting was encouraged (and voting by mail discouraged) by moving the deadline for early in-person voting closer to election day and by holding polls

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[18] The test that is used in the algorithm is the Harvey-Godfrey test.

open longer on election day. Finally, where a state required photo identification by voters, there was no significant effect on in-person voting.

5 Simulations of the Election

The fitted equations of the model have been employed to simulate the 2020 election under four scenarios: (1) as it was actually conducted, (2) without the added provisions for voting by mail, (3) without the provisions for early in-person voting, and (4) without any of the liberalizations made by the states to conduct the election. The first of these simulations allows us to judge the overall accuracy of the model. The other simulations support our basic finding that the impact of the changes made by the states were largely distributional effects on the method of voting.

The simulations were performed county-by-county with aggregate results that are summarized in Table 18.2. The simulations were made using the same data employed to fit the model except as indicated below.

The simulations exploit the recursive structure of the model. Several of the explanatory variables that appear in equations describing later stages of the election process are calculated from the predictions of an earlier stage as described below.

In order to obtain results that sum correctly to national totals, it was necessary to insert predicted values for observations that were missing. National totals that are sums of reported 2020 election values with these insertions are displayed in the second column from the left in Table 18.2. The insertions were estimated using proportions taken from the Baseline simulation.

The totals for the Baseline simulation are displayed in the third column from the left in Table 18.2. The controls describing the various states' choices of rules and procedures for mail ballots and early voting are identical to the controls used to fit the model. Therefore, the Baseline results can be directly compared to the actual results to evaluate the accuracy of the simulator.

The Baseline simulation also serves as the benchmark for analyzing three counter-factual scenarios. These scenarios yield the sums and percentages exhibited in the three right-hand columns of Table 18.2. The values of the election control variables differ from the values used to fit the model and to make the Baseline simulation in the following ways:

2020 Election without Added Mail Voting Measures – The dummy variables describing the states' conduct of the election were reset to eliminate changes in mail-ballot procedures and rules that were made for the 2020 election. States that temporarily adopted vote-by-mail were re-categorized as having traditional election systems with their usual restrictions on mail ballot usage. Traditional states that had liberalized their restrictions on mail ballots had their previous restrictions re-installed. No traditional states were allowed to send ballot applications to all eligible voters, as several had done for the 2020 election.

2020 Election without Early In-Person Voting – The election controls were reset to eliminate early in-person voting in every state which had conducted voting prior to election day during the 2020 election, including those states that had instituted early voting prior to 2020. Traditional states were reclassified as either with or without less restricted mail ballots; vote-by-mail states were all reclassified as without early in-person voting.

2020 Election with neither Added Mail Voting nor Early In-person Voting – The changes described above were combined to simulate an election with no early in-person voting and none of the changes in voting by mail made to deal with COVID-19.

The results of our simulations form a progression from the top to the bottom of Table 18.2 beginning with CVAP on November 3, 2020. The first simulated result is the numbers of active voter registrations for the states that register their voters. This is calculated by evaluating the Active Registration equation for its logit, converting the logit to the corresponding proportion as shown in Sect. 2, and then, applying the proportion to the estimate of CVAP. This is done county-by-county and summed over all counties to obtain the predicted totals shown on the "Active Registration" line of Table 18.2. "Active Eligible Voters" is derived by adding the CVAP for North Dakota to the total number of active registrations.

In states with traditional voting systems, voters must request a ballot in order to vote by mail. The predicted numbers of voters making requests for mail ballots is simulated by predicting the requests logit with the fitted Requests equation, calculating the requests rate and then applying the rate to the number of active eligible voters. The aggregated results appear in Table 18.2 on the line labelled "Mail Ballots Requested". To obtain "Mail Ballots Sent" we added the numbers of active eligible voters in vote-by-mail states to the numbers of mail ballots requested in traditional states.

"Mail Ballots Returned" is the number of mail ballots received back by whatever means. In traditional states most returning mail ballots return via USPS. But many states, particularly those with vote-by-mail systems, also collected mail ballots with drop boxes. The Returns equation is evaluated to obtain the returns logit and rate. The returns rate times the number of mail ballots sent equals the predicted number returned. The sum over all counties is shown in Table 18.2 as "Mail Ballots Returned". This is the first of two estimates of mail votes shown in Table 18.2.

The second estimate, labelled "Mail Ballots Cast", is derived from the total number of ballots cast in each county.[19] "Total Ballots Cast" is simulated using the Ballots equation to estimate the logit and rate, and then applying the rate to the previously-predicted number of eligible voters. Similarly, the equation for In-person Ballots has been used to project "In-person Ballots Cast" from the total ballots. "Mail Ballots Cast" is estimated as a residual by deducting the predicted in-person ballots from total ballots cast.

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[19] Mail ballots returned can differ slightly from mail ballots cast if a county does not treat invalid mail ballots as "cast".

Table 18.2 Simulated national totals summary

	Actual 2020 election with baseline predictions for missing values	Baseline prediction of 2020 election	Prediction of 2020 election without added mail voting measures	Prediction of 2020 election without early in-person voting measures	Prediction of 2020 election w/o added mail or early in-person voting
Citizen Voting Age Population (CVAP)	235,652,677	235,652,677	235,652,677	235,652,677	235,652,677
Active Registration Pct. of CVAP	199,405,234	199,104,424	198,323,629	202,597,481	201,325,254
	84.62%	84.49%	84.16%	85.97%	85.43%
Active Eligible Voters Pct. of CVAP	199,518,320	201,292,881	200,512,085	204,785,937	203,513,711
	84.67%	85.42%	85.09%	86.90%	86.36%
Mail Ballots Requested Pct. of Eligible Voters	45,356,775	46,336,836	56,222,221	49,222,454	55,903,497
	22.73%	23.02%	28.04%	24.04%	27.47%
Mail Ballots Sent Pct. of Eligible Voters	92,186,494	88,665,633	69,990,760	94,454,196	70,159,954
	46.20%	44.05%	34.91%	46.12%	34.47%
Mail Ballots Returned Pct. of Ballots Sent	72,578,411	70,106,246	59,221,606	83,162,416	65,470,765
	78.73%	79.07%	84.61%	88.05%	93.32%
Total Ballots Cast Pct. of Eligible Voters	159,703,126	159,979,808	159,654,632	158,862,549	158,753,508
	80.04%	79.48%	79.62%	77.57%	78.01%
In-person Ballots Cast Pct. of Ballots Cast	86,725,857	85,871,414	95,606,280	71,730,963	85,938,436
	54.30%	53.68%	59.88%	45.15%	54.13%
Mail Ballots Cast Pct. of Ballots Cast	72,977,269	74,108,394	64,048,352	87,131,586	72,815,073

(continued)

Table 18.2 (continued)

	Actual 2020 election with baseline predictions for missing values	Baseline prediction of 2020 election	Prediction of 2020 election without added mail voting measures	Prediction of 2020 election without early in-person voting measures	Prediction of 2020 election w/o added mail or early in-person voting
	45.70%	46.32%	40.12%	54.85%	45.87%
Turnout (Presidential Votes) Pct. of Ballots Cast	158,576,558	158,746,992	158,450,206	157,106,010	157,186,820
	99.29%	99.23%	99.25%	98.95%	99.01%
Biden Votes Pct. of Turnout	81,279,323	82,798,977	82,247,762	81,729,074	81,952,907
	51.26%	52.16%	51.91%	51.99%	52.14%
Trump Votes Pct. of Turnout	74,224,056	73,182,210	73,524,186	72,854,759	72,842,992
	46.81%	46.10%	46.40%	46.35%	46.34%
New COVID Cases Pct. of Population	10,568,663	9,696,168	10,307,381	8,698,921	9,772,127
	3.19%	2.93%	3.11%	2.62%	2.95%

Turnout differs from ballots cast because it does not include ballots that do not contain a valid vote for President. The Turnout equation captures this distinction and is employed to estimate "Turnout (Presidential Votes)" from the total number of ballots cast. In the estimates in Table 18.2 over 99% of ballots cast contain valid votes for President as has been the case in all recent presidential elections.

"Biden Votes" and "Trump Votes" are simulated using the Biden and Trump equations to project the proportion of the turnout received by each candidate. The numbers of votes are obtained by multiplying the predicted turnout by these proportions and summing. The fitted equations for Biden and Trump votes in Table 18.1 are almost mirror images of each other. Therefore, the national totals of simulated votes displayed in Table 18.2 come close to describing the outcome of a zero-sum game. The model directs nearly the entire simulated turnout to one or the other of the two major candidates.

Finally, many of the changes made to voting systems for the 2020 election were made in response to the COVID-19 pandemic. The last lines of Table 18.2 are simulated new cases of COVID from November 4 to December 31, 2020. The last equation of our model is a logit equation for the share of the population that became newly-infected post-election in 2020. The numbers of simulated new cases are found by applying the projected share to an estimate of the population on November 3 and summing over counties.

6   What Do the Simulations Show?

The Baseline simulation reproduces the actual outcome of the 2020 election with sufficient accuracy to ensure that the fitted model closely approximates the operation of the U.S. election system during the 2020 general election. The poorest of the Baseline predictions in Table 18.2, that for Mail Ballots Sent, is off the mark by slightly more than 2.0%. The discrepancies for all of the other Baseline predictions are less than 1.0%.

According to the simulations, the methods of voting offered by many states strongly impacted the ways voters chose to vote. Simulating the 2020 election without the measures taken to extend voting by mail results in severe decreases in the estimated number of mail ballots sent (-21.0%), returned (-15.5%) and cast (-13.6%) versus the Baseline predictions. The decrease in mail ballots is matched by a predicted increase in the number of in-person ballots cast (11.3%). Mail ballots requested increase (21.3%) because voters would have to request ballots rather than receive them automatically in states that sent ballots to all eligible voters for the first time.

Conversely, simulating the 2020 election without early in-person voting results in a severe drop in in-person ballots cast (-16.58%) versus the Baseline prediction. This simulated drop is accompanied by large increases in the use of mail ballots as exhibited by the numbers of mail ballots requested (6.2%), sent (6.5%), returned (18.6%) and cast (17.6%).

When both the extensions of vote-by-mail and early in-person voting are dropped, the predicted numbers for mail ballots and in-person ballots resemble the values for the Baseline simulation. The respective percentage changes are -1.8% and 0.1%.

The most notable feature of Table 18.2 is that the differences we see between the simulated scenarios are largely distributional. The variables that measure overall participation do not exhibit large changes from case to case. This is particularly true for voting by mail. The Baseline predictions for active registration, active eligible voters, total ballots cast and turnout drop only slightly when the election is simulated without the by-mail voting measures that states added for the 2020 election. The respective changes are approximately -0.4%, -0.4% and -0.2%.

Without early in-person voting the predicted decreases in participation also remain small. Total ballots cast would have been lower (-0.7%) and total turnout would have dropped (-1.0%). However, early in-person voting apparently discouraged voter registration for reasons that are unclear. Without early voting there would have been more active registered and eligible (1.8%) voters.

Altogether, there is little to support a belief that discontinuing the changes made for the 2020 election would constitute an existential threat to a state's election system. With neither by-mail voting nor early in-person voting, total ballots cast would have changed by -0.8% and total turnout by -1.0%. Active registrations and active eligible voters would have each increased by about 1.1%.

The outcome of the 2020 election, as measured by the percentages of the total turnout received by the two major candidates, would have been little affected by

eliminating the steps taken to cope with the COVID-19 pandemic.[20] The percentage differences we see between scenarios in the numbers of Biden votes (−0.7% to −1.3%) indicate that Biden benefitted slightly from both by-mail and early in-person voting, while the effect on the Trump vote was nearly undetectable (−0.5% to −0.5%). These effects are well below Biden's baseline predicted 6.0% national vote advantage.

Finally, our simulated results indicate that the steps taken to encourage voting-by-mail worked to suppress new COVID-19 cases, but that early in-person voting had the opposite effect. There would have been about 0.61 million more COVID-19 cases in late 2020 without the added by-mail voting, and 1.00 million fewer cases had the election been run with no early in-person voting.

7   Conclusion

The 2020 U.S. general election was held under the extraordinary conditions of the COVID-19 pandemic. We have exploited this circumstance to fit an election model that incorporates variables to measure the effects of changes in eligibility and procedure made by the states to conduct the election safely. Our simulations using the model demonstrate that voters responded strongly to these changes by redistributing the ways they chose to vote. When offered an expanded opportunity to vote by mail or early in-person, large numbers of voters did one or the other. On the other hand, the effects of the changes on various measures of participation were small; and the effects on the outcome of the presidential race were almost negligible.

Would these results be reproduced under more normal circumstances? Our guess is that the effects would still be present but somewhat muted. Voting by mail and early in-person were promoted to the public in 2020 as ways to avoid infection, but the distributional responses we have found are large and not strongly related to the incidence of COVID. We suspect that the responses are partly driven by voters' preferences for alternative methods of voting that will outlive the pandemic. Unfortunately, there is no knowing precisely how well our results will describe a non-pandemic election without refitting the model to data assembled after such an election, and with many of the provisional changes made by the states still in place.

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[20] This does not necessarily translate to an identical outcome in the Electoral College. The numbers of each state's electors are not proportional to a state's turnout. More critically, every state except Maine and Nebraska award all of their electoral votes to the Presidential candidate winning a plurality within the state. Following this rule, the Baseline simulation flips two states: Arizona to Trump, and Florida to Biden. Nevertheless, it is unlikely that, say, a 1% shift in the total popular vote from Biden to Trump would be distributed among the 50 states and DC in a way that would have caused the Electoral College to make Trump the winner of the 2020 election.

Appendix: Explanatory Variables of the Model

Section 1

Variable	Appears	Description and purpose
Intercept	All	Centers the fitted equation over the sample mean.
Rates of Change	All except New Covid-19 cases	The rate of change in the denominator of the dependent variables. The first bloc of variables are these rates of change measured from 2016 to 2020. For example. ln(CVAP/2016 CVAP) is the four-year rate of change of CVAP and is included as an explanatory variable in the equation for the logit of Active Registered Voters/CVAP. Inclusion of this variable allows the equations to adjust less-than-instantaneously to changes in the rate denominator, such as CVAP.
Historical Democrat/Turnout	All	Logit calculated with k = 1 from the Democratic candidate's combined proportion of the turnout in the presidential elections of 2000, 2004, 2008, 2012 and 2016. Intended to be a general measure of historical political preference. This measure of political presence is preferable to others based on voter registrations because it is unaffected by the 2020 election, and because it is known for every county.
ln(Population)	All	The logarithm of the county's estimated population on November 3, 2020. "ln(.)" denotes a natural logarithm. The variable accounts for non-specific scale effects.
2016 Dependent Variable	All except New Covid-19 cases	The dependent variable logit from the 2016 U.S. general election. The logit for Clinton's vote/turnout from 2016 is used in the equation for Biden vote/turnout. The presence of these variables makes the model dynamic by introducing the possibility of a lagged response.
Age Distribution of the Voting Age Population	All	The age distribution of the voting-age population is described according to the 2020 Census by the shares of this population in the age groups 18 to 29, 30 to 44, 45 to 59, 60 to 74, and, 75 and older. These shares always sum to one, therefore, one of these snares must be dropped. The proportion for 18 to 29 years of age has been omitted from all of the equations.
Other Demographic Effects	All	Shares of the population for males, rural residents and military veterans.
Ethnicity	All	Shares of the population for four ethnic minorities – Black, Asian, native American (including Pacific islanders) and Other (mostly Hispanics).
Educational Attainment	All	Highest academic degree held by adults 25 years of age and older. The three variables appearing in the equations are shares for high school graduates, adults with associate or bachelor's degrees and adults with graduate or professional degrees
ln(Personal Income)	All	The logarithm of the average per capita personal income in the county as reported by the Bureau of Economic Analysis (BEA) for 2019
Unemployment Rate	All	The unemployment rate reported by the Bureau of Labor Statistics (BLS) for September 2020

(continued)

Variable	Appears	Description and purpose
ln(GDP per Capita)	All	The logarithm of real Gross Domestic Product (2019) from BEA divided by the county's population in 2019. This variable acts mainly as a proxy for personal wealth. The year 2019 was chosen to avoid including the effects of the COVID-19 pandemic. This variable differentiates counties by their industrial output per person. It was also chosen to avoid COVID-19 effects.
COVID Infection Rate	All	The number of reported COVID-19 cases up to November 3, 2020 divided by population
ln(County Land Area)	All	The logarithm of the county's land area in square miles from the 2010 Census. The equations include variables for population, number of post offices and number of polling places that would normally be divided by county land area to obtain densities. A somewhat more general treatment for a log-log equation is achieved by including land area separately.
ln(Number of Post Offices)	All	The logarithm of the number of post offices in the county in November 2020 extracted from USPS historical statistics
Average Election Day Temperature minus 70 Degrees	All	The average temperature at the county seat on election day in degrees Fahrenheit minus 70 from the National Oceanic and Atmospheric Administration (NOAA)
ln(Number of Polling Places)	All	The logarithm of the number of polling locations for the 2016 general election reported to the Election Assistance Commission (EAC)
Senate Election	All	A dummy variable set to one if the county was within a state electing a U. S. senator, and set to zero otherwise. A Senate seat was on the ballot in thirty-four states during the 2020 general election
ln(Airings in DMA)	All	Every county in the U.S. is included in one (or rarely two) of 210 Designated Market Areas (DMAs) defined by Nielson. The DMAs correspond to television and radio markets and are used to report media activity in these markets. Airings in a DMA are the sum of local broadcasts and broadcasts reported nationally. Airings separately sponsored by the Biden and Trump campaigns from 9 Apr to 25 Oct 2020 are reported by Nielsen. The variable is included to measure the level of partisan political activity during 2020.
ln(Broadcast Media Cost per TV Family)	All	Nielsen has also measured the combined political broadcast media spending from 9 Apr to 25 Oct 2020 for each DMA. This data has been used, along with the number of families with a TV set in the home, to calculate Broadcast Media cost per TV family. The logarithm of this cost is assigned to each county in the DMA. The variable is included to proxy for the general level of all presidential campaign-related spending within a county.

Section 2

Variable	Appears	Description and purpose
Traditional with restricted mail ballots and without early in-person voting	None	The state relies largely on in-person voting on election day. Absentee ballots are only sent to voters on request. Voting by mail is limited to voters with a compelling reason for not voting in-person. No early in-person voting. The states enforce high standards for absentee ballots and have made few adaptations to their election systems.
Traditional with less restricted mail ballots and without early in-person voting	All where applicable	States in this category have liberalized rules for voting by mail but do not allow early in-person voting. Typically, in 2020, the state sent an absentee ballot to any eligible voter requesting one, or, allowed requesters to cite their fear of contracting COVID as a reason for the request.
Traditional with restricted mail ballots and early in-person voting	All where applicable	COVID accelerated an existing trend towards early in-person voting by states that were fearful that crowded polls on election day would endanger the health of voters.
Traditional with less restricted mail ballots and with early in-person voting	All where applicable	The answer to COVID-19 for most of the states with traditional voting systems was both liberalized voting by mail and early in-person voting. Nevertheless, these states continued to depend primarily on voters appearing at polls in-person on election day.
Vote-by-mail pre-2020 without in-person voting	All where applicable	"Vote-by-mail" refers to states that have chosen to shift from traditional in-person voting to relying on voting by mail. The hallmark of vote-by-mail is that ballots are mailed to all eligible voters, not just those that request them.
Vote-by-mail pre-2020 with in-person voting	All where applicable	The state had permanently adopted vote-by-mail prior to 2020 but continued to operate polls for in-person voters.
2020 election vote-by-mail with in-person voting	All where applicable	The most extreme response to COVID-19 by any state with a traditional system was to temporarily adopt vote-by-mail for the 2020 election.

Section 3

Variable	Appears	Description and purpose
Automatic Registration	Active Reg.	This variable is set to one if a state had a policy in place prior to the 2020 election to automatically register qualified voters whenever they interacted with a government agency, e.g., to get a driver's license. Otherwise, the variable is set to zero.
Pre-registration	Active Reg.	Upon turning 18 the pre-registration converts automatically to a registration.
Party Registration	Active Reg.	Registration by political party.
On-line Registration	Active Reg.	Registration allowed on-line.

Variable	Appears	Description and purpose
Election Day Registration	Active Reg.	Registration allowed on election day.
ln(Registration Deadline)	Active Reg.	The registration deadline is the number of days prior to election day that registration for the election is discontinued. The registration deadline does not include election day and is assumed to be at least 1 day.
Mailed Mail-ballot Applications	Requests	Mail-ballot applications sent to all eligible voters.
No Excuse Needed	Requests	Absentee ballots allowed for anyone requesting one without an excuse needed.
ln(Application Deadline)	Requests	The application deadline is the number of days prior to election day that an application for a mail-in ballot must be received in order to be accepted and processed.
Notary or Witness Required	Returns	Regulations requiring that voters returning valid mail-ballots must have their signatures on the return envelope notarized or witnessed.
Harvesting Prohibited or Restricted	Returns	Harvesting is the practice of having an intermediary collect mail ballots from voters and deliver them to USPS or to ballot collection boxes.
Prepaid Return	Returns	Postage paid on return ballots.
ln(Return Mailing Deadline)	Returns	The states make use of two dates to set deadlines for the return of mailed ballots. These are the date that the returning ballot is postmarked and the date that it is received by election authorities. If a state uses the postmark date, then the number of days of the latest permitted postmark prior to election day is the mailing deadline. If a state uses the date of receipt, then the mailing deadline is estimated as the number of days that the ballot could safely be mailed prior to election day with 5 days allowed for transportation, processing and delivery by USPS.
Proportion of Active Eligible Voters Sent Mail Ballots	Ballots, In-person	Depending upon the state, voters can obtain a mail ballot in several ways. First, in most states with traditional election systems, a mail ballot must be requested with each election. Second, some traditional states maintain lists of requesting voters who automatically receive a mail ballot for every election. And, third, vote-by-mail states send mail ballots to all registered voters.
Unknown Proportion of Active Eligible Voters Sent Mail Ballots	Ballots, In-person	A dummy variable set to one when the proportion of voters sent mail ballots by states with traditional systems cannot be determined from the publicly available data, and zero otherwise. The coefficient of this variable plugs the hole left by the missing proportion by installing an average effect estimated from the sample.
ln(Early In-person Voting Window)	Ballots, In-person	The early voting window is the number of days prior to election day that a state opened its polls to early voters.
Photo Identification	In-person	Set to one for states requiring that in-person voters present a photo ID, zero otherwise.
ln(Polls Open Hours)	In-person	The number of hours that polls were open on election day. November 3, 2020.

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Chapter 19
Cost Allocation and Cooperative Game Theory

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1   Introduction

Appropriate cost allocation is a challenge for postal operators and regulators. In many cases, postal operators are multiproduct firms that have high common costs that must be properly allocated between the different products or services offered. Moreover, some operators are in charge of universal service obligations (USO) (or other services of general economic interest – SGEIs) and must allocate their costs between products belonging to the USO (and other SGEIs) and those out of its scope. Indeed, "*The ERGP [the European Regulators Group for Postal Services] considers that ensuring appropriate cost allocation is essential for effective regulation, especially regarding the cost orientation of tariffs, the allocation of resources […], and for competitive issues.*" (ERGP, 2013 at 3).

Several allocation cost methodologies exist. Top-down ABC (Activity Based Costing) is generally used as the common accounting approach for regulatory accounts. The ABC system of cost accounting is based on activities that are considered as cost drivers. The cost driver is used to calculate the amount of indirect and overhead costs to a specific activity. This accounting method provides a good allocation of easily imputable costs. Nevertheless, it is unable to allocate all the costs of the postal infrastructure used to operate more diversified services and to reflect the relationships between them. In this regard, cooperative game theory can be a useful tool to generate an accurate cost allocation between various activities using the same infrastructure. It has already been used in the railway sector by Fragnelli et al. (1999) and in the water sector by Young et al. (1982), among others. However, the use of cooperative game theory in the postal sector is infrequent. It has been used in

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order to the Postal Regulatory Commission "*can ensure that the Postal Service's competitive products cover their attributable costs*" (Sidak, 2015 at 669).

Cooperative games theory appeared in the 1950s (Shapley, 1953). It focuses on the ways to share the value (profits or cost savings) resulting from cooperation between players. We can represent the cost allocation of the postal infrastructure as a cooperative game. In this article, we focus on a specific infrastructure: the post office network used to sell several products or services (mail, parcels, financial services, and so on). Each business unit selling a given category of products or services is viewed as a player. The pooling of various activities in a unique retail network (the post offices network) generates less total cost than the sum of several separated retail networks for each activity. In order to give incentive to all player to share this common retail network, its cost should be spread across the activities with an efficient and accurate method in a way that no subset of players has an incentive to stand alone. To this end, the Shapley value, developed by Shapley (1953), seems to be a relevant allocation method.

Section 2 focuses on the characteristics of the postal industry and its regulatory framework. In Sect. 3 we will use cooperative game theory as a new method for postal cost allocation. Section 4 concludes.

2   Basics of Postal Costing

Before presenting the main postal cost accounting approaches and their limits, it is necessary to explain some costs concepts, the characteristics of postal costs and the postal regulatory framework.

2.1   *Characteristics of Postal Costs and Postal Regulatory Framework*

The postal industry is a large network industry characterized by economic specificities affecting the allocation of costs. In addition, the European legal framework constrains the way to allocate these costs.

2.1.1   Cost Characteristics of the Postal Service

Postal operators are generally multiproduct firms using the same infrastructure to produce several goods. They have historical activities such as mail and parcel delivery and, facing the decline of mail volume, many have diversified their activities. Moreover, some have USO and the net financial cost of these obligations could be partially compensated through State aid.

Even when the cost of providing several services is lower together than apart, for a multiproduct firm using a common infrastructure calculating the different costs used to monitor activity (average cost, marginal cost, and so on) and allocating common costs becomes complex. For instance, average cost, the fundamental cost notion used in single product industries, has no meaning in a multiproduct firm. Postal operators deliver several products and services having each different cost characteristics, by using the same infrastructure. Dividing the total cost of production by the total number of items handled does not provide a relevant measure of the unit cost of a given good or service. An example is the time spent by a postman on his delivery route. Generally, he delivers different products (correspondence items, direct mail, parcels, and so on). To have an accurate estimate of the delivery cost of each sort of product, it is necessary to define an allocation rule of the time spent by the postman to deliver each of them.

Furthermore, the delivery of postal items is characterized by economies of scale and economies of scope, due to the presence of relevant fixed costs. It may be cheaper to deliver a letter and a package together than to have separate delivery routes for each type of mail product. And the more items delivered during the same route, the less costly the delivery of one item. As a practical matter, the presence of such economies makes it harder to estimate the unit cost of products.

Last but not least, in many countries, postal operators must meet a USO. Article 7 of the Postal Directive (97/67/EC amended by Directives 2002/39/EC and 2008/6/EC) states "*where a Member State determines that the universal service obligations, […], entail a net cost, and represents an unfair financial burden on the universal service provider(s), it may introduce: (a) a mechanism to compensate the undertaking(s) concerned from public funds; (b) a mechanism for the sharing of the net cost of the universal service obligations between providers of services and/or users*". To compensate the net cost of these obligations that entail an unfair burden, it is necessary to calculate the specific costs of these obligations. The Postal Directive has defined some rules to correctly allocate costs between products belonging to the USO scope and other products.

2.1.2   Costs in the Postal Services Directive

According to the Postal Directive, postal operators must present an accurate accounting system. Paragraph 2 of Article 14 states "*The universal service provider(s) shall keep separate accounts within their internal accounting systems in order to clearly distinguish between each of the services and products which are part of the universal service and those which are not.[…]. Such internal accounting systems shall operate on the basis of consistently applied and objectively justifiable cost accounting principles.*" Paragraph 3 of the same article adds "*The accounting systems referred to in paragraph 2 shall, […], allocate costs in the following manner: […] common costs, which are necessary for the provision of both universal services and non-universal services, shall be allocated appropriately; the same cost drivers must be applied to both universal services and non-universal services.*" The

scope of the regulatory accounting systems covers all activities belonging to the USO scope, and when these activities share the production infrastructure with non-USO products, clear allocation rules must be applied to avoid any cross-subsidy between USO and non-USO products and establish right transfer pricing between the universal service provider (USP) and her subsidiary when activity is outsourced.

This was illustrated in a decision[1] by the French Supreme Administrative Court. This decision followed a complaint by La Poste regarding the decision n°2007-0443 adopted by the French Postal Regulator, ARCEP. The ARCEP decision required La Poste to present, on a yearly basis, confidential regulatory accounts with a distinction between USO and non-USO products. The French Supreme Administrative Court compelled La Poste to detail the accounts (costs per activity and revenues) of products outside the USO but which shared the same activities as the USO products (one line for mail services and one line for parcel services outside USO). *"In addition, the decision given on 8 November 2010 by the Administrative Court of Helsinki regarding FICORA's decision on the pricing of USO products also highlighted the necessity that all costs (including those regarded as fixed costs) should be allocated to all products (USO and non-USO). This ruling set out that the fixed costs should be allocated to USO and non-USO products according to their respective use of resources, instead of allocating a part of the costs (fixed) to only one category (USO) of products.*" (ERGP, 2011 at 10).

2.2   Common Concepts and Allocation of Postal Costs

2.2.1   Useful Cost Concepts

The cost of a product or a service is a function of the consumption of the different activities and resources required to produce it. Hence, the global output (postal service) must be split into several activities, sub-activities and elementary activities. Usually, postal activities correspond to the collection, transport, sorting and delivery of postal items. These activities could be divided into sub-activities and sub-activities may themselves be decomposed into sub-sub-activities. Elementary activities are the finest level, they are the most elementary operations required for a specific task. In order words, elementary activities deal with a limited set of products or services that are treated homogeneously, leading to a simple cost function correctly translating the technical process. A process gathers the activities which are required to be undertaken together in order to produce outputs.

From an allocation perspective, the simplest type of cost to manage is direct cost. This cost can be directly attributed to a particular product or service through a specific cost driver (a factor that has a systematic relation to a particular type of cost and which causes that cost to be incurred).

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[1] Arrêt CE n° 309316 du 7 mai 2008

Joint costs and common costs are more difficult to allocate, because they cannot be directly attributed to one product or service. Moreover, the distinction between these two types of costs is thin: "*joint costs can be defined as costs that are common to a group of products, but what the cost driver(s) is (are), depends on the specific attributes of these respective products.[…] It can be allocated with appropriate cost drivers.*" Common costs are "*costs that are incurred in the supply of more than one product, and that cannot be attributed to a single product as they are not directly affected by the variation in the output of any one product.*"(ERGP, 2011 at 13). When costs could not be allocated through a specific cost driver, as in the case of common costs, the Equi-Proportional Mark-Up method (EPMU) is generally used. It splits the common costs between USO and non-USO products delivered by the postal operator in proportion of the volume of each type of products.

The relevance of a particular method of allocating joint or common costs depends on the particular context of the industry and on the regulator's objectives. If the costs to be recovered through a mark-up are small, and if demand elasticities for the products or services in question are similar, EPMU is likely to be an acceptable approach. However, where common costs are significant, and demand elasticities differ between products, as generally evidenced in the postal services sector, the EPMU approach could be less appropriate. Other methods have been developed such as Ramsey pricing. It focuses on what prices a public monopoly should charge for the various products it sells in order to maximize social welfare[2] while earning enough revenue to cover its fixed costs. In this sense, Ramsey pricing is an important and essential cost allocation method. However, it charges whichever activity has less elastic demand a higher price, a solution that customers who are charged more may consider unfair.

All of these cost concepts are used in the common accounting approach for regulatory accounting. Nevertheless, the main accounting approach to allocate costs and the net cost of providing USO has some limits, as we will see in the next section.

2.2.2   Costs Accounting Approach for Regulated Firms

General Accounting Principles

There are two main accounting approaches: the Top-Down approach and the Bottom-up one. The Top-Down approach means that cost accounting data, from the general ledger, are identified at a global level, and then successively refined to activities, sub-activities and finally to elementary activities using appropriate cost drivers. In the Bottom-Up approach, an explicit description of elementary activities is used and then combined with activity measures and unit costs for the different resources in an elementary cost function. These costs are then aggregated successively to sub-activities and finally to the activities to recover the total cost. Both use costs drivers for direct and joint costs and EPMU method for common costs.

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[2] The sum of producer and consumer surplus.

The Top-Down ABC (Activity Based Costing) methodology is the most common accounting approach used in regulated sectors. In the ABC method, the production processes are split into different activities. The ABC method considers the services and products as a series of activities, each of which consumes resources and therefore generates costs. This methodology traces and allocates costs through the activities performed and tries to establish a clear cause-and-effect relationship between activities, their associated costs and the resulting output from those activities.

While the use of the ABC methodology is in line with the regulatory accounting requirements of postal NRAs, the predominance of the Top-Down approach raises questions regarding allocation of common costs. Indeed, this kind of cost allocation methodology remains appropriate as long as the knowledge of the production process is sufficient. Moreover, this approach is limited regarding allocation of common costs because it only allocates them proportionally. ABC permits a good allocation of direct and join costs, but it is unable to measure accurately common costs.

Net Cost Evaluation of Meeting USO

According to the Postal Directive (2008/6/EC amending Directive 97/67/EC), Annex 1, *"the net cost of universal service obligations is to be calculated, as the difference between the net cost for a designated universal service provider of operating with the universal service obligations and the same postal service provider operating without the universal service obligations"*. In order to determine which services or elements of services and user groups would not be provided or served by the current USP without the USO, a counterfactual scenario shall be constructed. The counterfactual scenario shall present how the designated operator would position itself on the market if considering only its business strategy without the USO. The responsibility to verify this cost generally lies on the NRA, while the universal service provider(s) shall cooperate to enable the NRA to carry out this task.

Cremer et al. (2000) and Panzar (2000) recommended a profitability cost approach in which the burden that the USO imposes on an operator is equal to the difference in the operator's profits with and without the USO. Estimation of the counterfactual profit is a tricky exercise which relies among other things on a right cost allocation. Cooperative game theory can be a useful tool to do this.

3   Using Cooperative Game Theory for Postal Cost Allocation

Cooperative game theory models how players compete and cooperate as groups in unstructured interactions to create a value. It focuses on how the value resulting from cooperation is shared between players. In this sense, we can model the allocation of the costs generated by the post offices network through cooperative game theory in which postal activities are players. Moreover, as we will see, the classical cooperative game can be enriched by a permission structure to model the complex interaction between the USO and other activities.

3.1 Outline of Cooperative Game Theory

Before applying cooperative game theory to postal cost allocation, it is necessary to explain the essential framework of cooperative games. After modelling the allocation of postal costs as a cooperative game, we will focus on the sharing the value created by the cooperation.

3.1.1 Framework of Cooperative Games

Formally, a cooperative game describes a situation in which a finite set of players generates a value by cooperation. This game is defined as a pair (N, v) where $N = \{1, \ldots, n\}$ is the set of players. A coalition is simply a set of players which cooperate. If they form one coalition containing all the players, we call this coalition the *grand coalition N*. Any other coalition E corresponding to a subset of N, could be formed in a different scenario. We denote by $|N|$ and $|E|$ the number of players in the coalition N and E. Furthermore, 2^N is the set of all coalitions of N and $v : 2^N \to R$ is a characteristic function on N that associates to each coalition $E \in 2^N$ a value $v(E) \in R$ and satisfies $v(\varnothing) = 0$. It provides the best result that the players in a coalition E can achieve if they cooperate without help of the other players.

We represent the postal network as a cooperative game. The players are activities offered in the post office network. For the ease of exposition, we consider a limited set of players with three activities: banking services B, letter mail M and parcel delivery P. The set of players is given by $N = \{B, M, P\}$ and the set of all coalitions of N is:

$$2^{\{B,M,P\}} = \left\{\varnothing, \{B\}, \{M\}, \{P\}, \{B,M\}, \{B,P\}, \{M,P\}, \{B,M,P\}\right\}.$$

We consider the hypothetical characteristic function presented in Table 19.1.

The singletons, $\{B\}$ $\{M\}$ and $\{P\}$, correspond to the cost to be alone in a post office. For example, if the Banking services B operates alone in a post office its costs are 250. The logic is the same when there are two activities in one coalition. If Banking services and Mail $\{B, M\}$ are in the same post office their costs are equal to 380. The characteristic function v is sub-additive,[3] it is preferable that activities cooperate in the same post office rather than each being alone.

Note that this is a cost game: players share space in a same post office to reduce their costs. The cost of having a post office that brings together the three activities without being the grand coalition exceeds 400.

$$\{B\} + \{M\} + \{P\} = 450$$

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[3] Formally, $v(S \cup T) \leq v(S) + v(T)$ for all S and $T \subset N$ such that $S \cap T = \varnothing$.

Table 19.1 Characteristic function

E	{B}	{M}	{P}	{B, M}	{B, P}	{M, P}	{B, M, P}
v(E)	250	135	65	380	310	190	400

$$\{B,M\}+\{P\}=445$$

$$\{B,P\}+\{M\}=445$$

$$\{M,P\}+\{B\}=440.$$

3.1.2 The Shapley Value and Its Axiomatization

To determine how to distribute the value of the grand coalition among its members, cooperative game theory proposes several allocation rules, to be chosen according to desirable properties (or axioms) they satisfy. In cooperative game theory the value of the grand coalition is distributed among its members by an allocation rule. It is a function that gives to each player a part of the value of the grand coalition.

Formally, an allocation rule f on V_N is defined by a function $f: V_N \to R^N$ and associates to each cooperative game $(N, v) \in V_N$ an allocation $f(N, v) \in R^N$. The allocation of each player $i \in N$ is the real number $f_i(N, v)$. We concentrate on the Shapley value, Sh, but many other allocation rules have been developed. The Shapley value is the average added value of a player to all possible coalitions. It emphasizes the fairness of the distribution of value among players. In our example, for each coalition of activities, the sum of the shares of the total cost attributed to the coalition by the Shapley value is not greater than the cost generated by this coalition. In other words, the Shapley value is in the core of cost allocations, which means that there is no incentive for a coalition of activities to split from the other activities. Moreover, the Shapley value satisfies four principles that can be interesting for postal costs allocation.

The first is efficiency, in that the sum of the Shapley values of all players equals the value of the grand coalition, so that all the value is distributed among the players. Secondly, equal treatment of equals is that if two players always have the same contribution to coalitions then they get the same allocation of the grand coalition's costs. Third is null player, that is, if a player makes no contribution to coalitions, then the allocation to this null player is null. The last axiom is additivity: a game can be divided into two separate games without changing the final allocation obtained by the players.

Shapley (1953) and Shubik (1962) demonstrated that the Shapley value is the only allocation rule satisfying these four axioms (efficiency, equal treatment of equals, null player and additivity). In this sense, it is a "fair" distribution between the players. The Shapley value Sh_i for a player $i \in N$ is given by the following formula:

$$Sh_i(N,v) = \sum_{E \subseteq N \setminus \{i\}} \frac{|E|! (\||N\|| - \||E\|| -1)!}{|N|!} \left(v(E \cup \{i\}) - v(E) \right).$$

The last part of this formula, $(v(E \cup \{i\}) - v(E))$, corresponds to the marginal contribution of player i to the coalition E. It represents the contribution of the player i when he joins the coalitions which did not contain him before – it is like a counterfactual. Note that, firms must be able to construct a robust counterfactual scenario otherwise accounting methods (with accurate cost drivers) are more appropriate. In addition, the marginal contribution can be interpreted as an incremental cost, that is, the additional cost incurred by a coalition if a player joins it. Therefore, the Shapley value may be useful to justify compliance with competition law.

The Shapley value gives an allocation according to the productivity of the players. It appears that the Shapley value of a player is a weighted average of the play-er's contributions to the coalitions. The coefficient $\frac{|E|! (\||N\|| - \||E\|| -1)!}{|N|!}$

indicatesthe weight of the coalition E in this average. It depends only on $|E|$. An easy way to understand the Shapley value is to apply it to the example given in Table 19.1. Recall that the set of players is given by $N = \{B, M, P\}$.

With Shapley's formula, the allocation of players B is given by:

$$Sh_B(N,v) = \frac{0!(3-0-1)!}{3!} (v(\{B\}) - v(\varnothing)) + \frac{1!(3-1-1)!}{3!}$$

$$(v(\{B,M\}) - v(\{M\})) + \frac{1!(3-1-1)!}{3!} (v(\{B,P\}) - v(\{P\}))$$

$$+ \frac{2!(3-2-1)!}{3!} (v(\{B,M,P\}) - v(\{M,P\})).$$

$$Sh_B(N,v) = \frac{1}{3}(250 - 0) + \frac{1}{6}(380 - 135) + \frac{1}{6}(310 - 65) + \frac{1}{3}(400 - 190) = 235$$

In the same way we obtain, $Sh_M(N, v) = 117.5$ for the player M and $Sh_P(N, v) = 47.5$ for P. Using the Shapley value, the post office's costs are fairly allocated between players.

Until now, we dealt with "commercial" postal activities. In the following section, we introduce the concept of permission structure to be able to include the USO in the cooperative game.

3.2   How to Deal with Universal Service Obligations and More Generally Services of General Economic Interest

A complete representation of postal cost allocation necessitates to include the universal service obligations (USO) and any other services of general economic interest (SGEI) in the analysis. In the French case, there are mainly two SGEI, accessibility to postal services (*APS*) and contribution to the development of the territory (*CDT*). From an operational point of view, meeting these two SGEI results in a much higher density of contact points. The cost of such a network is much greater than the cost the postal operator would incur without the two SGEI, which can give rise to distinct compensations from the French state. However, these compensations can only be obtained after a precise evaluation of the additional costs generated by each of the two SGEI.

The total extra cost due to both SGEI, seen as a whole, can sometimes be assimilated to the incremental cost they generate. Nevertheless, there is no immediate way of distinguishing in this total what is attributable to each of them. Moreover, the use of incremental cost could neglect some interactions between the SGEIs and the commercial postal services. European regulatory institutions encourage the use of such counterfactual data and cooperative game theory allows to take them more into account.

3.2.1   Back to the Cooperative Game Approach

The cost attributable to each SGEI can be obtained through a suitable cooperative game as the allocation prescribed by an allocation rule to each of them. This means that both *APS* and *CDT* must be included as players in such a cooperative game. The new set of players is given by $N = \{B, M, P, APS, CDT\}$. In this section, we explain why the newly added players have a special status and how we can cope with it in order to calculate a plausible allocation.

As a start, since *APS* and *CDT* are players in the game, the associated characteristic function must specify the cost generated by any coalition containing one or two of these players who define a different set of constraints. There is no technical difficulty preventing the calculation of, for example, *v({APS})*. This should correspond to the total cost of having a dense network of post offices offering no service on the whole territory. Conceptually, it is more difficult to make sense of the value of *v({APS})*. The reason is that accounting for SGEIs within a coalition seems legitimate only if this coalition also contains the commercial services that make the postal company an appropriate operator to carry out these SGEIs. Let us illustrate these ideas with another coalitional example. Consider the coalition *{B,APS}*. It should be clear that the universal postal service (*APS*) obligation is strongly connected to the mail (*M*) and parcel delivery (*P*) services, but not to the banking (*B*) service. As a consequence, it would make little sense for the French state to entrust this SGEI to a company that would only offer banking services as is the case in the

{B,APS} configuration. As for the case of *v({APS})*, it is therefore difficult to interpret the value of *v({B,APS})*.

To summarize, only certain coalitions seem relevant in the description of the counterfactuals on the basis of which a cooperative game is built. These coalitions obviously includes all coalitions containing only postal services but also the coalitions in which the set of postal activities are sufficiently relevant to the fulfillment of one or both SGEI. But since a cooperative game is described by the value/cost generated by the set of all coalitions, adjustments must be made in irrelevant coalitions. Furthermore, it is necessary to remark that a coalition may be relevant with respect to one SGEI but irrelevant with respect to the other one since the relevant services may vary from one SGEI to the other. In the latter situation, adjustments are necessary only on the irrelevant part of the coalition.

The adjustments that we can make are as follows. Consider a coalition *E* which contains a SGEI. If none of the postal services relevant to satisfy this SGEI is included in Coalition *E*, then the SGEI is simply deactivated in the sense that the cost generated by Coalition *E* is calculated by dropping the irrelevant part of *E*. Proceeding in this way for all coalitions, we get a new cooperative game in which the cost associated with each coalition is easily interpreted.

In the context of our running example, it is reasonable to make the effective inclusion of *APS* in a coalition conditional on the presence of at least *M* or *P* in that coalition. In the same way, for *CDT*, we can impose the presence of at least one of the three commercial services *B*, *M* and *P*. As an illustration of these constraints, if we denote by *w* the characteristic function of the adjusted game, then $w(\{B,APS,CDT\}) = v(\{B,CDT\})$. In words, the total cost generated by coalition *{B,APS,CDT}* accounts for SGEI *CDT*, since service *B* is a member of this coalition, but not for the SGEI *APS* since neither *M* nor *P* are in the considered coalition.

At this point, there is no obstacle to apply the Shapley value to this adjusted game. In particular, this allocation rule allows us to properly evaluate the additional cost attributable to each SGEI while taking into account their interactions with commercial services. Of course, the Shapley value on the adjusted game continue to provide the cost attributable to each commercial service.

3.2.2   Cooperative Games with a Permission Structure

The method developed in the previous subsection is an application (with a new interpretation) of the model of cooperative games with a permission structure (Gilles et al. 1992; Gilles & Owen 1994, 1999) to take into account the specific role of postal SGEIs. Cooperative games with a permission structure were originally introduced to model exogenous hierarchical relationships between the players participating in a cooperative game. Roughly speaking, a player needs the presence (interpreted as a permission) of some or all of its hierarchical superiors in order to be able to cooperate within a coalition.

In this literature, various assumptions can be made about how a permission structure affects the cooperation possibilities. The disjunctive approach (Gilles & Owen 1999) is the one detailed in the previous subsection: the presence of **at least one** relevant postal service is needed in a coalition before a player corresponding to one of the SGEIs can be taken into account in that coalition. Under the alternative conjunctive approach (Gilles et al. 1992), the presence of **all** relevant postal services is needed in a coalition before a SGEI can be taken into account in that coalition. It is not immediate to determine which approach is the most suitable for allocating postal costs since it depends on the concrete application one has in mind.[4]

4   Conclusion

Postal operators manage many activities including the collection, the transport and the delivery of various products. Their production functions are characterized by the existence of economies of scale and scope. Some postal operators are in charge of the USO and/or other SGEIs. In particular, they must operate a wide network of postal points of contact to give access to universal postal services to users. Therefore, the allocation of costs is complex. The scope of the regulatory accounting system covers all activities that are used for the provision of the SGEI, in particular when those activities include products/services that fall outside of the SGEI.

The ABC methodology is used as the common accounting approach for regulatory accounts. In ABC method the production processes are split into a number of different activities. Then, it tries to establish a clear cause-and-effect relationship between activities. This accounting method permits a good allocation of direct and join costs, but is unable to measure accurately common costs.

For common costs, it is not possible to find a cause-and-effect relationship. One solution consists in using EPMU method. It means splitting the common costs in proportion of the volume of SGEI and non-SGEI products delivered by the postal network. Another solution would be to use cooperative game theory to model the allocation of post office's costs. Indeed, we assume that the post office network is a common infrastructure used by several players: parcel delivery, letter mail, and banking services. The post office's costs could be allocated to each participant by using the Shapley value.

Moreover, the classical cooperative game can be enriched by a permission structure to model the complex interaction between commercial activities and the

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[4] Both the conjunctive and disjunctive approaches give rise to adjusted cooperative games, called the conjunctive restricted game or disjunctive restricted game. The Shapley values of these games are known as the conjunctive permission value and the disjunctive permission value, respectively. Let us mention that axiomatic characterizations of the conjunctive and disjunctive Shapley values have been provided in the literature. We refer the reader to van den Brick (2017) for a comprehensive survey which details the aforementioned different approaches and presents these characterizations.

SGEI. Accessibility to postal services associated to the USO implies that the density of the points of contact takes account of the needs of users and that users find the proper postal services in the postal network. Therefore, a coalition made up of USO without the activities that make it feasible is not relevant and is not considered in the calculation of allocation.

Cooperative game theory can propose relevant cost allocation methods that are operational and academically recognized. Indeed, there are several allocation rules that satisfy desirable properties. The Shapley value can be considered as "fair" distribution of costs between the players, preventing any cross-subsidy between commercial activities and SGEIs. Critics of the Shapley value will point out the complexity of its calculation. However, the development of computer software makes it easier to calculate.

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Chapter 20
Demand Elasticities for Publishing Mail Traffic in the UK: Intensive and Extensive Margins

Frédérique Fève, Thierry Magnac, Jonathan Pope, and Soterios Soteri

1   Introduction

The on-going decline in letter volumes is encouraging national postal operators to examine segments of mail traffic at a finer level of detail to identify new commercial opportunities and protect existing business. A segment that Royal Mail has been examining for some time and foresees potential opportunities within is the publishing sector, and in particular, the delivery of physical magazines.[1]

At first sight, it may seem counter intuitive to focus on a market segment that is declining at a rate faster than letter volumes. However, there are aspects of this market where postal operators can work constructively with sending customers to better meet their strategic aims. With respect to this last point, most physical consumer magazines are sold through retail outlets which themselves are under pressure from on-line competition and other factors that reduce in-store traffic, resulting in local

[1] For the purpose of this study, we use the Royal Mail publishing mail definition which consists of periodical items such as newsletters, journals, and magazines (but not brochures, catalogues, directories and exhibition guides) with at least one-sixth of the periodical being of editorial content.

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and main street closures. In response, publishers are increasingly turning to subscription models, both in terms of physical and digital delivery, as a core enabler of their diversification strategy. Looking ahead, more magazine brand owners are expected to extend their proposition from providing print and\or digital content to unknown audiences, funded by cover price and advertising spending, into a reader focussed model, where direct relationships with the end consumer allow the brand to be taken into new markets and provide new sales opportunities.

A key factor often cited by some Royal Mail commercial and sales personnel is that the cost of postage has a substantial impact on the quantity of physical publishing mail sent by organisations and, therefore, reduces opportunities for increasing customer subscriptions. For example, it is the case that physical magazine publishers need to compare the business cases of distributing magazines through different retail supply chains. In retail physical distribution they face increasing competition for shelf space, a lack of absolute knowledge of reader behaviour and high levels of returns. In a subscription model the cover price is discounted, to achieve consumer commitment to every edition, they incur a postage cost but acquire the benefit of knowing the customers and being able to communicate directly with them.

To the best of our knowledge, there is no publicly available analysis of UK publishing mail price elasticities to help inform business opportunities aiming to raise (or reduce the decline in) the number of magazines and other published material delivered by postal operators and the few studies that exist for other countries provide mixed messages and may not be appropriate to informing business decisions in the UK. For example, Cigno, Patel and Pearsall (2013) estimate price elasticities in the US which range from −0.8 to −3.5 with most in the elastic range, Nikali (2016) provides an estimate for magazine prices in Finland to be around −0.2, Bzhilyanskaya et al. (2015) estimate periodical postage price elasticities in the US to be around −0.6 and Borsenberger and Muller (2019) estimate reader demand magazine price elasticities in France to be considerably higher than unity, with most estimates lying in the range −1.2 to −2.1.[2]

This paper attempts to address the empirical shortfall for the UK. It provides econometric estimates of price elasticities for publishing mail demand in the UK using a large customer panel data set over the period 2011 to 2018. The data covers over 1000 Royal Mail publishing mail account customers and can segment senders into the following four categories of mail: business-to-business; business-to-consumer; brand magazines; and membership material (which itself can be consumer or business oriented).

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[2] It should be noted that the magazine price elasticity of demand estimated by Nikali was not significantly different from zero and the periodical postage price elasticity estimated by Bzhilyanskaya et al. refers to the periodical product elasticity net of switching to other products (that is, the result reported in Table 20.3 column row sum elasticity). With regards to the non-news related magazine price elasticities reported by Borsenberger and Muller these differed by magazine content type, with those focussing on topics related to Arts, Family, Law and Economics, Lifestyle, Nature, Science and Sport topics estimated to be in the range −1.2 to −2.1 and those focussing on News, Society, Technology and Women estimated to be in the range −0.6 to −0.9.

We examine customer price elasticities at the intensive margin (i.e. those consuming a positive quantity of a publishing mail product) by restricting data to effective customers of each type of publishing product, and at the extensive margin by analysing the customer's binary response to consume each product, to a price change. We allow for endogeneity of prices because of the presence of measurement errors and use instrumental variables to account for endogeneity at the sectoral and group size mean prices. We use a variety of instrumental methods (as per Fève et al., 2018a, b) and show why panel data estimation methods allowing for random customer effects are the best adapted to these data. Furthermore, we provide evidence on the independence between the two margins, thus validating that zeroes in consumption are likely due to infrequency of purchase.

Among salient results, most estimated elasticities at the intensive margin are slightly below −1 (−1.26 in the full sample with a standard error of 0.20) and are quite homogenous across the subsamples that can be constructed according to products, customer size or sector. Estimates at the extensive margin are equal to −1.3 and −0.8 depending on whether a Probit or Logit specification is used. The full price elasticity is then estimated to be approximately equal to −2.3 (with a standard error of 0.69) for Probit estimates and −1.8 (with a standard error of 0.44) for Logit estimates.

Section 2 describes the data and estimation methodology for modelling price elasticities at the intensive and the extensive margins. Section 3 reports empirical results and consolidates these estimates to provide full price elasticity estimates. Section 4 contains a summary and conclusion.

2 Modelling Demand for Publishing Traffic

Our objective is to examine customer price elasticities at the *intensive margin* by restricting data to effective customers of each type of publishing product (i.e., those consuming a positive quantity of a publishing mail product) and at the *extensive margin,* by analysing the customer's binary response to consume each product, to a price change.

2.1 Price Elasticities

Price elasticities of demands for publishing mail are derived from the function relating traffic volumes, denoted by Q_{ijt}, — sent by different customers, each denoted by i, for different types of letter mail products, denoted by j, at each period t — and the level of prices charged to send mail, denoted by p_{ijt}. In the following econometric analysis, we use a data set of individual Royal Mail customers who send publishing products by mail. We specify demand in a logarithmic format, regressing the logarithm of volumes on log-prices while adding controls related to time, product, and

characteristics of the customers. Information is available for 2,036 customers (i), 6 products (j) in each period (t) between 2011 to 2018.

To concentrate our focus on the effect of price changes on volume, we define period t as the time between two price changes, which mostly occur once every year between April 2010 and January 2019 with one exception to account for bringing forward the annual price change date from April 2015 to January 2015.[3] Thereafter, prices were adjusted each January until 2019. In line with this level of time aggregation, customer panel data were constructed by aggregating monthly information falling between each of the defined price change periods. The 6 mail products considered consist of two sortation levels (low and high sort), two speeds of delivery (first class and second class) and two letter format sizes (large letter and parcel, the latter being only high sort).[4]

Following the advice of Royal Mail publishing product experts, customers were segmented into the following four categories or sectors of mail; business-to-business which include trade and industry publications; business-to-consumer publications that mainly refer to news and leisure or hobby related publications; brand magazines refer to publications by companies maintaining contact with customers and informing them of product enhancements and news related to their business; and membership material relating to newsletters and magazines for clubs and societies. The size of these groups are roughly of equal magnitude. Customer "size" is a binary variable recording whether customers have small or large turnovers, as defined by a threshold of £750k which makes the groups broadly equal in size. For about 15% of customers in the sample, this information is missing and is recorded as such as a size category.

The main specification we use is the following:

$$\ln\left(Q_{ijt}\right) = \alpha + \beta \ln\left(p_{ijt}\right) + \lambda_j dproduct_j + \mu_t dtime_t + \delta_{kk'} dsector_{ik} * size_{ik'} + v_{ijt} \quad (20.1)$$

in which $dtime_t$ is a time dummy, $dproduct_j$ is an indicator of products, $dsector_{ik}$ are dummy variables for the four sectors of activity and $size_{ik'}$ are dummy variables for the size of the firm (categorized in 3 groups, one of which denoting that size is missing).

We also split samples and estimated elasticities (i.e. β) by firm size, by sectors and by class of products (first and second) in order to analyse observed heterogeneity in price elasticities.

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[3] As we aggregate volumes and values in levels exactly, the different length goes into the time indicator of this period without affecting estimated elasticities.

[4] In the UK, publishing mail prices depend on the extent to which customers presort their mail and their size dimensions. For example, low sort items are presorted to 86 ways and high sort up to 1529 ways. In both cases, publishing mail prices are also dependent on their volumetric profiles, with smaller items weighing up to a maximum 750g classified as large letter formats and those with larger dimensions as parcel formats.

2.2 Selection and Endogeneity of Prices

There are two important empirical challenges that we need to address in our estimation methodology.

The first one is that customers do not consume every product every period. Out of potentially 114,016 customer-year-product observations, only 13,755 of them are positive, that is those customers who effectively consumed this product in that year. Therefore distinguishing intensive and extensive margins is important. We proceed by modelling each of these margins first separately by estimating Eq. (20.1) and the intensive margin elasticity on the sample of positive observations; further on, we report elasticities at the extensive margin obtained by modelling the determinants of whether customer i consumed product j in period t. Denote $Z_{ijt} = 1$, if this is the case ($Z_{ijt} = 0$ being the alternative) and we write the binary model as:

$$Z_{ijt} = \{\alpha_0 + \beta_0 \ln(p_{ijt}) + \lambda_{j0} dproduct_j + \mu_{t0} dtime_t \\ + \delta_{kk'0}\, dsector_{ik} * size_{ik'} + \varepsilon_{ijt} > 0\} \quad (20.2)$$

The two margins might not be independent however if unobserved determinants of positive consumption are correlated with those affecting consumption levels. This would generate selection biases. However, when we test for the absence of selection issues in this specific empirical application, we find that this hypothesis cannot be rejected. Unobserved determinants of a positive consumption seem to be orthogonal to the level of such consumption as shown in the seminal paper by Deaton and Irish (1984) dealing with infrequencies of purchase by customers. For this reason, it is valid to sum our elasticity estimates at the intensive and extensive margins together to obtain full price elasticity estimates and we therefore present results on each of these separately and then combine them afterwards.

The second caveat relates to the way we compute prices. Namely, prices are constructed by dividing the values of sales by the volumes sent in each period for each product and customer. In consequence, prices are likely to be endogenous if there are measurement errors in volumes (Borjas, 1980). Indeed, those measurement errors enter the error term as well as prices resulting in a spurious negative correlation between errors and regressors. Discounts in prices given by Royal Mail to large customers, or customers of large amounts, might also create such a spurious correlation that makes OLS estimates biased. To solve this issue, we chose to use an Instrumental Variable (IV) approach that controls for the endogeneity bias we have just described.

The instruments to be used should be relevant – significantly correlated with prices – and valid – orthogonal to unobserved determinants of volumes (Davidson & McKinnon, 2004). Our preference thus goes to variables constructed using information on prices. The first IV candidate we considered were rate card prices which are the official prices announced in the absence of discounts. Unfortunately, rate card prices were not significant in the first stage regression of regressing observed prices on rate card prices, in part because rate card prices vary little. The second

candidate considered were the average prices in groups defined by sector and by size of the customer. In contrast, these proved to be highly significantly although the method relies on the validity of those instruments. This second set of IV candidates could be questioned on the basis that the aggregated average prices might still be affected by discounts and measurement errors, but as we use panel estimation methods these concerns are alleviated.

2.3 Estimation Methods

Our empirical strategy proceeds as follows. We first use Instrumental variable (IV) methods and extend the analysis to panel data IV methods - either random or fixed effect ones - and we then compare the estimation results. This empirical strategy proceeds based on the following argument.

If differences between results obtained when using IV, random effect IV and fixed effect IV methods, in that order, are statistically significant, this means that fixed effect panel data results are to be preferred since those are the ones which are obtained under the least restrictive assumptions (Hsiao, 2004). Models for which IV and random effect IV are valid, are specific sub-models of the encompassing model in which IV fixed effect methods are valid. This means that allowing for specific product-and-firm fixed effects also controls for the endogeneity of discounts and measurement errors on top of controlling endogeneity using instruments.

In contrast, if estimates are statistically indistinguishable, we may retain the estimates under the most restrictive assumptions because standard errors are likely to be smaller and tests more powerful. In this empirical application, we will see in the following section that we retain the elasticities using the second method (random effect IV) as our preferred estimates because random effect and fixed effect estimates are quite close, and because the underlying binary model, on which selection correction is based, is also estimated by a random effect method.

3 Empirical Results

3.1 The Intensive Margin

Price elasticities estimated by simple IV methods are reported in Table 20.1. We only report the estimated elasticities even though the IV regressions also include time dummies and dummies for products and for customer size interacted with sectors. All instrumental regressions whose results are reported below are estimated using our main instruments, rate cards and sectoral prices. The results are robust to the choice of instruments when sectoral prices are replaced by lagged sectoral prices or only using sectoral prices. We also experimented with other covariates like the

Table 20.1 Price elasticities: Instrumental Variable method

Variables[i]	Coefficients	Number of obs.
Elasticity: β Full sample	−2.83 (0.30) [iii]	13 755
Class 1	−2.19 (0.65)	1 774
Class 2	−2.00 (0.47)	11 981
Brand[ii]	−2.64 (0.31)	3 442
Business[ii]	−3.13 (0.32)	3 126
Consumer[ii]	−2.85 (0.34)	3 910
Membership[ii]	−2.91 (0.32)	3 277
Turnover < 750000[ii]	−2.90 (0.31)	5 990
Turnover > 750000[ii]	−3.14 (0.31)	6 166
Missing Turnover[ii]	−2.23 (0.32)	1 599

Notes: (i) Control dummies (time, product, size and sectors) are included, although not reported; (ii) Estimates in sub-samples relative to sectors and size impose that the coefficients of controls (time, product, size and sector dummies) are the same; (iii) (standards errors in parenthesis)

price of potential substitutes (e.g., "downstream access" products[5]) but they turned out to be insignificant.

The simple IV method produces an estimated price elasticity in a 95% confidence interval [−2.2, −3.4] if we consider the full sample. In Table 20.1, we also report estimated elasticities by class (first class, and second class), by sectors and by size. Estimated elasticities in all sub-samples are not significantly different from the full sample ones.

In Table 20.2, we report estimated elasticities using random effect IV or fixed effect IV methods. The controls also include time, product and the interaction of size and sector dummies, although for obvious reasons, those, except time dummies, are absorbed by customer and product effects in the estimation by fixed effects.

Estimated price elasticities are considerably smaller in Table 20.2 than in Table 20.1, since the 95% confidence intervals are now [−0.86; −1.66] using random effects or [−0.68; −1.52] using fixed effects. These contrasting results with simple IV methods denote that the endogeneity of prices might partly be due to the unobserved heterogeneity of customers in term of the products they consume, and for which customer effects stand.

When we estimate those price elasticities by class, by sectors or by size, we obtained the same result that those elasticities are not significantly different than those obtained in the full sample. There is however slightly more heterogeneity by size for instance, the largest customers having a higher elasticity.

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[5] For example, over the data period examined, publishing mail customers could have used a Royal Mail competitor service in which the latter would collect, sort and trunk the mail prior to handing it back to Royal Mail and paying a downstream access price to deliver the mail to the recipient.

Table 20.2 Price elasticities: panel IV methods

Model	Price Elasticity	Price Elasticity
	Random effect IV	**Fixed effect IV**
Full sample	−1.26 (0.20)	−1.10 (0.21)
Class 1	−1.88 (0.37)	−1.74 (0.40)
Class 2	−1.02 (0.27)	−0.94 (0.28)
By sector		
Brand	−1.40 (0.21)	−1.42 (0.23)
Business	−1.21 (0.21)	−0.99 (0.22)
Consumer	−1.03 (0.22)	−0.75 (0.23)
Membership	−0.94 (0.22)	−0.63 (0.24)
By size		
Turnover < 750000 (size 1)	−1.19 (0.21)	−0.99 (0.22)
Turnover > 750000 (size 2)	−1.51 (0.21)	−1.27 (0.23)
Missing data (size 3)	−1.49 (0.22)	−1.59 (0.23)
Products 1,3, 6 only		
	−0.99 (0.23)	−0.68 (0.25)

Notes: (i) Control dummies (time, product, size and sectors) are included, although not reported; (ii) Estimates in sub-samples relative to sectors and size impose that the coefficients of controls (time, product, size and sector dummies) are the same; (iii) (standards errors in parenthesis). Random effect estimation method uses GLS, and the fixed effect one, a within estimation method

Finally, as results between random and fixed effects are not statistically different, neither in the full sample, nor in each specific subsample, we retain random effect results as our preferred estimates following our discussion above in Sect. 2.3.

3.2 The Extensive Margin

We now turn to estimates of the determinants of the probability of consuming each product in each period by customers that we have denoted as a binary variable Z_{ijt}. We used different estimation methods: (1) independent over time binary Logit and Probit models (2) random effect Logit and Probit methods with different correlation structures (Liang & Zeger, 1986; Hin & Wang, 2009). Namely, we assume that the marginal distribution at period t of the binary variable $Z_{ijt} \in \{0, 1\}$ is given by a normal or a logistic function (F) so that we can write:

$$E\left(Z_{ijt}|x_i\right) = F\left(x_{ijt}\,\beta\right),$$

as a function of covariates given in Eq. (20.2). When shocks are independent over time, the estimation principle boils down to a maximum likelihood

interpretation (Avery et al., 1983) and estimates are consistent and asymptotically normal. We assume that there is a random effect term that is constant over time for each customer and product it consumes, and we estimate coefficients by Logit or Probit type methods. The specification is still restrictive since the correlation structure is the same for all observations. In our empirical application however, performing model selection among alternatives, following Pan (2001), leads to the simplest correlation structure given by random effects.

First it is to be noted that the frequency of consumption for publishing mail is higher than that for advertising mail in the paper by Fève, Magnac and Soteri, 2020. Table A in the Appendix reports frequencies of non-zeros and shows that Products 2, 4 and 5 are not consumed very frequently. This affects the convergence of a few of the estimation methods below, and therefore the estimations we report only use the observations relative to products 1, 3, and 6.

Table 20.3 reports the estimated elasticities at the extensive margin derived from Probit and Logit estimated coefficients presented in Tables B and C in the Appendix. The estimate is equal to −0.80 for Logit with a standard error around 0.4. The estimated elasticity at the extensive margin for Probit is larger in absolute value, and around −1.3. Both estimates are significant at the 5% level.

Estimated elasticities by class, by sector and by customer size are also presented in Table 20.3. Elasticities do not vary significantly across first and second class, or turnover, but vary significantly across sectors, more so than at the intensive margin, especially Business or Consumer sectors for which the extensive margin elasticities are small and insignificantly different from zero. This might be because binary information is much poorer than rich information on levels of purchases although publishing mail tends to be highly price sensitive customers in sectors Brand and Membership.

Table 20.3 Price elasticities at the extensive margin

| | PANEL random effect | |
	Logit	Probit
Full sample[i]	−0.84 (0.37)[ii]	−1.34 (0.65)
First class	−0.77 (0.44)	−1.19 (0.55)
Second class	−0.95 (0.45)	−1.57 (0.52)
Brand	−1.00 (0.43)	−1.55 (0.67)
Business	0.01 (0.39)	0.14 (0.71)
Consumer	0.03 (0.39)	0.18 (0.71)
Membership	−2.15 (0.49)	−3.59 (0.68)
Turnover < 750000 (size 1)	−0.74 (0.41)	−1.13 (0.66)
Turnover > 750000 (size 2)	−0.52 (0.40)	−0.84 (0.66)
Missing data (size 3)	−1.44 (0.44)	−2.37 (0.64)

Notes: (i) Products 1,3, 6 only: product 1: Large Letter 1C High Sort, product 3: Large Letter 2C High Sort, product 6: Parcel 2C High Sort
(ii) (standard errors in parenthesis)

3.3   Testing for Selection Issues

Using these results, we can now return to our estimation of the intensive margin and test for selectivity issues. As each product is consumed a varying number of times over the period, it could be that unobserved determinants of positive consumption might be correlated with unobserved determinants of volumes sent by mail as given in Eq. (20.1).

We use the standard Heckman selection procedure using the Mills ratio (Heckman, 1979) as it arises in labour economics to test and correct for selection bias when we estimate hours of work equations given labour market participation (for women in particular). In this case, the dependent variable is truncated, i.e., a non-zero outcome is observed for participants only. If this is not taken into consideration in the estimation procedure, OLS estimates are biased (selection bias). If normality of errors is assumed, the introduction, in the OLS estimation, of an additional regressor, called the Mills ratio, allows selection bias to be tested and if rejected, also corrects for selection bias.

Indeed, the selection term (Mills ratio) is significant in our empirical application when the estimates are obtained through simple IV (a Student statistic over 6) or some of the panel IV fixed effect estimations. When using panel data random effect methods however, the Mills ratio is not significant (Student statistic equal to 0.9). This means that allowing for product-and-firm effects is sufficient in controlling for selectivity and there are no significant selection biases.

3.4   Full Price Elasticities

The estimated publishing price elasticities at the intensive margin reflect the extent to which customers' demand reacts to price changes of the specific publishing products that customers purchase. While the elasticities at the extensive margin provide estimates of the impact of price changes on customers' decision to start, stop or continue purchasing a specific product.

The price elasticity at the intensive margin is estimated using a conditional model while the elasticity at the extensive margin is estimated using a marginal model.[6] Given the empirical conclusion we arrived at above on the absence of selectivity, these two estimates are independent, and full publishing price elasticity estimates can be estimated by summing the intensive and extensive elasticity estimates. For example, Table 20.4 reports the estimated elasticity at the intensive margin using our preferred random effect model for products 1, 3 and 6 (−0.99 with a standard error of 0.23, see Table 20.2), to be consistent with our extensive model results

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[6] Because extensive margin elasticities are estimated using a restricted set of products (1,3, and 6), the intensive margin elasticities, reported in Table 20.4 below, were estimated using this restricted sample. They thus differ marginally from those reported in Table 20.2.

Table 20.4 Full price elasticities

Margins/Methods	Logit	Probit
Intensive	−0.99 (0.23)	
Extensive	−0.84 (0.37)	−1.34 (0.65)
Full	−1.84 (0.44)	−2.34 (0.69)

Notes: Products 1, 3 and 6 only. product 1: Large Letter 1C High Sort, product 2: Large Letter 1C Low Sort, product 3:Large Letter 2C High Sort, product 4:Large Letter 2C Low Sort, product 5:parcel 1C High Sort, product 6: parcel 2C High Sort

reported in Table 20.3, and provides estimates for the full price elasticity equal to −2.34 (with a standard error of 0.69) using the Probit estimates and −1.84 (with a standard error of 0.44) using the Logit estimates.

In terms of informing UK postal market insights, it seems that our estimates for full publishing price elasticities are consistent with views expressed by Royal Mail commercial and sales personnel in which they cite increasing postage costs to have a substantial negative impact on the quantity of physical publishing mail sent by organisations.

With regards to informing postal operator strategies in the UK our results suggest that if they wish to increase publishing mail volumes (or more likely, slow down the rate of decline) as high street closures continue to take place, and possibly accelerate in a post-Covid environment, postal operators should pay particular attention to the price sensitivity of such mail and consider the merit of adopting differential pricing profiles for this stream of mail compared to other types of mail and possibly lowering publishing mail prices where it is feasible to do so and providing a greater degree of price certainty to cost conscious publishing customers.

4   Conclusions

This paper examined the behaviour of Royal Mail publishing customers over the period 2011 to 2018 to provide new insights on the degree to which periodical and magazine mailings in the UK are sensitive to price changes. The main conclusion reached in this paper is that UK publishing mail full price elasticity estimates (equal to the sum of the estimates at the intensive and extensive margins) are, in aggregate, of the order of around −1.8, and therefore although some segments of traffic are estimated to be higher than this (Brand and Membership magazines) and some lower (Business and Consumer), the sensitivity of publishing mail demand to price changes is, in general, price elastic.

Our findings differ to those of Nikali (2016) and Bzhilyanskaya et al., (2015) who report low mail price elasticity estimates for periodicals and magazines in Finland and the USA of around −0.2 and −0.6 respectively. However, they are more directionally consistent with those reported in Borsenberger and Muller (2019) who estimate reader price elasticities for different types of non-news magazines in

France to be in the range -1.5 to -2.1, which suggest magazine reader circulation figures in these segments are somewhat sensitive to changes in magazine prices.

Consequently, our results suggest that postal operators and policy makers should consider paying more attention to the price sensitivity of publishing mail. In particular, it is recommended that postal operators consider the merit of adopting differential pricing profiles and policy maker frameworks allow greater pricing flexibility to increase mail consumption that are able to deliver a positive contribution to meeting the cost of providing postal universal service obligations.

Appendix

Table A Frequency of consumption

	Product 1 Large Letter 1C High Sort		Product 2 Large Letter 1C Low Sort		Product 3 Large Letter 2C High Sort		Product 4 Large Letter 2C Low Sort		Product 5 Parcel 1C High Sort		Product 6 Parcel 2C High Sort	
	Nbr	Freq.	Nbr	Freq.	Nbr	Freq.	Nbr	Freq.	Nbr	Freq.	Nbr	Freq.
$n_{ij} = 0$	1 612[a]	79.17	2 016	99.02	95	4.67	1 954	95.97	1 966	96.56	1 770	86.94
$n_{ij} = 1$	163	8.01	12	0.59	300	14.73	26	1.28	29	1.42	91	4.47
$n_{ij} = 2$	70	3.44	3	0.15	253	12.43	12	0.59	9	0.44	50	2.46
$n_{ij} = 3$	48	2.36	2	0.10	212	10.41	7	0.34	8	0.39	27	1.33
$n_{ij} = 4$	20	0.98	–		128	6.29	9	0.44	5	0.25	16	0.79
$n_{ij} = 5$	21	1.03	2	0.10	110	5.40	9	0.44	6	0.29	21	1.03
$n_{ij} = 6$	18	0.88	–		118	5.80	2	0.10	2	0.10	15	0.74
$n_{ij} = 7$	8	0.39	–		106	5.21	4	0.20	7	0.34	9	0.44
$n_{ij} = 8$	15	0.74	1	0.05	113	5.55	13	0.64	2	0.10	12	0.59
$n_{ij} = 9$	11	0.54	–		117	5.75	–		1	0.05	6	0.29
$n_{ij} = 10$	50	2.46	–		484	23.77	–		1	0.05	19	0.93
TOTAL	2 036	100.0	2 036	100.0	2 036	100.0	2 036	100.0	2 036	100.0	2 036	100.0

n_{ij} = the number of times if the firm i consumes product j all over the time period
[a] 79.17% (that is 1 612 / 2 036 customers) never consume product 1 in any period from 1 to 10

Table B Coefficients of prices: repeated cross-section binary models

Model	Coef.	Nbr of obs.
Products 1,2,3,4,5,6		
LOGIT	-0.47 (0.16)	114 016
PROBIT	-0.15 (0.07)	114 016

Notes: Standard errors in parenthesis

Table C Coefficients of prices: random effect ML or GEE methods

Model	Estimated coefficients	
Products 1,3,6[i]	PANEL random effect LOGIT	PANEL random effect PROBIT
Global	−1.05* (0.47) [ii]	−0.52* (0.25)
Number of observations 61 080		
By sector		
Brand	−1.26* (0.50)	−0.58* (0.26)
Business	0.01 (0.51)	0.05 (0.27)
Consumer	0.04 (0.53)	0.07 (0.28)
Membership	−2.71* (0.53)	−1.35* (0.28)
By size		
Turnover < 750000 (size 1)	−0.93 (0.49)	−0.43* (0.26)
Turnover > 750000 (size 2)	−0.66 (n.s.)	−0.32 (0.26)
Missing data (size 3)	−1.80* (0.52)	−0.90 (0.28)
By class		
Class 1	−0.96* (0.48)	−0.46 (0.26)
Class 2	−1.19* (0.50)	−0.60* (0.27)

Notes: *denotes statistically significant at 5% level
(i) product 1: Large Letter 1C High Sort, product 3: Large Letter 2C High Sort, product 6: Parcel 2C High Sort (ii) (standard errors in parenthesis).

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Chapter 21
The Temporal and Spatial Dynamics of the USPS' Service Performance Scores Over the Period 2011–2020

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1 Introduction

For each market dominant product,[1] the United States Postal Service (USPS), henceforth, the Postal Service, is required by law to measure and report its service performance against an annual target. The Postal Regulatory Commission, henceforth, the Commission, then makes a determination on whether the Postal Service is complying with the statutory requirements regarding service performance. Statutory requirements pertain to an aggregated national number for each product. Consequently, the service performance result that is compared to the annual target and for which the determination of compliance is made, is a nationwide average. However, postal customers experience service performance failures at a local, rather than nationwide, level.

Although not used in determining compliance, to further transparency Commission rules also require USPS to report service performance results at a more granular level than a nationwide average. The rules require reporting below the product level for some categories of mail, disaggregated by geographical area, and on a quarterly basis. Service performance results are reported for each Postal

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[1] USPS products are categorized as either market dominant or competitive based on specific criteria.

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District, along with aggregated Area-level and National-level service performance scores, and volume weights. Variance scores measuring late mails' excess-time relative to standards are also reported. This allows comparison across several different metrics.

A possible shortcoming of this reporting of service performance scores, however, is that they do not account for spatial variations in results at the district or area levels. Because the Postal Service delivery system is a network, geographical variations in the network's node-specific performances raise a number of questions, such as: Are the variations important? Are they persistent over time or sporadic? Are the underperformances localized to a set of nodes or spatially distributed? Are the spatial variations due to inadequate resource allocations to geographical nodes or to purely exogenous factors or both? The answers to these questions are important from both a regulatory and operator point of you as they can lead to improved overall service performance, higher customer satisfaction, and potential cost savings from properly allocated resources.

Questions like the above cannot be adequately answered without first designing a set of metrics to measure the phenomenon. This chapter is devoted to the measurement question. The statutory requirements regarding the reporting of service performance measures are the level of service, described in terms of speed of delivery and reliability, on an aggregated basis, not of the variation across spatial entities, such as administrative districts. (Order 4697, July 5, 2018, available at prc.gov). A systematic account of inter-district or inter-area variation in performance scores is absent from the Postal Service's reports and the Commission's compliance reports.

The present chapter argues from both economic and policy perspectives that, although part of it is due to idiosyncratic geographic differences, the relative performance differences between administrative districts or postal areas are, or should, for a given performance standard, be part of the quality of service measurement. It views the district-specific service performance scores as inter-related dimensions – spatial dimensions – of a same "good", namely, service quality, demanded by the public and supplied by the Postal Service, along with each mail product. For this reason and others that are discussed below, spatial variations in the level of service quality should be deemed relevant to the assessment of service performance. The chapter proposes a methodology in which the incorporation of spatial variance in the composite score results from a reweighting of the reported scores based on the performance measurement volume-weights reported by the Postal Service along with the performance scores. With the new weights, the aggregate (or composite) score automatically incorporates the coefficient of variation across the local (district-level) scores. This new composite score is applied to analyze the dynamics and the spatial structure of the reported scores over the period 2011–2020. The chapter focuses on Single-Piece First-Class Mail (SPFCM) service performance.

The relevance of the methods developed in this chapter extends to any situation in which there is a need for an overall assessment of a group of entities in which the performances of the members are reported as percentages. As a word of notice, this chapter does not address the open-ended quality-relevant issues raised by the

dichotomy existing, in the case of the Postal Service, between market-dominant products and competitive products.

Section 2 proposes the score aggregation method that adjust the existing one for spatial dispersion of the performance scores. The time series of the resulting composite score is analyzed to stress the periods of relatively large dispersion among the district scores. This analysis is also performed for each area and the contrast between the time-evolution of the within-area and nation-wide dispersion of the scores is stressed. In Sect. 3, an econometric model for the dynamics of the performance scores, in which the new composite score plays a substantial role, is specified and estimated and the estimation results are discussed. Section 4 concludes the chapter.

2 Adjusting the Aggregate Service Performance Scores for Spatial Dispersion

2.1 Background on Service Performance Measurement

In July 2018, the Postal Regulatory Commission, approved the replacement of the Postal Service's External First-Class (EXFC) service performance measurement system for market dominant products with an internal Service Performance Measurement (SPM) system. Both the legacy and the new system measure delivery performance against delivery service standards. Service standards represent time requirements (in days) for mail piece delivery set by the Postal Service. For example, the service standards pertaining to SPFCM, which have changed over time, are 2 days or 3–5 days. The Postal Service sets annual service performance targets for each product and service standard (mail type). These targets represent the percentage of time that the Postal Service will meet or exceed the given service standard. These targets are set by the Postal Service's Executive Leadership Team (ELT), with the Board of Governors approval.

The legacy system, operated by a third party, tracked test pieces injected into the mail delivery system on an end-to-end basis. It determined service performance of letter-shaped mail pieces by measuring the duration from the time a test piece enters the mail stream (via a postal facility, collection box, post office, or lobby chute) to the time it was delivered to its final destination—typically a home or business address. The recorded duration was compared with the applicable standards to calculate the performance score as the proportion of mail pieces delivered on-time.

The new system does not track mail pieces end to end. For Single-Piece Letters/Cards that enter the mail stream via a collection receptacle, it combines samples over three stages of the delivery process: First Mile (collection), Processing Operation, and Last Mile (delivery). These performance scores are computed based on the delivery times recorded from these samples.

To present analytically the problem that the chapter is seeking to address, the following notations will be used: let the target be denoted by τ. Let P_j denotes the

service performance score pertaining to District j; $P \equiv (P_1, \ldots, P_N)$ is the performance score configuration over the set of N districts (for example all the postal districts of the nation); $\eta \equiv (\eta_1, \ldots, \eta_N)$ is the corresponding vector of volume weights, with η_j denoting the proportion of (performance-measurement) volume assigned to District j's score in total (performance-measurement) volume.[2] With these notations, the aggregate score for the N districts is $\bar{P}_\eta \equiv \sum_{j=1}^{N} \eta_j P_j$.

The Postal Service's assumed goal is to get each district's score as close as possible to the target and this goal can be expressed as the effort to minimize under some budget constraint, the Euclidean squared distance,

$$\left\| P - (\tau, \ldots, \tau) \right\|_\eta^2 \equiv \sum_{j=1}^{N} \eta_j \left(P_j - \tau \right)^2, \tag{21.1}$$

between the performance configuration and the N-dimensional constant target configuration $(\tau, \ldots, \tau)$.[3] The decomposition

$$\sum_{j=1}^{N} \eta_j \left(P_j - \tau \right)^2 = \sum_{j=1}^{N} \eta_j \left(P_j - \bar{P}_\eta \right)^2 + \left(\bar{P}_\eta - \tau \right)^2 \tag{21.2}$$

highlights the two inextricably related components of the objective function: the effort to raise the aggregate score, i.e., to minimize $\left(\bar{P}_\eta - \tau \right)^2$, and the effort to minimize the spatial dispersion of the score, i.e., to minimize the variance $\sum_{j=1}^{N} \eta_j \left(P_j - \bar{P}_\eta \right)^2$. This analysis underscores the importance, in assessing the overall service quality of the Postal Service, of looking not only at the individual scores and the aggregate scores, but also at the spatial dispersion of the scores.

Noteworthy is the fact that although the equality $\sum_{j=1}^{N} \eta_j \left(P_j - \bar{P}_\eta \right) \left(\bar{P}_\eta - \tau \right) = \left(\bar{P}_\eta - \tau \right) \sum_{j=1}^{N} \eta_j \left(P_j - \bar{P}_\eta \right) = 0$ makes the covariance term irrelevant in (21.2), the nullity of this covariance does not mean that districts' performances do not interact. The relation (21.2) stresses the fact that the effort to achieve the service-performance standard in each district entails the minimization of discrepancies among district, as captured by the variance $\sum_{j=1}^{N} \eta_j \left(P_j - \bar{P}_\eta \right)^2$, an issue that is not given due attention in the existing reporting policy.

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[2] The performance-measurement volume is the volume determined as part of the service performance measurement system. It does not represent actual mail volume flowing to or departing from a postal district.

[3] The scores are in percentage.

2.2   *A Composite Performance Scores Accounting for Spatial Dispersion*

A thorough assessment of service-quality performance should include the national scores, discussion of the individual district scores, and the spatial dispersion among the district scores. Figure 21.1 displays the time (quarterly) evolution of the current national volume-weighted service performance scores for the 3 service-performance standards considered in the chapter, namely, Overnight mail, 2-Day mail and 3–5-Day mail.[4] These time trends provide no information on how the scores are spatially distributed.

To address the spatial variation problem, the overall service-quality performance assessment could use a bi-variate metric (for example, the average and the standard error). A practical reason for not doing so is that score configurations pertaining to
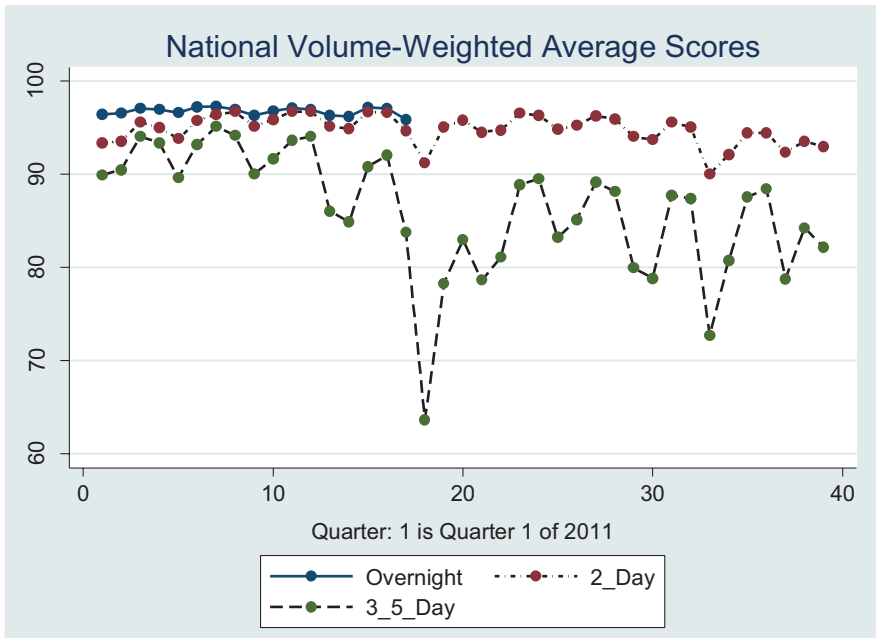

Fig. 21.1 Nationally aggregated performance scores over the 40 quarters

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[4]In 2015 the Postal Service discontinued overnight service for First Class Single Piece Mail. DEFINE.

two different quarters may not be comparable. One could have a larger average score, but also a larger standard deviation compared to the other.[5]

Building a univariate metric that serves the same purpose should satisfy some minimal requirements. First, the resulting aggregate score should be derived as a weighted average of the initial scores and be meaningfully comparable to the currently reported aggregate score. Second, the new aggregate score should remain invariant to whether the scores are expressed in decimals or percentage, i.e., the aggregate score must be invariant to a scaling of the score configuration under consideration. These two requirements can be satisfied by appropriately reweighting the scores using both the score configuration and the score-measurement volumes, as shown in the next section.

2.2.1 Reweighting the District-Specific Service-Performance Scores

This section concentrates on the national weighted average score. The derived conclusions will apply to all levels of aggregation. The main benefit of reweighting the district-specific scores is to identify areas of poorer performances based on the presumption that an important objective of performance assessment is to invite more scrutiny on localized perturbations that result in below-average performance scores. The underlying rationale is the known fact that localized perturbation in a complex network can induce domino-like sequences of failures and cause major damage to how the overall network functions.[6]

Starting from the initial performance-measurement volume-weights, η_j, $1 \leq j \leq N$, new weights, $w_j(\eta, P)$, $1 \leq j \leq N$, are described by the mapping

$$\eta_j \mapsto w_j(\eta, P, a) \equiv \eta_j\big(a + G(P)P_j\big), \tag{21.3}$$

for all N > 2, where a is a real number assumed to satisfy $a > 1$, and $G(P)$ is some suitable function of the performance configuration score P. In relation (21.3), the reweighting factor, $a + G(P)$ is a two-part factor. The reweighting is done, therefore, by simply multiplying the existing weight by a factor, ($a + G(P)P_j$), that depends on the performance configuration and the individual score under consideration. The fixed part a of the reweighting factor represents, as it will soon become clear, the maximum factor by with the measurement weight η_j can be scaled up. It is common

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[5]A bi-variate aggregate measure will most likely generate a partial ordering over the set of all possible score configurations. In other words, assuming that a higher average score is better than a lower one and a lower standard deviation better than a higher one, two score configurations may not be comparable using the bivariate metric. For example, the one with higher average may also have a higher dispersion compared to the second. In contrast to this, a one-dimensional composite score would generates a total ordering over the set of score configurations: for every two score configurations, one has a larger composite score than the other or the two have equal composite scores.

[6]See for example, Daqing et al. (2015).

to all districts and corresponds to the unlikely case where a district has a null performance score ($P_j = 0$). For District j, the variable part of the scaling factor is the product of the function $G(P)$ by District's performance. The function $G(.)$ is assumed to be symmetric in its components and independent of j. In fact, the requirement that the new weights add up to 1 and the condition that the function $G(P)$ is independent of j assure that $G(P)$ depends only on the average score $\overline{P_\eta}$. Indeed,

$$\sum_j w_j(\eta, P, a) = \sum_j \eta_j \left(a + G(P)P_j\right) \tag{21.4}$$

$$= a + G(P)\sum_j \eta_j P_j = a + G(P)\overline{P_\eta} = 1, \tag{21.5}$$

which implies,

$$G(P) = \frac{1-a}{\overline{P_\eta}}. \tag{21.6}$$

Hence, the reweighting formula takes the form

$$\eta_j \mapsto w_j(\eta, P, a) \equiv \eta_j \left(a - (a-1)\left(\frac{P_j}{\overline{P_\eta}}\right)\right) = \eta_j \left[1 - (a-1)\left(\frac{P_j}{\overline{P_\eta}} - 1\right)\right]. \tag{21.7}$$

The weight $w_j(\eta, P, a)$ will be positive if and only if $P_j < \dfrac{a}{a-1}\overline{P_\eta}$. The latter inequality determines the set of district scores that will be included in the assessment. Scores larger than the threshold score $\dfrac{a}{a-1}\overline{P_\eta}$ will not be considered, or will be considered high enough to be ignored in the aggregation. The remaining scores are simply normalized so as to sum to 1.

Remark The mapping (21.7) can, in fact, be generalized by introducing a new parameter, $c > 0$, as follows[7]:

$$\eta_j \mapsto w_j(\eta, P, a, c) \equiv \eta_j \left(1 - \left(\frac{a-1}{c}\right)\left[\left(\frac{P_j}{\overline{P_\eta}}\right)^c - \frac{\overline{P_\eta^c}}{\left(\overline{P_\eta}\right)^c}\right]\right). \tag{21.8}$$

where the following additional notation is used for moments of order c: $\overline{P_\eta^c} \equiv \sum_j \eta_j P_j^c$.

It can easily be verified that the right-hand side of (21.8) sums to 1 over the indices j and it is positive if and only if

[7] This alternative reweighting has some relation with the analysis conducted in A. F. Shorrocks (1982, pp. 193–211).

$$P_j < \overline{P_\eta} \left[\frac{c}{a-1} + \frac{\overline{P_\eta^c}}{\left(\overline{P_\eta}\right)^c} \right]^{1/c} \tag{21.9}$$

The case $c = 1$ corresponds to (21.7). $c = 0$ is a limit case. To fix ideas, the rest of the chapter concentrates on the case $c = 1$.

The weight $w_j(\eta, P, a)$ in (21.7) is a one-parameter family of weight vectors, depending on the parameter a, which will be specified by imposing the following two additional requirements: (i) the maximum factor to apply to a weight η_j with corresponding score $P_j = 0$ is made to depend on size of the network, roughly measured by the total number of postal districts. So, this number will vary according to whether the service performance assessment is conducted at the national or area level. Consequently, the parameter a, is assumed to increase as the total number of district increases. It is specified, therefore, as a proportion of the total number of districts, i.e., $a = kN$, for some positive integer k; (ii) $w_j(\eta, P, a) = \eta_j$ for $N = 2$, i.e., there is no reweighting if only two districts are considered.

The condition (i) has the meaning that the greater the number of districts included in the service performance assessment is, the more complex the system to assess will be, and the larger the weights assigned to below-average performance scores will be.[8] To the extent that the number N of districts approximates the complexity of the service performance network, condition (i) is guided by the fact that localized failures of a complex network are usually not immediately apparent, hence the need to magnify their weight in the aggregate performance in order to help identify them. Condition (ii) is motivated by the conjecture that for a system of only two nodes, score averaging may not even be necessary for assessing the system's performance.

The conditions (ii), i.e., $[N = 2 \Rightarrow$ for all j, $(w_j(\eta, P, a) = \eta_j)]$, is equivalent to $\left[N = 2 \Rightarrow \text{for all } j, 1 - (a-1)\left(\frac{P_j}{\overline{P_\eta}} - 1\right) \equiv 1 \right]$, which implies $a = 1$ for $N = 2$. Together, (i) and (ii) imply $k = 1/2$ or $a = \dfrac{N}{2}$. The resulting weights are

$$w_j = w_j\left(\eta, P, \frac{N}{2}\right) = \eta_j \left[\frac{N}{2} - \left(\frac{N}{2} - 1\right)\left(\frac{P_j}{\overline{P_\eta}}\right) \right] \tag{21.10}$$

$$= \eta_j \left[\frac{N}{2} - \left(\frac{N-2}{2}\right)\left(\frac{P_j}{\overline{P_\eta}}\right) \right] = \eta_j \left[1 - \left(\frac{N-2}{2}\right)\left(\frac{P_j}{\overline{P_\eta}} - 1\right) \right]. \tag{21.11}$$

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[8] The derivative of $w_j(\eta, P, a)$ with respect to a is equal to $1 - \dfrac{P_j}{\overline{P_\eta}}$, and it is positive if $P_j < \overline{P_\eta}$. Hence, the weights assigned to below-average performance scores increase with a.
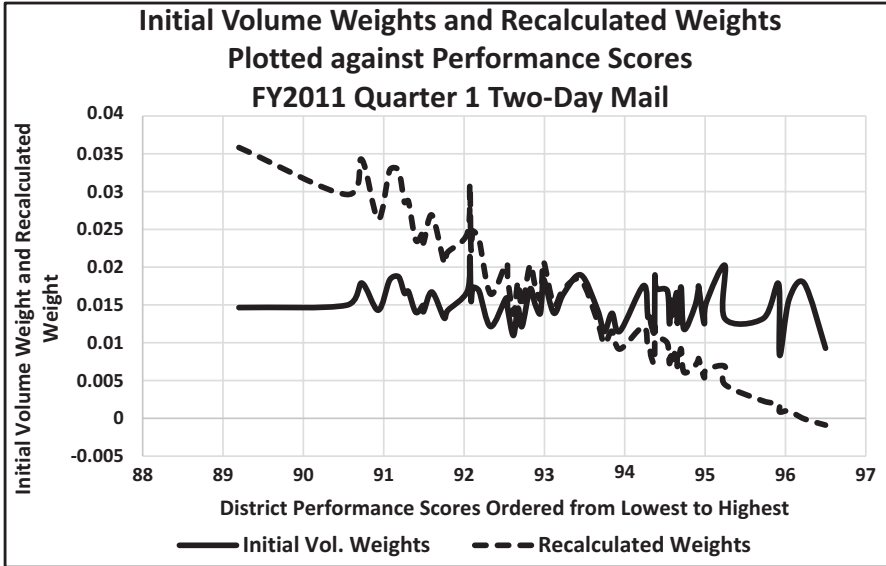
Fig. 21.2 Illustration of the reweighting

Figure 21.2 displays the plot of initial volume weights and recalculated weights (the performance measurement weights) against the district performance scores, shown on the axis in the order of the lowest to the highest, for Two-day mail and for FY 2011, Quarter 1. As the figure shows, the reweighting operation is a point-wise re-scaling and clockwise rotation of the score measurement weight curve. The weighted national average in the considered case is 93.3. The lower a performance score is relative to the national average, the larger the new weight assigned to it will be. Likewise, the larger a performance score is relative to the national average is, the lower the new weight assigned to it will be.

2.2.2 The Mean-Variance Composite Score

The aggregate score corresponding to the reweighting, denoted by $MV(P)$, is

$$MV(P) = \sum_{j=1}^{N} w_j P_j = \overline{P_\eta}\left[1 - \left(\frac{N-2}{2}\right)C_v^2\right] \tag{21.12}$$

where C_v^2 denotes the squared coefficient of variation of the scores computed using the measurement volume-weights, i.e.,

$$C_v^2 = \frac{Var(P)}{\overline{P_\eta}^2}, \text{ and } Var(P) = \overline{P_\eta^2} - \left(\overline{P_\eta}\right)^2 \equiv \sum_j \eta_j P_j^2 - \left(\sum_j \eta_j P_j\right)^2. \quad (21.13)$$

The aggregate score $MV(P)$ will be referred to as the Mean-Variance composite Score, in short, the MV score, for it incorporates both the mean and the coefficient of variation. It represents a downscaled version of the reported national aggregate score. It discounts more or less the reported aggregate score when the coefficient of variation increases or decreases.[9]

The MV score can be interpreted as measuring how well the operator has managed its resources to increase the aggregate national score, while reducing the dispersion among the district performance scores. The higher the MV score is, the more it reflects a better allocation of performance-relevant resources among the geographically dispersed nodes of the network. This interpretation should be made, however, conditional on uncontrollable factors, such as geographic characteristics and weather conditions. Alternatively, the MV score can be interpreted as measuring how geographically integrated the performance scores are, given the level of relevant resources that are spent. In this interpretation, a higher MV score provides evidence for a greater geographic integration of management efforts devoted to service performance. Understanding the effectiveness of resource allocation can help the operator design incentive mechanisms aimed at encouraging district and area managers to achieve the firm's overall goals. There can be tensions between manager-specific and overall firm goals. A properly designed labor-relevant incentive system could resolve those tensions. Although interesting, the exploration of this topic is outside the scope of this paper.

The magnitude of the scale factor, $1 - \left(\dfrac{N-2}{2}\right)C_v^2$, can be interpreted as a penalty.

The 3 graphs in Fig. 21.3 suggest that the gap between the quarterly reported national volume-weighted average score and the MV composite score is the largest for 3–5-day mail, followed by 2-day mail. Overnight mail, which is now discontinued, appears to have performed best in that respect over the period of its existence. The total size of the reweighting can be computes as the distance[10]

$$D = \sum_j \eta_j \left(\frac{\frac{w_j}{\eta_j} - 1}{\frac{N-2}{2}}\right)^2 = \sum_j \left(\frac{P_J}{\overline{P_\eta}} - 1\right)^2 = C_v^2. \quad (21.14)$$

---

[9] The ranking of service performance score configurations based on the MV score falls into the general setting of two-moment decision models. The consistency of these models is discussed in Jack Meyer (1987) and Haim Levy (1989)

[10] This distance is inspired by the one used in Johane Dufour et al. (2001).
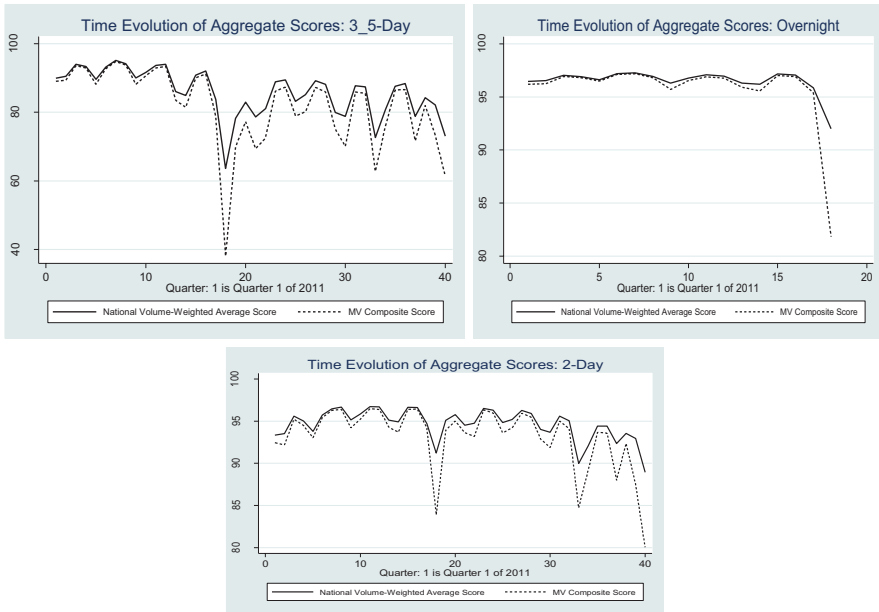
Fig. 21.3 Quarterly evolution of the reported and the MV scores

Hence, the larger the coefficient of variation is, the larger is the total size of the reweighting.

A quantitative comparison can be made by first noting the equality:

$$\frac{MV(P) - \overline{P_\eta}}{\overline{P_\eta}} = -\left(\frac{N-2}{2}\right)C_v^2 \tag{21.15}$$

Using the logarithmic approximation $\dfrac{MV(P) - \overline{P_\eta}}{\overline{P_\eta}} \approx \ln\left(\dfrac{MV(P)}{\overline{P_\eta}}\right)$, the averagerate of penalization over the time period considered, expressed in percentage, can be defined for the service standard S, π_S, as

$$\pi_S = -100\frac{\sum_t\left(\dfrac{MV(P) - \overline{P_\eta}}{\overline{P_\eta}}\right)_t}{T} = 100\left(\frac{N-2}{2}\right)\frac{\sum_t C_v^2(t)}{T} \approx -100\frac{\sum_t \ln\left(\dfrac{MV(P)}{\overline{P_\eta}}\right)_t}{T}$$

$$\tag{21.16}$$

where T denotes the total number of quarters.[11] A larger π_S means a larger penalization applied to the aggregate national score to reduce it. Hence, a lower π_S value is evidence of a smaller spatial dispersion of the performance scores. The calculated penalization magnitudes are:

$$\pi_{overnight} = 0.7\%, \ \pi_{2-day} = 1.5\%, \ \text{and} \ \pi_{3-5-day} = 4.0\%.$$

The calculations can, of course, also be conducted at the postal-area level, which allows comparisons to the 7 postal areas. Using the total rank as a summary of the ranking on the 3 service standards, Table 21.1 shows that the top performing group includes the Capital Metro Area, the Eastern Area, and the Pacific Area, which have, each, a total rank equal to 7. The remaining areas are in the following order of performance: Great Lakes Area, Western Area, Northeast Area, and Southern Area.

3 An Econometric Model for the Dynamics of Service Performance

The departure point of the present section is the interpretation of the *MV* score as the degree of geographic or spatial integration of the performance scores, given the performance relevant resources committed. However, the specific way in which the interpretation is used requires consideration of time. The first quarter of Fiscal year 2011 is interpreted as time one. At each subsequent quarter, say t, the history of the *MV* score up to time t describes the pattern of integration between the performance scores over that period $[1, t]$.

The network nature of the Postal Service suggests that the district-level scores are statistically interrelated, both temporally and spatially. The modelling assumption that will be maintained throughout the section is that once their interrelation is controlled for by the history of the *MV* scores, the scores behave statistically as if, at each given time, they only depend on district-varying and/or time-varying factors, but they no longer also on each other. Stated alternatively and more precisely, the assumption means that at each given time, given the history of the *MV* scores and a set of control variables to be listed, any group of scores is statistically independent of the scores non-members of the group.

3.1 The Model

The assumption described in the introduction to this section is now made formally precise: If X is a (column) vector of conditioning (or control) variables, the assumptions that the history of the *MV* scores summarizes the spatial interplay between the

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[11] The subscript t is applied to a parenthesis to indicate that all variables in the parentheses pertain to the quarter t. Also, $C_v^2(t)$ denotes the squared coefficient variation corresponding to quarter t.

Table 21.1 Area-level penalty

Penalty			
Postal area	**Overnight**	**Two-day**	**Three-five-day**
Capital Metro Area	0.36%	0.80%	3.42%
Eastern Area	0.49%	0.85%	2.62%
Great Lakes Area	0.70%	1.06%	1.69%
Northeast Area	0.75%	2.44%	7.65%
Pacific Area	0.68%	0.53%	2.70%
Southern Area	2.06%	2.03%	8.22%
Western Area	0.87%	1.28%	6.28%
Ranking			
Postal area	**Overnight**	**Two-day**	**Three-five-day**	**Total**
Capital Metro Area	1	2	4	7
Eastern Area	2	3	2	7
Great Lakes Area	4	4	1	9
Northeast Area	5	7	6	18
Pacific Area	3	1	3	7
Southern Area	7	6	7	20
Western Area	6	5	5	16

district-level scores is expressed by the following 3 relations in which, α, λ_1, …, λ_p, β, γ, δ, are parameters and ϵ_{tj} and ϑ_t are error terms:

$$(P_L)_t \perp\!\!\!\perp (P_K)_t \mid MV(P)_t, MV(P)_{t-1,}, MV(P)_{t-2}, \dots, MV(P)_{1,}, X_t, \text{ for all } L \neq K, L, K \subset \{1, \dots, N\}$$

21.17

where $(P_L)_t$ and $(P_K)_t$ are two *non-overlapping* groups of scores taken at time t, and $MV(P)_t$, $MV(P)_{t-1}$, $MV(P)_{t-2}$, …, $MV(P)_{1,}$ is the history of the *MV scores*.

$$P_{tj} = \alpha + \beta MV_t(P) + X'_{tj}\gamma + \epsilon_{tj} \tag{21.18}$$

$$MV_t(P) = \delta + \lambda_1 MV_{t-1}(P) + \dots + \lambda_p MV_{t-p}(P) + \vartheta_t \tag{21.19}$$

The Eqs. (21.17) and (21.18) describe the dynamics of the score configuration. Relation (21.17) states that given the history of the *MV* scores, the scores group $(P_L)_t$ does not depend on the remaining scores non-members of (P_L). In a linear spatial regression model, the dependence on nonmembers would be modelled, for example by some weighted combination of these nonmembers' scores with known weights. This role is played here by the average score adjusted for spatial variations, i.e., the MV score and its lags. Equation (21.18) states that at each time t, District $j's$ score, P_{tj}, is a linear function of the time-t MV score and the control variables.[12] Equation (21.19) states that the *MV* score's dynamics is linear and Markovian, i.e., it is a linear autoregressive process of a given order denoted by p.

Combining (21.18) and (21.19), one obtains

$$P_{tj} = \alpha_0 + \alpha_1 MV_{t-1}(P) + \dots + \alpha_p MV_{t-p}(P) + X'_{tj}\gamma + u_{tj}, \tag{21.20}$$

where α_0, α_1 are functions of the previous parameters and u_{tj} is a linear combination of ϵ_{tj} and ϑ_t.

Model (21.20) has a panel-data structure and the error u_{tj} will be assumed to be the sum of a district-specific effect, ξ_j, and an idiosyncratic error ν_{jt}: $u_{tj} = \xi_j + \nu_{jt}$.

The assumptions (21.17), (21.18), and (21.19) have the following implications:

(i) The prediction of a district-level performance score for time t, i.e., P_{tj}, only depends on the history of the *MV* score and the control variables to be listed.

(ii) The dependence of the district-level performance score on the history of the *MV* scores and the control variables is linear.

(iii) The P_{tj} may still be dependent over time.

These implications are summarized in model (21.20), the estimation of which will assume that the order of the autoregressive process, p, is equal to 2.

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[12] It is important to note here that the *MV* score is likely endogenous in (21.18) since it is built from all the scores, including P_{tj}.

3.2 Variable Description and Model Estimation

The estimation of the model (21.20) hinges upon the availability of control variables that are both time and district dependent. Actual mail volumes, not the volumes included in the performance score measurement, are the main control variables and they all depend on time only. Fortunately, the measurement of the score configuration is conditional on measurement volumes that are estimated by the Postal Service and depend both on the district and the quarter. Hence, the modelling of the distribution of the score configuration must take these volumes as given, even though they will likely be uncorrelated with the scores.[13] Their inclusion assures that at least one explanatory variable is both district and time dependent. As a byproduct, the claim that these measurement volumes have no effect on the scores becomes a statistically testable assumption.

The variables describing the actual volumes are the market-dominant FCSPM total volume and the competitive volumes: Express, Priority, Return, and International. The choice of actual mail volumes as explanatory variables is motivated by the assumption that higher volume may put more pressure on the delivery network and may, therefore, reduce service quality. Volumes, however, are handled by labor and the Postal Service is a labor-intensive network. Yearly work hours are also controlled for. Specifically, yearly total hours for clerks and mail handlers are included, as well as work hours for City Delivery Carriers and Vehicle Service Drivers.

Table 21.2 displays the summary statistics of the variables involved in the model. The estimation is performed separately for each service standard. The specified model is a fixed-effect linear panel data model and it is estimated using the STATA command *xtreg* with robust standard error.

In the estimation, each of 67 districts is observed over the number of quarters for which data are available. This number is only 18 for overnight mail and 40 for 2-day and 3–5-day mail.[14] Measurement volume is the only variable that is both time and district dependent. All the other covariates are time-dependent only, some of which, namely labor variables, are only observed annually. The estimation results are displayed in Table 21.3. To ease the interpretation of the results, the marginal effects per chosen units of change in the variables are summarized in Table 21.4, where the volume effects (the effect of actual volumes) are measured per one-million pieces change.

Statistical significance is indicated in Tables 21.3 and 21.4 with 3 stars for 1% level, 2 stars for 5% level, and 1 star for 10% level. As expected, from the within and between R-squared displayed in Table 21.3, it can be concluded that most of the explained variation in the scores is the variation over time. Table 21.4 shows that the lags in the *MV* scores are all significant, albeit the significance of the first lag is only

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[13] This lack of correlation can be viewed as a positive feature of the measurement system.

[14] There are a few missing data albeit very small in number due to small modification of area compositions in some quarters.

Table 21.2 Summary statistics

Variable	Obs	Unit	Mean	Std.	Min	Max
Overnight performance score	1206	Percent	96.44	2.10	68.29	100.00
Overnight mail measurement volume	1206	Pieces	7947.32	2561.13	38	23,637
2-Day performance score	2660	Percent	94.61	2.78	67.00	99.19
2-Day mail measurement volume	2660	Pieces	13300000.00	29000000.00	2333	176,000,000
3–5-Day performance score	2677	Percent	85.82	7.63	44.29	96.54
3–5-Day mail measurement volume	2677	Pieces	4959157.00	11300000.00	3151	90,800,000
Total first-class mail volume	2679	Thousands	15600000.00	1766865.00	12000000.00	19900000.00
Volume of express	2679	Thousands	9216.16	4224.62	5533.00	29763.00
Volume of priority	2679	Thousands	279198.50	150674.30	184188.00	1022959.00
Volume of select	2679	Thousands	602005.10	499188.40	74461.00	2796085.00
Volume of return	2679	Thousands	17642.26	10697.78	8715.00	69154.00
Volume of international	2679	Thousands	70562.67	33278.02	37567.00	207404.00
City delivery carriers and vehicle service drivers	2679	Million hours	14.46	2.25	12.30	18.30
Clerks and mail handlers	2679	Million hours	200.60	10.36	189.10	221.00

The volume data are collected from the Postal Service's Revenue and Revenue, Pieces & Weight (RPW) quarterly reports, Financials – What we do – About.usps.com. The labor data are collected from the USPS Annual Tables, TFP (Total Factor Productivity). USPS Reports | Postal Regulatory Commission (prc.gov)

Table 21.3 Estimation results

Variable	Overnight			2-Day			3-5-Day		
	Coef.	P > t		Coef.	P > t		Coef.	P > t	
Measurement volume	0.0004271	0.00	***	0.0000000	0.00	***	−0.0000001	0.00	***
Total first-class mail volume	0.0000045	0.00	***	0.0000006	0.00	***	0.0000033	0.00	***
Express	−0.0004704	0.01	**	0.0007279	0.00	***	0.0028752	0.00	***
Priority	0.0000168	0.17		−0.0000376	0.00	***	−0.0000983	0.00	***
Select	0.0000019	0.65		0.0000069	0.00	***	0.0000085	0.00	***
Return	−0.0000132	0.98		−0.0000277	0.33		−0.0001852	0.00	***
International	0.0000261	0.25		0.0000012	0.63		0.0000257	0.00	***
City delivery carriers	6.7897530	0.00	***	0.1797834	0.04	**	3.0769660	0.00	***
Clerks and mail handlers	−0.2437459	0.00	***	−0.0595082	0.00	***	−0.2102238	0.00	***
Quarter 2	6.4271090	0.00	***	1.0717130	0.00	***	4.7555150	0.00	***
Quarter 3	10.9260800	0.00	***	2.5307440	0.00	***	12.5128300	0.00	***
Quarter 4	12.2306400	0.00	***	1.7311750	0.00	***	10.4984500	0.00	***
Lag 1 of MV	1.1664500	0.08	*	0.1683766	0.00	***	0.2964039	0.00	***
Lag 2 of MV	1.5027160	0.02	**	−0.0935849	0.00	***	−0.1115757	0.00	***
Constant	−284.7015000	**0.05**		86.8835700	0.00	***	6.7576230	0.09	**
Sample Size	1072			2528			2543		
R-sq	**Within**	0.4117		**Within**	0.3674		**Within**	0.6166	
	Between	0.0000		**Between**	0.0036		**Between**	0.0721	
	Overall	0.3395		**Overall**	0.3089		**Overall**	0.5595	
F	F(14,66) = 23.61			F(14,66) = 93.55			F(14,66) = 212.58		
P > F	0.0000			0.0000			0.0000		

Table 21.4 Marginal effects

Variable	Marginal effect					
	Overnight		2-Day		3–5-Day	
	Significance	Effect	Significance	Effect	Significance	Effect
Measurement volume	***	0.000	***	0.000	***	0.000
Total first-class mail volume	***	0.004/Million	***	0.001/Million	***	0.003/Million
Express	**	−0.470/Million	***	0.728/Million	***	2.875/Million
Priority	No	0/000/Million	***	−0.038/Million	***	−0.098/Million
Select	No	0.000/Million	***	0.007/Million	***	0.009/Million
Return	No	0.000/Million	No	−0.028/Million	***	−0.185/Million
International	No	0.000/Million	No	0.001/Million	***	0.026/Million
City delivery carriers	***	6.790/Million	**	0.180/Million	***	3.077/Million
Clerks and mail handlers	***	−0.244/Million	***	−0.060/Million	***	−0.210/Million
Quarter 2	***	6.427	***	1.072	***	4.756
Quarter 3	***	10.926	***	2.531	***	12.513
Quarter 4	***	12.231	***	1.731	***	10.498
Lag 1 of MV	*	1.166	***	0.168	***	0.296
Lag 2 of MV	**	1.503	***	−0.094	***	−0.112
Std. of the performance score		2.10		2.78		7.63

at 10% for Overnight mail. They are strongly significant (1%) for 2-day and 3–5-day mail, which validates the assumptions (21.17), (21.18), and (21.19) underlying the model. Tables 21.3 and 21.4 show that measurement volumes are all significant and their effects are, as expected, negligible compared to the standard deviation of the scores corresponding to the service standards, displayed in the last row of Table 21.4. These standard deviations are calculated using in each case the entire sample, i.e., the sample observed over the entire time period of the analysis.

Volume effects are seen in Table 21.4 to be negligible when they are compared to score standard deviations. With the exception of Express volume, which has a negative effect on Performance, all other competitive mail volumes have zero effect on overnight performance scores. The signs of the volume effects are consistently the same for 2-day and 3–5-day mail. Priority and Return volumes have a negative effect on service performance while Express, Select and International volumes display positive effects. It is a known fact that statutorily, competitive products must not be subsidized by market dominant products. It is also expected that the management of competitive products will have zero or negligible impact on mail service performance. The negative effect of Priority and Return volumes should therefore raise concern. The characteristic of being the fasted service could suggest that priority Mail Express, by possibly mobilizing, more than other mail types, time and labor resources, puts more pressure on market-dominant mail service. So, the positive effect that Express mail volume has contributes to mitigate these concerns.

Table 21.4 displays an interesting contrast between the effects of City-carrier labor and clerk and mail handler labor, both measured in millions of hours.[15] A one-million-hour increase in City-carrier labor has positive effect on performance scores while the same change in clerk and mail handler labor has a negative (though somewhat small) effect on performance scores.

Seasonal effects are all significant at 1% level and indicate that the first fiscal quarter (October, November, and December) is the most burdensome quarter by its effect on service performance in comparison to the other quarters. These effects are stronger for overnight and 3–5-day mails than for 2-day mails.

4   Conclusion

This chapter has introduced a methodology for reweighting the quarterly (district-specific) service performance score so as to give the underperforming district, more representation and, hence, more visibility in the aggregate score. The outcome of the methodology is a composite score, called the Mean-Variance score (the *MV* score). The *MV* score is the reported aggregate score discounted by a factor which is larger, the larger the coefficient of variation among the scores is. It therefore put a penalty on the spatial discrepancy between the performance scores.

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[15] Recall that labor variables are measured annually in the data set.

The *MV* score is used next to control for the spatial integration between the performance scores in an econometric model, which seeks to explain the statistical variation in performance scores by the variations in a set of covariates including actual market dominant and competitive mail volumes, city-carrier labor and clerk and mail handler labor, and seasonal (quarter) dummies. The considered model is a linear panel data model, and it is estimated as a fixed effect model with robust standard error. Measurement volumes are controlled for since they condition all performance measurements and have the desirable property of varying with both district and quarter.

The results suggest that FCSPM mail volume, while statistically significant, has almost no effect on service performance and the negligible effect has an unexpectedly positive sign suggesting that more volume is good for service quality. The same can be said about competitive volumes, although the corresponding effect are greater in comparison with FCSPM volume. Labor variables have stronger effects than volumes on service performance. The *MV* score, which appears in its first 2 lagged periods has significant effects, providing some empirical support for the assumptions that motivate the inclusion of these lags among the covariates.

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